DESIGN DIALOGUES

ASSESSMENT 2

IMD11112

40135901

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Introduction

The Lion's Gate Project is an open platform designed by Edinburgh Napier University to allow for thought-provoking designs to be created and implemented. The aim of the project is for the development of these projects and to allow for visitors to gain a greater understanding of blended spaces and permaculture.

Blended spaces are the result of bringing digital and physical spaces together in a harmonized and unified manner opposed to mindlessly placing digital content anywhere in a physical space (O'Keefe & Benyon, 2015). These spaces are successfully being used as a form of tourism, creating a narrative in digital storytelling. The purpose of the Lion's Gate garden is to enable a blended space to showcase permaculture, the development of sustainable systems that benefit the environment and everything that lives within it (Mollison, 1988). The digital enhancements to the garden seek to deepen understanding of the ecological process and provide a vision of sustainable living.

The subject of this report is the development of an idea that could be implemented into the Lion's Gate garden. The proposed system is a mobile app called '*Lion's Gate AR*' which is a 'recognition' based augmented reality system designed solely for use within Lion's Gate gardens. It will be designed for use on Android and Apple devices, requiring a functional front facing camera. Speakers and vibration ability will improve the experience but are not necessary. Electronic markers (such as QR/2D codes) placed around the garden will be recognised by the system on a given mobile device in a pre-determined route, indicated by signposts. The app will detect the first markers signal which will begin the narrative process in place. Here the user will have to point their device at the marker and a 3D animated squirrel (other animals are available) will appear out of a hole in the ground and welcome the user, inviting them to follow on a guided tour of the garden and gain a reward at the end as incentive to complete the trail. After this the squirrel will disappear and come out of the ground near marker 2 indicating the user must move around the garden. The user will proceed to perform a mixture of minigames and quizzes, heavily involving information regarding both the garden and permaculture, gaining 20 points per marker, finally ending the final activity with 100 points. After receiving 100 points the user can redeem a digital voucher that allows them a percentage discount off their next purchase in the Napier cafeteria. The user will be

encouraged to come back next week as new information will be on display through the application.

Many people when first introduced to the concept of permaculture don't fully grasp its meaning purpose immediately to the point where they may not comprehend its importance. When designing this application, the aim was to help bridge that gap, allowing users to learn about permaculture through an interactive and gamified medium. Being able to contribute to the pro-active knowledge base that is Lion's Gate whilst also creating an enjoyable interactive system is the ideal destination for any designer who is interested in permaculture and user experience.

Augmented reality gaming is something that has been proven to be widely successful. The prime example of this would be *Pokémon GO* as one of the most successful mobile games of all time (Chamary, 2018). It's ability to get players to move around outside and socialise is a spectacular feat alone. For this application I have noted that augmented reality, although still a technology in the works, is a useful tool. In addition, the application of gamification and its use of rewards systems and incentives provides motivation for many users, which is shown in 'Lion's Gate AR' by the points and reward system (Richter, Raban, & Rafaelia, 2014). It would be very generous to state that the app would have a similar rate of success as Pokémon Go but that is the aim by using these technologies to garner a wider audience for the garden.

To overview the methodologies used within this project, to gain understanding of the topic and task ahead the data gained from brainstorming, semi-structured interviews and online research will be gathered and analysed by hand to create a list of requirements. To show proof of envisionment, sketches of the proposed system have been drawn up alongside a storyboard use case example. Usability and accessibility will be tested through questionnaire's assessing these points. The evaluation will be conducted by participant-based cooperative and expert-based heuristic methods.

Design Approach

For this project I have gone for a human centred design approach. The aim is to iteratively refine the project based on feedback received during the various stages of development compared to the consensus of wants and needs from users. I can gain insight into what thoughts and opinions users have on the garden itself based on what features the garden

already contains and what they would like to see and do. This data will be coming from the initial research stages detailed prior; brainstorming, semi-structured interviews and online research. Sketches and storyboards will be produced which will then be subjected to accessibility and usability tests. With each new test I will be able to go back and update the proposed product requirements and design. After further refinement, if necessary, evaluative processes can be conducted by getting a cooperative participation from users and data from a heuristic evaluation from an expert in the field of UX and design. This approach is being used in hopes to make the development process much more user oriented.

Understanding

Brainstorming

For the initial stages of research, workshops were attended to brainstorm for ideas. It was found by many of us that consulting with the workshop facilitator was very beneficial to generate ideas. As a group the class managed to generate many different ideas as seen in Figure 1.

