Chapter 7
Game Design Principles Usable in Gamification

Abstract This chapter presents focuses on a few principles of game design used in gamification. Game design is the process of applying the design and its aesthetics to develop a game for either educational, entertainment, experimental, or exercise purposes. Game design bears significance to develop rules, challenges, and goals applicable to various kinds of gamification settings. We will discuss game design as a concept, game as a tree, dynamics, game theory, game thinking, and game design elements, success criteria development, and types of games interaction. In addition, it highlights the game design and its application in non-game-based settings involving engagement and decision-making. It also included the game flow model, goal-setting theory in gamified settings, constraints and rewards, and incentives. The last part of the chapter bears important implications for the designers by highlighting what is not gamification and the considerations to make for differentiating between the two for determining design principles truly usable in gamification.

Keywords Games · Game thinking · Game flow · Models · Evaluation games · Objectives · Goals · Constraints · Success criteria · Rewards · Game design · Relationships · Interactions · Narration · Design solutions · Game theory · Game-inspired design · Rule development · Victory conditions · Players · Player-centered design

7.1 Introduction

In academic terms, game design is the part of the comprehensive game studies, while game theory involves the study of strategic decision-making, mainly in the non-game settings. Games have inspired historically the seminal research in the areas of artificial intelligence, probability, optimization theory, and economics.

Game design principles are seen everywhere; from education to technology to finance to corporate culture and therefore we see gamification on the rise. Setting up the games with clear constraints as well as goals helps you focus on your efforts and

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energies, can clarify and enhance the outcomes, and motivate to move ahead to the following clearly designed challenge as well as a reward cycle.

Game design increasingly cross the traditional boundaries on the medium, as shown by the growth of pervasive and serious games as a research and industry field. The widely talked phenomenon seen in this trajectory is the gamification; the umbrella term we use for the usage of game elements (not the full-fledged games) to enhance user experience as well as engagement in non-game applications and services (Kort and Ljsselsteijn 2008). An increasing number of researchers in the Human–Computer Interaction (HCI) and management sciences have determined the design elements that increase the motivational affordances of the computer-supported collaborative work principles that are congruent with the research on the motivational psychology of the video game (Lockton et al. 2010).

7.2 Games

Games are very versatile in nature; hence, it may be hard to define what the games are (Juul 2005). Game is a rule-based system having a quantifiable and variable outcome, where diverse outcomes are linked with different values, the players attempt to influence the outcome, they feel emotionally attached to the outcome, and the result of the activity is negotiable. The games rules come with a story, which brings meaning to the actions (Bernhaupt 2010; Koster 2004). It is also essential to ensure that the player follows the rules of the game voluntarily (Suits 2005), or else, the player won't be playing a game, or would be cheating. Games have a range of contexts and forms, and almost everything can be transformed into a game.

Games are usually used for the entertainment purpose, but there are also purposeful or serious games that are played for a range of purposes, like experiential learning. Pervasive games give games a new context, space, and situation, implying that they break the magic circle of play temporally, socially, or spatially (Montola et al. 2009).

Purposeful games, which also refer to an online tool to create and play interactive games, are one of the best examples of the educational side of games. Purposely games make it possible to create game strategies and apply them to other areas (such as the development of soft skills). The aim is to ensure active learning and to improve the evaluation of the person taking part, without them giving up or losing motivation.

7.3 Game Thinking

In simple words, game thinking is defined as the use of games and game-like approaches to resolve problems and develop better experiences. Game thinking is vast notion that covers the areas of playful design, serious games, gamification,

simulation, and play games and toys. All these are the non-game contexts where the game elements are used to achieve specific outcomes (Juul 2017).

Game thinking is the science and art of engaging users on a path to mastery. One critically significant aspect of game thinking is developing an experience. This is usually done through audio, visuals, and storytelling, like developing a virtual world. The experience makes the game useful and learning oriented for the player. Developing the right type of experience can be viewed as the creative side of the game design.

