



Wordomino

A word game for improving children's language skills

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Degree Project for Master of Fine Arts in Design
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Print year 2021

ISRN LUT-DVIDE/ EX--21/50553-SE

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Abstract

This research examines the board game market, which can help the client in improving their existing board games. Based on the literature review, the board game is situated in a large-scale market (Arizton, 2019) that is suitable for developing novel games. Meanwhile, this research includes a survey on popular board game mechanics and an examination of relative word games and target groups. Regarding its research methods, it applies questionnaires and literature review. Consequently, the final design of the word game is improved by incorporating some of the most popular game mechanics and determining the existing pain points originating from the competitors of the client.

Keywords

Educational game design, Board game mechanics, Spiel des Jahres

INTRODUCTION

This research has six chapters, adopting a double diamond approach (Dan, 2016). The two fundamental components of the said approach are “Designing the right thing” and “Designing things right”. The chapters on “Discover” and “Define” comprise the “Designing the right thing” component, while “Develop”, “Result and discussion” and “Deliver” comprise the “Designing things right” part.

Figure 1 presents the design development process for the Wordomino.

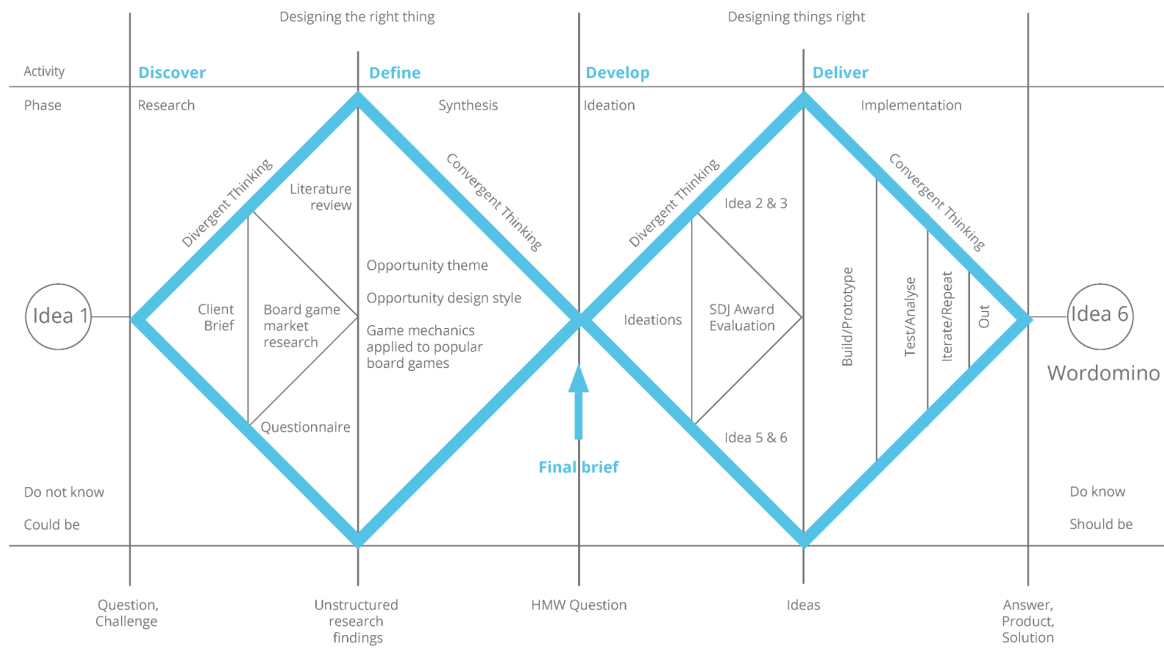


Figure 1. The double diamond design process (Dan, 2016) for the Wordomino

CHAPTER 1: DISCOVER

This chapter focuses on the research aspect, including the client brief, and research on the board game market, popular board games, relative word games, and target groups. The research methods involve literature review and questionnaires.

1.1 Client Brief

1.1.1 Background

A board game is developed with the aim to build words in specific categories. The game's rules are already established. Nevertheless, some adjustments may be applied regarding the balance of the game's elements. Furthermore, the design process shall be environmentally friendly and sustainable. The primary target group comprises those between 12 and 19 years old, as well as parents and grandparents between 45 and 70 years old. The company intends to initiate its business on developing various educational board games. Regarding the word game, its unique selling points involve competition between teams and communication within the team. It has various existing and upcoming language versions, including English, Swedish, and German.

1.1.2 Plan

The plan is to make a board game to kickstart the business. The said word game aside, another strategy game needs to be developed. Thus, a board game market research is necessary. Table 1 presents the intended schedule of the project.

Table 1: Schedule based on the double diamond design process								
Milestone	Activity	Week 5	Week 7-11	Week 12-14	Week 15-17	Week 18-20	Week 21	Future
Discover	Meet client							
	Evaluate client's idea 1							
	Board game market research							
	Design questionnaires							
	Distribute questionnaires							
	Receive the questionnaire results							
Define	Analyse and interpret data							
	Data graphics							
Develop	Idea 2							
	Idea 3							

	Meet supervisor and examiner							
	Idea 5							
	Idea 6							
	Meet supervisor and examiner							
Deliver	Test Idea 2							
	Test Idea 3							
	Test Idea 5							
	Test Idea 6							
Manage	Peer review							
	Meet supervisor and examiner							
Presentation	Prepare the PowerPoint							
Publish	Business plan							
	Manufacturing							
	Kickstarter							
	Instagram, Facebook							
	Spiel des Jahres Award							
New game	Strategy game research							

1.1.3 Aim

The word game intends to help parents and grandparents in teaching their children words, which can enhance their communication and language skills. It can also develop children's teamwork and collaboration skills.

1.1.4 Research Questions

The following questions are proposed to analyse the feasibility of idea 1:

1. Is it feasible to develop a word game? If so, what are the attractive features of this game for customers to purchase?
2. What are the criteria in determining a "good" board game?
3. Is the client's target group accurate? Where are the target market areas? Are the buyers and the target groups the same?
4. Who are the client's competitors? What are their pain points?

1.2 Board game market research

Based on the client brief, some other board games need further development. In this case, general board game market research is applied.

An article depicting the history of board games (Peter, 2016) has comprehensively introduced the developing trends of the West and the East throughout said history. Board games have spanned more than five millennia of history. Their identity has evolved, from being used as talismans and for other religious and military-strategic purposes, to become eventually part of childhood life. The same article has also mentioned Kickstarter as a viable method to help the team obtain funds. It has also introduced the Spiel des Jahres award (1978), which includes the following evaluation criteria (Peter, 2016):

- Game concept: originality, playability, game value;
- Rule structure: composition, clearness, comprehensibility;
- Layout: box, board, rules; and,
- Design: functionality, workmanship.

However, it is necessary to determine which factors have a greater effect on obtaining the award. After a perusal of the awarded board games on the official website of Spiel des Jahres, as well as various testing and unboxing videos on YouTube, this research has compiled the statistical results in Appendix 1. Indicatively, five high-ranking factors are selected to help the team in developing the project:

- Design functionality;
- Rule structure: comprehensibility;
- Game concept: originality;
- Game concept: playability; and,
- Rule structure: composition.

Another article entitled *Why board games are making a comeback* (Michelle, 2020) indicates that the actual driver of Euro game popularity is social dynamics. Relative to this, strategy and war games manifest the highest growth rate and occupy the majority of the market share. Due to cultural differences, various board

games are divided into European style and American style. The American style tends to have sharper game rules, including direct conflict, high randomness, and player eliminations. In contrast, the keywords for European-style board games typically include low randomness and indirect conflict. Based on the article, industry experts classify board games into five categories (Michelle, 2020):

- Strategy and war games;
- Educational games;
- Fantasy games;
- Sports games; and,
- Others.

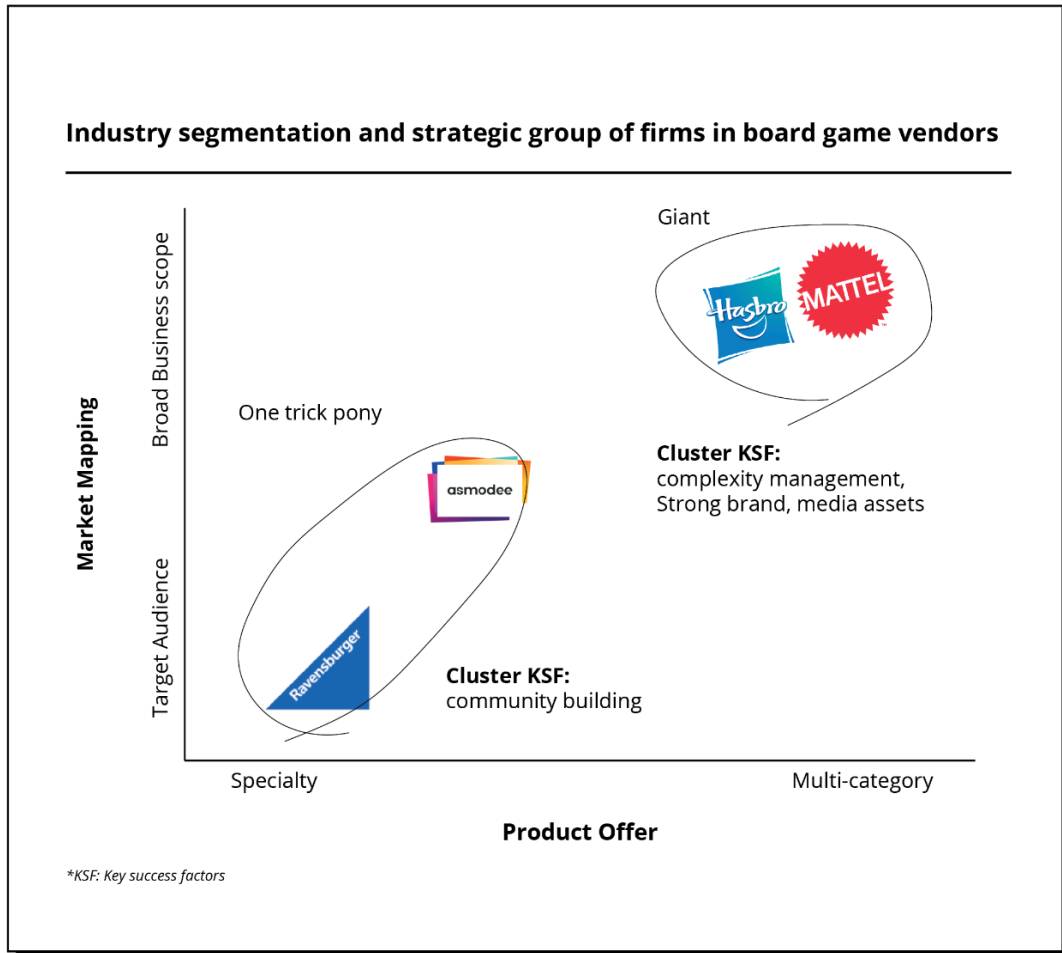
Furthermore, the research entitled *Gamification in education: a board game approach to knowledge acquisition* (Bahar, et al., 2016) presented that board games can increase students' learning efficiency. Thus, there is an opportunity market for the development of educational board games. Accordingly, it is feasible to devise a business plan in developing an educational word game.

As educational tools, board games play a vital role in influencing peoples' minds. One research stated: "For students to learn about and respond to this challenge, they need to be equipped with the right knowledge and to critically analyse today's society and industrial systems, which involve multiple stakeholders. This implies a need for an open mind and broad thinking in decision-making" (Mélanie, 2018). Therefore, it is significant to let people learn from sustainable thoughts. In this case, the Sustainable Development Goals (SDGs) can be applied as a game theme.