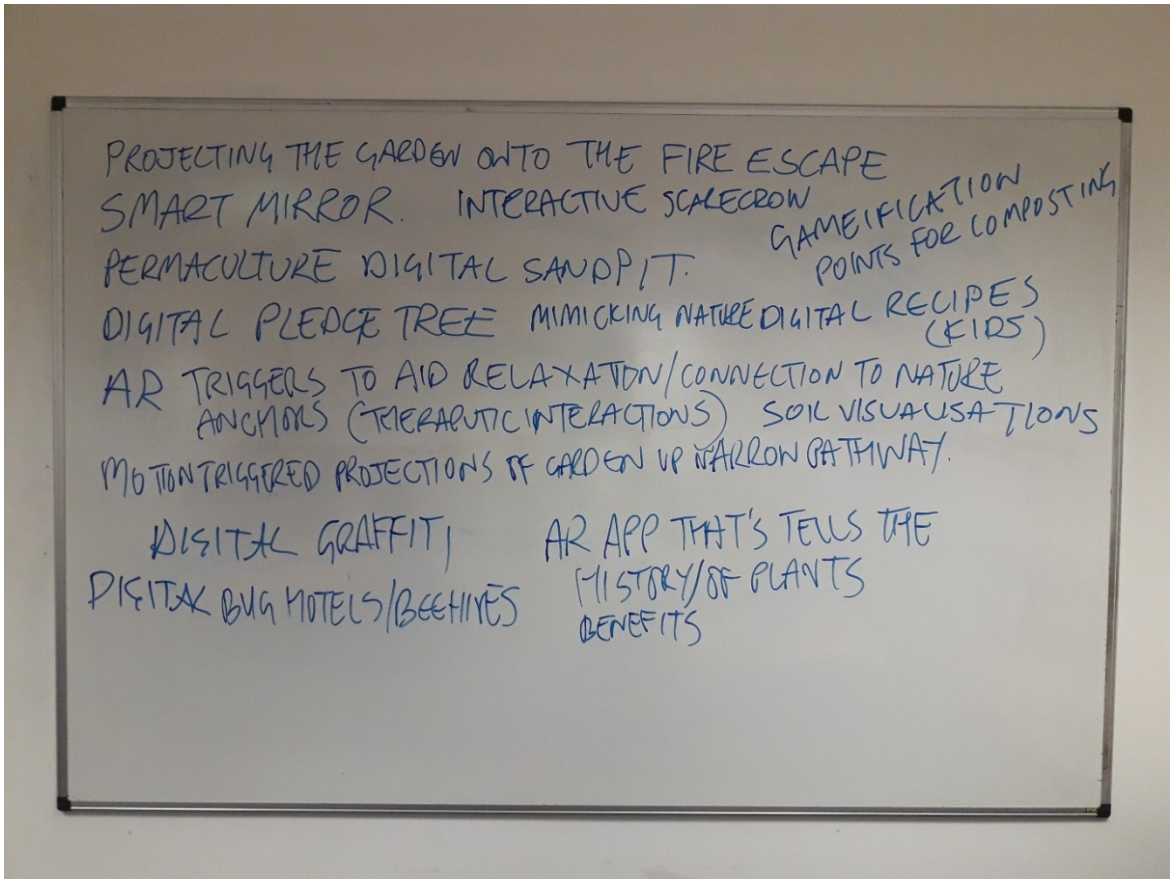


Figure 1 - Braintstorming for ideas

The session itself was only semi-organised and conducted in a casual manner as befitted the moment. To effectively analyse these ideas, with this image I was able to filter them down dependant on feasibility, practicality and personal intrigue in hopes to create a personal spin on an already existing idea or to come up with something completely unique. With my interest being more drawn towards developing technology, AR and its ability to engage and satisfy a user stuck out as the most viable technology to base the idea on.

Semi structured interviews

Semi-structured interviews are the chosen and more integral method of research in this project. The reason for choosing semi-structured, as opposed to structured, is because rather than setting out and asking many specific questions with a hopeful set of responses, the interview is more free form and conversational. It's important to get proper feedback on the design and allows me to gather data based upon the experience of the participant through open ended questions. This meant I could adapt each interview to the interviewee's understanding rather than forcing them down a specific path of questioning. I think this allows for a more authentic, meaningful and well thought out response even if it is more demanding for myself as I have to analyse free form data and categorise it accordingly but the benefits are proven by the method's versatility and ability to explore a participants contextual influences (Galletta, 2013).

It's important to have a checklist of discussion points to use as a loose guide of the interview to ensure all points of theory and research are covered. Once a high-level question is asked then further probing can be conducted to gain a low-level understanding of how a participant feels about the design. With the feedback received I was able to greater define my list of requirements and tweak my design according to their suggestions.

During the initial stages of development a few unstructured interviews were conducted to gain some insight into people's understanding of the overlying concepts of permaculture and blended spaces. For the purposes of this project I'm highlighting the semi-structured interviews conducted with students and members of the university who have a range of experience with technology and understanding of the concepts. To ensure the interviews weren't completely different each time I ensured that each participant had a foundational knowledge of permaculture, blended spaces and the types of applications being designed for

Lion's Gate, alongside the sketches and storyboards created to showcase this idea. The interviews were conducted 1 to 1 in some available spaces on campus and notes were taken of their spoken word. The following is a selected of some of the key questions asked accompanied by some excerpts from the participants:

What is your opinion of the design?

"I think it's kind of a simplistic, or even minimalist design but its able to do quite complicated things."

"It could use some thought in regard to the layout but overall it serves its purpose."

Do you feel that it is effectively engaging?

"I think that it would be engaging if I was actually able to use it."

"I think so yes, but my worry would be that any difficulties using the app would probably mean the engagement would quickly drop off."

"It's a good way of encouraging users to move around and learn about the garden."

"Actually being able to move around and interact with the areas around the garden would be very engaging."

Do you feel that it could effectively garner more attraction for Lion's Gate? (is the concept justified?)

"Yes, I think a functional app like this for the garden would be really interesting, it would make me want to see it in action."

"It could be a sort of guided tour of the garden for new visitors if you want to set it up like that, so I think it would."

If at all, how would you improve the app?

"Well, maybe if the animated animals had voices for those who are hard of hearing it would be a useful upgrade."

"So far the user can only go down a linear path through the garden so if this was changed to be a bit more flexible it could be better."

“I think that the app could be a bit more creative when interacting with the interface, like something to make each experience more unique?”

“… more utility.”

