Principles of game design

Introduction

Game design is the art of applying design and aesthetics to create a game to facilitate interaction between players and the game (Wikipedia 2017). The starting point for good game design is a creative team and a good game idea (Dörner, Göbel, Effelsberg & Wiemeyer 2016).

In the case of serious games the purpose, the goal, the domain and the target group of the game are essential key factors. Game design covers the game world, story, rules, actions, resources, conflicts, boundaries and challenges of the game. Game may have one path or several alternate paths. Game may have one level or multiple levels. Game may be a single-player game or multi-player game. In the case of serious games guidance may be needed for player. Games can have different paces. Some games are fast reactive games and some games require thinking and thus the pace of the game can be very slow. Game design is the design of all these different things in order to make game to fulfill its purpose. (Dörner, Göbel, Effelsberg & Wiemeyer 2016; Ijäs & Viitala 2017.)

Interdisciplinary teamwork

There are many contributing disciplines behind the development of games. The most important are computer science, art, design, psychology, didactics, pedagogy and storytelling. Interdisciplinary collaboration is very important and because of this excellent teamwork skills are common requirement in game development positions. Member of a team has a specific role and s/he is an expert of his/her area of responsibility. (Dörner, Göbel, Effelsberg & Wiemeyer 2016; Ijäs & Viitala 2017.)

In practice the roles and responsibilities of game development team members are case-dependent. Common roles in game design are (Dörner, Göbel, Effelsberg & Wiemeyer 2016; Ijäs & Viitala 2017):

- Designer
- Programmer
- Artist
- Producer
- Project manager
- Users and testers
- Domain experts (especially for serious games)

Understanding domain

One key difference between the design of entertainment games and serious games is the need for domain expertise. When developing serious games understanding domain is a critical success factor. If the company is developing an own serious game product, domain expertise has to be get somewhere. If the company is making serious games in the form of contract work, domain experts usually come from customer's side. In this way the development of serious games by order-basis is very much the same as it is in the case of software development. (Dörner, Göbel, Effelsberg & Wiemeyer 2016; Segabu 2017a; Segabu 2017b; Segabu 2017c.)

Because serious games developers often have to work with customers, good interaction skills are very important. Developers and customers often have their own language. For example, when developing a learning game for children, developers and customer need to understand each other and they also need to understand how children think and act. Usually the game designer has the key role in the creation of mutual understanding. From this point of view designing entertainment games is far more free and far more unrestricted. (Segabu 2017a; Segabu 2017b; Segabu 2017c.)

Game idea

Game design is always based on an idea. There are several origins for game idea. The idea can be the result of the imagination of single developer or team. This kind of approach is more typical for entertainment games. Game idea can base on the requirements of the customer which is quite usual origin for serious games. Game idea can be very strictly defined or on the contrary it can have very loose definition. Game ideas can be anywhere between these two extremes. (Ijäs & Viitala 2017.) The better the idea is, the more fun the game is usually to play, and the more useful it might be for achieving the goal to entertain and to reach characterizing goals (Dörner, Göbel, Effelsberg & Wiemeyer 2016).

Several methods and tools exist dedicated to idea refinement. Game designer often rely on previous experience. Analyzing existing games is an essential part of game idea refinement in order to stick to working formulas and to reduce the risk of a game being a failure. Creative atmosphere may have a remarkable effect for game idea generation. Typical idea generation techniques are:

- Game analysis
- Idea sketchbook
- Brainstorming

(Dörner, Göbel, Effelsberg & Wiemeyer 2016; Ijäs & Viitala 2017)

Brainstorming is very broad concept including several techniques (Neidlinger 2015). On the other hand brainstorming does not necessarily lead to innovation which is also acknowledged in game design (e.g. Kultima & Paavilainen 2007).

Game design process

Game design is a work process aiming to solve a challenge or problem. The result of successful process is a game. Actions that are included in normal software development projects are included in game design process as well. Among other things these include schedules, phases, dependences between tasks, resource planning and risk management. (Ijäs & Viitala 2017.)