7.4 Game Design Framework

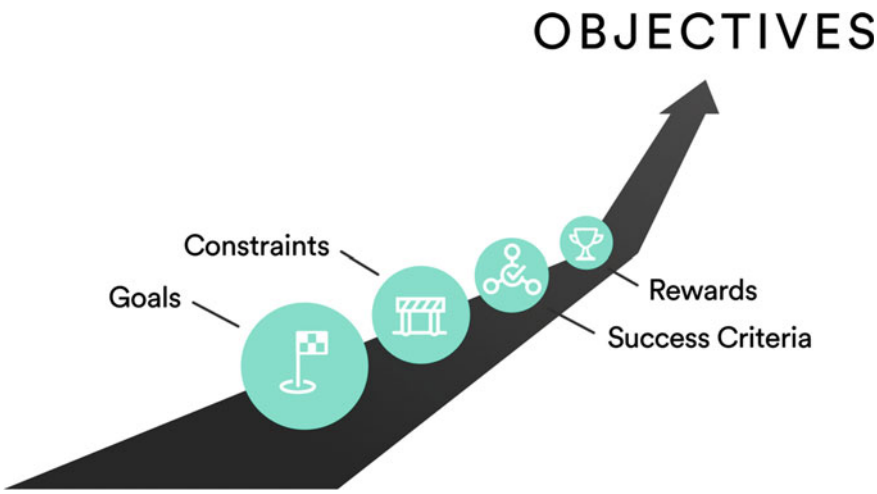
Games can be divided into the game design elements that make the games. These game design elements are further divided into lower and higher level elements. Werbach (2012) has presented the hierarchical pyramid representation of the game elements, according to which game design elements are divided into dynamics, mechanics, and components, where dynamics present the highest level elements while the components present the lowest level. These game design elements lead to an overall user experience of the game. The user experience is made in parts with aesthetics such as sound and visual. Game dynamics reflect the big picture that shows the structure of a game, of which the rules might be manifestation. Dynamics are also taken as the grammar of the game elements. Examples of the game dynamics are emotions, constraints, progression, narrative, and relationships which make the basis of developing meaningful choices.

Game mechanics are the elements that trigger an action in a game. Mechanics are taken as verbs. Examples include challenges, competition, feedback, cooperation, rewards, resource acquisition, transactions, win states, and turns. Challenges bring goal for the player to achieve and chances imply the involvement of luck.

Game components are the specific instantiations of the game dynamics and mechanics. Components are taken as nouns. Examples of the game components include avatars, achievements, badges, collections, boss fights, unlocking, leaderboards, quests, points, virtual goods, etc. For instance, badges show the achievement while virtual goods present objects in the virtual world.

7.5 Game Design Elements

Some of the most common and important elements in a game include (Sweetser and Wyeth 2005) the following:



Setting up games with popular and clear objectives to help achieve the desired outcomes:

- **Goals**
  There is a kind of goal or some outcome in a game that players can work toward. The more defined and concrete is, the easier it becomes for the players to participate. However, fuzzy objectives may be more rewarding as they model the real situations in a better way. Also, it is important to mention that the game objective isn't the same as a learning objective.
  Goal-setting theory has been used for decades to explain how to motivate people to perform better in work-related tasks by setting and monitoring goals. Gamification is also inherently a goal-oriented activity, aimed at fostering motivation; therefore, it is logic to expect that these two practices would fit very well together and help us design better motivational experiences.
  Goal-setting theory is a theory of motivation that aims to explain the causes of people's performance in work-related tasks. It was developed from findings of hundreds of empirical studies and posits that performance is directly related to the goals set by individuals for pursuing. Both the content (the object of an action) and the intensity (the difficulty or the amount of effort required to achieve the goal) are relevant.
  There is a linear relationship between the degree of goal difficulty and performance. Difficult goals lead to higher performance than no goals at all or abstract goals such as "do your best." Therefore, goal-setting theory posits that optimal performance is achieved when goals are specific (the objective to accomplish is clear) and difficult (the achievement of the goal requires considerable effort) (Locke and Latham 2002).
  Although having goals is not a requisite for gamification, goals are present in many gamified applications. Hence, goals are often specific in gamification,