My understanding based on the feedback received is that the application has a good premise and initial design, but work needs to be done to make this application a fine addition to the Lion’s Gate ecosystem. Participants have noted problems with some levels of intuition in the design. Many people are not familiar with the technological capabilities of augmented reality so for some interviewees it was difficult to imagine how it would function initially, so this may have skewed feedback by those unexperienced. Some interviewees noted that whilst the app itself may be complex, the utility provided does not have enough substance which is something I partially agree with. At some stages the application comes across as an informative app under layers of interaction and gamification. The worry is that this may be too transparent. Whilst gamification is generally well received, it is the manner of implementation that would affect a user’s satisfaction rather than having it bluntly placed in a user’s path. Finally, one of the final worries expressed by the interviewees was the linearity of the marker placement and app function. Currently it is designed to showcase a set path through the garden. Whilst it would be versatile to allow users to go to any marker they wish, it’s important that the information introduced to each user is conveyed in a controlled environment so to not confuse user’s with incoherence. Overall, I’d say the feedback is positive but it’s very easy to be critical of the app in its current conceptual state.

List of Requirements

Based on the feedback from the brainstorming, semi-structured interviews and research into AR and gamification, the following tables represent the list of requirements necessary for a functional and efficient Lion’s Gate AR app. Table 1 shows the list of Functional Requirements and Table 2 shows the list of Non-Functional Requirements.

Table 1 - Functional Requirements

Ref #	**Description**	**Rationale**	**Priority (MoSCoW)**

F001	Augmented Reality interface	The key requirement of this application is to provide a fully functional augmented reality interface	M
F002	Marker detection	The AR is recognition based and so must be able to detect the markers set up around the garden	M
F003	AR object interaction	User's must be able to interact with the 3D objects displayed on the interface	M
F004	Haptic feedback	This will be used to provide feedback to the user that they have interacted in some way with the interface	C
F005	Change Language settings	A main menu button to change the language	C
F006	Push notifications	To alert any users if they are near a marker	W
F007	Change animal	To switch between the 3D animals chosen on the main menu	S
F008	Collect points	Allow the user to collect points after successfully completing a marker	M
F009	Redeem points	Allow the user to redeem points after successfully completing the course	M
F010	Toggle music	Toggle theme music on/off	S
F017	Text to speech	Have the text displayed on screen be fully voiced	S

Table 2 - Non-Functional Requirements

Ref #	**Description**	**Rationale**	**Priority**
N011	Performance	A responsive UI and system functionalities to	M

		ensure a user stays engaged	
N012	Scalability	The ability to be used on other Lion's Gate sites	S
N013	Reliability	Must consistently perform well at the same level throughout use	S
N014	Security	The application will request access to certain features of a user's mobile device. Any data collected, if at all, will have to be lawfully stored/removed.	M
N015	Usability	User's must be able to achieve their goals and be satisfied by what the app offers.	M
N016	Accessibility	The design should be intuitive and easy to understand for users of all experiences and abilities	M

Envisionment

Colours

The colour scheme choice for this application was based on the Napier logo. I wanted users to feel connected with the university whilst using the application so RGB 195, 45, 70 (#c32d46) was the found colour code identified on the university website.

Typography

The sans-serif font, Arial, was used because it's very easy to read online and on mobile applications (Woods, 2014). This font is very commonly used and so the choice was in hope that it would be familiar to users. It's classified as a 'grotesque' sans-serif as there is a low contrast between thick and thin strokes with no sign of stress. It's designed to be very easily read. Use of boldness in headers and increases thickness in some text was to carry emphasis and provide a text hierarchy.

Iconography

A minimalist design was selected for creating the icons. The size and scale of these icons have been carefully selected. The aim was to have negative white space around the icons on the main

menus to draw attention to the icons. The alignment and proximity of the icons is supposed to create a focal point for users.

Sketches

Below are examples of what the design would look like conceptually.