During the first team meeting, the client mentioned that it was possible to sell the final product to board game vendors. According to the report *Board Games Market - Global Outlook and Forecast 2019-2024* (Arizton, 2019), it gave support to both European and American vendors. It also listed four of the most popular vendors:

- Asmodée Éditions, since 1986 (France);
- Hasbro, since 1923 (United States);
- Mattel, since 1945 (United States); and,
- Ravensburger, since 1883 (Germany).

Detailed research was conducted to determine the suitable vendors for the team to publish the product. Figure 2 below indicates the differences among these vendors. European vendors typically concentrate on a specific goal or field. Additionally, they tend to design their products according to culture and the necessity to obtain awards. Their product segmentation is based on various game types. In contrast, American vendors are focused on highly extensive business scope, are IP-driven, and advocate best-selling products. Their product segmentation is based on gender and age differences, which may arguably shape stereotypical minds whenever people play board games. In this case, European vendors can be a better choice for the team to sell the product.



European vendors

1. Concentrate on one goal or one field
2. Theme: Culture based
3. Advocate: Award
4. Product segmentation: by game type

United States vendors

1. Business scope is wide and complicated
2. Theme: Brand driven, IP-driven
3. Advocate: Sell the best, commercial
4. Product segmentation: by age and gender (e.g. boy, girl and preschool)

Figure 2. Industry segmentation and strategic group of firms in board game vendors

According to the book *The Art of Game Design*, "game mechanics are the core of what a game truly is. They are the interactions and relationships that remain when all of the aesthetics, technology, and story are stripped away" (Jesse, 2008). Hence, game mechanics play a vital function in game design. It could depict the user interaction process and players' journeys. In this case, popular game mechanics may increase the playability of the word game. Therefore, popular board game research was applied to determine the most popular game mechanics in the market.

1.2.1 Popular board game research

The first questionnaire was distributed to gain insights on the popular game mechanics. It involved open questions posted via Facebook. It garnered 308 replies, with 303 board games recommended by people who were also members of the largest board game group on the said social media platform.

The results presented the Top 15 most popular board games (Figure 8) plotted in a positioning chart (Figure 9), involving frequencies greater than four. There is an unsaturated market share in the top-left area of Figure 6, which showed the opportunity theme trend. Additionally, the first questionnaire's results indicated that Terraforming Mars was the most popular board game. Meanwhile, as the unique board game, Azul garnered the Spiel des Jahres award. All popular board games recommended by the respondents' replies were plotted in a word cloud using Matlab (Figure 7). The generated word cloud could help the team members easily determine all recommended board games. Combined with the data provided on the BGG website, all popular game mechanics applied to the Top 15 board games were plotted in a word cloud (Figure 10). Based on this word cloud, the following nine mechanics had a relatively high frequency concerning the top 15 board games:

- Solo / solitaire game;
- Hand management;
- Variable player powers;
- Set collection;
- Dice rolling;
- Tile placement;
- Hexagon grid;
- Cooperative game; and,
- Worker placement.

1.2.2 Relative word game research

The second questionnaire aimed to determine the popular word games and potential competitors. It was distributed via the same Facebook group, the biggest board game group, and included one open question. The open question asked people to recommend word games they like the best. In this way, the team could learn from the respondents' recommended word games. Based on the 102 garnered responses, there were 46 recommended word games (Figure 11). There were 11 word games indicated in Figure 12. From the positioning chart in Figure 14, the top five word games and two competitors were plotted, listed as follows:

- Paperback;
- Codenames;
- Just one;
- Letter Jam;
- Quiddler;
- Bananagrams; and,
- Scrabble.

Figure 12 includes thorough information on the top five word games and the pain points from two competitors, Scrabble and Bananagrams. Meanwhile, Appendix 6 provides insights on the research on letter value and quantity. Vowels occupy a huge proportion of the total letter quantity. For Bananagrams and Scrabble, letter quantity has a positive correlation with the number of players. Bananagrams is designed for one to eight players; on the other hand, Scrabble is designed for two to four players.

Figure 14 demonstrates the pricing disparity among the four quadrants. The products in the star market were quite expensive. The pricing of such products in the question market was variable, ranging from medium to low in the cash cow area. The products for the dog market were affordable. Except for Paperback, which could be purchased from a second-hand website, all price information was obtained from Amazon. Furthermore, it was found that “party type” was more popular than “family type”. Since the game type involved strategy combined with party type, it made the top one-word game unique. Eventually, the products in the star market garnered the Spiel des Jahres award.

To sum up, party type was more popular than family type, and people preferred to play relatively easy games. In addition, the competitive product Scrabble was not even included amongst the Top 15 board games. For competitive products, their pain points (Figure 13) include fixed reading directions, tiles fading out, counting points, and a large board to be upgraded while developing the project.

1.2.3 Target group research

A third questionnaire was distributed to a group of people who like word games. It focused on research involving word game buyer group and user group. It garnered 63 replies, including 25 participants who would like to help with further research. The detailed information could be found in Appendix 4. There were seven word games included—two competitors, and the top five most popular word games (Figure 15). The questionnaire was further divided into two sections—buyer group research and user group research—with the goal to determine what drew buyers to purchase word games fundamentally.

The target group consisted of seventeen people (Figure 16, Figure 17) who supported “Scrabble” and “Bananagrams” as determined by the questionnaire results. The raw data of seventeen participants are presented in Table 3.1 and Table 3.2.

It is vital to identify a viable solution to increase the willingness whenever buyers purchase the product. According to a complaint by participant 17, the Scrabble was not thrilling enough for the participants to purchase it willingly. It signified the need for a goal or theme, not just to obtain points by making words.

CHAPTER 2: DEFINE

This chapter focuses on the key findings from the literature review and the administered questionnaires. The findings in this chapter manifest the opportunities and design directions for the word game.

2.1 Summary of research findings

An European style board game is popular than American style board game. Moreover, developing a strategy word game by applying popular game mechanics and an undeveloped theme could be a design opportunity. In addition, the pain points provided by the competitors can be considered to enhance the word game.

Firstly, design functionality, rule structure (comprehensibility), game concept (originality), game concept (playability), and rule structure (composition) from Spiel des Jahres need to be applied in word game design. Moreover, the following game mechanics can be applied in idea 1: solo / solitaire game, hand management, variable player powers, set collection, dice rolling, end-game bonuses, tile placement, turn order (claim action), and hexagon grid. Accordingly, it is better to follow a simple design. Finally, the opportunity themes include near-future and contemporary themes, since there is an unsaturated market in that quadrant (Figure 8). Specifically, SDGs can be applied as a theme.

The third questionnaire result showed the potential target group (Appendix 4). The primary target demographic involved families with children who intended to educate their children through board games. As for the secondary target group, it included people who had been playing word games for years. Meanwhile, the tertiary target group included educators who work closely with language teaching.

2.2 Mind map

The mind map in Figure 3 presents a summary of the key findings, including three target groups, popular game mechanics, and user scenarios. The physical product aspects include theme, design style, and components.

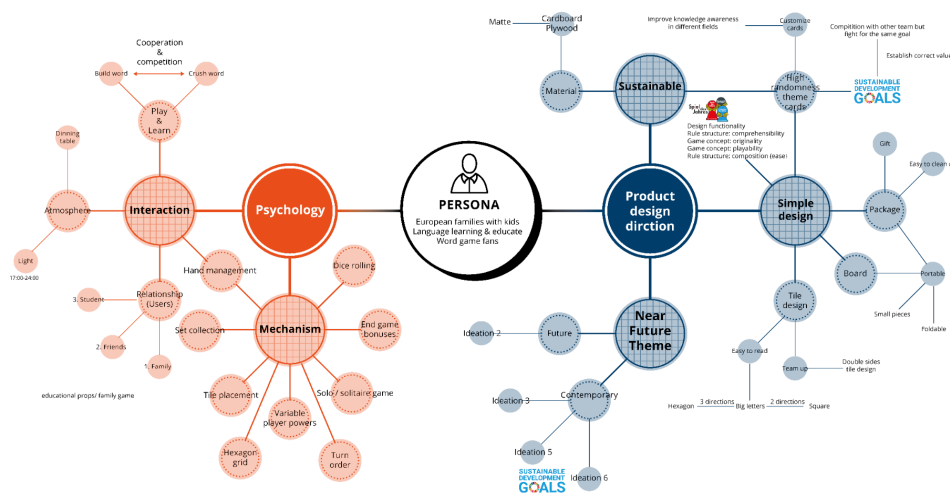


Figure 3. Mind map

CHAPTER 3: FINAL BRIEF

This chapter provides a development plan for the word game project.

3.1 Goal

The project goals include designing an educational team-based word game, and incorporating opportunity themes and popular game mechanics to enhance game playability and concept originality. It is an advantage if new games can let players learn more words by playing. Additionally, the Spiel des Jahres criteria were applied to evaluate the concepts. Finally, by redesigning the letter tiles and boards, the team-based concept may be improved and mitigate pain points from the competitors.

The new word game would suit the needs of three target groups, based on the results of the third questionnaire. It would be designed to assist children to expand their vocabulary while playing family games and enhance their collaboration skills. Furthermore, it would cater to the interests of word game fans and language-teaching people. Hence, it could let players learn SDGs or other themes, which may be able to suit the needs of the three target groups. It is also necessary to improve the pain points signified in relative word game research to boost market competitiveness; for instance, applying modular design or different materials could solve related problems. To upgrade idea 1, popular game mechanics were applied to generate more interesting ideas.

3.2 Business plan

Although the board game market in North America was relatively large, the team chose to launch the company on the European market. Firstly, the business plan was to win the Spiel des Jahres Award, which could increase public exposure and potentially mitigate advertising costs. Secondly, submitting a project on Kickstarter was a viable strategy for raising funds. Thirdly, if the first plan did not work, the team could sell the product to European vendors. Fourthly, since the product is an educational board game, a B2B strategy might work; collaboration with language learning software could be an option. Finally, the product would be gradually disseminated outside the European market.

CHAPTER 4: DEVELOP

This chapter includes the design process and new ideas, six ideas were involved. The first and fourth ideas were provided by the client. Meanwhile, ideas 2, 3, 5, and 6 were designed after incorporating the research results; they involve popular game mechanics and opportunity themes. However, idea 4 is not discussed in this chapter, since it is covered by the NDA with the client.

4.1 Design process

Different ideas were developed, as laid out in Table 2.

