Game Design Document for Utopolis

Educational Gamification – IN4302TU Building Serious Games

Version: 2.0 (08.01.2014)

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1 Basic Information

1.1 The game

The game Utopolis is about motivating students to perform better in school by receiving in-game rewards for desired real-world behaviors. It is a multi-player city building game with both individual and collective incentives. Students need to decide how to build their cities, which together comprise a province, in order to reach a higher achievement score (of the province) than the province of a competing class.

The setting of the game takes place in a fictional iron age style world. One region corresponds to one class and is composed of cities. The students in the class are divided among these cities based on grouping by the teacher (either random or with an express purpose). The game play revolves around building the city and province guided by completeing given quests. Each city is built of structures, which can be built with [an initial stock] of resources and citizens; citizens are only received by being awarded by the teacher for desired behavior. A student can then assign citizens to build a structure (using the resources the student has). Structures then produce further resources (except houses, which when built produce one citizen – making houses the only way to increase the number of citizens a student has, other than being rewarded citizens by the teacher). Resources are both tangible (such as brick and wood) and intangible (such as knowledge).

The game will be open source in order to allow schools, who usually have low budgets, to easily implement the game. This will also facilitate that ability for the developer community to further develop the project to a higher level. We also believe this is ethically correct. The project will be hosted on Github, which will contain the information on installing and setting up the game, the state of game development, the code of the game itself and log of issues that are still open as well as completed. Security of the game is simple at this stage with a server with database behind it (using basic authentication).

1.2 The team

The project team consists of the commissioner and the team members. The commissioner in this case is Dr. Martijn Koops, a physics lecturer and serious game developer from the Faculty of

Education in the University of Applied Sciences of Utrecht. The team consists of six MSc students from the Delft University of Technology. Team roles are mentioned after each team member.

- Georgi Khomeriki (Computer Science) – Programmer
- Tiago Mota (Computer Science) – Testing
- Rashmi Narayan (Technology, Policy and Management) – Artist
- Anika Rose (Technology, Policy and Management) – Communication and Producer
- Wouter van den Heuvel (Media Technology) – Designer
- Mircea Voda (Computer Science) – Architect

1.3 The problem and objective

Th organizational problem stems from students under-performing in class, not only regarding academics, but also in the terms of social behavior or sports. This behavior comes from the lack of motivation students feel to perform well. Thus the problem of this project is: *How to motivate students to exhibit desired social and academic behaviors both in and outside of the classroom*? Thus the scope of the problem allows for multiple areas of achievement (the different areas in which students might excel) as well as for different situations where desired behavior might be exhibited (for example not only during class hours, but also in the breaks).

Thus the objective of the game is to allow teachers to reward students who exhibit desired behavior. The teacher should be able to determine the level of the reward and what behaviors (or results) will be rewarded.

1.4 General considerations

A number of considerations are important for this game. First, the complexity of the game should be limited in order to be able to meet the deadline. Another consideration is the age (15-18) and level (high school) of the students who will be the target for this game. The game must be designed to be attractive to this target group. Further, the game itself will be implemented in schools. The game must be playable in a browser in order to reduce complexity for school in the implementation of the game.

2 Game Elements

2.1 The meta structure

Basically, game-play revolves around city building in a SimCity fashion. A group of about four students, grouped by the teacher, works together to build one province. These students individually earn "citizens", as their work force, from the teacher when the teacher deems they should (based on exhibiting desired school behaviors). With citizens and resources (an initial amount is given), students can build structures in their city. Once a structure is built, it produces resources continuously.