Serious game design usually begins with a preparation phase, followed by a development phase and a deployment phase (figure 1). Both the development phase and the whole design process are iterative. Agile software development methods are utilized and user-centered design has a very important role. (Dörner, Göbel, Effelsberg & Wiemeyer 2016.)
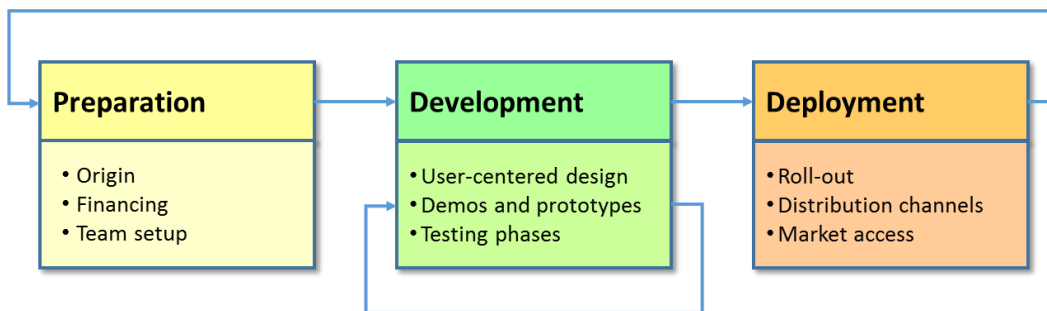

FIGURE 1. Lifecycle and iterations of a serious game (Dörner, Göbel, Effelsberg & Wiemeyer 2016)

Game design

The main sectors of game design are mechanics, storytelling and interaction. Game mechanics design focuses on the logic of the actions in the game, rules and functionality. Storytelling design means the design of the dramaturgy of the game. It is part of the manuscripting consisting of choosing and organising the turning points. The goal of storytelling is to understand game world, rules, goals and game characters. The mission of storytelling is to get gamer hooked. Interaction design focuses on the way how players interact with the game. (Dörner, Göbel, Effelsberg & Wiemeyer 2016; Ijäs & Viitala 2017.)

For serious games the design of game scenario is very important. Designers need to think the situation where game will be played. Game can be a single-player game or it can be a multi-player game. Sometimes playing serious game may require guidance. Designers also need to think is the game such that will be played many times or is it more "play once" -style game. Because of this the duration of the game is essential. Moreover, the pace of the games may vary from slow-paced game requiring very much thinking to fact-paced reaction games. Serious game can be anywhere between these two extremes. (Dörner, Göbel, Effelsberg & Wiemeyer 2016.)

Game design also covers the game world and the representation of the game. In the case of entertainment games the game world is often some kind of fictional universe that is associated with a game. For serious games it is much more common that game world is more realistic and closer to the real world. Examples of different representations are 2D, 3D, first-person and eyebird. The representation of the game has a strong connection to game controllers, the devices that are used and needed for playing. (Dörner, Göbel, Effelsberg & Wiemeyer 2016.)

Games may have different levels and different paths of progression. All games have at least one level but entertainment games often have several levels. Multi-level serious games are possible as well but those are not so common as in the case of entertainment games. The most simple path of progression is the linear progression meaning there are no alternate paths. Network is another example making it possible to choose from alternate paths but to have the same ending. However, games may have alternate endings as well. (Dörner, Göbel, Effelsberg & Wiemeyer 2016.)

One of the key aspects of serious game design is the integration of the characterizing goal with the game content. Without successful integration the game will be either just an entertainment game, a technology or an alternate medium for content. Playing of serious game should be fun and if it is not fun, maybe the so-called game is not game. (Dörner, Göbel, Effelsberg & Wiemeyer 2016; Segabu 2017a; Segabu 2017b; Segabu 2017c.)

There are two main ways how to integrate the serious content and the goal of the game. Statical integration of the content is more common approach meaning the serious content and the game are designed and developed together from the beginning to the end. This means the serious content is "hardcoded" into the game and because of that it is not possible to change the content. The alternative way is the dynamic integration making it possible to change the serious content or at least some parts of it after the game has been created. (Dörner, Göbel, Effelsberg & Wiemeyer 2016.)