Table 2: project development			
Idea	Applied findings	Player journey	Spiel des Jahres evaluation criteria
Idea 1: Team-based word game, provided by the client	Game mechanics: Dice rolling, cooperative game	<ol style="list-style-type: none"> 1.Team up 2.Draw 16 tiles (from 2 different bags) 3.Draw 4 theme cards from 18 random theme cards 4.Place bonus tiles 5.Build words according to theme cards 6.After each player finish 4 cards, end the game 	
Idea 2: Team-based word game	Game mechanics: Dice rolling, set collection, cooperative game Theme: Future, universe	<ol style="list-style-type: none"> 1.Team up (human against alien) 2.Purchase tickets: dice rolling 3.Travel among different planets (destination) to build words 4.Block other travellers 5.Finish missions on different destinations to win the game 	
Idea 3: Strategy word game	Game mechanics: Hand management, turn order (claim action), set collection, variable player powers, cooperative game Theme: Contemporary, life	<ol style="list-style-type: none"> 1.Draw different player ID 2.Build word according to personal ID to start the game 3.Purchase resource cards 4.Purchase random power cards: fight with the game (positive & negative powers) 5.The player got 3 badges or arrive 00 to win the game 	

<p>Idea 5: Customizable team-based word game</p>	<p>Game mechanics: End game bonuses, tile placement, solo / solitaire game, hand management, variable player powers, set collection</p> <p>Theme: Contemporary, SDGs</p>	<ol style="list-style-type: none"> 1. Assemble cards 2. Team up (bright against dark) 3. Draw 16 tiles (from 1 bag) & 5 boards 4. Build words according to the theme (SDGs) on paved boards 5. Collect award tiles / Crush word (flip) 6. Win game 	
<p>Idea 6: Customizable team-based word game</p>	<p>Game mechanics: End game bonuses, tile placement, solo / solitaire game, hand management, variable player powers, set collection, hexagon grid</p> <p>Theme: Contemporary, SDGs</p>	<ol style="list-style-type: none"> 1. Team up (bright against dark) 2. Draw 16 tiles (from 1 bag) 3. Build words according to SDGs (no less than 3 letters) on a paved board 4. Collect award tiles / Crush word (flip) 5. Win game 	

Idea 1: The client provided the initial word game concept, known as idea 1, which involved constructing words based on themes. There were eighteen unorganized themes, including art, physics, and shipping, etc. Following the testing, the initial concept was operational; moreover, the rule structure was straightforward. In this way, players could easily compute their scores using the numbers on the edge of the large board. However, the game concept was similar to that of Scrabble; furthermore, it demonstrated no utility of the teamwork concept. Finally, each player could learn only four words after playing one time. It was not sufficient as an educational game.

Idea 2 (Figure 18): The players were divided into two teams—human and alien—to emphasize the game’s team-based concept. Since the players had to roll the dice several times to purchase enough cards, the game proved too complicated to play overall. Furthermore, the team felt that there were no sufficient interactions with the other team members regarding alphabet letters. Thus, the team gave up on idea 2.

Idea 3 (Figure 19, Figure 20): It was generated according to the team’s feedback. The game board returned, but was different compared to that of idea 1. More functions were incorporated around the edge. In addition, a soft material was applied to address the “large board” pain point. The original theme cards were split into two categories: power cards and ID cards. Positive and negative powers were included. The game had to be fought against by the players. However, after testing by the team, the team-based concept was depicted as unimportant. Thus, idea 5 was designed.

Idea 5 (Figure 21): It was designed according to the team’s inputs. The tiles were designed as double-sided to emphasize a team-based concept. The game board was made up of little pieces, with each colour on the board having a distinct function.

Idea 6: It was an upgraded version of idea 5. Tile development was applied to idea 6 (Appendix 6) to enhance the game’s concept originality. Following the testing on various tile shapes, a hexagon shape was

chosen. The reason why the hexagon shape was selected was that it is one of the popular game mechanics from the research results.

4.2 Insight and learning from playing the games

The team played the game to determine and evaluate if it met the Spiel des Jahres criteria. Following the testing of idea 6, Wordomino was found effective in generating higher overall scores. Furthermore, the rule structure was comprehensive, as idea 6 involved the end goal for all players. Specifically, the players constructed words based on the SDGs as the theme. There were also 17 blank theme cards for players to customize as the primary goal. Furthermore, game playability was enhanced, as players could decide whether to attack or cooperate with the other players. Additionally, the game board was designed as a modular board with various functions. Thus, every time players would play the game, a new game board would be generated. The tiles were designed as hexagonal and double-faced to improve the game's concept originality. However, rule structure composition was decreased by having more game rules. Nevertheless, idea 6 served as the viable outcome.

CHAPTER 5: RESULT AND DISCUSSION

Whether the players are on the bright or the dark team in the game, finishing all SDGs or other customizable themes is the primary goal for all players. Players can construct their island or link their domain with that of their opponents. Such an interaction addresses “fixed reading direction” as one of the competitor’s pain points. In this way, players can choose whether to attack or cooperate with their opponents by activating power tiles. Furthermore, the problem of “tiles fading out” has been alleviated by applying laser cut technology in tile production. Additionally, the dark-against-bright concept enhances the game’s team-based intent. Instead of learning four words by playing one, the players may learn up to 17 words.

The final design of the Wordomino has improved the game’s randomness by using a modular board design, making the game board portable. The tiles are made double-sided to emphasize the game’s core idea—teamwork. Compared to the client’s idea 1, idea 6 is relatively more challenging. It is not just a cooperative game, as players can decide how to play the game by acquiring different power tiles. Moreover, players can learn from meaningful themes by playing the game.

5.1 Playing journey

The words should work from three directions when they are in the same colour (same team): from left to right, or up to down in straight lines, with no “curved” words. If an adjacent word is by another team (opponent), the words should not be read as connected words, since their letters have different colours.

Players can use the letter tiles placed by the opponent when the given new word crosses the opponents’ letter and is longer. In this case, they can flip the crossed letter tile to crush the opponents’ word. The crushed words, which are fragments of the letter tiles, can be collected when the players activate a specific superpower. Eventually, the longest word will be left on the board.

The modular board should be placed before the letter tiles. If there are no letter tiles on the board, the board returned in place. Each letter tile is placed on the power area; meanwhile, a player can gain corresponding power tiles from the power shop. A superpower is activated when using three same-power tiles. However, players can decide when to activate the power tiles.

After all 17 theme cards are finished, the team with more letter tiles left on the board wins the game.

The game rules are listed in the Appendix 8.

CHAPTER 6: DELIVER

Overall, an educational team-based word game was designed to enhance game playability by applying SDGs and popular game mechanics. The game's modular board design increased its concept originality, which upgraded "large board" as a pain point. Besides, hexagonal double-sided letter tiles enhanced the game's team-based concept. Finally, it was an advantage that idea 6 could let players learn more words even by playing one time.

6.1 Limitation

Considering the pandemic situation, the game test session had its limitations. The testing phase was finished by the team itself. Besides, the designer and team members alike could make the decisions. Finally, the evaluation process might include bias, since the evaluation process was accomplished by the designer by watching unboxing and testing videos on YouTube.

6.2 Conclusion

To summarize, this research provides the following answers to the research questions.

1. Developing a word game is a reasonable business plan. Factors like cooperation with others, ease of start-up, affordable price, and capability to defeat others all attract people to purchase the word game. Adding a goal or theme to the initial idea, combined with target group research, can make the word game appealing for consumers to purchase.
2. A "good" board game can be defined in two ways. One is to win an award, specifically the Spiel des Jahres award. The other is that, if the product sells well, it can be a "good" board game.
3. The client's target group is correct. However, the actual target group can be far larger. Not only should families with children be included, but also language teachers and fans of word games. Meanwhile, North America and Europe can be the target markets. Possibly, the buyer and user target groups are not similar.
4. The game's competitors are Scrabble and Bananagrams. Their pain points include fixed reading direction, counting points, tiles fading out, the large board, and no theme or goals.

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APPENDIX

Appendix 1: Top five key factors extracted from 2016-2020 Spiel des Jahres

Basing on popular board game research, awarded games can be deemed as good games. The top five key factors to garner the Spiel des Jahres award include design functionality, rule structure (comprehensibility), game concept (originality), game concept (playability), and rule structure (composition).

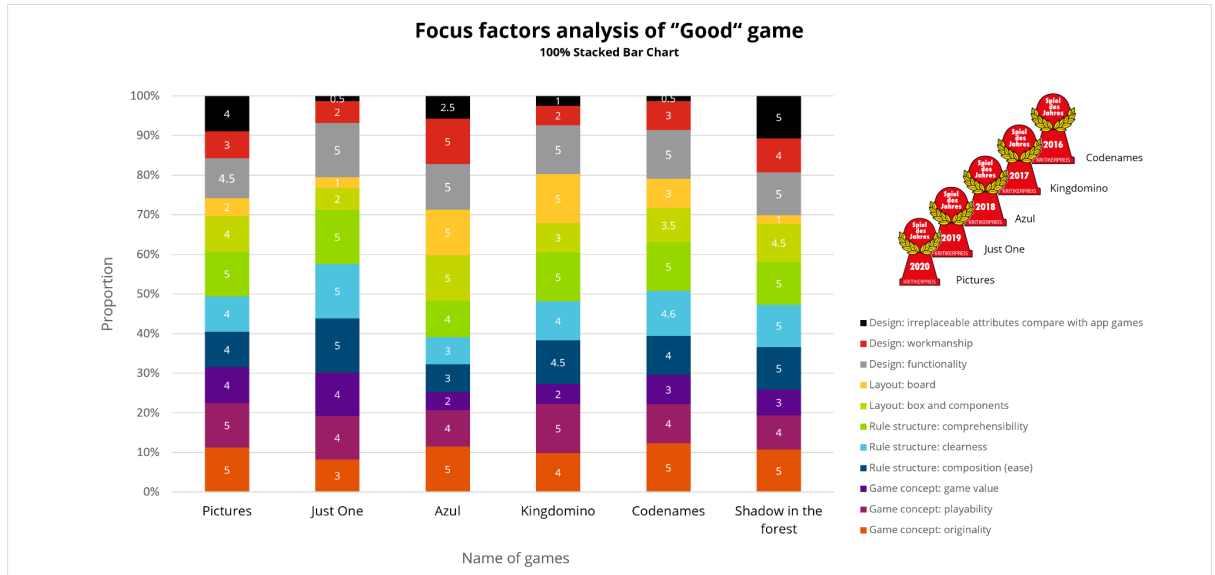


Figure 4. Factor analysis from 2016-2020 Spiel des Jahres

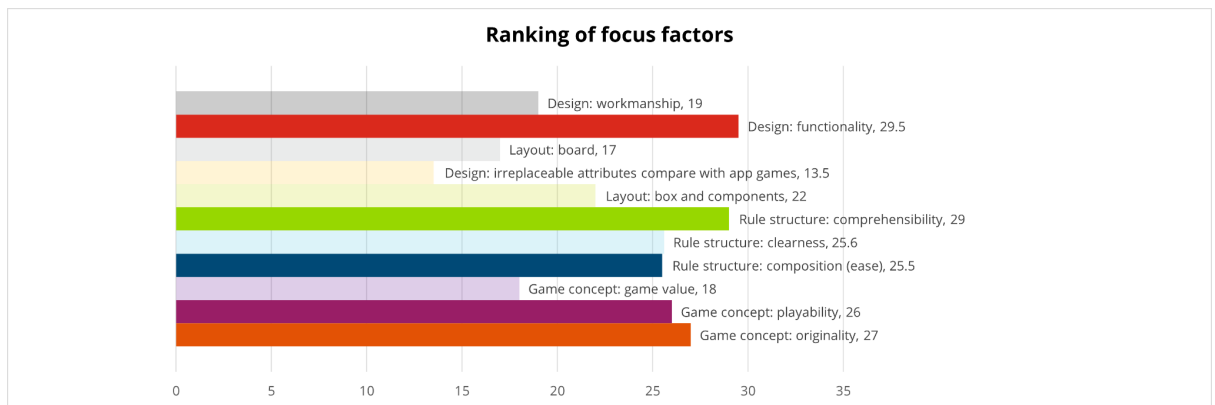


Figure 5. Ranking of focus factors based on Spiel des Jahres

Evaluation of "Good" board games (theme, design style, year & game type)

