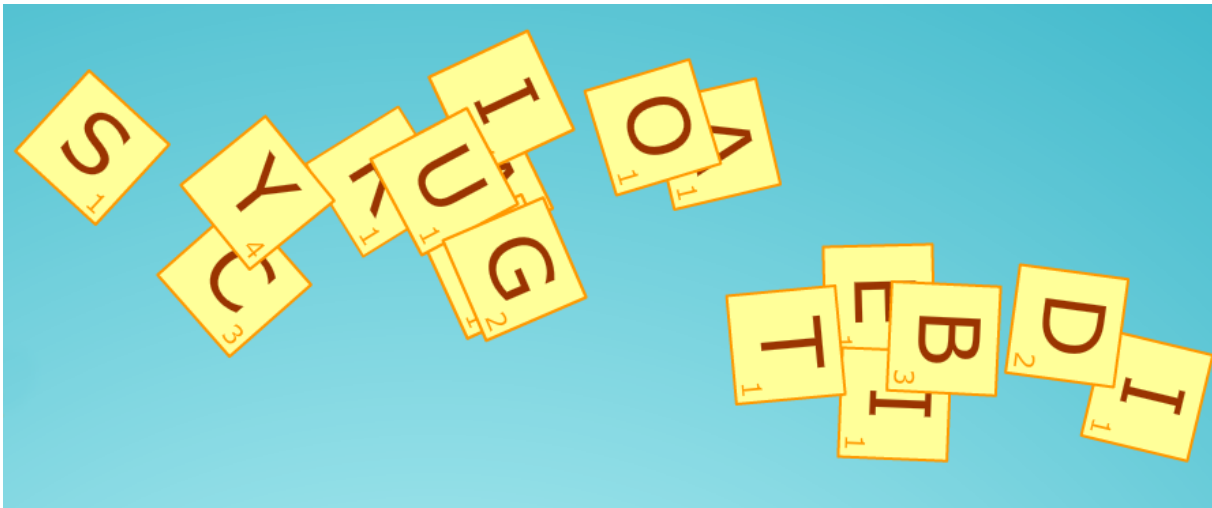


TINS

This Is Not Scrabble
Formally known as Community Scrabble



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Final Report

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Contents

- **Introduction**
- **The Project Name**
- **Inspiration and Literature**
 - Literature Review
- **Problem Space**
 - Assumptions
 - Project Goals
- **Conceptual Model**
- **Our users**
 - Stakeholders in our Project
- **Design Approach**
- **The Process**
 - Meetings
 - Workshop 1
 - Workshop 2
 - First Interview
 - Second Interview
 - Third Interview
 - Opportunistic Evaluation Results
 - Workshop 3
 - Goal, questions and evaluation approach
 - Place
 - Initial reaction
 - Testing the Timers
 - Demo Clip and Star Power
 - Moving Tiles
 - Free Areas
 - Rotating the first Tile
 - New Ideas
- **Evaluation**
- **The High Fidelity Prototype**
- **Future Work**
- **References**

Introduction

Multi-touch tables is today a exotic piece of technology that you seldom encounter and few is experienced with using such technology. With the opening of the new IFI2 building there are plans of placing a multi-touch table in the library open for public use. With this in mind we wanted to design an application based on a familiar and motivating concept that invites people to experience the new technology in a positive way. The application should be intuitive and self explained, offer motivation and purpose for repeated use and give positive experiences. We thought that making a game would be ideal for this purpose.

Inspired by the well known Scrabble board game we wanted to design a game based on placing of letter tiles. We imagine that the familiar concept will make it easier for new users to approach and try the game, but we have no intention to re-create Scrabble for touch based interfaces since this has been done before [1] [2]. A multi-touch table introduce new requirements and possibilities and we want to develop a complete new game based on this aspects.

Multi-touch tables invite and accommodate simultaneous participation of multiple users [3]. This introduce challenges in the design process that we find very interesting. As Pelton et al. [3] states: “we are still in the infancy (...) of the whole application area of designing applications for such group usages.”.

