GAME DESIGN THROUGH THE LENS OF BEHAVIORAL ECONOMICS

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ABSTRACT

Game designers effectively design the experiences that players encounter when using a game (or gamified product). This makes the behavior of these players a key area of interest for designers, since understanding the responses that certain mechanics are able to elicit in the player is essential to the process. By expanding this understanding, a game designer can wield greater control over the players in question, resulting in an increased ability to design a specific experience. This paper intends to help expand the set of techniques available to the game designers of today. This is done by linking common game mechanics to concepts within the field of behavioral economics and examining why these mechanics are effective from that perspective. By examining these mechanics via the existing research in behavioral economics, game designers can increase their understanding of the root causes behind certain behaviors and gain the benefit of an alternate perspective, potentially illuminating new game mechanics or new ways to use existing ones. The included framework enables designers to begin with the desired goals of a project and then derive a type of mechanic to include based on the behavioral economic concepts tying the goals to the mechanics.

KEYWORDS

Game design, game mechanics, gamification, video games, behavioral economics

1. INTRODUCTION

With the growth and expanding reach of the video game industry, it is becoming a more prominent factor in our society. While it is fair to assume that the video game industry is predominantly focused on entertainment, it should be noted that video games are still software projects that potentially involve the creation, use, and storage of considerable amounts of data, making the industry highly relevant to the study of information technology. (Note that this paper focuses on *video games* in general, but only on *video* games, and as such, this relevance as well as the content of this paper may not be entirely applicable to all game types, specifically traditional or analog games such as board games, card games, or even sports.) As an integral part of the development of video games, the field of game design presents both researchers and practitioners alike with a unique set of opportunities and challenges. On one hand, game designers guide the conceptualization and creation of potentially massive software projects, most often intended for entertainment. This seems like it should be the quintessential creative field, where practically anything could be possible. However, on the other, the realities of the marketplace and implementation difficulties keep much of the field's potential from coming to fruition. The contrasting goals that a game designer must cope with can be seen in two quotes from Jesse Schell, in his landmark book on game design (Schell 2008). Early in the book, he contends that game designers need to "create games that will somehow create wonderful, compelling, memorable experiences." However, once the topic turns to profit, his outlook seems less idealistic when saying "… the money people are going to step in and tell you how to design your game, because they are afraid that you might not understand the impacts of your design on profitability."

To overcome, or at least somewhat mitigate, these challenges, game designers have a strong incentive to continually pursue new insights and enhance their professional abilities in order to expand the potential number and variety of mechanics and concepts that they're able to effectively bring to bear. This helps them to continually make the most of whatever constraints their next project is subject to. In Schell's words, "We must use every means we can muster to comprehend, understand, and master the nature of human experience." An additional challenge is the lack of a generally accepted formalization of these techniques which could help their collective development, accelerating the rate of innovation in the game industry. To illustrate this difficulty, it can even be difficult for game designers to agree on what the definition of a game actually is (Koster 2005).

With this in mind, this paper sets out to help game designers expand their perceptive abilities by suggesting an alternate lens though which a project may be considered. The intent for this potential expansion is twofold. First, by considering a set of relevant features from a different perspective, it may be possible to use current techniques in non-obvious situations or combinations, at least when compared to the common implementations in the industry today. Second, by examining the underlying causes behind the effects created by common mechanics and then linking those causes to existing research in an entirely different field, it may be possible to see more clearly what actually makes these techniques effective. The alternate perspective chosen for this paper is that of the behavioral economist.

2. BEHAVIORAL ECONOMICS FOR GAME DESIGNERS

2.1 Traditional Economics Versus Behavioral Economics

It is expected that most game designers have at least a general familiarity with the basic concepts within economics, as many games feature simple economies, which must be balanced to some degree. The field of behavioral economics may be less familiar, though it has the potential to be just as relevant as traditional economics, if not more so. A highly simplified definition would be that traditional economics focuses on what people would theoretically do if they were perfectly rational and were acting in their own best interest (Ariely 2008). In contrast, behavioral economics examines the behavior that people actually tend to display in real life and the reasons behind those behaviors. Of course, when people display the behavior that traditional economics would predict, there is not really a need for a divergent field, so the focus is really on the areas where people commonly diverge from the expected. However, that leads, unavoidably, to a potentially unsettling conclusion. If economics predicts rational behavior and behavioral economics focuses on areas where people diverge from that behavior, it is almost by definition focusing on irrational behavior.