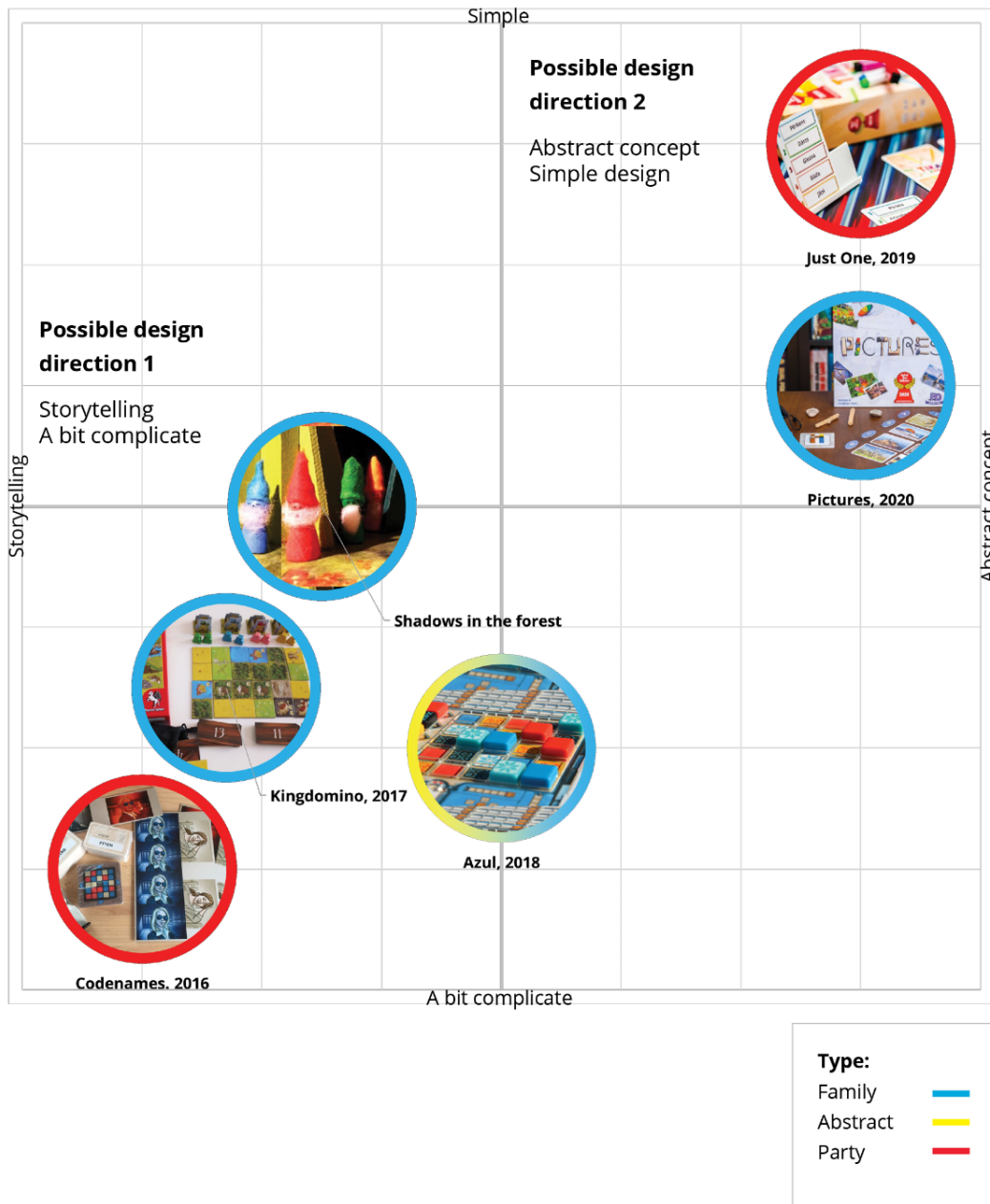


Figure 6. Analysis of possible design styles

Appendix 2: Popular board game research

This appendix presents the results from the first questionnaire.

Popular Board Game Wordcloud



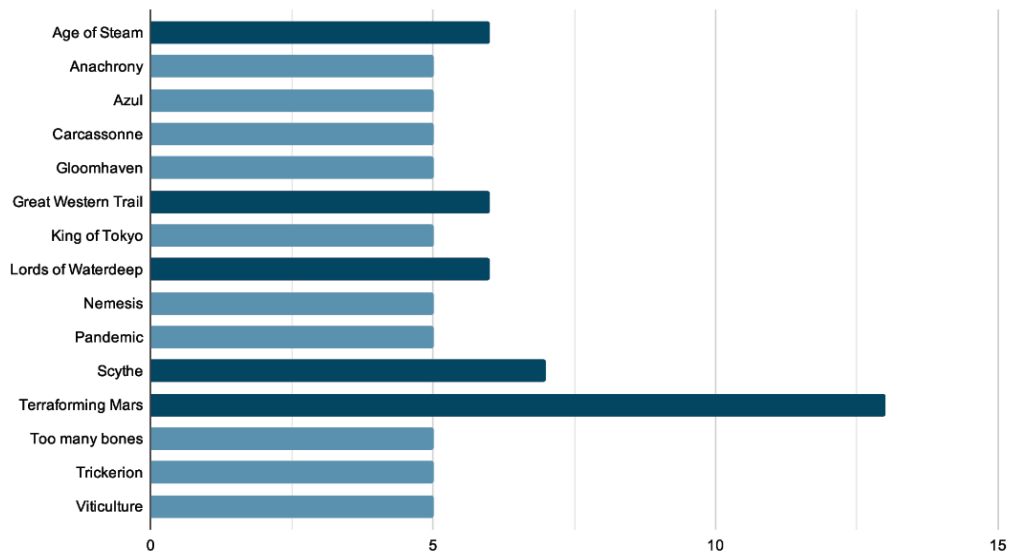
*303 board games

Figure 7. A word cloud of all popular board games as the responses of the first questionnaire

Summary of popular board games

Open question 1: Which board game you like the best?

Hand out: Mar 12. Collect: Mar 14.



Raw data

Data collected from Facebook Reply.

- **308** replies
- **303** board games
- Filter condition: **frequency larger than 4**
- **15** games were listed

Keywords

Strategy game
Top 5 are Euro game
Award and honor, Sell the best

Figure 8. A summary of Top 15 popular board games as the responses of the first questionnaire

Top 15 popular board game positioning (theme, design style & game type)

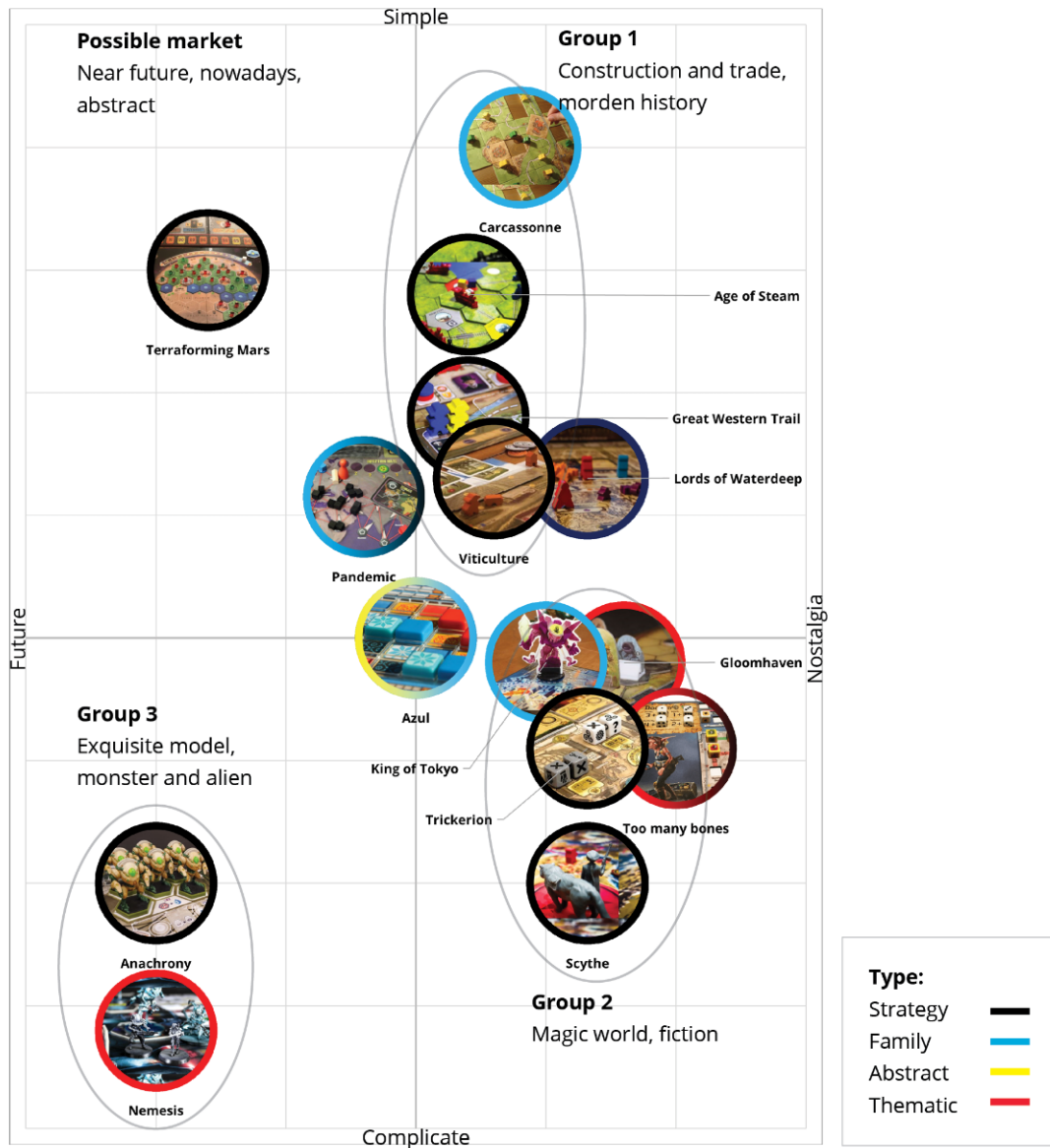


Figure 9. A positioning chart of Top 15 popular board games

Popular game mechanisms wordcloud from Top 15 board games



*73 game mechanisms

Figure 10. All game mechanics applied to the Top 15 popular board games

Appendix 3: Relative word game research

This appendix presents the results from the second questionnaire.

Popular Word Game Wordcloud



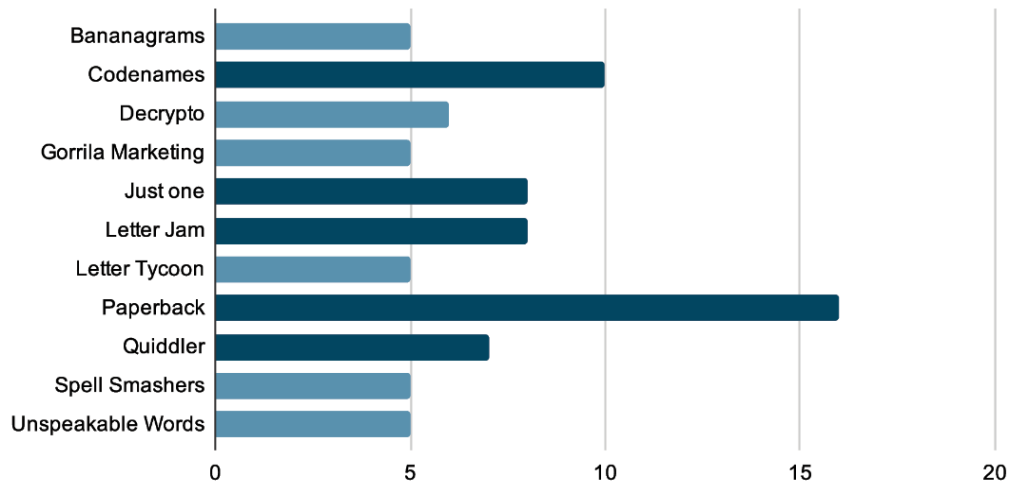
*46 word games

Figure 11. A Word cloud of all popular word games as the responses of the second questionnaire

Summary of relative product research

Open question 2: Which word game you like the best?