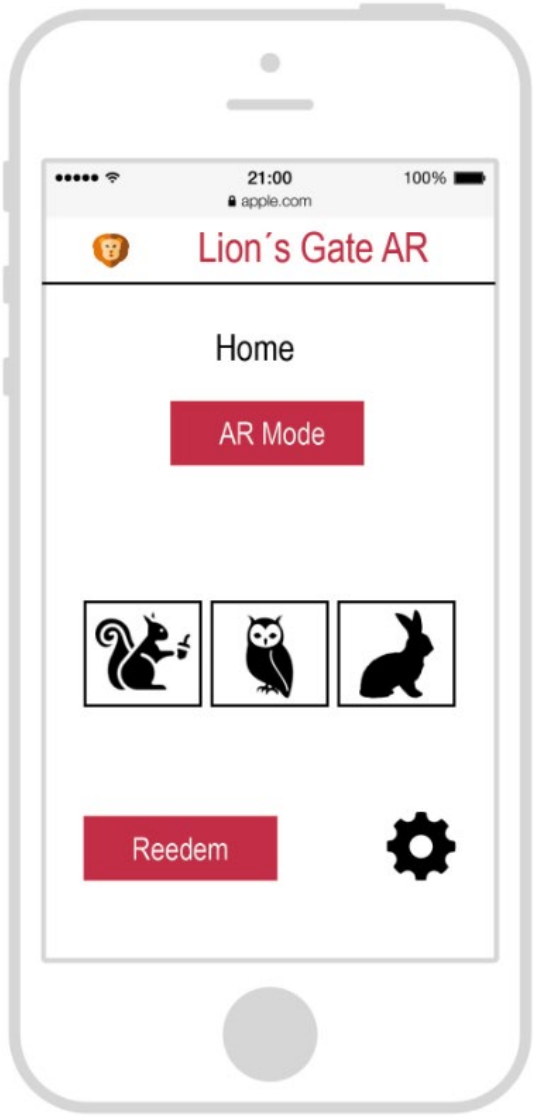
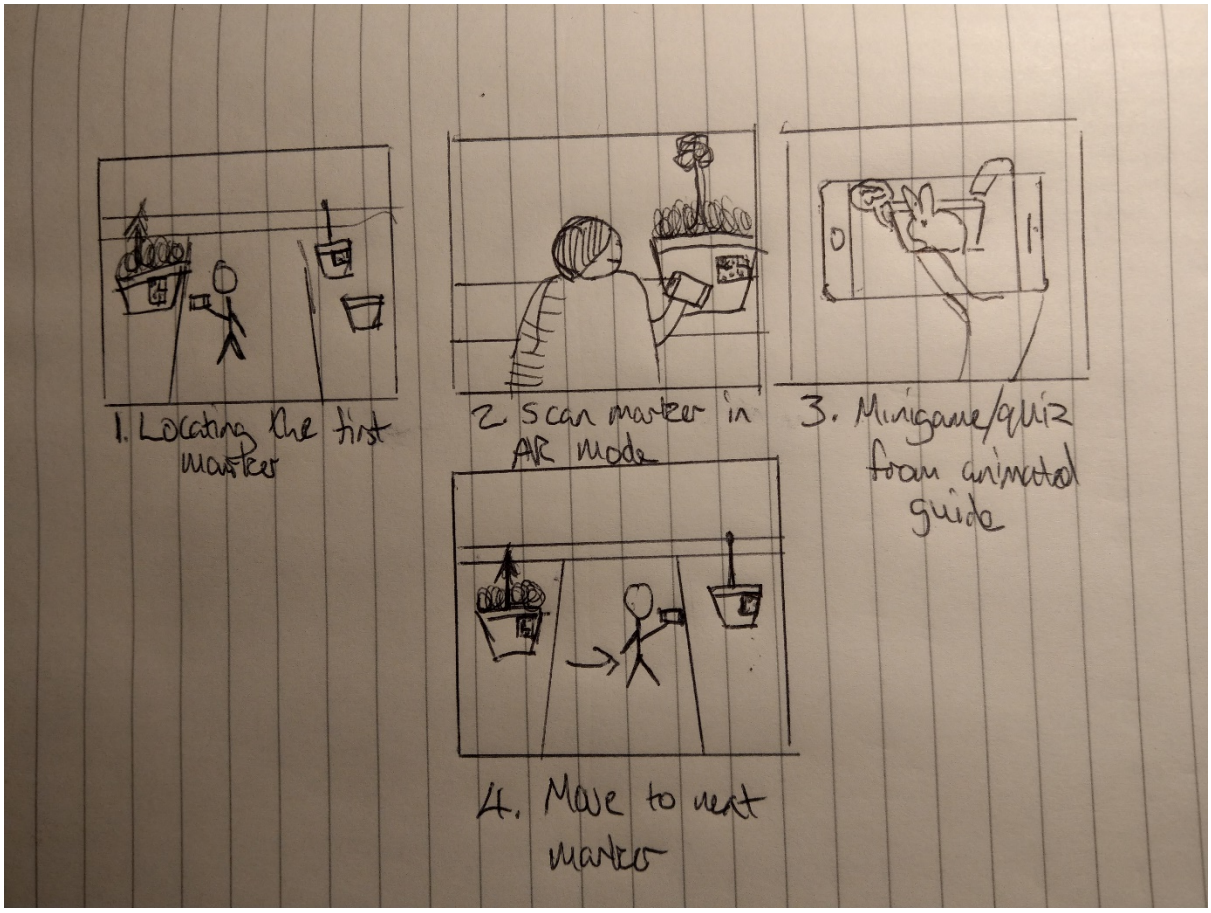


Figure 2 - Sketch 1 - Main menu

Figure 3 - Sketch 2 – Follow the white rabbit

Storyboard



Testing

Usability Test

The SUS questionnaire is a 5-point Likert scale which aims to determine if the proposed system is efficient, effective, intuitive, safe and satisfying (Benyon, 2013). As a part of this human centred design approach it was important to test for these key characteristics during the design process to iteratively refine the product with the user's needs at heart. The aim of testing usability was to get the product to a point where the technology itself was as close as possible to not hindering the user in their desired, goal-oriented activities.

Summary

Evaluating usability on a concept with illustrations was always going to be quite difficult but after expressing the flow of the design and what the app intends to do, the ability to effectively evaluate a design can still be achieved. In a 1-1 setting, 3 varied participants were tested for usability. The test is being used to identify any issues user's may have with usability, specifically the ease of which they can utilise the application fully and achieve their goals. Qualitative results will be produced to give insight into the path that participants took and any problems they experienced.

Methodology

The test was conducted by explaining the overall process of the applications usage in a low-level manner aided by the envisionment diagrams. Participants were asked to assume the role of a new user in the Lion's Gate garden. Participants were handpicked for their expectations of the software and personal ability. Participant 1 was a 24-year-old student with above average internet usage and technical ability. They have a high understanding of the technologies being used and how they will be used. Participant 2 was a 29-year-old student with moderate internet usage and technical ability, nothing beyond the average user. They have a very low understanding of the technologies being used and how they will be used. Participant 3 was a 32-year-old student with a high internet usage and technical ability. They have a high understanding of the technologies being used and how they will be used.

Test Results

Having explained the applications usage and allowing the participants to gain an understanding of what needed to be done they were issued the usability chart seen in Figure

2. The chart states that the participants engaged in testing a website, but this is not true and all participants were made aware that this is a mobile application, however the data collected still shows valid information. Participant 1 achieved an SUS score of 67.5, Participant 2 achieved 47.5 and Participant 3 achieved 77.5. These scores are an effective way of putting a user's thoughts of usability into scalable terms.

Findings

Overall whilst most participants expressed a high satisfaction, the average is brought down by Participant 2. It can be assumed that due to their technical prowess they were not able to conceptually utilise the software. This proves there is still much work to be done refining the product to satisfy users. Only finding usability in more experienced users is not a sought-after aim. Users found the concept of moving around the garden to interact with individual features to collect points satisfying but the drawbacks come from the design itself.

