Top Right Corner

How the requirements were elicited and negotiated

We first took a copy of the brief and from it and extracted as many requirements as possible and identified any ambiguities. We then interviewed the client basing our questions on what we had extracted from the brief and any ambiguities we had found (questions and responses available here: https://sepr-topright.github.io/SEPR/documentation/assessment1/extras/QA-Richard.pdf). We then wrote up a list of user requirements and used these to generate our system requirements. After this we talked to the client once more to confirm our requirements, this discussion highlighted a number of problems. (Notes from this meeting available here: https://sepr-topright.github.io/SEPR/documentation/assessment1/extras/confirmingrequirements271016.pdf). We then updated our requirements to address these problems. Later once we had designed our system architecture and generated several use cases and collaboration diagrams (see the architecture report) we checked our requirements against these use cases to ensure that everything had been covered (in our case we did not see the need to add any new requirements).

Presentation and specification

We specified each requirement using a format recommended by Suzanne and James Robertson. For each requirement we stated[1]:

- A description of the requirement (what the system is to do)
- A rationale (explaining why this requirement should exist)
- A fit criterion that describes to the reader how they will know whether or not the requirement has been implemented

Sommerville recommends sticking to a standard format such as this[2]. We also used bold text to highlight key parts of the requirements as per his recommendation.

Initially thought we were going to use IEEE standard as a template to help us layout the requirements specification. However, we decided against it as we felt that we would have to include a lot of irrelevant information such as an overall description that only provides the background for requirements rather than actually specifying them[3]. We also decided that ranking our requirements by importance wouldn't be a good idea as many of them are equally important. We decided against labelling requirements as optional or essential as they all bring something important to the game. The standard also allowed us to further verify the description, rationale, fit criterion format as it is clear that the rationale provides backward traceability as it makes it clear where a requirement came from and the fit criterion makes requirements more easily verifiable (easier to test that they've been implemented).

Many of the sections used in the IEEE standard for specifying requirements were irrelevant (such as logical database requirements) so we decided instead to use the following sections:

- 1. Functional (system) requirements
- 2. Non-functional requirements
- 3. Constraint requirements
- 4. User interface requirements

We wanted to include a section for the user requirements that we initially specified and used to generate our system requirements, but due to the page limit we couldn't. (The user requirements

and lists of which user requirements generated which system requirements are available here: https://sepr-topright.github.io/SEPR/documentation/assessment1/extras/Userrequirements.pdf).

Requirements specification

1. Functional (system) requirements

1. Description: the system shall allow **at least two human players** to compete against **each other**
   Rationale: extracted from the brief and first interview (assuming all players play on the same computer).
   Fit Criterion: one human player shall be able to play the game against at least one other human player until one of them wins or they draw.
2. Description: the system shall whilst the game is in play, allow **each player one turn per round**.
   Rationale: this keeps the game fair as each player will have the same number of turns.
   Fit Criterion: when a game is played from start to finish each player will have one turn per round
3. Description: the system shall support a **minimum of 16 plots of land**.
   Rationale: extracted from the first interview.
   Fit Criterion: at the start of the game the first player will be able to choose to acquire one of at least 16 plots of land.
4. Description: the system shall **keep track of which player (if any) has acquired each plot.**
   Rationale: players may only acquire previously unacquired plots of land and may only place roboticons on or get resources from plots of land that belong to them.
   Fit Criterion: it shall not be possible for a player to acquire a plot of land that has already been acquired or to place roboticons plots of land that they do not own.
5. Description: the system shall **maintain an inventory for each player** that contains all the resources, roboticons and money in their possession.
   Rationale: players must be able to acquire resources, roboticons and money and may sell only the resources currently in their possession.
   Fit Criterion: the system shall track how many units of food, energy, ore and how many roboticons and how much money the player is in possession of.
6. Description: the system shall at the start of the game, **assign each player a small amount of money.**
   Rationale: extracted from the brief.
   Fit Criterion: at the start of the game each player will have some money in their inventory.
7. Description: the system shall **maintain the markets inventory** which will contain all of the resources and roboticons that the market is in possession of.
   Rationale: players must only be able to buy resources that the market has in stock.
   Fit Criterion: the system shall track how many units of food, energy, ore and how many roboticons the market has in stock.
8. Description: the system shall at the start of the game allocate **16 units of food**, **16 units of energy**, **0 units** of ore and **12 roboticons** to the **market**.
   Rationale: extracted from the brief.
   Fit Criterion: at the start of the game the market shall have 16 units of food, 16 units of energy, 0 units of ore and 12 roboticons in its inventory.
9. Description: the system shall ensure **certain plots are better at producing a certain type of resource** (food, energy or ore).
   Rationale: extracted from the brief, modified using information from the interview and confirmation.
   Fit Criterion: each plot of land will produce more of a certain resource than any other resource.
10. Description: the system shall whilst the game is in play, **stop the game once all plots of land have been acquired.**
    Rationale: extracted from the brief.
    Fit Criterion: the game should end when the last plot of land is acquired.
11. Description: the system shall at the **start of each turn**, allow the current player to **acquire one plot of land** that has not previously been acquired by any player.
    Rationale: extracted from the brief, decided to limit to one plot after the interview.
    Fit Criterion: at the start of a player's turn they must be made to acquire any unacquired plot of land.