Hand out: Mar 13. Collect: Mar 15.



Raw data

Data collected from Facebook Reply.

- **102** replies
- **46** word games
- Filter condition: **frequency larger than 4**
- **8** word games were listed

Keywords

Game type: Party > family

Game difficulty: light

Top 1 game type: Strategy and family

Figure 12. A summary of Top 8 word games as the responses of the second questionnaire

Evaluation of relative product research

Image	Introduction	Fascinating points	Pain points
	Paperback: Use letter cards to build words that let you buy more powerful letters and score. (BGG, 2021)	Strategy Purchase App Story telling Visual design	Repeated words Similar mechanisms with Quiddler Difficult to clean up table
	Codenames: Give your team clever one-word clues to help them spot their agents in the field. (BGG, 2021)	Guess Story telling Read from both directions Visual design	Limited vocabulary
	Just One: Give one-word clues so someone can guess one word, but duplicate clues are discarded. (BGG, 2021)	Guess Cooperate	Could be replaced by app easily No need of buying product
	Letter Jam: Provide word-based hints so everyone can deduce their scrambled mystery word. (BGG, 2021)	Guess Cooperate	Meaningless visual design Package design
	Quiddler: Short words and long words can make for high scores in this versatile word game. (BGG, 2021)	Portable Old game Luck driven	Visual design of letter is not easy to recognize
	Scrabble: Carefully place your lettered tiles to make high-scoring words. (BGG, 2021)	Competition Classical Old game Touch of tiles	Fixed reading direction Tile fade out Counting points Large board
	Bananagrams: Race to arrange your letter tiles into a crossword before anyone else. (BGG, 2021)	Package Portable Flip	Counting points

*Grey grids are competitors, blue grids got the Spiel des Jahres Award

Figure 13. An evaluation of Top 5 popular word games and two of the client's competitors

BCG Matrix of word game products (Market share, market growth & price)

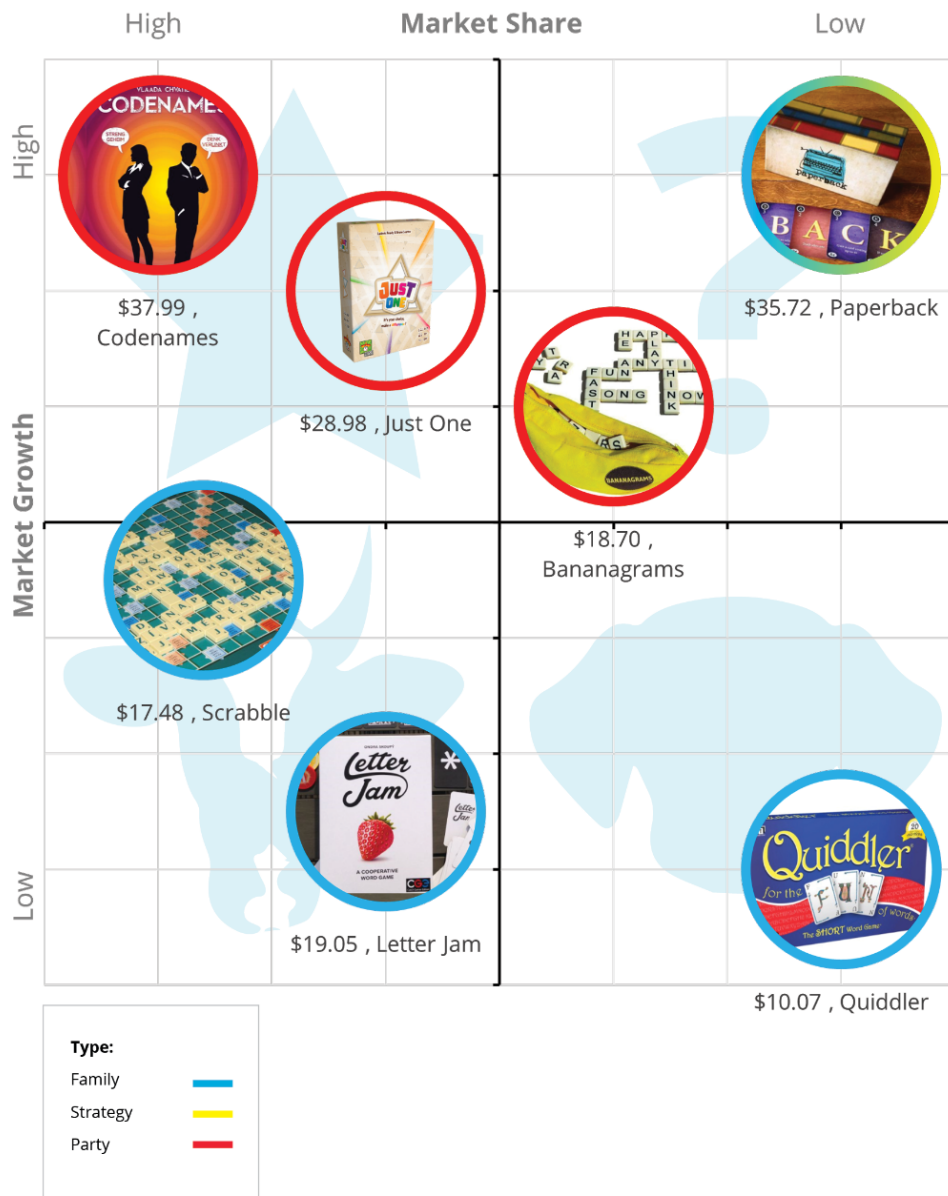


Figure 14. A positioning chart of the BCG Matrix of Top 5 popular word games and two of the client's competitors

Appendix 4: Target group research

This appendix presents the results from the third questionnaire.

There were 63 replies, including 25 participants who would like to help with further research. The questionnaire was distributed via the biggest board game Facebook group. Seventeen participants chose “Scrabble” and “Bananagrams” as their favourite word games (Figure 15). Table 3.1 and 3.2 presents the raw data of the target group from the third questionnaire.

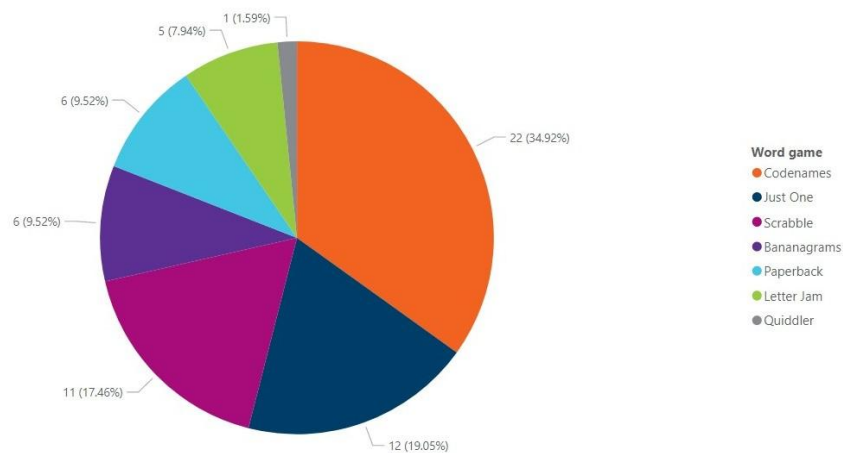


Figure 15. A ratio proportion of seven relative word games as the responses of the third questionnaire

The high-density buyer groups were determined in North America and Europe, with North America having the largest group of buyers (Figure 16). In North America, more participants chose Scrabble. Contrarily, in Europe, more participants chose Bananagrams. Interestingly, a large proportion of the buyers worked for the education and training industries. Thus, the target group could include educators or those who intended to use the product as a teaching tool.

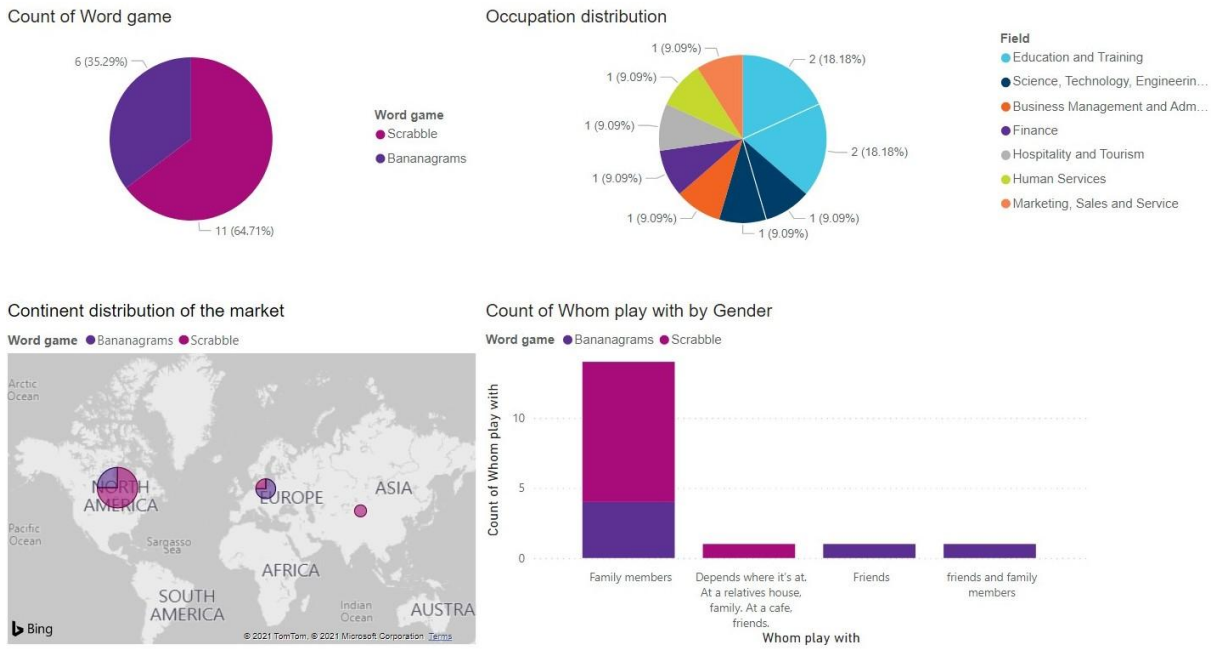


Figure 16. Seventeen participants chose "Scrabble" and "Bananagrams" responses of the third questionnaire

A large proportion of the participants played the word game indoor at a dining table for around an hour, from 17:00 to 24 o'clock. Most of them revealed to have played the word game annually (Figure 17).