consonant to the theory. In practice, there are many ways by which goals can be implemented in gamification designs; however, there are two common strategies: giving the users clear goals to follow or allowing the users to self-set their own goals. These goals can be explicit, identified as goals or quests, for example, or they can also be implicitly presented as outcomes that can be pursued, such as earning badges or achievements or reaching a certain position in a leaderboard. The reviewed literature recognizes the following elements as potential mechanisms for goal setting in gamification: badges, leaderboards, levels, progress bars, rules, goals, challenges, conflict, points, achievements, and rewards.

- **Constraints**
  A constraint is a rule that applies throughout a game mode. A constraint enables or restricts play in certain ways, but it does so universally and usually without variation. Constraints let the player know the boundaries of the game world, and the player develops an instinctive feel for them. They frame the actions that the player can take, and so the game world becomes a functioning self-enclosed system.
  Players can sometimes affect constraints, depending on the game. When the player buys upgrades in a game, for example, he or she permanently alters the features in the game system. The player has changed the constraints, and so interactions will play out differently than previous attempts.
  Constraints also play a role in AI behaviors. Non-player characters often have default or randomized behavior patterns that they follow when not directly interacting with the player. The ability to recognize those patterns allows the player to play with a sense of strategy. Once he or she understands a constraint, it often becomes an advantage rather than a hindrance (Lockton et al. 2010).
- **Success criteria**
  There is some way of determining when the objectives are achieved. The clearly defined success criteria develop expectations and engage more gamers. There are games that are less structures and have less well-defined criteria. This ambiguity makes such games sometimes to better model some scenarios, but more difficult to sell in an organization as they don't have a defined ending.
  However, it has also been predicted that a majority of gamification implementations are doomed to fail due to poor understanding of how to successfully design gamification. This gap canonically often manifests as modest gamification designs commonly consisting only of simple mechanics, such as point, badges, and leaderboards. Gamification is difficult to design:

  (1) The source of innovation, games, are complex, multifaceted, and therefore difficult to holistically transfer to other environments.
  (2) Gamification involves motivational information system design which entails understanding a host of (motivational) psychology.
  (3) The goal of gamification is commonly also to affect behavior which adds yet another layer into the scope of gamification design (Arrasvuori et al. 2011).

  Gamification is typically applied in order to enrich information systems or services with motivational affordances for gameful experiences. Therefore, it is

reasonable that both a profound understanding of the target group and the characteristics of the system that should be gamified are of particular importance to design gamification approaches (Brito et al. 2015).

- **Rewards**
  Incentives that reward success can be intrinsic outcomes of the game (good results and recognition), embedded in the game itself (getting more Monopoly money), or external recognition or prizes (the winner gets dinner at a nice restaurant). Balancing rewards between players can be a challenge and needs to be considered when adopting games.
  According to the theory of human motivation, our actions are driven by outside reinforcement. Gamification combines as we know two motivational affordances: extrinsic/external rewards such as levels, points, and prizes to improve engagement; and intrinsic/internal motivation from striving to raise the feelings of mastery, autonomy, and a sense of belonging. One recent study by professor Rebekah Russell-Bennett found that people played a gamified app five times more than they needed to in order to get a reward (Russell-Bennett 2016).

7.6 Game Dynamics

Game designers often struggle to write documents that convey dynamics but they are almost impossible to capture in text form. Diagrams help, as do maps and spreadsheets, but the fact remains that the actual dynamic often remains elusive. It needs to be prototyped before anyone (including the people working on it) has the realization that it's working or not.

Game dynamics govern the breadth of actions, the pace of activity, and the speed of the game. They establish rhythm and tone, which if done well can give the game a unique signature. The balance of dynamics in a well-working game doesn`t come easy, due to the fact there probably many games that use the same actions and world structure. That success comes from the tone set by the game dynamics.