Accessibility

The purpose of testing for accessibility is to ensure that the product is in line with the Equality Act 2010 and so does not prohibit any users from using this product based upon their abilities (Equality Act, 2010). In this stage of testing I aim to look at how people with different levels of technical ability and different levels of interaction ability (eyesight, hearing and any physical restraints) can engage with this application in this scenario. The forethought of this test is that whilst this application does offer content in a few different forms, by toggling on and off theme music and haptic feedback, the only method of relaying information to the user is through text. Currently there is no text to speech in place, but it is on the list of requirements. To measure the accessibility of the product a questionnaire was set up on AttrakDiff to help gauge user's thoughts on this (AttrakDiff, n.d.). 7 participants of varying technical ability and physical ability were invited to test the product for accessibility.

Results

Of the 7 participants I invited to test the product on accessibility only 2 of them were hard of sight whilst it proved troublesome to gain the insight of those who may experience other disabilities. This means that whilst the data is useful to see it doesn't provide the in-depth analysis required to effectively state that this application is fully accessible to all people. The diagrams of results, which can be seen in appendices, show that most people consider the

application to be task oriented which is a positive thing to take away from this. It does also partially correlate with the data found from usability regarding whether a user can achieve goals (or successfully fulfil tasks). The description of word pairs diagram is considerably easier to understand than the other 2 and it shows the leaning of consideration from the participants. Of the 28 selection choices only 7 were considered negative and of those 7, 3 were considerably more neutral than negative. Overall it can be assumed from the feedback that the accessibility for the average person is above average, to the point at which it is acceptable but more refined studies will have to be conducted to get a more valuable set of test results. In the future it would be important to gain insight from colour blind individuals to help improve the chosen colour scheme. A suggestion could also be to allow the user to choose their own colour schemes and set up presets designated for those who are colour-blind.

Evaluation

Participant-Based Evaluation

Cooperative evaluation a type of participant-based evaluation and is another method of interviewing user to gain insight and feedback on the design but in a more participatory manner for both the interviewer and interviewees. It helps with the iterative refinement of the product in this human-centred design approach and shows it users understand the aim of the application, helping convey if the application is successful in fulfilling a user's needs.

The participants were asked to evaluate the design and its utility. The concept of the application was explained as well as how it fits into the Lion's Gate ecosystem. This explanation was accompanied by the illustrations of the application. Further explanation was given to ensure all participants were on the same path. Two students from the university were chosen, both of whom are aware of the technologies being used and of the Lion's Gate project. They were asked questions in a group format, notes were taken in written form. They were asked questions such as the following;

- How do you feel about the design choice?
- Does the design choice correlate with the purpose of the application in Lion's Gate?

- Do you feel like this application would encourage more people to visit Lion's Gate?
- Is there anything that application doesn't do that you would like to see it do?

Results

Both participants understood easily how the application could fit into the Lion's Gate ecosystem. Participant 1 expressed some distaste towards some of the design choices and after encouraging them to share their preferences we discussed alternative colour schemes, iconography and system layout. The participant stated that currently the sketches show the system as lacking in colour which is a very agreeable statement, even if it is an early prototype. Participant 2 suggested different icons and less sharp edges on the main menu. They also suggested the portrayal of more web pages and user journeys. It was explained that currently there is only a single set path set up through the garden and both participants expressed that it would be beneficial to have more freedom of movement.

Recommendations

Interviewing multiple people does affect answers as some participants may feel that they can't fully express themselves. As the design process is iterative it was very easy to take these suggestions on board to upgrade the prototype. It's difficult to create tasks for user's as the design is completely conceptual so the feedback is determined by the what the user assumes that can do.

Expert Evaluation

An expert who is trained in HCI, UX and interactive design in general, was contact to perform a heuristic evaluation of the product. This is an effective method to show how a human-centred design approach effectively implements the 10 general heuristic design principles (Nielson, 1995). The expert contacted is a former Napier student who currently works in the interactive design field as their profession. The evaluation was conducted by informally meeting 1-1 and providing an overview of the product alongside its illustrations. Below are some excerpts from the evaluation regarding specific areas of the design:

Visibility of system status

“The visibility of system status refers to how well the state of the system is conveyed to its users. Ideally, systems should always keep users informed about what is going on, through appropriate feedback within reasonable time.”

Scenario:

User has clicked one of the animal icons.

Result/Possible Solution:

The user can decide what to do next by being informed their action was effective. It would be suitable to add a message: ‘You have chosen rabbit’ or similar.

Match Between the System and the Real World

“Systems should speak the users' language with familiar words, phrases, and concepts rather than system-oriented terms. Interfaces that follow real-world conventions and make information appear in a natural and logical order demonstrate empathy and acknowledgement for users.”

Scenario:

User navigated to the home page and clicked AR Mode

Result/Possible solution:

The app should feel familiar to invoke trust and demonstrate that it knows and care about users. Therefore, technical terms such as AR should be avoided. Designer can use full terms instead of abbreviations.

User control and freedom

“Users often choose system functions by mistake and will need a clearly marked "emergency exit" to leave the unwanted state without having to go through an extended dialogue. Support undo and redo.”

Scenario:

User has chosen rabbit, is in the middle of the quest but wants to change to another animal.

Result/Possible solution:

Add settings icon to all screens and make an option to do it there. User might be worried they will lose their progress if they just go home.

Recommendations

The evaluation itself is a good method of properly evaluating a products design but the methodology and the implementation of this iteration of heuristic evaluation was flawed compared to the recommended methods. The evaluation was set up like a 1-1 interview with this expert as opposed to the recommended discussion with multiple evaluators. As the design is still very conceptual, no task list was able to be created, which is another important step of gaining this expert evaluation.