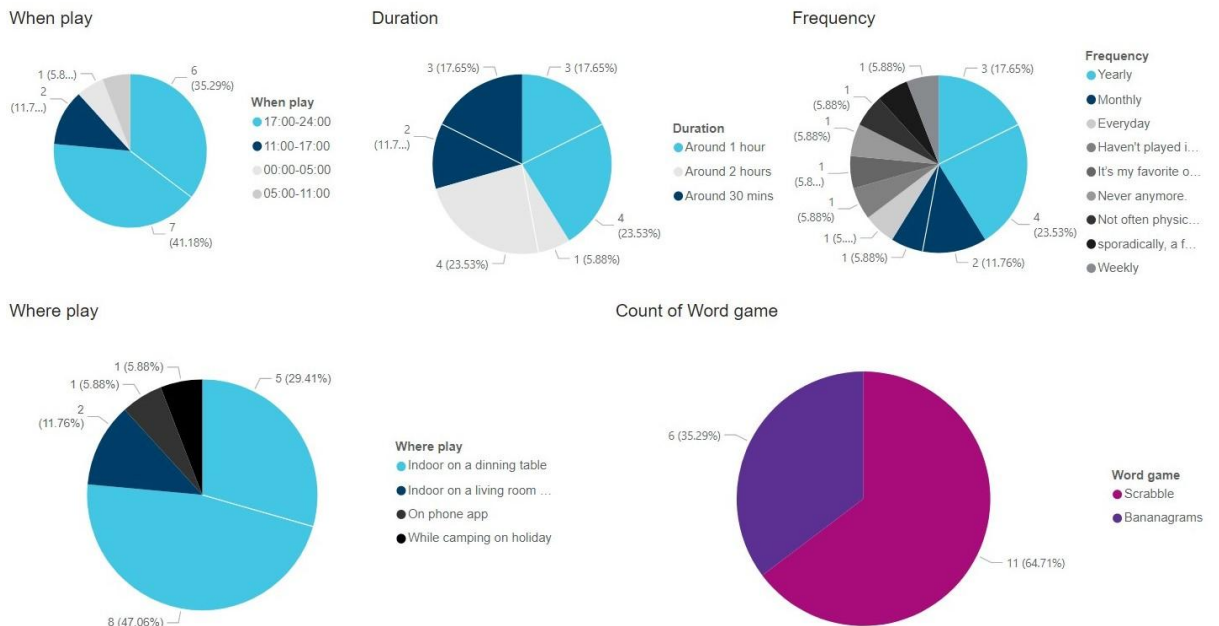


Figure 17. Game behaviour analysis from the responses of the third questionnaire

Table 3.1 and 3.2 showed the target group included people who play the word game since they were kids, people who are word games' fans, and people who worked closely with language teaching.

Table 3.1: Raw data of target group									
Participant	Age	Gender	Continent	Word game	Duration	When play	How did you know the game?	Frequency	Attractiveness
1	30-40	Male	North America	Scrabble	Around 2 hours	17:00-11:00	From friends	Yearly	The theme and story plot, Easy to start up
2	40-50	Male	North America	Bananagrams	Around 1 hour	24:00-17:00	directly from the publisher at a convention	a few times per year	Educational tool, The price, The product design (e.g. package, components), Easy to start up, allows different levels of spelling a complete chance
3	40-50	Male	North America	Bananagrams	Around 1 hour	24:00-17:00	From friends	Monthly	Defeat others
4	40-50	Male	North America	Scrabble	Around 2 hours	24:00-17:00	Family game	Haven't played it in years, but it holds a dear place in my heart	Educational tool
5	50-60	Female	North America	Scrabble	Around 30 mins	17:00-11:00	Grew up playing with family	Every day	Educational tool
6	50-60	Female	Europe	Bananagrams	Around 2 hours	24:00-17:00	From friends	Monthly	Educational tool, The price, The product design (e.g. package, components), Easy to start up
7	40-50	Male	North America	Scrabble	Around 1 hour	05:00-11:00	From friends	Yearly	The visual design, Easy to start up
8	30-40	Female	Europe	Scrabble	Around 1 hour	24:00-17:00	TV	Not often physical game, maybe yearly. Phones app daily.	Defeat others, Educational tool, Easy to start up
9	30-40	Female	North America	Scrabble	Around 30 mins	24:00-17:00	Grew up playing with family	Never anymore.	Cooperate with others, Educational tool, Easy to start up
10	30-40	Female	Europe	Bananagrams	Around 30 mins	24:00-17:00	From friends	Yearly	The theme and story plot, Easy to start up
11	40-50	Male	North America	Scrabble	Around 1 hour	24:00-17:00	Store	Yearly	It's fun
12	30-40	Female	North America	Scrabble	Around 1 hour	24:00-17:00	Board game club	Weekly	Educational tool, Improve communication skills, The product design (e.g. package, components), Easy to start up
13	30-40	Male	North America	Bananagrams	Around 1 hour	24:00-17:00	From friends	Yearly	Defeat others
14	50-60	Female	Europe	Bananagrams	Around 30 mins	24:00-17:00	From friends	Yearly	Defeat others, The price, Easy to start up
15	50-60	Female	North America	Scrabble	Around 2 hours	24:00-17:00	Grew up playing with family	Monthly	Easy to start up

16	40-50	Female	North America	Scrabble	Around 2 hours	24:00-17:00	Grew up playing with family	Yearly	Educational tool
17	30-40	Female	Asia	Scrabble	Around 30 mins	00:00-05:00	From friends	It's my favourite out of the list, but I don't have it or play it if there are other games available.	Lots of people have it, even non-gamers, so it's easy to get access to. As mentioned earlier, I wouldn't play it if there are other board games. I would only play it if it was the only one available.

Table 3.2: Raw data of target group

Participant	Who bought	Play with whom	Location	What aspects do you think this word game needs to be improved?	Reason bought the game	purchase channel	student or not	Field	Buyer field
1	Myself	Family members	Indoor on a dining table		visual design	shop	I have a job	Marketing, Sales and Service	
2	Myself	friends and family members	Indoor on a dining table		Decided to buy after playing once	shop	I have a job	Education and Training	
3	Partners	Family members	Indoor on a dining table						Human Services
4	Partners	Family members	Indoor on a dining table	I think it is a very solid and proven game	I bought our family copy as an educational tool for my kids who are in their early literacy years	shop	I have a job	Education and Training	
5	Myself	Family members	On phone app		Because of the recommendation from others (e.g. Friends, Social Media, Shop clerk)	Online	I have a job	Hospitality and Tourism	
6	Myself	Family members	While camping on holiday	Print the instructions on the bag as we keep losing them	Because of the recommendation from others (e.g. Friends, Social Media, Shop clerk)	shop	I have a job	Education and Training	
7	Grandparents	Family members	Indoor on a dining table					Finance	Human Services
8	Myself	Family members	Indoor on a living room table		Because of the recommendation from others (e.g. Friends, Social Media, Shop clerk)	online	I have a job		
9	Parents	Family members	Indoor on a dining table						Payroll
10	Partners	Family members	Indoor on a dining table						Science, Technology, Engineering and Mathematics

11	Myself	Family members	Indoor on a dining table		Because I played it as a kid	online	I have a job	Business Management and Administration	
12	Myself	Family members	Indoor on a living room table		Decided to buy after playing once	shop	I have a job	Science, Technology, Engineering and Mathematics	
13	Myself	Family members	Indoor on a dining table		Decided to buy after playing once	online	I have a job	Human Services	
14	Myself	Family members	Indoor on a dining table		visual design	online	I have a job	Science, Technology, Engineering and Mathematics	
15	Parents	Family members	Indoor on a dining table						Marketing, Sales and Service
16	Parents	Family members	Indoor on a dining table						Physician
17	Maybe cafés I go to or relatives who bought it a long time ago	Depend on where it's at. At a relatives house, family. At a café, friends.	Indoor on a dining table	By itself as a product, it can be fun but is too simple for me to want to buy. There's no art or graphic design, and it's all just about creating words, which unfortunately is not very thrilling for me. For it to improve, there would need to be a goal - not just get the most points by making words - like a goal with a theme and something connected to that theme where you can get letters, and maybe those letters add to an engine of sorts - I don't know, that's just my opinion though.	I did not buy it, nor do I ever intend to unless I start teaching an ESL class.	shop	I have a job	Education and Training	

Appendix 5: Design process

This appendix includes images of different ideas.