The Project Name

Our original project name, “Community Scrabble”, reflected the idea of a game based on cooperation. The thought behind the “community” part of it was to reflect the fact that unlike the original scrabble game where every player has their own limited number of tiles, and as a result often do not have the right tiles to form the word they desire, this will almost never happen. We will eliminate this problem by introducing all tiles as community tiles, there to be used by anyone who wants to. A problem with the “Community Scrabble” name was the fact that people associated it too much with the original board game. We wanted to use the original Scrabble concept of placement of tiles to form words, since we thought the familiarity in concepts would help people learn how to play easily. On the other hand, our game brings a lot of new elements to the table that makes it an entirely new game. Based on the feedback we got, it seemed like people would judge it prematurely without fully understanding what our game really is. By calling it Scrabble, people seemed to expect a game with just small variations from the original Scrabble game play. We therefore changed the name of the project to TINS, an acronym based on a defensive statement from a brain storming: “This Is Not Scrabble”. We found it quite likeable and got good feedback on it from classmates. TINS is a game that you can enjoy by yourself but also a game that shines the brightest when you bring along a couple of friends.

Inspiration and Literature

Our inspiration for creating a game on the multi touch table is simply that we wanted to create a

new and fresh game that would take advantage of the multi touch table while using inspiration from a traditional board game called Scrabble in which 2-4 players compete by forming words both horizontally and vertically on a rectangular grid and scoring points based on the difficulty of the words they create.



Figure 1: The traditional Scrabble board game

With this new game we wanted to create something that is more fast paced and where several players can play at once by then working together to get a good high score. It would also be possible to play alone if preferred. As seen for both in [1] for scrabble for iPad you would say that the game is slightly slow-paced with waiting time for the other player to finish their turn, this would apply for [2] iPhone as well. We were unable to find any applications that resemble ours for multi-touch table so to our knowledge our game should be the first of its type for this platform.

Our game will be very different from the original Scrabble board game when it comes to game play. We adopted the concept of combining letters to make words in a cross word pattern and score points with the given points assigned to each letter. Another inspiration we got from Scrabble was to have some sort of bonuses in one or more of the squares on the board. In Scrabble these bonuses are double word points, double points for a letter and so on. We decided to add something similar which is of the form of a «star» that will increase their score by a great amount. By doing so we hope to increase the difficulty, for those that wish to play for a good score, a little by randomly spawning the star which acts as a multiplier bonus that would encourage the players to rethink their strategy and possibly change the direction they intended to make words to get hold on multipliers. This will also make the game more dynamic so you can't just plan where you should make words, like say if a couple of stars appeared soon as the game started most players would already have a plan for where to make words, but with this they will have to think faster not to mention being able to find the letters you want to make the word that would benefit the most.

Apart from the inspiration Scrabble provided we have come up different ideas on how to make the game more exciting, like unused lettered tiles moving around the game board and a free «area» to have tiles so that they stop moving. These free areas are of course limited to just a few lettered tiles at once. This is more specified in the conceptual model.

Literature Review

We have found many articles that have inspired and supported us in the project. Many articles exist on the use of multi-touch technology and the development of games. The multi-touch tables has been found as a natural platform for games [6], where Adobe Flash, the platform later used in our prototype, also is found to be particularly well-suited for the creation of complex and novel visual interfaces.

One aspect that concerns us is the introduction of multi-touch technology into public spaces. Do people interact with the technology as a group or single users? Pelton et al. [3] conducted a study to look into this, and state that the size and availability of multi-touch surfaces in public spaces invites to simultaneous participation of multiple users. A game using this hardware should therefore be open for multiple simultaneous players. But should it be cooperative or competitive? In one study they found an increase in interaction and communication between cooperative players, but less between competing players [5]. The size of the table was also found to provide limitations on how many players that may play at the same time without bumping into each other. Tables at the same size as the one we hope to use has been found to be adequate for four simultaneous players [5]. But when several people have to share a common screen for interaction an article preaches for a distinction between “personal territory” and “group territory” [4]. There should be places in the interface that are intended for each individual, and places that are for the whole group. This gives arguments for introducing “free areas” in our game board. The article also discusses the need for individual orientation for users, which we have discussed a lot in group sessions but not found a good practical solution for yet in the grid area.

Another aspect that concerns us is how players learn game rules while playing. To be able to be motivated for playing a game you are dependent on understanding the basic rules [8]. Learning of rules can be conducted by using different types of learning. A visual demo animation of play would teach rules through model learning. Instant feedback on construction of correct word will function as reinforcement in operant conditioning. Learning of rules by playing and making mistakes depends on constructivism where knowledge is constructed through trial and error or mental reflection. When a star appears on the board, the player needs to try to interact with it to find out what it does.