2.2 Irrational Behavior

It may come as no surprise to game designers that players, at times, might behave in ways which are somewhat less than rational. What may be more surprising is that this irrationality is not entirely random. There are certain situations where people will behave irrationally in an oddly consistent manner. With this realization, Dan Ariely, a leading researcher and author in the field of behavioral economics, has noted that people are not simply irrational, they're *predictably irrational* (Ariely 2008).

If it is possible to engineer situations in the real world that cause people to tend to exhibit certain economic behavior, it should be possible to create similar effects within a virtual environment. There seems to be reasonable backing for this assumption in the existing research, with Lehdonvirta and Castronova (2014) going so far as to say, "In empirical studies, we have found no discrepancies in the fundamentals of economic behavior in virtual and real settings, and indeed there are no theoretical reasons to expect any." This concept seems highly relevant to game designers due to the potential control that they wield over the game environment. With the leverage possible through the increased potential for control, game designers could find themselves far more able to elicit and benefit from irrational behavior than the current level of awareness in the traditional game industry allows.

2.3 Ethical Considerations

Any research involving the undisclosed manipulation of subjects or users likely warrants a look into the ethics of the situation, and the control that the game designer wields over the behavior of players makes it especially relevant in this field. Some game mechanics can elicit responses remarkably similar to gambling, even when no money is at stake, and rewards from games can be addictive, resembling that of drugs (Karlsen 2013). Even when a technique may be considered ethically sound, some game designers may be uncomfortable with certain tactics or simply with the realization that they have the ability to surreptitiously alter a player's behavior. However, game designers should also keep in mind that much of the work they do, the creating of experiences, involves deciding what a player should be doing and how exactly to make the player do so. Of course, even if a player has not thought about their activity in this manner, they have surely submitted themselves to some level of control by deciding to engage in the act of playing a particular game. That's not to say that this submission absolves a designer of any responsibility, but the line is very blurry and likely requires each designer to make a choice about what is and is not acceptable. For example, a tool readily available and used by designers is the leveraging of emotional narrative devices which could cause distress for the player (Perry and DeMaria 2009). Some designers seem happy to elicit emotional distress while at the same time considering many forms of consensual payment via micro-transactions to be unethical. As another common example, online game companies obviously want to optimize player *retention* (the length of time a player continues to be an active player of a certain game) for financial reasons. However, they also likely want to distance themselves (for legal reasons, if not ethical) from intentionally designing *addictive* game mechanics.

3 GAME MECHANICS

3.1 A Game Designer's Intent

A game designer can have a difficult time defining the proper intent or purpose throughout the course of a project. At times (and typically to the designer's delight), the intent may be to make a game, or a certain element therein, *fun* (though that word comes with its own set of problems (Koster 2005)), entertaining, or otherwise enjoyable for a player. At other times, there are objectives which have the potential to conflict with the previously mentioned goals (Schell 2009). These typically take the form of some business-oriented metric that must be optimized. At the most basic level, major game projects are extremely expensive undertakings, and there can be great pressure on development teams to stick to a strict production schedule. However, as Bygstad and Waal (2013) point out, solidifying the required *fun factor* is not something that is easily adapted to rigid product management methodologies and schedules. Sadly for most designers, designing for optimal money extraction (or even for tight deadlines) is often at odds with designing for optimal enjoyment.

While these objectives can be aligned, as is arguably the case with games which have a business model based on a traditional, 100% up-front payment, this is becoming less and less the case with the rise of free-to-play variants. The following charts illustrate that as early as 2010, revenue from free-to-play games was eclipsing that of traditional business models in subscription-based segments and as early as 2011 in mobile segments.