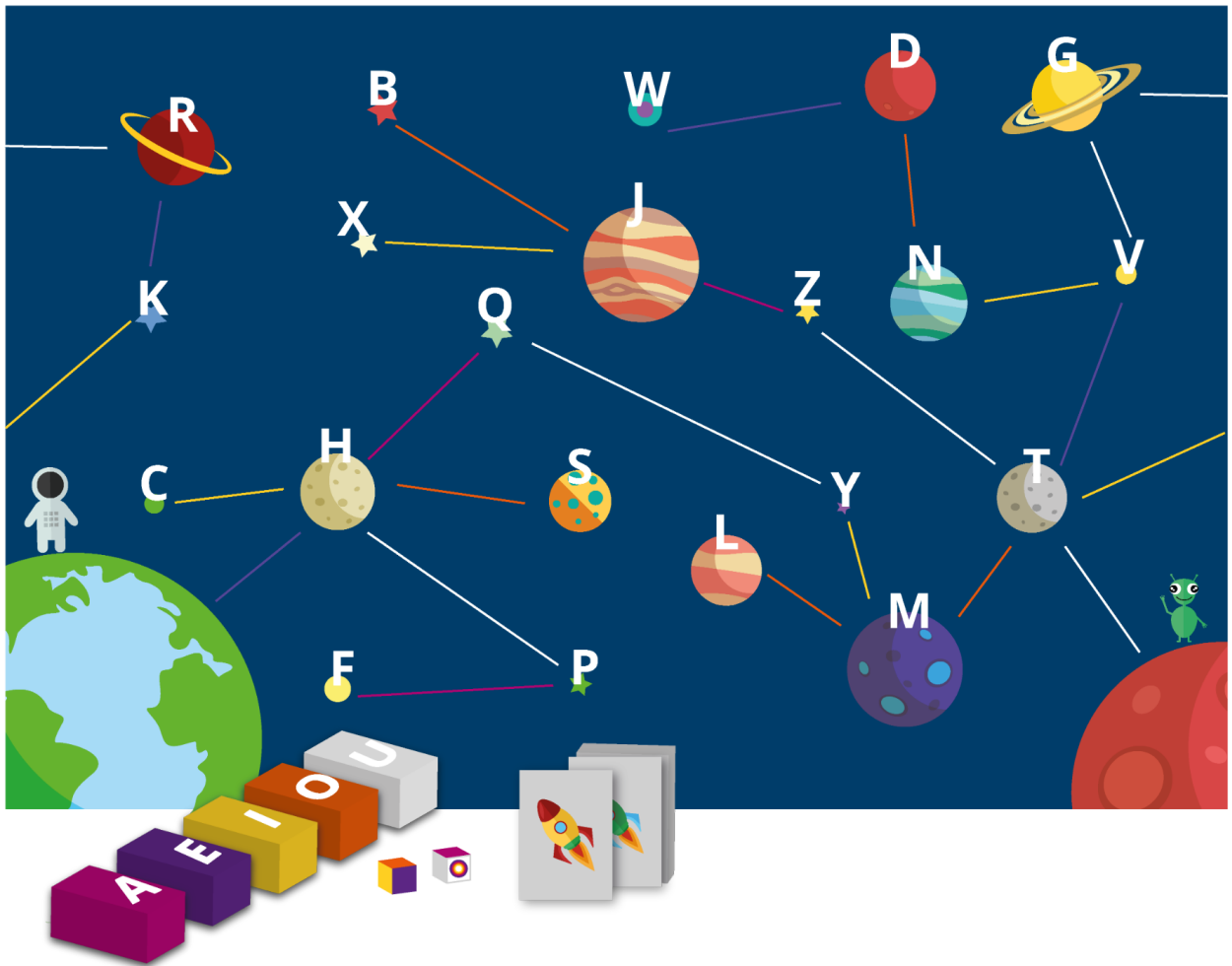


Figure 18. Idea 2, involving human against aliens

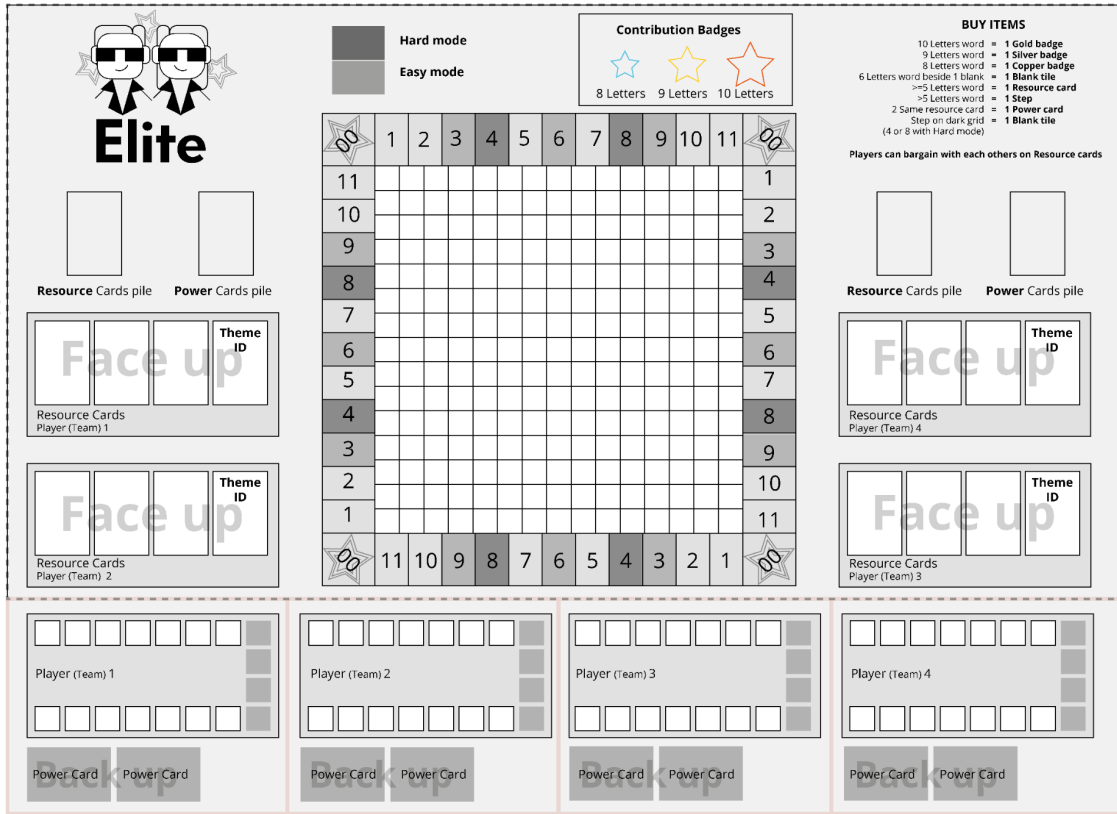


Figure 19. Idea 3, depicting a “keep using the game board” idea

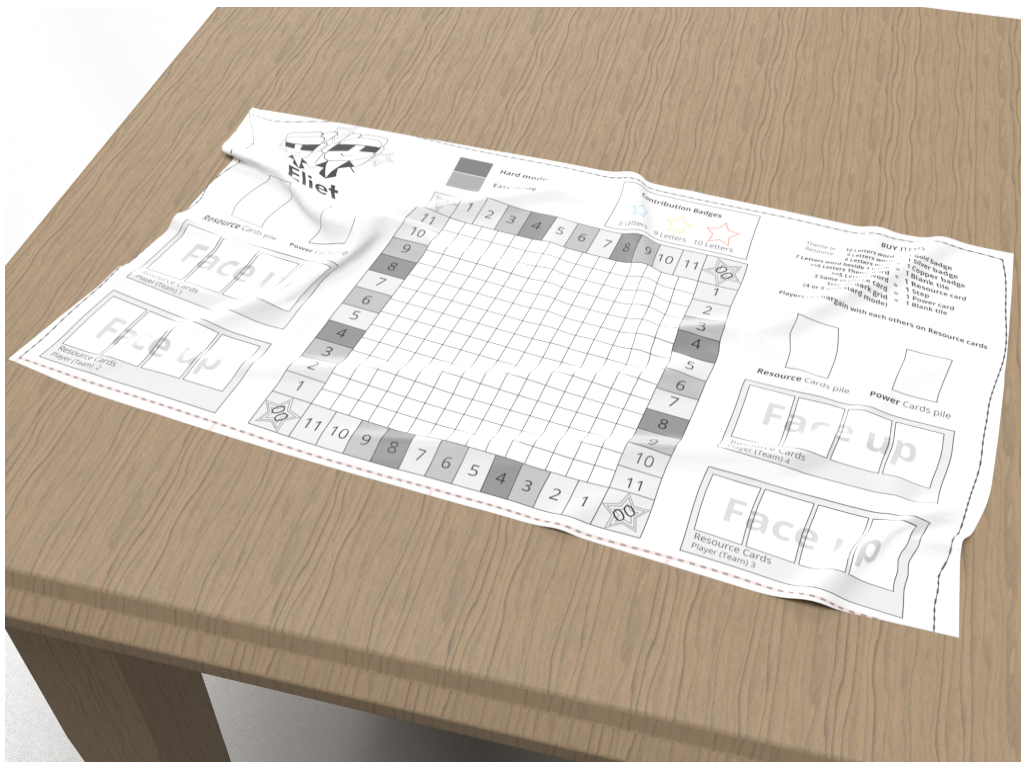


Figure 20. Idea 3, applying soft material on the game board



Figure 21. Idea 5, using a modular game board with double sides letter tiles



Figure 22. Instructions and theme cards included in idea 5



Figure 23. Idea 6, a modular game board with double sides letter tiles in hexagon shape

Letter tiles × 215 (199 + 16)
 Player panel (Foldable instruction) × 8
 Box × 1, Bag × 1, Theme cards × 17
 Power tile × 89
 Modular board × 60




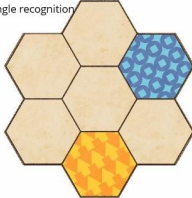

<p>Double faces design Laser cut machine engraving Wood & metal</p> 	<p>Attack Snatch 1 tile from opponent</p>
<p>Pattern: multi-angle recognition Modular design Portable Cardboard</p> 	<p>Purchase 1 extra tile</p> <p>Trade Exchange 1 tile with others (Bargain)</p>
<p>Foldable instruction Embossed printing Cardboard</p> 	<p>Lucky 1 blank tile</p>

Figure 24. The Wordomino components design, face A

Letter tiles × 215 (199 + 16)
 Player panel (Foldable instruction) × 8
 Box × 1, Bag × 1, Theme cards × 17
 Power tile × 89
 Modular board × 60

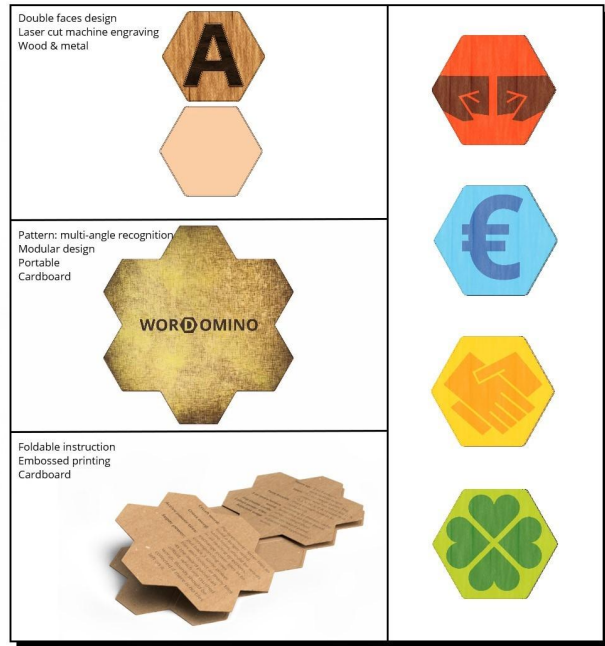


Figure 25. The Wordomino components design, face B



Figure 26. The Wordomino usage scenario

Appendix 6: Tile development

This appendix presents the results of the letter tiles research.