- **Building relationship**
  Rather than suggesting the points are the primary reward, the player presents an opportunity to build upon a social relationship as the main motivator. This is a similar positioning seen in many popular social games, where players can catch up with friends as you kick their butts or on the contrary team up in a game. Taking it a step further and offering both parties added synergies in gameplay will enforce the link, emphasizing the importance of the relationship.
  Some of the most popular games support collaborations. To progress quickly through the games, you need to help other players, and they need to help you. Such collaborations, according to game designers and users, foster a sense of community in an often-splintered world. Individuals differ enormously in what

makes them happy—for some competition, winning and wealth are the greatest sources of happiness, but for others, feeling competent or socializing may be more satisfying.

- **Types of interaction**
  A game can provide at least three types of interaction. First, the game can react to player actions. This is bread and butter for many games.
  Second, games can interact with themselves. Different pieces work together in interesting ways, and rules can yield unexpected results. This might not sound very interactive as far as the player is concerned but discovering these interactions can be a great source of pleasure. Games with even moderately complex internal interactions can serve as fun puzzles for players to solve.
  The third type, player–player interaction, is where games shine. Most games provide a framework in which players interact with each other. Even though many players get excited about fancy bits, beautiful artwork, and novel mechanics, it's the interaction that brings friends around a table to share an experience together.
- **Narrative environments**
  Narrative is the larger narrated story. This can exist without a plot or as a larger system in which plot exists. Narrative does not necessarily require a causal chain. It could be a history of events or sequence, and technically the level progression in a game could be a narrative. A game's narrative is the aspects of a game that contributes to it telling a story.
  Questions concerning whether games are narratives, or whether narrative provides just one way to look at games are still actively debated.

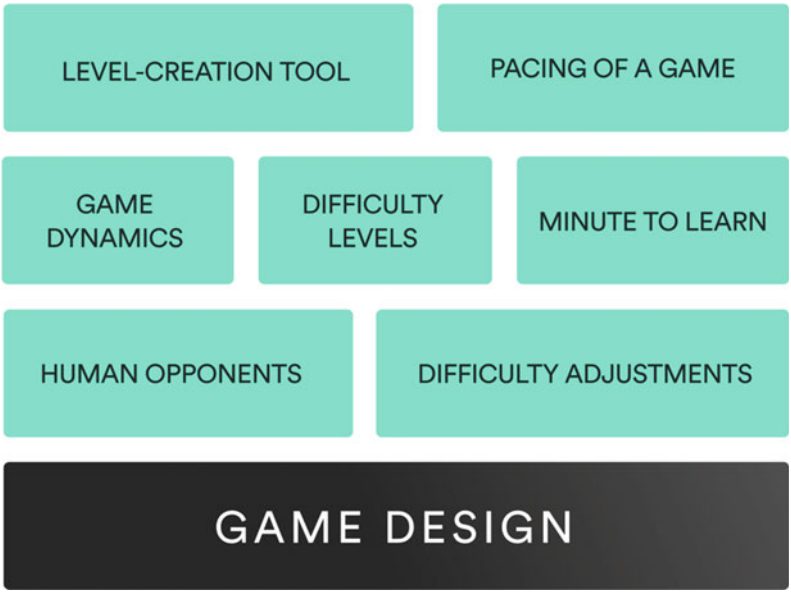
7.7 Embedded Narrative

- Pre-generated narrative content that exists prior to a player's interaction with the game.
- Cut scenes, back story.
- Are often used to provide the fictional background for the game, motivation for actions in the game, and development of story arc.

7.8 Emergent Narrative

- Arises from the player's interaction with the game world, designed levels, and rule structure.
- Moment-by-moment play in the game creates this emergent narrative.
- Varies from play session to play session, depending on user's actions.