Design principles for serious games

Design of serious game is based on few key principles. The most important principles are player-centered design, iterative development, interdisciplinary teamwork and the integration of play and learning. (Dörner, Göbel, Effelsberg & Wiemeyer 2016.)

Player-centered design, also called user-centered design, is the principle where players are involved in the game design process offering them an opportunity to participate in the game design include resolving of usablity issues and participation of the creative part of the process. Because domain expertise is needed when developing serious games, player-centered design can have a huge impact to end result. (Dörner, Göbel, Effelsberg & Wiemeyer 2016.)

Both iterative and incremental approaches are common in the field of game development. Interdisciplinary teamwork means that all team members, not just the designers, participate in every aspect of the development process and learn from each other's field of expertise. Again for serious games this kind of approach is very important. Finally the integration of play and learning needs to be integrated as closely as possible. (Dörner, Göbel, Effelsberg & Wiemeyer 2016.)

Participatory design (PD) is an approach that is very common for interactive systems development. However, it has not been so popular in the game design community, especially in the case of entertainment games. The main reason of this is the fact that game designers often are similar to players of their games and they often make games they prefer to play. Thus, there is not so much need to bring in any additional players. Moreover, small game studios do not even have the possibility for this because of limited resources. In the field of serious games the need for participatory design is bigger and totally different. For stakeholders there are many roles available like, for example, as a user, tester, informant or design partner. (Dörner, Göbel, Effelsberg & Wiemeyer 2016.)
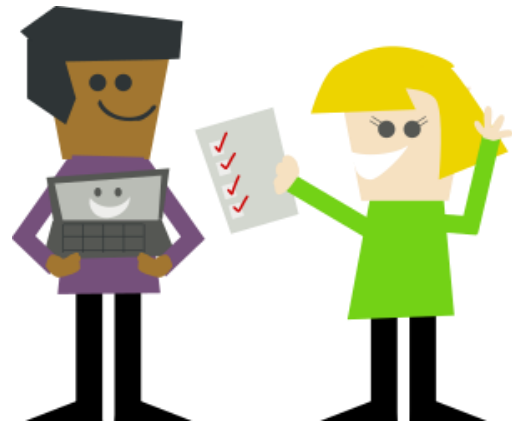
Entertainment games and serious games

There are many combining factors between the design of entertainment games and serious games. However, there are remarkable differences as well. First, serious games try to fulfill some purpose that gives the base for the goal or the message of the game. Because entertainment games are often played just for fun, there is no same kind of background including the purpose and the goals. This fact is probably the most biggest challenge for serious game development. (Dörner, Göbel, Effelsberg & Wiemeyer 2016.)

Secondly, when developing serious games, good domain expertise and domain experts are needed. Domain experts usually have the key role. When developing entertainment games, domain experts are not needed in most cases. (Dörner, Göbel, Effelsberg & Wiemeyer 2016.)

Thirdly, excellent game development knowhow alone is not enough for developing serious games because making of successful serious game may require other knowhow as well. As a general requirement good serious game developer should be a software developer as well. Other requirements depend on the case and the domain. (Dörner, Göbel, Effelsberg & Wiemeyer 2016.)

There are many entertainment games that can be used for serious purposes as well. Originally the game has been developed to serve as a pure entertainment game. Later the serious aspects of the game have been understood. Angry Birds is an example of the game that was originally meant to be a pure entertainment game. The game became extremely popular and after that people have realized the benefits of the game like, for example, getting a bit of education about the physics and ballistics. (Dörner, Göbel, Effelsberg & Wiemeyer 2016.).

There are also entertainment games that have been released as business or education versions. Monopoly is an example of the classic board game that has been developed for computers and mobiles as well. Nowadays dozens of different versions of Monopoly are available. One serious meaning of Monopoly is to taught players the negative effects of monopolies on the economy. (Dörner, Göbel, Effelsberg & Wiemeyer 2016.)

Games can be developed so that the game hides the serious characteristics and the serious content. This is called stealth learning and sometimes it might be a good option because it has been reported that some players might be demotivated to play the game because it is labeled to be serious. Stealth learning gives an opportunity to avoid the ignorance of playing. (Dörner, Göbel, Effelsberg & Wiemeyer 2016.)

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