Problem space

The original Scrabble board game has a lot of strict rules that control the game play. You have to be two to four to play and these players need to compete since the goal is to win over each other. This makes the game suitable in some situations, but fails to support single players or players that want to contribute towards a shared goal. We call the original Scrabble game strict in this sense.

Most board games are presented with the rules of the game in textual form. To understand what to do, you first have to read the manual, or be told what to do by more experienced players. This makes it mandatory to invest time and effort to understand the game before you may experience it. Not all possible users are motivated to invest this effort, and may leave the game before it even starts. As Siang and Rao state [8]: “It must be remembered that if players fail to understand the rules of game in the first few minutes, they would simply walk away.”.

Most games we have seen made for multi-touch tables are simple, intuitive and do not rely on the need for reading manuals. The concept of the game is often rooted in the multi-touch experience in itself, where the motivating aspects often is the experience of the technology. This makes it interesting and fun for first time users, but fail to motivate users in the long run. In some of the games you can not even win, something that can be described as one of the needs for game players [8]. The games are often not challenging enough in their own way to encourage repeated use, and the technology stays as something you have tried but not something you are familiar with from repeated sessions.

Our goal is to adapt to these problems and make a more flexible, intuitive and motivating game which people can enjoy for either a short or a long time span. Multi-touch technology will give us a natural way to encourage and reward cooperation, where the users decide if they want to play alone or together. We want to provide an easy entrance to become familiar with multi-touch technology. By playing the game users would get more familiar with touch table technology and get a positive experience.

Assumptions:

- Users enjoy board games such as scrabble.
- Users who are used to the original Scrabble will find the game intuitive and would be able to play immediately.
- Users like to exercise their brain with challenges
- Users find High scores motivating
- Users are not negative to cooperation in game play

Project Goals:

1. The core rules in the game should be so intuitive that all is understood during the first game
2. The game should support single as well as multiple players at once
3. All rules shall be communicated without the use of written statements
4. The interface should be as minimalistic as possible without sacrificing usability
5. High game value and replay value: It should be fun to play the first time, and challenging enough to satisfy experienced users
6. The users should be left with a positive attitude towards multi-touch technology
7. Give mental exercise on applied knowledge like word recall.

Conceptual model

We call the application we want to develop a game since it is a structured activity that involves enjoyment and a common goal based on competition or achievement. The game is based on multi-touch table technology as a technical requirement, where the table is thought of being stationary placed in a public place such as the IFI2 library and running our application as default.

The game board

The table is always ready for a game, inviting users to play. When a player touches the table the game starts immediately. In this way we hope to encourage new users to experience our game. The game have a grid area where letter tiles may be placed, and an area around this where collections of letter tiles is presented. The letter tiles is interactive by touch. By putting a finger on a tile, you are able to move it out from the ring and place it in the grid. If a tile is dropped before it reach the grid, it will drift back into the ring. A count down timer is visible in the interface during play.

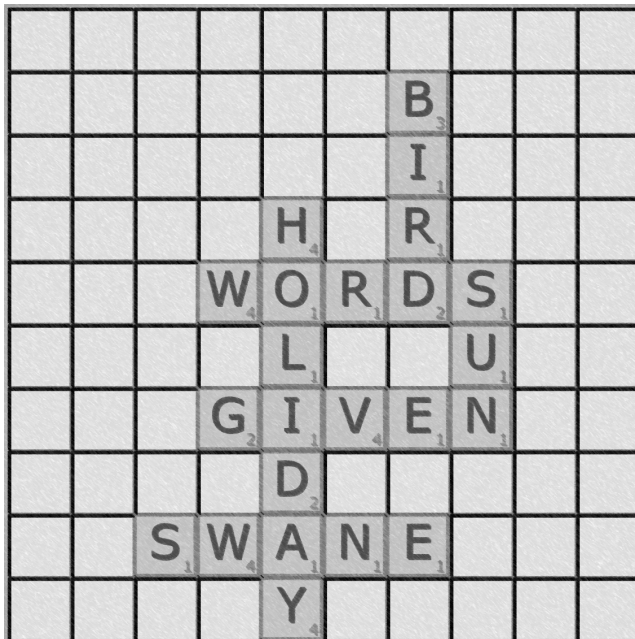


Figure 2: A cross-word like structure of letter tiles

Purpose and game play

The goal of the game is to construct as many valid words with the letter tiles as possible. Tiles positioned next to each other on the game board may form words either horizontally or vertically. The tiles should be connected in a crossword-like structure on the grid, where words formed outside the main structure of words is not counted. With valid words we mean words you normally would find in a dictionary. the prototype now supports English words, but could possibly use dictionaries from several languages at once. When the last tile in a valid word is placed the game gives some form of feedback to the user that the word is valid. In the end of the game each valid word is counted to form a score.