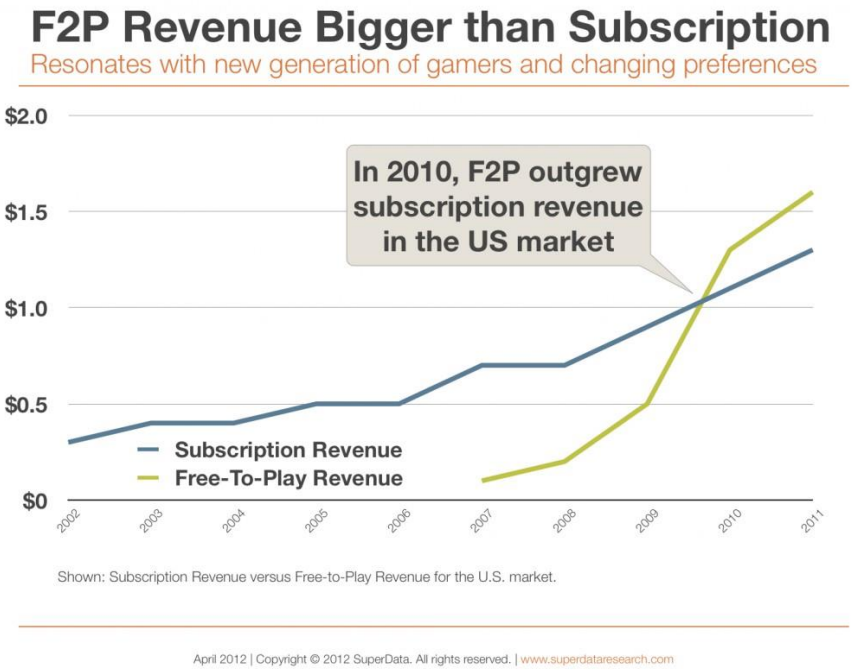

Figure 1. F2P Revenue Bigger than Subscription (Super Data Research 2012)

Figure 2. Revenue Generated, U.S. App Store Top 100 Grossing Games (Valadares 2011)

This expansion of the traditional goals which a game designer must be able to accomplish creates a need for a deeper understanding of not only the mechanics themselves, but also of the underlying reasons that make the mechanics function. Designers may instinctively recognize that certain types or categories of mechanics (various types of progression or advancement systems, for example) enhance player retention, but without understanding the various reasons *why* that result occurs, the designer is left in the dark to some degree. If a designer is tasked with eliciting typical results from typical mechanics, this may only be a theoretical problem, but this can quickly become a dire limitation if a designer would like to use innovative mechanics or achieve uncommon results. Note that the notion of innovative mechanics does not necessarily imply that such a mechanic must be one that has never been used before. Simply using a common mechanic in an uncommon way could suffice. Additionally, the innovation could occur at a

high or low level, or in other words, at the concept level or the implementation level. For example, the concept being able to trade items between players likely emerged as soon as games had both items and multiple players. However, using the ability to send gifts to non-players as a viral recruitment mechanism was an innovative technique that helped to drive the expansion of the social game market (such as with Zynga's various games). Potential players were exposed to the game by friends (introducing social proof) and via a gift that they can only get if they play (introducing loss aversion and reciprocity). This could be called a conceptual or high-level innovation since using a trading mechanic for the purposes of user acquisition wasn't a common mechanic at the time (even though it was possibly used in such a manner at some point). Soon after, that mechanic had evolved to include the possibility of restricting a player's advancement or progression unless they were able to successfully solicit multiple gifts from other players, driving either the retention of existing players or the acquisition of additional ones. This could be considered more of a low-level innovation since it was an incremental change to an existing mechanic.

3.2 The Evolution of Game Mechanics

Of course, when discussing common and uncommon game mechanics, one might obviously wonder how the common mechanics became common. The simple answer is because they worked. Some of the most familiar concepts in video games (concepts so common, we hardly think of them as mechanics at all!) predate the concept of video entirely (Elias, et al. 2012). Concepts such as competition and cooperation (teams) were present in sports long before anything appeared in video, not to mention concepts such as scoring, time limits, tournaments, etc. Video games pull many concepts from the past, and these concepts survived the test of time because they were effective at eliciting a desirable response. Of course, that may not have been the intended effect, if there even was an intended effect originally, but they have managed to successfully propagate their existence throughout countless games, thereby winning the current state of game mechanic evolution (Elias, et al. 2012).