Game design offers a number of design solutions. Among them



- **Pacing of a game** is increasing difficulty as the game progresses. As the player gets better, they get access to more difficult levels or areas in a game. This is common with level-based games.
- **Difficulty levels** or handicaps, where better players can choose to face more difficult challenges.
- **Dynamic Difficulty Adjustment** (DDA), a kind of feedback loop where the game adjusts its difficulty during play based on the performance of the player.
- **Human opponents** as opposition. Sure, you can get better at the game, but if your opponent is also getting better, the game can still remain challenging if it has sufficient depth.
- **Level-creation tools**, such as new levels made by player-created expert challenges.
- **Minute to learn,** lifetime to master supports multiple layers of understanding (the quality that so many strategy games strive for).
- **Game dynamics** as they set the tone of a game and serve to empower and constrain the player in specific ways, and the results can be very engaging.

7.9 Game Theory—And It's Not Gamification

It is to be noted that game design and gamification design are mistakenly taken as the same thing, though both are different from each other, and hence should be handled in a different way.

The game theory analyzes the strategic situations where a user's strategy is based on the strategic choices of others. Prisoner's dilemma is an ideal game theory situation. A classic game theory equilibrium occurs when all the game players minimize their respective losses and maximize the gains. The min (max) is done based on how the competition is going to act (Barr et al. 2007).

On the other hand, the gamification is about using the game experience to make people more engaged. It uses the rewards to motivate the desired behaviors. Gamification is applied in many real-life contexts. For instance, just as the children are asked what they like more: studies or games? Indeed, the answer is going to be "the game". Why? This is what the gamification tends to answer and that's what it attempts to do. The concept tends to provide the notions that can be implemented to develop a game-like experience (Shaffer 2015).

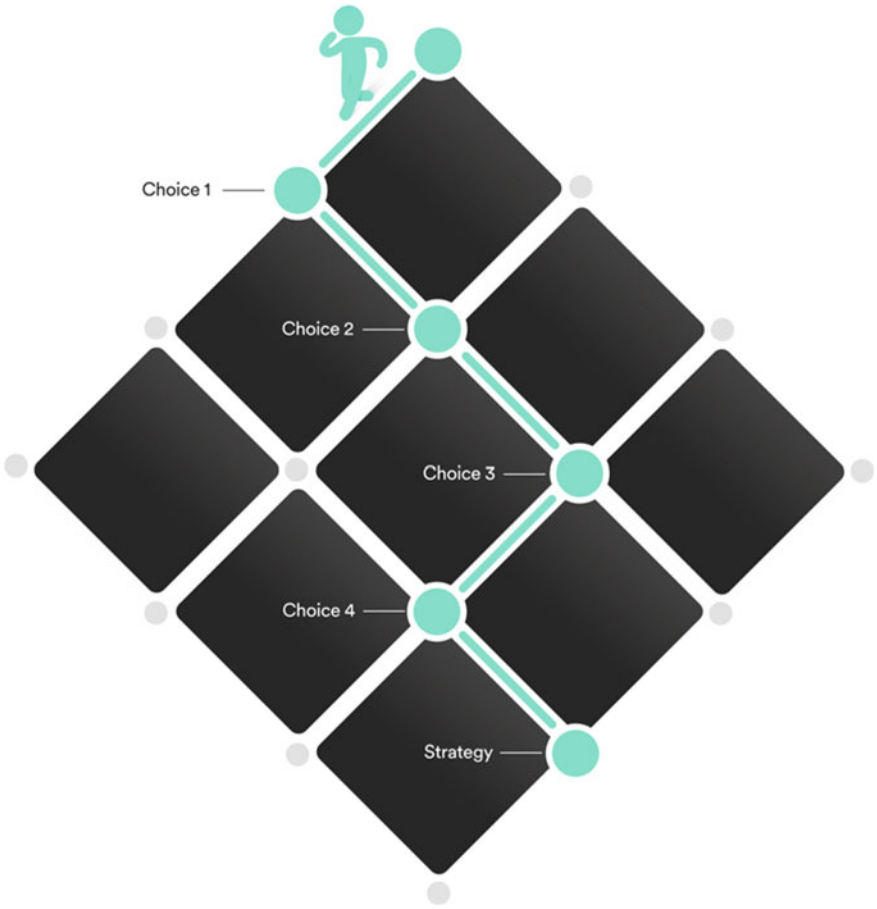
Gamification uses the competitive game-playing instincts in order to influence and transform behavior via game systems. It includes elements like scoring and achievement levels to the things where such game elements are not usually found. Numbers become the users' motivators. It implies that gamification is not the same as game theory, which probes strategy and motivations (Zhang 2013). Gamification functions on an individual level (self-motivation) and in a group (competition). It works with a single or more persons, based on the type of application that is developed and the rewards that are offered.