Students can gift resources and structures to each other within the game. Gifts can only be traded by agreements in the real-world to give reciprocated gifts. Each student will start the game with a

customizable flag that is differentiated from other players. As students reach achievements in the game, more alterations can be made to the flag, such as uploading their own pictures or putting the flag on a monument. Game play is driven by quests given to the player sequentially. Upon quest completion, rewards in the form of resources are given to the player. These are not yet specified precisely. These quests include:

1. Quest: *Village* (individual)
   (a) Welcome to Utopolis! As you are now in charge of new city within Utopolis, your citizens need a place to live. Thus, your first quest: Build the first village in your city. A village contains at least 3 houses, a civic center and a farm. Once you have completed the first quest, you will be able to move onto the next quest.
   (b) Remember that your actions are not limited by quests. You are free to build your city outside of the requirements of the quest. (A similar message is shown for each quest)
2. Quest: *Boundaries* (group)
   (a) Congratulations on completing your first quest! Your second quest is a group quest. This means each city in your province must complete this quest before you can go onto the next quest. (All group quests will have a similar message)
   (b) Your citizens have started to notice other cities. They feel they need to define their home clearly. Your second quest is to set the boundaries of your "downtown". This means you will need to build at least 4 wall towers.
3. Quest: *Nurishment and Wealth* (individual)
   (a) Your citizens are not getting enough food. They are hungry! In order to give your citizens nourishment, you need to be wealthier! Reach at least a level of wealth of 1000. (all individual quests have a similar message)
   (b) Your citizens are not getting enough food. They are hungry! Give your citizens nourishment. Build at least 3 farms and 2 corrals.
4. Quest: *Rainy Day* (individual)
   (a) As your citizens are becoming richer, they are thinking further in the future. They are worried they will not have enough food in the future. Provide your citizens with at least 2 food stores in case of a rainy day (build 2 storehouses). In order to complete this quest, you must also have healthy citizens. This means you must have at least 1000 units of health.
5. Quest: *Trading* (group)
   (a) Your citizens are happy in the city, but are starting to hope to see the world. Open the trade routes between your city and the rest of the province. Build at least 2 markets. Give at least three gifts to someone else.
6. Quest: *Order* (individual)
   (a) Your citizens are starting to wonder where the birds come from and what they mean. Build a temple to honor the flying gods. In order to complete this quest, you must also have spiritual citizens. This means you must have at least 1000 units of peace and 1000 units of spirituality.

7. Quest: *Beautification* (individual)

    (a) Your citizens are content, but jealous of the other cities. They want a beautiful city too! Build at least 10 trees, update your flag and receive at least 1 gift from 2 different players as a sign of the beauty of your city.

8. Quest: *Another Province?* (group)

    (a) Your scouts have detected another province. Your province needs to prepare itself. Build 2 barracks and a Fortress. To defend your province, you need enough citizens and strong foreign relations. In order to complete this quest, you need have at least 1000 units of population and 100 of foreign relations.

In addition to the quests, collectively students work towards having a the "best" province, as given by certain indicators shown on leaderboards. Individual students may have different in-game goals, such as a nice city layout, a nice flag, reaching achievement levels or others. This depends on the type of player the student is.

2.2 Game Start

Before students interact with the game, the teacher initializes accounts for all of the students. Then students use the created account to first customize their city by choosing a name of it in order to differentiate it from other students. They also set up the game by choosing pre-set flag (a sort of logo for the city) and a player color. Students then enter the game world. This consists of a view of the three-dimensional world they are building in.

2.3 In-game actions

Students can build different types of structures when they have sufficient resources and citizens available, meaning structures have a cost expressed by the resources needed to build them and a certain number of citizens need to be assigned to each building process in order for it to be completed. The more citizens assigned to build a structure, the faster the structure will be built. More complex structures will not be achievable at the start of the game as they will require further resources than what students have available. As students gain further resources, they will be able to build more complex structures.

In addition to citizens, two types of resources are needed to build a structure: basic resources and intangible resources. First, basic resources (stone, metal, wood and food), are resources which will be consumed when the structure is built. Some additional intangible resources (culture and knowledge) are needed for certain structures to be built. The resource production rate by each structure will be instantaneous, but at a slow rate. Therefore, while students will have an instant reward from building a structure, they may also will gain further resources while logged out of the game. Additionally, the level of resource production depends on the number of citizens allocated to the structure. Because having more citizens result in more resources, students are always in need of more citizens.

Teachers can award a number of citizens to students with an individual message that indicates what behavior resulted in the reward.