However, in recent years, we have begun to understand enough about this process and about human behavior to begin moving it forward intentionally (though the driving factor is obviously the search for profit, assisted by games now having enough players to make it feasible). Specifically, social game companies popularized the use (at least in the game industry) of a technique called split-testing, where portions of a game's players are given different versions of the same game, each with a specific modification of a certain element. The behaviors of each segment's players are then measured to see which modification has had the desired effect, allowing for an unprecedented level of optimization. However, for the average game designer, it is not necessary to design these tests to benefit from the concept (though if one has the resources to do so, it can be incredibly effective). By analyzing how games change over time (especially games from companies that do have the resources for this), it is possible to draw one's own conclusions about the effectiveness of certain mechanics.

3.3 A Restriction on Innovation

A good game designer likely possesses an ever-expanding set of techniques that can be called upon to elicit various types of behavior from a player. However, it often seems as though the mechanics themselves are the focus instead of the experience they bring about for the player. At the macro level, game concepts seem to typically start with the type or genre of game, and then the details are filled in from there. Once the genre is decided, there are certain mechanics and expectations that are common to the genre, resulting in many decisions being made essentially by default. This is not to say the process is inherently bad, however. If a game does not fit within a previously recognized niche, or if it violates expectations too drastically, then players can find it difficult to connect with and enjoy the experience. To some degree, this forces innovation in the game industry to evolve iteratively, only making small leaps within certain areas of new titles. We do not often see entirely new genres explode into the industry. However, even considering that, starting with a set of mechanics instead of the experience that the set of mechanics is intended to create is a fundamental limitation on creativity in exchange for a set of decision-making shortcuts. This does not suggest entirely changing the concept creation process but only that there is another way, which could expand the set of techniques that a designer might consider in a situation.

4 LEVERAGING CONCEPTUAL PARALLELS

4.1 Outlining a Framework

By starting with a behavior-based framework, a game designer can approach a situation in a new way and with a number of potential techniques which may or may not have been considered otherwise. Additionally, the root causes of these behaviors can be further investigated via the existing base research on behavioral economics. While research may or may not exist on any specific mechanic, if the behavior and motivations that actually cause the mechanic to work can be examined, the designer would be better able to understand its effect. Additionally, even if such research exists within the field of game design, examining the effect through another perspective could add valuable insight.

This framework was originally developed in conjunction with an analysis of game mechanics and their potential uses within gamification settings (Butler forthcoming). The intent was to associate various behavioral economics concepts with common game mechanics which leverage those principles in order to enhance the development of gamification or game-based implementations. However, it should be noted that the game mechanics can typically elicit these resulting effects without the game designer being aware of corresponding behavioral economic concepts. This paper reconsiders the original framework with a focus specifically on game settings in order to allow the game designer to effectively work backwards from the workflow cited earlier. Using this process, the designer would start with the project's goals and use the outlined concepts to identify a category of mechanics that could best accomplish that goal. Once a category is chosen, a mechanic could be designed or adapted to best fit the current project. To better illustrate the difference, consider the different perspectives that the following two questions could enable. Game designs often start (sometimes explicitly, sometimes instinctively) with a question like, "We're going to make an *x*, so what mechanics do *x*'s need?" (In this case, the *x* could be any genre of game along with whatever modifiers are necessary, such as *a retro-styled role-playing game*, for example.) Compare that to a question more like, "We would like players to *x*, so what type of mechanics cause players to *x*?" (In this case, *x* might be *return to the game at least once per day*.)

4.2 A Bottom-Up Tool for Game Design

The framework is comprised of the behavioral economic concepts underlying common game mechanics, as well as the mechanics with which they are associated (Butler forthcoming). These concepts are organized into three key categories, as explained in the following three tables, based on what would be seen as the most typical use, though there can be considerable overlap in practice. It would likely be outside of the scope of this paper to define and discuss each concept individually, so this is kept to a minimum level. The intent is to provide what is effectively a bottom-up model for game design where designers start with the intended outcome and then derive a category of mechanics based on the behavioral economic concepts deemed most likely to lead to the desired result. The framework and this bottom-up process can be used together as a creative tool which provides an alternate lens from which to consider a game's design.

However, as a caveat, the following tables should not be used as a blueprint, assuming that the examples are features all games should have. The listed examples are simply implementations in existing games representing the matching behavioral economic concepts which have proven effective enough to become commonplace. One cannot accurately judge the effectiveness of any game mechanic in isolation nor when transferring a mechanic from one game to another. Everything about a specific game implementation has the potential to change the outcome, so the gestalt of the game as a whole must be considered. One might, more safely, use the following lists to inform the desired design outcome and then choose the core set of mechanics that will best support the design intent.