Game theory is the study of the interdependent rational choice, and not independent. In simple words, it is the people who make strategic decisions based on the way they think someone in a team would respond to their decisions. Game theory is more about the choices and outcomes (Leonard 2010).

If there are two or more persons working toward a specific goal, game theory is applicable. They would use rationalization for making decisions based on the potential outcomes all while assuming that others are involved in doing the same. There is a competition whether it is just to get the highest score or even better, a zero-sum game where there is just a limited reward available to win. In this case, one player wins the same amount the others lose, and sum of the game is zero. It's a simple transfer of the total variable from one player to another.

7.10 Game Theory as a Tree

Game theory can also be illustrated like a tree, where every decision is a branch and we weight the alternatives. One decision takes to a new decisions' set. This is for the sequential games where there is more than a single choice is available to be taken for the resulting outcome.



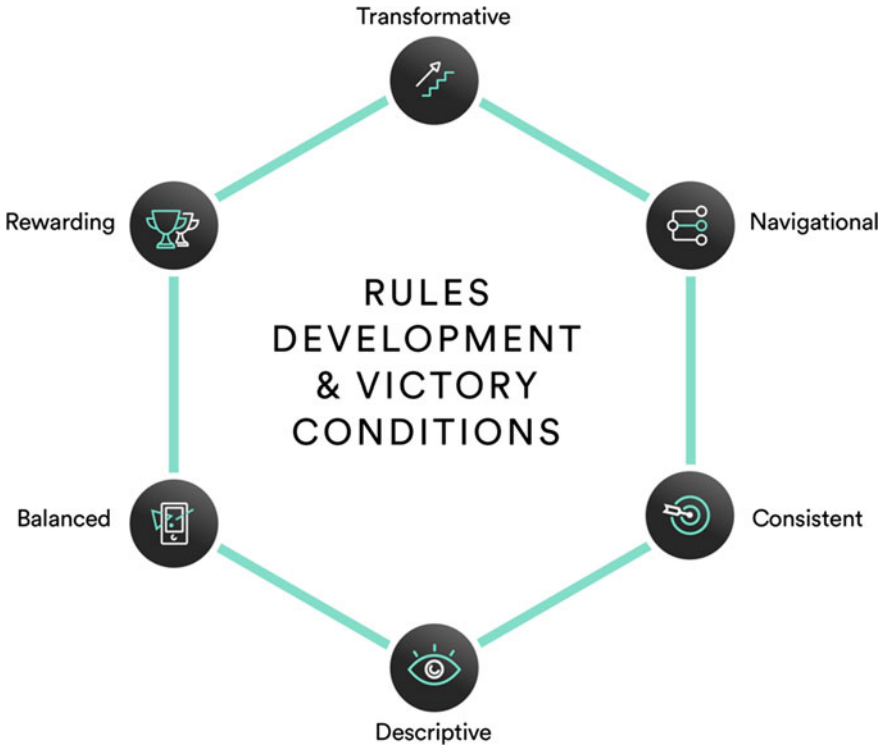
This shows a player as an example. The player needs to make choices regarding which paths to pursue, with every choice taking onto a diverse set of options. The player cannot go back and amend his choices; hence, he/she must think in a strategic way so that he/she ends up with the best possible outcomes.

This tree structure as shown above is handy when a game is ongoing, and you are taking decisions early on that are going to impact the decisions you would be able to take later. You try to think in a strategic manner and map out the optimal route.