From the moment you touch the surface the game starts with showing a count down timer and the game ends when the timer reach its end. We have used two minutes deadline in workshops, but plan to test this further later in the process. When the game ends you are shown a visualization of how the points are being counted and presented with your score. It should be possible to write your name on a high score that is visible for later users. The player may use tiles to write their name, just as in the normal game play. The score makes it possible to compete in short time frames by comparing scores, or compete in longer time frames by getting your name further up the high score.

Single or multi player, compete or cooperate

The game do not have different modes and the game play is not changed, but it should be able to use the game in different ways. You can play alone, compete with others, or in a group collaborating to a shared score. Its up to the users to decide how they want to use the game. The motivating part is the score. A single user will compete with himself/herself with trying to reach better scores or trying to beat other peoples scores from the highscore. Multiple users can either take turns and compete towards the highest score between themselves, or collaborate to reach the highest score on the list. The single high score list encourage collaboration since we believe multiple users would reach the highest scores and collaboration therefore is necessary to reach the top of the list.

Further functionalities

Since the game has no logical up or down, and it is plausible that the table could be placed in the middle of a room, orientation is an issue. We want the players to be able to adapt the orientation of the game to their liking. We can expand on the concept with additional functions to make the game more flexible, challenging and long lasting. This includes bonus tiles that appeared throughout the game and give extra points, or extra time if the players manage to build a valid word over it. Combinations of different languages may form extra scores, or words that may be read both ways may give extra scores. This will give the possibility of a more advanced game play for experienced users. We also plan to give circular motion to the tiles around the table to raise the challenge and the stress level in the game.

Our users

There is essentially no age limit to play TINS, but since it is a word game that requires basic knowledge of languages it is not suitable for children under the age of 8. Other than that, the game can be played by everyone with a normal vision, knowledge of language and a free hand. However we want to elaborate in more detail who the users will be we shall have to take into consideration the most likely place that the multi-touch table will be placed.

Assuming that multi-touch table will be placed in the new IF12 building we can look a little closer on who the primary, secondary and tertiary user groups are[7], as well as who the stakeholders will be for our project. Unless the table is placed in an area where students don't have access, the primary users will be the students who are attending lectures, lab sessions, or for some

other reason find them selves walking into IFI2. the majority will be students who are taking a degree in informatics and this is also why most of the people we interviewed were students at the institute for Informatics.

Having such a mature group as primary users will allow us to make some of the user interface aspects a lot more sleek and less “in your face” compared to what we would have to do if our primary users were mainly children. Some of our initial ideas were based on this very fact that students, being mature and smart people, would be able to understand the game mechanics fairly quickly and as a result we had thought up an initial design that we ourselves thought would be very intuitive to understand, but this proved not to be the case as we’ll discuss later with regards to the interviews.

Secondary users are those who will be occasionally using the the multi-touch table and in our case that would be employees at the university, visitors (such as kids from high schools), guest lecturers and even civilians who come to check out the brand new building. This introduces new types of users who have vastly different backgrounds and with varying knowledge of computers and who probably have never experienced a multi-touch table.

Our tertiary users are those who are either affected by the introduction of our finished product or will influence its deployment. For example if the touch-table that our program is running on is placed in the library in IFI2 then the librarian would be a tertiary user since that person will be affected by it. Other tertiary users could be the people who are tasked with the maintenance of the touch table and making sure it functions properly, the institute for informatics or the course leader for INF4260 who will have influence where the table is placed, and even professors who may be affected by students who come a couple of minutes late to their lectures because they were busy interacting with the touch table and lost track of time.

Stakeholders in our project:

- The University of Oslo administration
- The development team(us)
- Developers of the multi-touch table
- The course leader
- Users
- Visitors at IFI2
- University professors

We believe that our stakeholders will mainly be the university in some way and also people associated with it, like the users, who will mostly be students and university employees.

Design Approach

We have started to use a user-centered design approach in this project. As the main book in this subject clearly describes: “the real users and their goals, not just technology, should be the driving force behind development of a product” (s425). Gould and Lewis states three principles

that today is accepted as the basis for user-centered approach.