It's important to note that with only 1 evaluator it may be difficult for that single person to identify all the problems with the application, however utilising multiple would yield greater results. Having a higher number of more detailed sketches and illustrations would have also yielded greater results. Two people won't look at the same idea the same way, so any concepts should be eventually as detailed as possible. This will ensure nothing is misconstrued.

A recommendation that was discussed verbally was the implementation of a sort of guide for the user when first opening the application. As seen in the below figure, the background image could dim with arrows pointing to certain features, giving information on them.

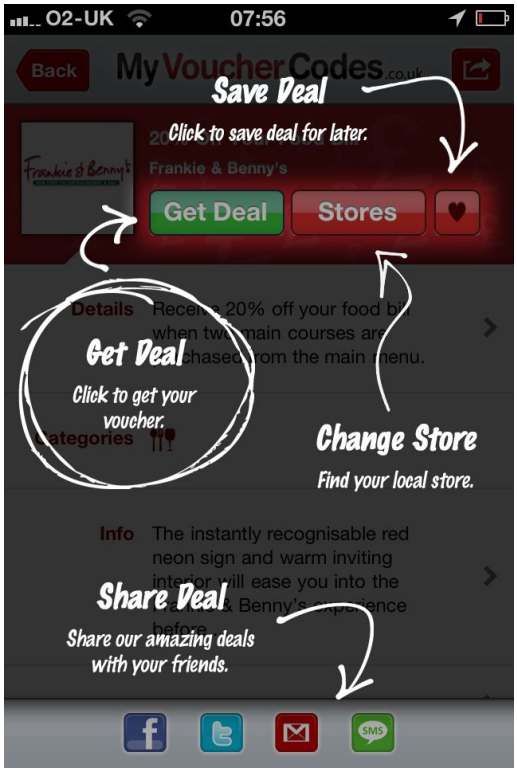


Figure 4 - Expert evaluation - Improvement idea (Griffin, n.d.)

Conclusion

A human-centred design approach has proven to be an effective method of designing a system but there are some issues to be highlighted. It does put all the focus of the development process on iteratively refining the product so to match the user's needs which is an important quality for a design method to have. The feedback gained from having so much interaction with users meant that throughout the process I was able to identify and improve any design flaws in addition to highlighting the things that the product does well. As important as it is to be self-critical it's equally important to show positive results when apparent. The issued I faced heavily sat on finding valuable participants for the understanding, testing and evaluation stages. Whilst it is useful to gain the insight of the most common visitors to the garden, it's very important to gain insight from a wider variety of possible visitors.

Generally, implementing a blended space is a difficult task due to the necessity to find a middle ground between having subtle and blunt digital interaction points (O'Keefe & Benyon, 2015). Creating a narrative is a delicate process in digital tourism. O'Keefe & Benyon conducted a study involving digital tourism of heritage sites with schoolchildren and the results of this study provide many applicable points. The concept of allowing a user to create something unique, such as a story, is in my opinion one of the best ways to engage and interact. Instead of the linearity of a pathway game such as this, their study allows a greater freedom of movement in the physical space as well as freedom of expression in the digital space. The Lion's Gate garden is clearly a very different scenario to O'Keefe & Benyon's study but further development of the garden and the introduction of such a storytelling design would be a great step forward. The scope of future improvements for the current garden exists as more content can be added but overall scalability is heavily influenced by whether more blended spaces, in the form of digital gardens, are created. For example, if a new garden was created at a different site at Napier in tandem with the Merchiston lions gate then the scalability of the app would drastically increase as it would be upgraded to function at multiple sites, especially with an introduction of GPS functionality. Due to the gamification of this app this means the 'reward' of the app could also see some improvement. I'd like to stress that even though the application design was well received, there is still much work to be done in perfecting the process and in further developing Lion's Gate garden.

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Appendices

Participant ID: _____ Site: _____ Date: ___/___/___

System Usability Scale

Instructions: For each of the following statements, mark one box that best describes your reactions to the website *today*.

		Strongly Disagree				Strongly Agree
1.	I think that I would like to use this website frequently.	☐	☐	☐	☐	☐
2.	I found this website unnecessarily complex.	☐	☐	☐	☐	☐
3.	I thought this website was easy to use.	☐	☐	☐	☐	☐
4.	I think that I would need assistance to be able to use this website.	☐	☐	☐	☐	☐
5.	I found the various functions in this website were well integrated.	☐	☐	☐	☐	☐
6.	I thought there was too much inconsistency in this website.	☐	☐	☐	☐	☐
7.	I would imagine that most people would learn to use this website very quickly.	☐	☐	☐	☐	☐
8.	I found this website very cumbersome/awkward to use.	☐	☐	☐	☐	☐
9.	I felt very confident using this website.	☐	☐	☐	☐	☐
10.	I needed to learn a lot of things before I could get going with this website.	☐	☐	☐	☐	☐

Please provide any comments about this website:

Figure 5 - System Usability Scale (https://www.measuringux.com/SUS.pdf)