Amount of different letters

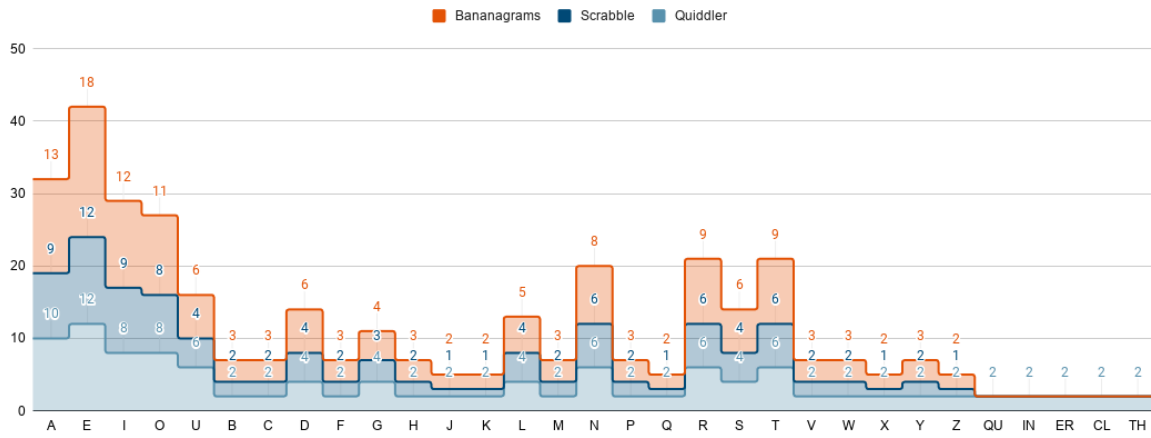


Figure 27. Tile quantity design

Letter value

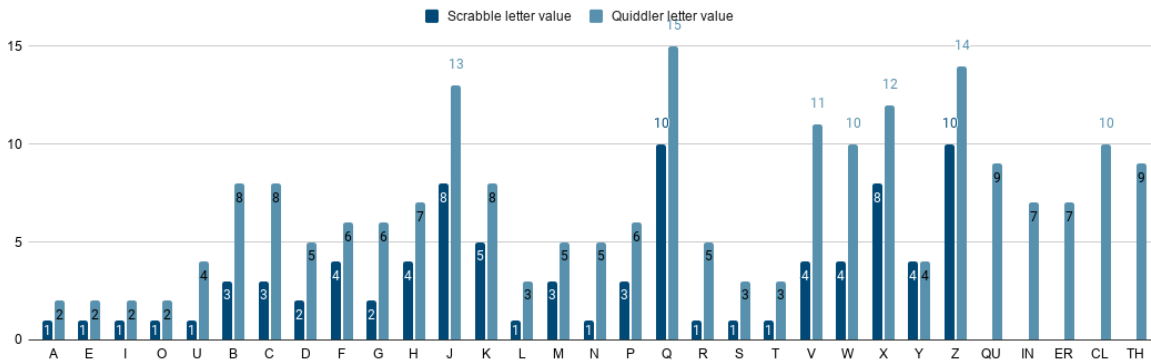


Figure 28. Tile value design

Tile design



No orientation

Design things right: Develop



3 directions



Laser cut engraving

2 directions



Busy orientation



Figure 29. Tile design process

Drawing vowels: a probability test

4/16 5/16 4/16 6/16 5/16 5/16 6/16 9/16 7/16 4/16 7/16

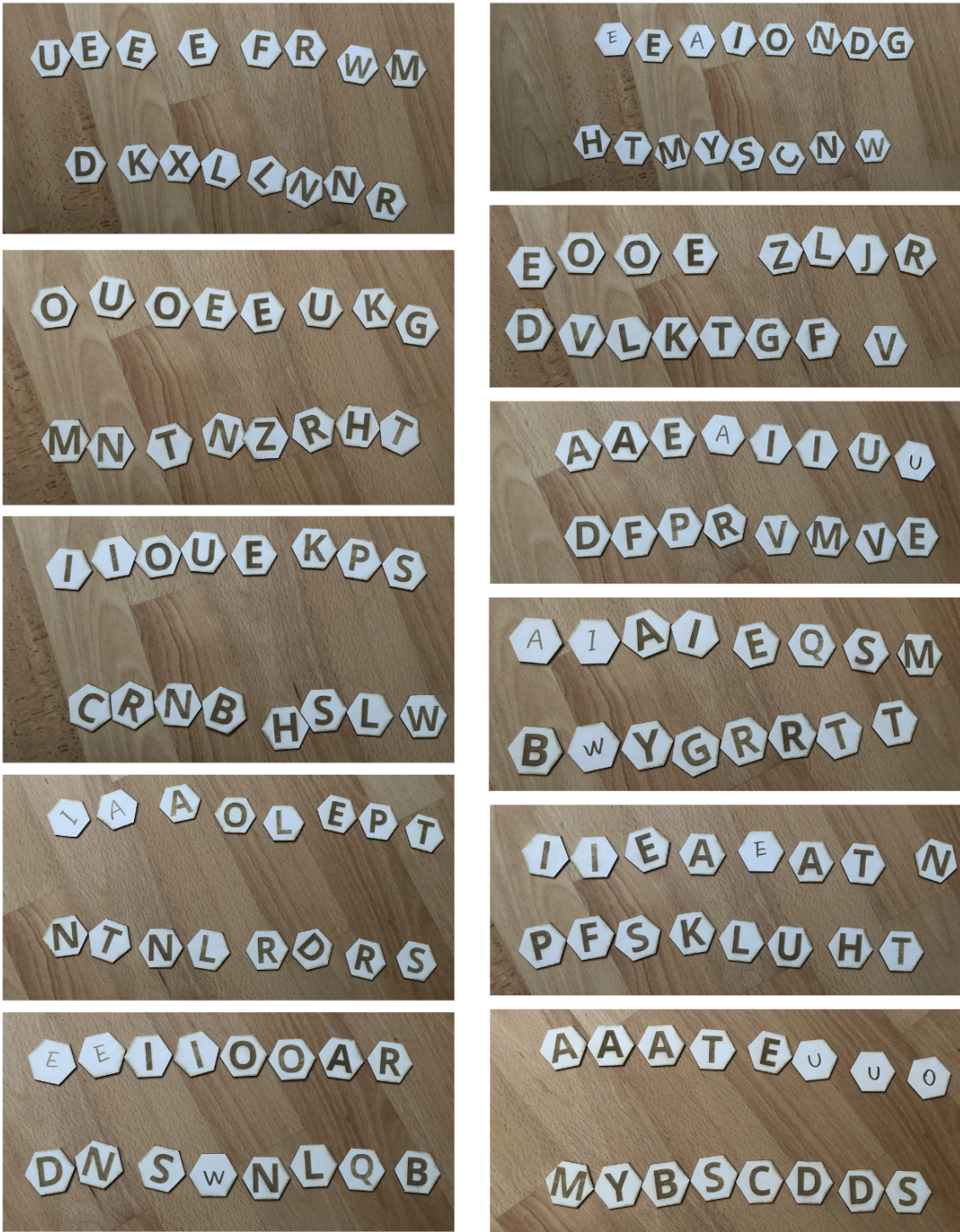


Figure 30. Tile quantity testing on drawing vowels

Appendix 7: Testing idea 6

This appendix presents the playing process as expressed in idea 6.

Step 1: The bright team builds word according to flip theme cards, SDGs. The boards need to be placed before the letter tiles.



Figure 31. Step 1

Step 2: The dark team builds word according to SDGs. Flipping the theme cards when the word is built accordingly.



Figure 32. Step 2

Step 3.1: The new word "member" is built longer than the opponents' word "meets". The two words cross at the letter "M".



Figure 33. Step 3.1

Step 3.2: Flip the crossed letter tile "M".

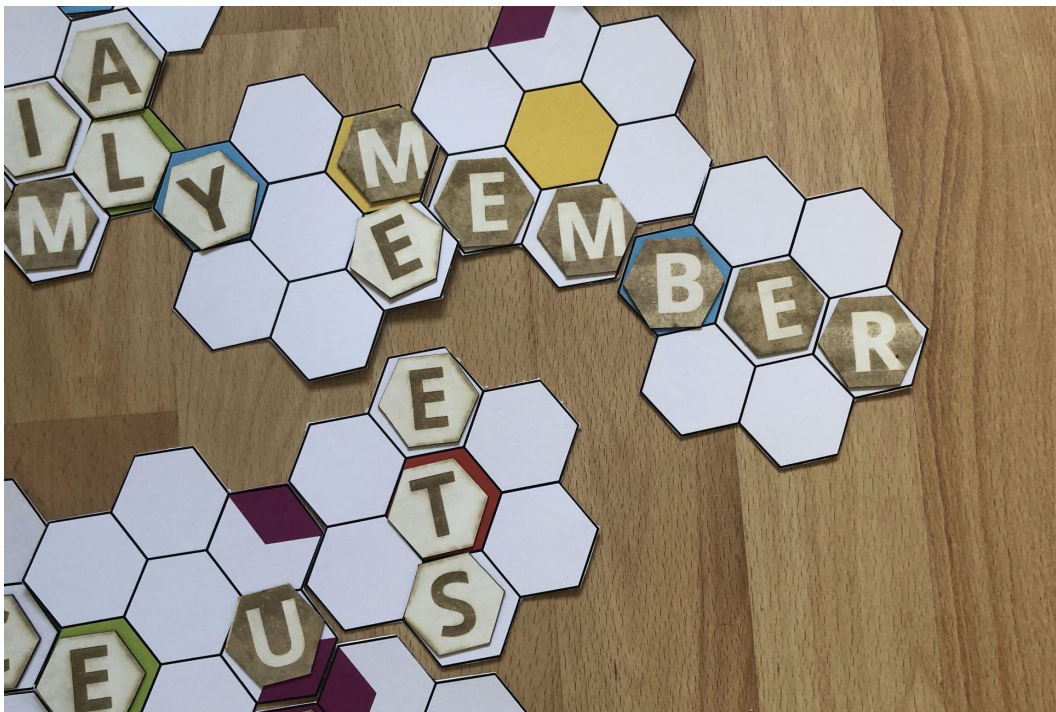


Figure 34. Step 3.2

Step 4: Collect power tiles. Different colours illustrates different powers. Different power could be found in Figure 24.



Figure 35. Step 4

Step 5: Power tiles are activated to be changed into corresponding letter tiles.

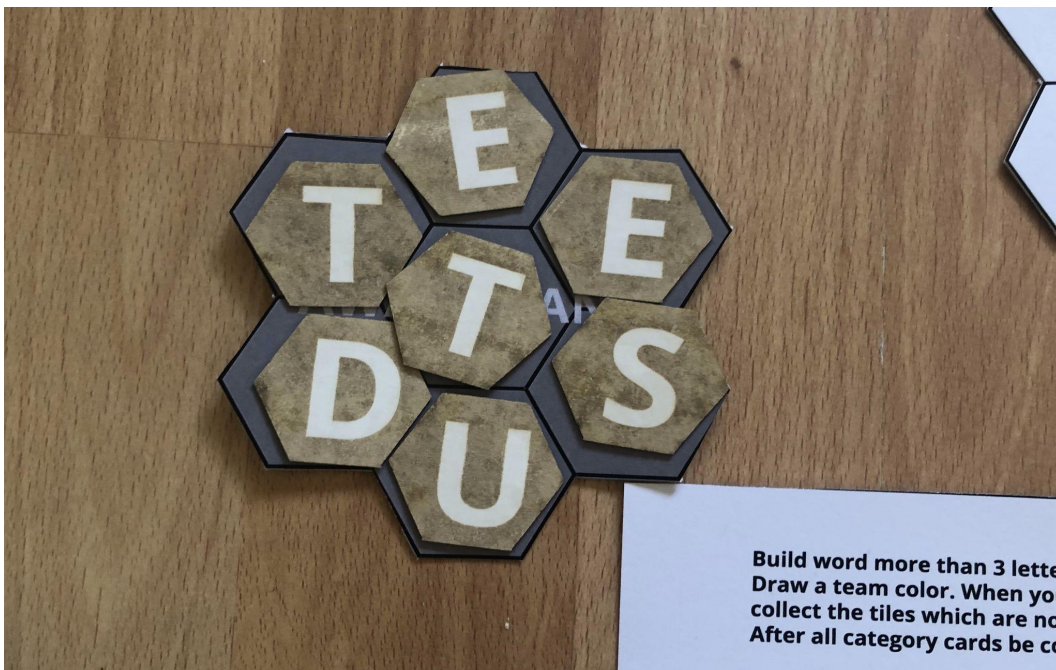


Figure 36. Step 5

Step 6: Words built by the different team could be placed adjacent. After finishing all 17 cards, the team with more letter tiles left on the board wins the game.



Figure 37. Step 6

Appendix 8: Game rules of the Wordomino

This appendix presents the game rules of the Wordomino.

10 Rules of Wordomino

Educational, team-based



1

Team up

The game is best played with four players. The maximum accommodation is up to eight players.



2

Draw letter tiles

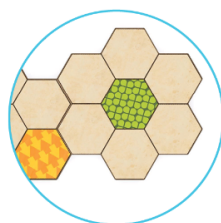
Bright team against dark team.
In one round, each player could draw 16 letter tiles and 5 boards.



3

Draw theme cards

Randomly draw 4 cards from themed cards.

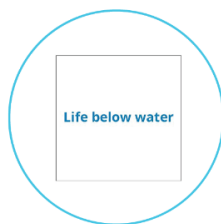


4

Pave boards

Before building words, pave enough boards.

The player who has letter tiles Z, X, Q, J, Y, W, V, P or H could start first.



5

Build words

Words should be built according to the theme cards, and the word length should not less than 3 letters. The reading directions are from top to bottom, and from left to right. Words from different teams can be placed adjacent but do not need to be read consecutively. However, words from the same team must be read coherently.

6

Flip theme cards

Flip the theme cards when accomplished the words.



7

Collect power tiles

The collected power tiles should be placed on Award panel.



8

Crush word

When the new word built uses the opponent's letter tiles, and is longer. Then the word is disintegrated. Therefore, flip the used letter tiles.



9

Activate power tiles

Players could exchange power tiles into corresponding tiles at the end of the round. Or save power tiles for the next round.

Lucky (Green): 1 blank tile from the bag.
Purchase (Blue): 1 extra tile from bag.

Trade (Yellow): Exchange 1 tile with other players.

Attack (Red): Snatch 1 tile from opponent, including power tiles.

Super power: put back 3 same power tiles and collect as many tiles as the award panel could afford, which are crushed words. (e.g. letter F, I and H)



10

End game

After all theme cards were flipped. The team has more letter tiles left on the board win the game.



Figure 38. 10 Game rules of the Wordomino