1. *Early focus on understanding the users and the tasks in depth*
2. *Empirical measurement of users reactions, use and thoughts on the product in development.*
3. *Iterative design where each development go through several cycles of design, test and evaluation.*

In the early days of software development these principles were often accepted as obvious important issues that should be included in every design process. But it is not until the last decade that these principles are given the weight and focus Gould and Lewis intended.

When designing a game that is based on intuitive understanding of game rules and ways of interaction, a user-centered approach becomes crucial. We can't expect that the users will be motivated enough to read a manual to figure out how to play. The game has to meet the users where *they* are, not the other way around. To challenge this we involved users early in the process and plan to continue to do this out the project. We try to meet users with an open mind and encourage and elaborate on their thoughts and ideas. With this we borrow some ideas and techniques from Participatory design, where the users as stakeholders are more actively involved in the design process as designers in their own way. Since a game has no clearly described task that it shall fulfill, larger user involvement could have made the project harder to complete. We decided on user-centered design as the best design approach for our project, since it gives more power to us as designers to guide the process and keeps the strong focus on the users.

The Process

Our initial idea was to develop a drawing application for children to be used on a multi-touch table. A few weeks into the planning of our project we had to abandon this idea due to technical restrictions. After trying multi-touch table hands on, we discovered that it wasn't responsive enough to be used as a drawing surface in the way we wanted. In addition, the application we planned would be very time consuming to develop a prototype of. We still wanted to develop something for the multi-touch and after a brainstorming session we agreed on making a game based on forming words, inspired by the famous Scrabble board game.

Meetings

Our group consists of people with quite different schedules. We figured that Thursday afternoons from around 12.00 to whenever we felt we were done for the day was the best solution for everyone. Having a fixed time to meet is very helpful when planning for the future and it also helps the project progress consistently. During our meetings we discussed ideas and approaches, planned and held workshops with unrelated people. We also evaluated the results and reflected on what we had learned.

We call our meetings workshops from here since we think this best describes what it is. We

interview users, but lets them also interact with prototypes and let them try out each concept. In this way the users also direct the meetings in an active way, and new ideas emerge and may be elaborated upon. In that way it becomes something more than semi-structured interviews or usability tests.

Workshop 1

Our first workshop had only ourselves as participants. The goal for the meeting was to test our initial ideas and broaden the picture a little. Since our user group are students as ourselves, we started the design process by describing and discussing what the main focus and aspects of the game should be, based on our own preferences and ideas. Even in a small group of four people it took a while to reach common ground on some aspects of our game in mind and identify several aspects we disagreed on. Benjamin brought a Scrabble board game so we had tangible pieces to interact with and try out the game concepts.



Figure 3: From our first workshop using a traditional Scrabble board game as inspiration

After discussing and trying different ideas we made a list of functionality that needed to be tested on our users.

- Grid in the middle of the touch table with lettered tiles scattered around it.
- The lettered tiles moves slowly around the table in a circle.
- “Starpower” -> a multiplier that randomly appears in a square on the grid. It disappears after a short time. If the users manage to build a word over it, their total score is multiplied by 2.
- We could not agree on grid size. Normal Scrabble is 15x15, but we want our grid to be a rectangle. This can easily be tested when we have a digital prototype and is not important to figure out now. We would like to know what our users think of a rectangle vs a square though.

- Each game is quite short. We are thinking 2 or 3 minutes.
- Points only awarded at the end of the game because we want to make the game dynamic. This means that once on the grid, the lettered tiles can still be used to form other words (at the expense of the already created word of course).
- We need some visual feedback during the game and we will ask our users what they like during the interview.
- Do we want the users to start wherever they want on the grid, or do we dictate it i.e. first word must be created in the middle
- Since it is possible to move all the way around the touch table, do we want the players to created words in any direction they want or do we follow the scrabble rules i.e. can only created words towards the right and downwards.
- Do we want the users to choose which direction the play in and if so how do we determine in which direction the game is played?
- Since the game is time based we need a timer. It can be a “cake timer” such as an analog clock, a digital timer, a timer bar or something else entirely. We will have to ask our users what they prefer.
- The Scrabble lettered tiles have a numbered value on them that gives the value of that tile. We want something similar, but easier. Our idea is to have all the letters in three categories. Assigning a numbered value is the most obvious, but we want to experiment with other ways of visualizing the value of a letter such as “dots” etc. We will ask our users what they prefer.