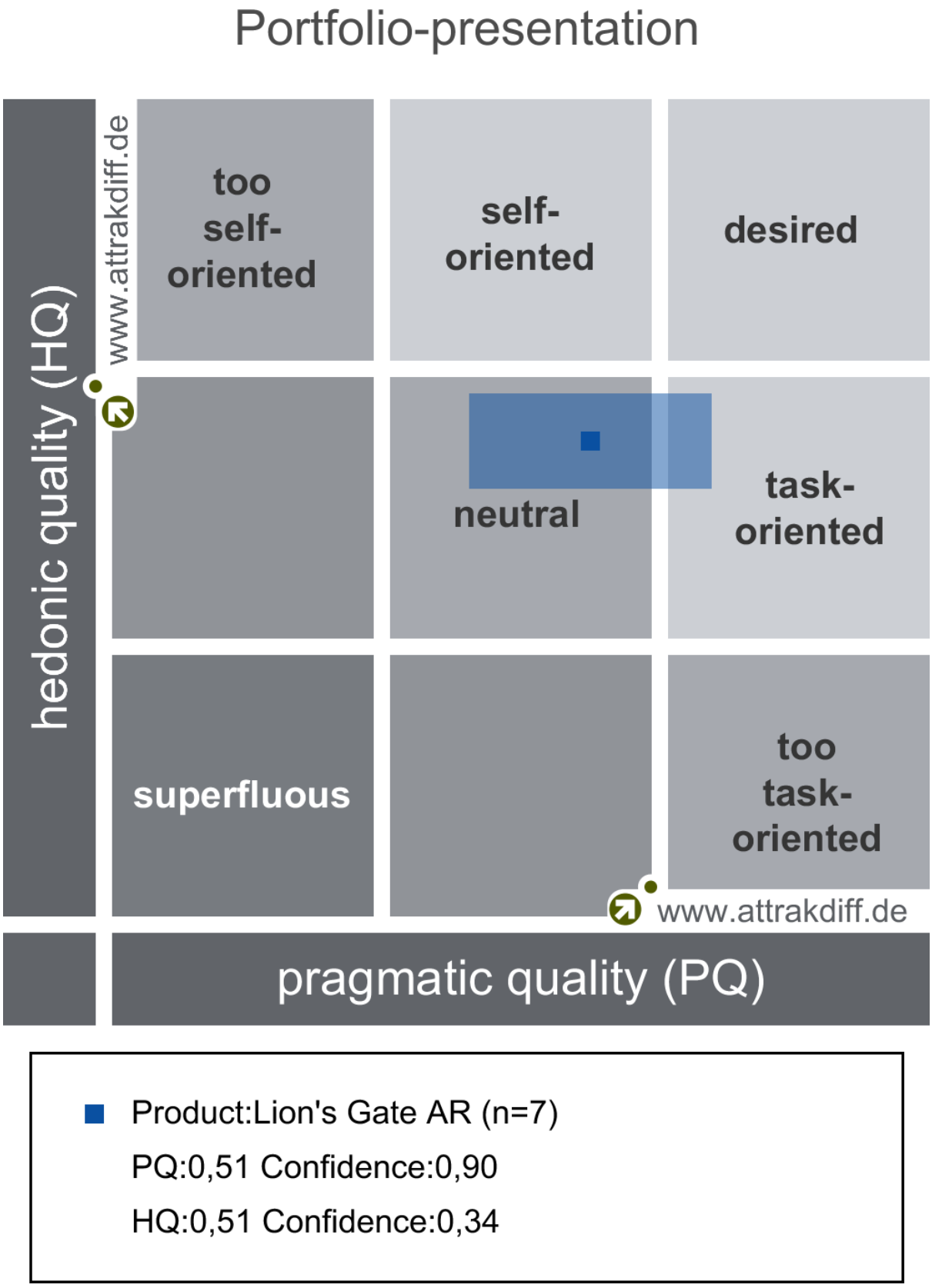

Figure 6 - Accessibility Test - Portfolio of Results

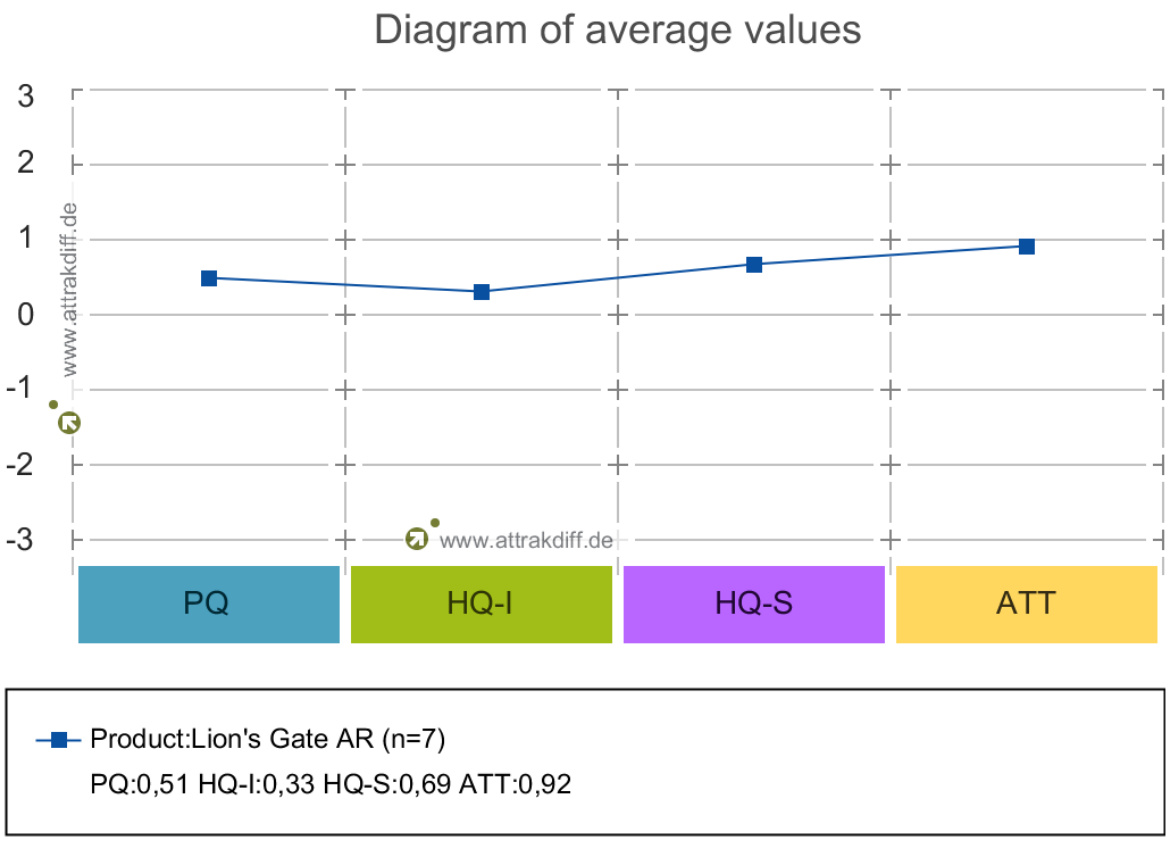

Figure 7 - Accessibility Test - Diagram of Average Values

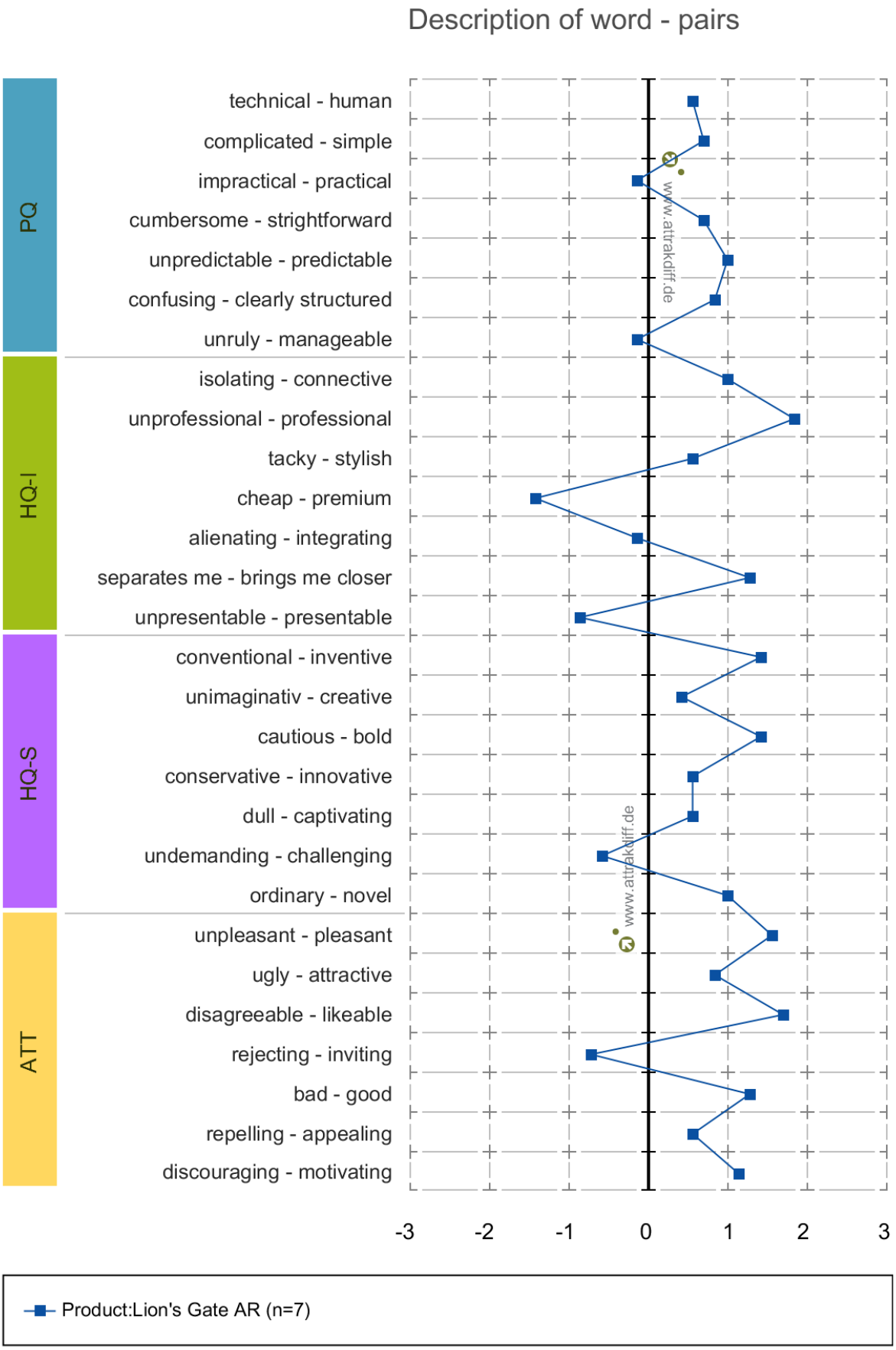
Description of word - pairs
PQ
HQ-I
HQ-S
ATT
technical - human
complicated - simple
impractical - practical
cumbersome - strightforward
unpredictable - predictable
confusing - clearly structured
unruly - manageable
isolating - connective
unprofessional - professional
tacky - stylish
cheap - premium
alienating - integrating
separates me - brings me closer
unpresentable - presentable
conventional - inventive
unimaginativ - creative
cautious - bold
conservative - innovative
dull - captivating
undemanding - challenging
ordinary - novel
unpleasant - pleasant
ugly - attractive
disagreeable - likeable
rejecting - inviting
bad - good
repelling - appealing
discouraging - motivating
-3
-2
-1
0
1
2
3
www.attrakdiff.de
www.attrakdiff.de
Product:Lion's Gate AR (n=7)

Figure 8 - Accessibility Test - Description of Word Pairs