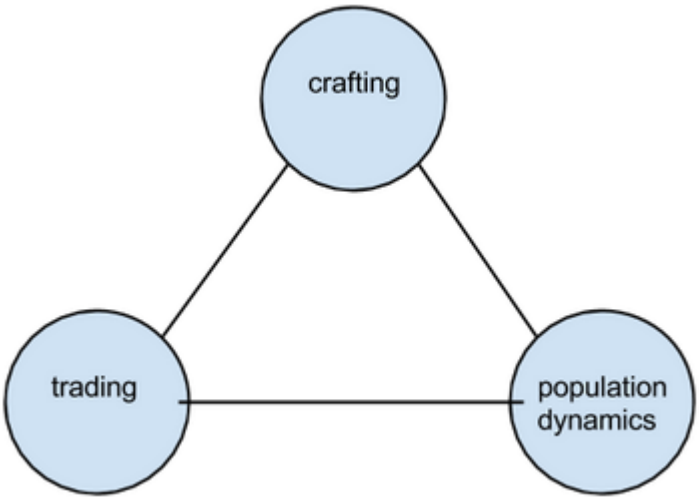

Figure 1: Feature Triangle

2.4 Information (in-game) and indicators

Information about structures and the student's resources will be displayed on a panal on the top of the game. Messages about quests will pop-up in the game. Messages about gifts and citizens awarded by the teacher are shown in a *mailbox* way. Students will not communicate with each other through the game.

The indicators of level of achievements are present in the form of leaderboards. These will show the name (initially chosen by the student) of the city with the highest level of achievement. The levels of achievement can be shown in multiple categories, called KPIs, including happiness, population, technology and wealth. There will be leaderboards not only for each city, but also for the entire province. Leaderboards will also be accessible at all times through a menu.

3 Furture Work

This section describes proposed furture work for the game Utopolis.

The biggest change that this revision proposes revolves around three new concepts, presented in a triangle:

These three concepts all interconnect and support each other.

3.1 Crafting

Crafting is the creation of goods through processing basic materials. These goods could be sub-assembly requirements for the creation of other crafted goods. For example one crafted good can be creating spear points from iron, another wooden shafts from felled trees. Spear points and shafts together can be combined to create spears.

Other than the required materials the player also needs to have free workers working in the appropriate buildings. Crafting an item can take a certain amount of time (think hours). During that time the worker (who is automatically assigned) cannot take up any other tasks. Therefore an

incentive exists to have more Citizens (thus workers). The player crafts items from the GUI. Once crafted, they are added to the players' Inventory. An extensive list of crafted goods exist, some examples:

- *Food*: Bread, soup, stew, wine, various meat and fish dishes
- *Household*: Pots and pans, storage jars, baskets,brooms, whetstones, knives, spoons, chests, sofas
- *Clothing*: togas, sandals, tunics, cloaks
- *Military*: swords, spears, armour, helmets
- *Luxury/ vanity items*: Various jewelry, charms, shrines, religious tokens, mirrors

All basic goods can be crafted by all races, however some specific advanced technology is available only to certain races (e.g: persian carpets are only available to players with Persian race). This is to encourage trade between players.

3.2 Population dynamics

Population dynamics provide a dynamic, changing element to the game where the player has to respond to acute changes. Population dynamics is manifested through the needs and wishes of the players' city population (i.e Citizens). The player has to keep tabs on his Citizens frequently in order to have a prosperous city. Primarily, the player polls the houses of families (by clicking on them, and there should be a 'cycle' button that focusses on the lowest scoring house first and then moves onward) to get some idea of their needs. These change over time and influence their mood or happiness (authors note: Perhaps a better word can be found). Indeed, these mechanics can be regarded as a form of rudimentary A.I. At first, families will have need of basic things, pots and pans, flint and timber, knives, bread, soup etc. Over time, they will have fulfilled their basic needs and move on to more advanced requirements, like furniture, oil lamps and once all that is taken care of will start to yearn for luxury items such religious idols, jewelry, tapestries etc. If the player wants to satisfy her Citizens she has to Gift the house with what they most need at that point, but beware that if left without any gifts for a period of time, their happiness will decay.