7.11 Game-Inspired Design

It was previously called gameful (playful) design but now it has more gamification like connotations. In gameful design, no actual game elements are used, only ideas. Game-inspired designs are the attempts to utilize the engaging game traits to enhance engagement in the non-game contexts. For instance, when used in classrooms, the game-inspired design tends to transform the place from a traditional classroom to a game that students play. Rather than taking the elements of game out of the contexts (like in gamification) or wasting the class time learning the way to play commercial games (like in the game-based learning), students are treated as the players in the classroom. This shift in the perspective lets the teacher plan for diverse kinds of players and what motivates them in the gaming world (Scanlon et al. 2007). Fundamentally, if there is no meaning for an individual player in a game, they will not play. It enhances the present educational reform models with blending learning, flipped class, etc.

The rule development and victory conditions in a game-inspired design could be based on the following common principles:



- **Transformative**: Go from simple to complex. In the start of the gamified experience, don't include numerous levels packed full of different elements. Starting with simple levels and slowly adding complexity leads to meaningful storytelling, which simplifies user entry as well as engagement. Especially important if it is about developing a specific skill-building or influence behavior.
- **Navigational**: Pay extra attention to navigation. Develop levels that don't confuse the players.
- **Consistent**: Avoid the game elements that are inconsistent with the game design.
- **Descriptive**: Include a concise description at every stage as conciseness helps achieve the engagement and retention of the players.
- **Rewarding**: Include clear victory conditions, with escalating rewards with every stage ahead.
- **Balanced**: Balance the game elements before publishing the product.

7.12 Game Player in a Wider Context

User-centered design is a framework of processes that puts the user, and their goals, at the center of the design and development process. It strives to develop products that are tightly aligned with the user's needs. Game designers and gamification designers who adopt the user-centered design philosophy in their daily work pay attention to the user's goals and strive to build products that help the user achieve them in an efficient, effective, and satisfactory manner.

While effectiveness, efficiency, and satisfaction are worthy goals, games and gamification extend and add increased engagement to these goals. In the context of a game, we have argued that millennials and younger voluntarily seek challenges to enhance their playing experience. They seek empowerment over efficiency, delight and fun over mere satisfaction. These factors increase their level of engagement.

Game design is the process of developing the rules and content in the pre-production stage and developing the gameplay, environment, storyline, and characters in the production stage. The game designer of a game is very much like the film director of a film or the creative director for an application; the designer is the visionary of the game and controls the artistic and technical elements of the game in fulfillment of their vision. Gameplay is the interactive aspects of video game design. Gameplay involves player interaction with the game, usually for the purpose of entertainment, education, or training (Bethke 2003). The player-centered design approach is used to understand the player and his/her context. The success of your gamification efforts depends on this clear understanding.

7.13 Conclusion

Game design is related to the strategic decision-making. Game is a rule-based setting with variable and quantifiable outcomes, players affecting the outcomes and the associated activities they pass through and decisions they make. Games are used for various purposes, including entertainment, serious games, experiential learning, persuasive games, etc. Game thinking is the application of games and game-like methods to develop better experiences and solve issues in playful designs, gamification settings, and simulation settings. In terms of game design frameworks, each game has elements, which in turn has dynamics, mechanics (the highest level elements), and components (the lowest level elements). Goal-setting theory in gamification explains how to motivate people to perform better in work-related tasks by setting and monitoring goals. Constraints let the player know the boundaries of the game world and also play a role in AI behavior setting and changes. Games and gamified settings must have clearly defined success criteria as it develops expectations and engages more gamers. Incentives that reward success can be intrinsic, embedded, or external and must be balanced. Game dynamics determine the breadth of actions, the pace of activity, and the speed of the game. In terms of interactivity, the game can react to player actions as well as with themselves. Game theory is based on interdependent rational choice, and not independent; the people who make strategic decisions based on the way they think someone in a team would respond to their decisions, and thus is not gamification. Game theory is like a tree, where every decision is a branch with weighted alternatives.

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