To illustrate how this could work in practice, imagine that a game designer has been tasked with creating a game that focuses on player retention or improving the retention of a current game. Improving retention is a fairly broad goal though, so it might be refined into a goal that is easily quantifiable and trackable such as the goal mentioned in a previous example, which was to encourage the player to *return to the game at least once per day*. The first table, Encouraging Engagement, focuses on concepts which drive player participation and are thus highly relevant to retention. The designer can then examine the table for the relevant concepts and their corresponding in-game effects, so *loss aversion* might be considered. To

paraphrase the descriptive text, to leverage loss aversion, the designer might want to find a way to introduce a cost to the player for *not* playing. How exactly this best manifests in-game is still in the domain of the designer, but an example might be a highly rewarding event that happens at a certain time each day, causing an absent player to lose the opportunity for the reward.

Moving in this direction forces the desired behavior to drive the mechanic and potentially enables the creative process to consider mechanics that might have otherwise been filtered out by genre convention, obscurity, or even preference.

Encouraging Engagement

The concepts listed here attempt to keep the player participating and returning to the game through either building obligation or preventing the sense of obligation from falling away. These mechanics can serve to increase a number of retention metrics, some effectively acting in a manner similar to a retargeting marketing campaign. (Butler forthcoming)

Concept:	In-Game Examples:
Loss Aversion The tendency to avoid loss or even a chance at a loss (Kahneman and Tversky 1984)	Once players realize that chances at rewards are lost if they are not taken advantage of them within a fixed time period, the opportunity cost of *not* playing can become acutely apparent. This is especially true in games with persistent elements, where competitors are potentially able to make progress while the player in question is offline. Common examples: • enemies to kill • plots to fill with crops • real-time events, etc.
Maintaining Intrinsic Focus Improper reward systems can turn an enjoyable activity into work (Heyman and Ariely 2004)	The inclusion of *grinding* activities, in which players are merely exchanging their time for a fixed reward, can destroy the joy of discovery, making an attained item a deserved payment instead of a spontaneous reward. This should be prevented as much as possible. Note however, that players will attempt to eliminate luck/chance whenever possible (Karlsen 2013). Common examples: • currency rewards for killing enemies • repeatable quests/tasks/missions • faction/reputation rewards • token/alternate currency rewards
Pseudocertainty The tendency to treat uncertain outcomes as certain (Tversky and Kahneman 1986), or to overestimate the value of the chance (Tversky and Kahneman 1979)	Introducing uncertainty can incentivize players to invest time into activities by making the uncertain outcome more desirable. Even when made aware of the probability via external means (spoiler websites, for example) the potential time investment is often disregarded due to the possibility of *getting lucky*. Common examples: • rare enemy spawns • rare rewards • card packs (as with collectable card games or similar micro-transaction purchases in video games) • lottery mechanics • slot machine mechanics

Table 1. Encouraging Engagement concepts and in-game examples

Guiding Action The concepts listed in this category attempt to keep the player moving forward in the game, often by making clear what action should be taken, preventing decision fatigue from setting in. Many mechanics based on these concepts are meant to boost retention and session times, drawing players in, and imparting significance to in-game action and elements. (Butler forthcoming)	
Concept:	**In-Game Examples:**
Paradox of Choice The tendency of people to see an increase in the number of potential choices as positive even though it makes choosing more difficult (Iyengar and Lepper 2000)	Carefully guiding the player prevent ambiguity, confusion, and decision fatigue. Players should have enough choice to keep them engaged, but a careful balance must be struck to ensure that they are not exposed to undue pressure from the choices. However, the optimal complexity can vary considerably between players. Using a very low complexity mode (in terms of gameplay, controls, or even GUI/HUD) by default while having advanced settings for expert players can be a good compromise. Common examples: • tutorials • linear progression • quest/task/mission systems • limiting the number of different items in a shop
Scarcity/Urgency The tendency to overestimate the value of an object with limited availability (Cialdini 2006)	Multiplayer, persistent games spawn a great deal of scarcity and urgency by their nature, since even in games that aren't directly competitive, progression (or at least accumulation) still incites competition between players. However, even in other game types, scarcity/urgency can be utilized via limited offers or careful resource allocation. Common examples: • enemies (especially rare or otherwise significant spawns) • gatherable resources • auction house/trade systems • limited offers/events (limited in time or quantity) • players for guilds/groups (possibly with highly desirable in-game traits or personal skills)
Variable Reinforcement Schedule Irregular reward patterns tend to maximize the repetition of an activity (Lee, Sturmey, & Fields 2007)	If you ensure that players know what to do for a reward (or at least, if they *think* they know what to do) but make the time between rewards variable (through uncertainty or other means), players will engage in the activity thought to provide the reward far more frequently than if the reward were given at a set or predictable rate. Common examples: • Rare drops/spawns • Card pack mechanics • Overcoming a difficult challenge (especially one where randomness is involved) • Rewards based on competition such as defeating another player or winning an auction