This happiness is used in two ways, 1) an aggregated average of all happiness can be used in the leaderboard and 2) when a family's' happiness is below some threshold they will stop working and thus lower income and taxes. Note that happiness could be a pretty complex function and its internal workings should be hidden from the player. he also does not see the internal number value(s) but rather something more abstract e.g a smiley face or a short story explaining the situation. So the happiness function does not yield a single value but is rather a pretty complex calculation taking into account many factors to define what a Houses' greatest needs at this point in time are.

3.3 Trade

All cities in a province have access to an Auction House. This works similar to ebay, where you can sell and buy resources for gold. The idea is that an economy will start to emerge where players will actively try to sell their excesses and buy the things they can't produce themselves. Because of the complexity created by randomness in the population dynamics as well as players' choices of resource generation and crafting workshop buildings the goods that players will have will be very asymmetrical and trade will be necessary to progress. Add to that the fact that some goods are race specific thus they only way to obtain them is to purchase them from other players.

3.4 New buildings functions

Buildings work pretty different.

3.4.1 Houses

Houses require a small amount of resources and 6 citizens in order to be built. These citizens are now 'living' there (as a family) and cannot be reallocated or anything. The houses themselves are a central focus point in the game because they provide feedback for population dynamics. In a way the house is the most important structure in the game.

Other types of buildings in the neighbourhood provide work opportunities for the citizens. Note that proximity plays an important role here. Citizens will prefer to take up a job at an available 'work spot' closer to home (although a small amount of randomness here I think would be in order). If no work buildings with free work spots are located within some fixed threshold those citizens will stay home unemployed (which means sub optimal production as well as less happiness - in our world work makes one happy).

Cost: 6 Citizens + tdb (very, very cheap)

3.4.2 Storehouse

This is the structure that does not craft but rather generates (per worker) four basic resources: wood, stone, metal, clay. It would be best if the ratio of the resources generated would differ, maybe based on if the player placed the storehouse near a vein of ore, some rocks or woods. Storehouses have 8 workspaces available. Each occupied workspace in the storehouse generates some of these resources.

Cost: tbd (cheap)

3.4.3 Farmstead

Farms generate some amount of wheat and vegetables for each assigned worker. They also enable crafting of bread and soup.

cost: tdb (cheap)

3.4.4 Corral

Corrals are used to herd animals. They generate different types of meat, wool, skins (possibly some other animal byproducts, no bone though, because that is yucky). Workers in corrals can craft stews, various meat dishes and leather items.

cost: tdb (moderate)

3.4.5 Blacksmith

This structure enables crafting of metalworks such as cutlery, weapons and armour, barrel hoops, basic jewelry. Blacksmiths have 6 workspaces available.

Cost: tbd (moderate)

3.4.6 Market

Markets are the center of artisanal craft such as basket weaving, cloth making, carpets and such. Markets have 10 workspaces available.

cost: tdb (moderate)

3.4.7 Civic center

In a civic center advanced technologies such as glass blowing is practised. Also finer cloth is produced then on the market. Civic centers also enable things like paper. Civic centers have 10 workspaces available.

cost: tdb (expensive)

3.4.8 Temple

Temples enable crafting of religious tokens and shrines that Citizens will want for. They can also provide various life improving balms and potions. cost: tdb (expensive)

Note: as you will rightly notice, barracks, towers and fortresses are not included, this is due to time constraints.

3.5 Empire

You really can play one 'empire'. This is important because of race specific traits and recipes. This means: for a fun, balanced game where players get the full game experience there needs to be as much race diversity in a province as possible. For that reason it is recommended the

teacher/mentor/game admin inputs each players' Race. It would be nice if she did cooperate to take into account players' preference but this is up to the teacher.

3.5.1 Gold and tax

Gold is a new resource. It is required for building more advanced houses and crafting some products. It is also the currency in the auction house. Gold is acquired through tax. The player - as the city governor - can raise tax money from its citizens. This tax is closely linked to happiness. DISCUSS I suggest the player can set a tax rate that is taken into account in the happiness function. So the player has to balance gold income with the happiness of the citizens.

3.5.2 Inventory

The inventory is just a players' current stash of raw materials (resources) and crafted goods. They can be gifted to Houses or traded in the Auction House.