12. Description: the system shall after giving the current player the opportunity to acquire a plot of unoccupied land, give the player the **opportunity** to **purchase roboticons for money from the market**.
    Rationale: extracted from the brief.
    Fit Criterion: the player must be able to purchase roboticons after acquiring a plot of land.
13. Description: the system shall during each turn after allowing the current player to purchase roboticons, allow them to **customise any roboticons in their possession for money**.
    For example roboticons may be customised to support:
    a. Food production
    b. Ore production
    c. Energy production
    Rationale: extracted from the brief.
    Fit criterion: players must be able to customise roboticons after being given the opportunity to purchase them.
14. Description: the system shall only allow players a **fixed amount of time** to **purchase, customise and place** roboticons.
    Rationale: extracted from the brief.
    Fit criterion: once the player has started the purchasing roboticons phase and the set period of time has elapsed the game should end the player's turn (if it has not already ended).
15. Description: the system shall, after the current player has had the opportunity to customise roboticons, allow them to place any **customized roboticon** in their inventory on **any plot of land that belongs to them that has not already had a roboticon placed on it**.
    Rationale: extracted from the brief and confirmed using information from the interview.
    Fit criterion: each player will be able to place one of their roboticons on any plot of land that they own so long as it does not already have one on it.
16. Description: the system shall **once per round**, after all players have taken their turn, **cause each plot of land with a roboticon on it to produce resources** for the player that owns it.
    Rationale: extracted from the brief.
    Fit criterion: players shall obtain resources from every plot they own with a roboticon placed on it.
17. Description: the system shall after causing each suitable plot to produce resources, **allow all players access to the market simultaneously**.
    Rationale: extracted from the brief.
    Fit criterion: Players should be able to access the functionality provided by the market only at this point in the game (other than the purchasing of roboticons).
18. Description: the system shall support an auction system involving the players and the market.
    Rationale: extracted from the brief, fine tuned with information from the second interview. **See risk 14 alternatively:** just allow players to offer other players resources for a set price and offer money to other players for resources.
    Fit criterion: it must be possible for the players to enter into an auction with the market.
19. Description: the system shall, when players have access to the market, allow players to **sell resources** in their possession to the market **in exchange for money**.
    Rationale: extracted from the brief.
    Fit Criterion: players shall be able to sell resources in their possession to the market for money.
20. Description: the system shall, when players have access to the market, allow players the opportunity to **buy resources from the market** for money if and only if the market has them in stock.
    Rationale: extracted from the brief.
    Fit Criterion: players shall be able to purchase resources that the market has in stock for money.
21. Description: the system shall **start the next round** (so long as the game has not finished) once **each player** has indicated that they have **finished accessing the market**.
    Rationale: extracted from the brief.
    Fit Criterion: once both players have finished accessing the market the first player shall be able to acquire a plot of land (as long as the game has not ended).

22. Description: the system shall once the game has ended, **calculate each player's final score** based on the resources in their possession.
    Rationale: extracted from the brief.
    Fit Criterion: some score shall be calculated for each player at the end of the game.
23. Description: the system shall once the game has ended and each player's score has been calculated, **report which player is the winner**.
    Rationale: extracted from the brief.
    Fit Criterion: the player with the best score must be reported as the winner.
24. Description: the system shall, when players have access to the market, allow them to **gamble their money** on a **game of chance**.
    Rationale: extracted from the brief, the fact that it can only be done via the market is from the 1st interview.
    Fit criterion: it must be possible for players to gamble their money.
25. Description: the system shall, allow **at least 3 random events** to occur that will have a positive or negative effect on one or more player(s).
    Rationale: extracted from the brief, we decided that three was the minimum to have an interesting effect on gameplay.
    Fit criterion: it must be possible for at least 3 random events to occur that have some effect on at least one player.
26. Description: The system shall, at the **start of the game** ensure that **all plots are unacquired**.
    Rationale: extracted from the brief.
    Fit criterion: at the start of the game it must be possible for the first player to acquire any of the plots.
27. Description: the system shall allow the market to use its ore to produce more roboticons.
    Rationale: extracted from the brief.
    Fit criterion: it must be possible for the market to produce roboticons in exchange for ore.

<u>2. Non-functional requirements</u>

1. Description: the system must be **easy to learn**.
   Rationale: player's will not enjoy the game if they don't understand how to play.
   Fit criterion: 80% of first time users will take no longer than 4 rounds to work out what is required of them and what actions they can take in each phase of the game.
2. Description: the system must be **reliable**.
   Rationale: if the system is not reliable and is prone to crashes players will not enjoy their experience.
   Fit criterion: the system must crash less than 1% of the time when used as intended.

<u>3. Constraint requirements</u>

1. Description: the system shall be capable of running on a **PC in CSE/069&070**.
   Rationale: the system may be used on open days using these computers.
   Fit Criterion: the system shall run on a PC in CSE/069&070.
2. Description: the in game map shall **resemble the University of York's campus**.
   Rationale: the customer will want to use the system as marketing material for the university.
   Fit Criterion: 3 recognisable landmarks from the University of York's campus should be visible.

<u>4. User interface requirements</u>

1. Description: the system shall make it clear which player (if any) owns each plot.
   Rationale: if the player can't tell which plots they own then they may try and perform invalid moves, leading to frustration when don't understand e.g. why they can't place a roboticon on a plot they do not own.
   Fit Criterion: 80% of first time players should be able to identify which plots are: unoccupied, occupied by them, and occupied by their opponents.

Bibliography

[1]S. Robertson and J. Robertson, *Mastering the requirements process*, 2nd ed. Boston: Addison Wesley, 2006.

[2]I. Sommerville, *Software engineering*, 10th ed. Harlow, England: Addison-Wesley, 2015, p. 122.

[3]*IEEE recommended practice for software requirements specifications*. New York: IEEE, 1993.