Table 2. Guiding Action concepts and in-game examples

Identity Investment

These concepts help to build a player's sense of identity via the game. The players invest their thoughts and efforts into creating and achieving in a game, thereby developing some sense of ownership over the elements that they have interacted with. This can lead players to develop bonds with those elements, making them reluctant to abandon them, even if they would prefer not to play the game. (Butler forthcoming)

Concept:	In-Game Examples:
Commitment The tendency of people to be more likely to act if they had previously agreed to act and for them to be more likely to act on subsequent requests (Cialdini 2006)	Allowing players to schedule their own time for returning to the game makes it more likely that they will do so. This can be done via appointment mechanics, where an activity requires a fixed amount of time but the player must return after that time to gain the reward for the activity's completion. An even more powerful method is to enable the player to make appointments with other players for a cooperative activity which relies on the presence of each committed member. Common examples: • harvesting crops • skill training • regular groups • guild raids
The Ikea Effect The tendency of people to overestimate the value of something that they contributed to creating (Ariely 2010)	Customization of any sort can enable a sense of ownership within the player. This is especially true if the customization takes some degree of effort. This effort might be in the form of deep/complex options, but it can also be based on in-game content and challenges, such as options that are dropped, unlocked, or otherwise rewarded via gameplay. Common examples: • avatar customization • player housing • character development/progression • pets/companion non-player characters • GUI/HUD
Sunk Costs The tendency of past decisions to affect future decisions, even when no rational reason exists (Arkes and Blumer 1985)	Once a player has invested in a game, whether it be money, time, or effort, it can be irrationally difficult to stop playing because it makes the investment seem wasted. Therefore, any mechanic that increases this investment or makes the investment obvious can intensify this effect. This could include any completionist content as well as any opportunities to develop or display mastery. (Being an expert at one game can make it painful to start over from scratch in a new one.) Common examples: • monetary investment (total cost of playing thus far, regardless of business model) • progression • achievements • collectables • status • social connections

Table 3. Identity Investment concepts and in-game examples

5 Implications

No game designer should be surprised that it is possible to control the behavior of a player to some extent. However, game designers unfamiliar with the concepts listed here may be quite surprised, both by the number of ways in which they can wield that control and by the amount of research available that they can benefit from. The groundwork here has already been laid, so game designers simply need to realize how much benefit can be derived from incorporating the research findings from other fields. Even for game designers who do not dig farther into behavioral economics than the framework presented here, it offers an alternate perspective through which they can view a number of game mechanics that they are already familiar with. Once a game designer is exposed to the behavioral underpinnings of common game mechanics, it can be difficult not to see these effects everywhere.

6 Future Work

Future work in this area could include the replication of any of the foundational work from the behavioral economics field in a virtual environment (both with game and non-game purposes) in order to establish the extent to which these concepts are sound when taken out of their original context and into various game-related contexts. It would be useful to test each of the individual behavioral economic concepts included in this paper in isolation and in a controlled setting, since, in the wild, we typically see games which have numerous features with overlapping (and sometimes opposite) intent.

In addition, it could be useful to develop a more comprehensive model which attempts to encompass the entire range of cognitive biases which are often utilized (or could potentially be utilized) in game design. While this framework was not intended to be a blueprint, the possibility exists that a blueprint might be possible to develop which would enable a designer to simple choose from an appropriate set of mechanics after providing the initial design objectives for the project. This could move game design closer to a set of best practices instead of the seemingly current *design by convention*.

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