Workshop 2

During our second workshop we conducted our first interviews with potential users. In the first meetings we had produced a lot of ideas and assumptions about our users and before we moved on we found it necessary to evaluate them. *Opportunistic evaluations* are feedback given early in the design process, in an informal setting with just a few local users [7, p. 593]. In this workshop we talked with only four people but got a lot of valuable feedback and new ideas that influenced the direction the project where going. This kind of interviews worked great in the early part of the design process, because it gave us the possibility to interact with the users to see if they understood our thoughts and the open ended form of the interview gave us a lot of information we did not think of asking about in the first place.



Figure 4: From our second workshop with interviews. Scrabble tiles functioned as an easy mock-up.

Setting for the interviews

In addition to our group being present we held interviews with subjects of either one or two. We had a relaxing environment for the interviewees where they sat on a sofa while our group sat on the sofa or in chairs on the opposite side. Our “prototype” for these interviews were letter pieces taken from a Scrabble board game that were distributed on a white table

First interview

Our first interviewee had played Scrabble before and therefore understood the concept quite quickly. However, he was missing some sort of help menu so that he would be able to read the rules before playing the game for the first time. Since we want to make our game as intuitive as possible and have a very minimalistic user interface, we didn't really like the idea of having a big red “help” button on our screen. We realized we needed to come up with a solution that would show the users how to play the game, but without having to spend a lot of time reading the rules. We think that an elegant solution to this problem is to play a prerecorded animation whenever the board is idle. This makes it possible for entirely new players to see how the game is played without having to read any rules.

We initially toyed with an idea that the users could build words in any direction they wanted. When asked about this, the interviewee did not like the idea very much, because words become hard to read and it looks very messy when the board fills up with many words. In addition, it creates unnecessary trouble for the players as it takes longer to read words that are upside-down. This is especially true when the game is timer based.

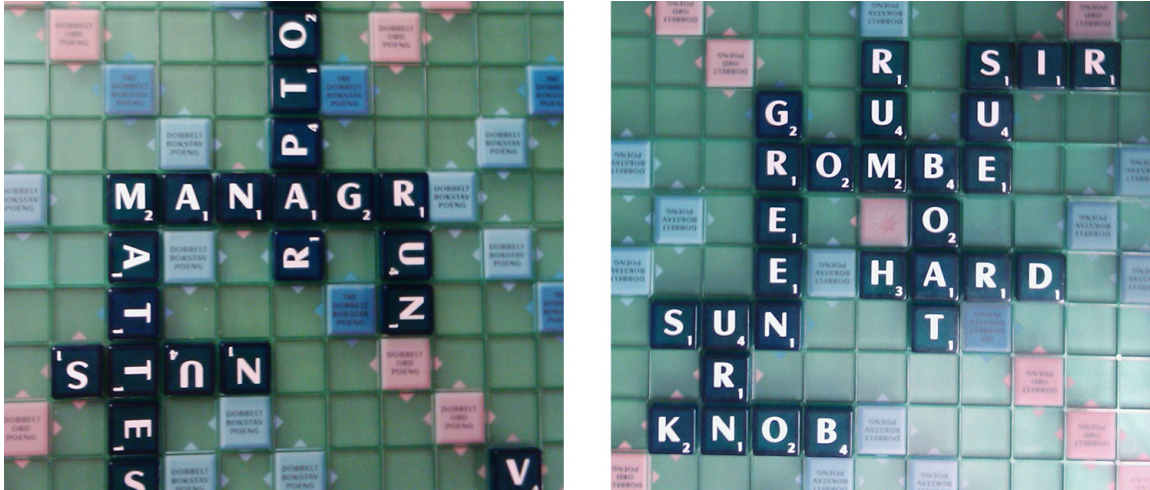


Figure 5: Testing alternative ways of letter orientation

After showing several ideas for timers, our interviewee really like the concept of a bomb with a fuse that became shorter and shorter as time went on.

Second interview

In our second interview we wanted to try out our idea on two people at the same time. Obviously, the reason for this is that our game is above all multi-player based and we wanted to see how they interacted with each other.

One very interesting thing about the second interview was that one of the interviewees had never played Scrabble before and was not familiar with the concept. When he tried to play a game and created a word on the board he expected some sort of feedback. The interviewee expressed some frustration with the lack of feedback from the game and would have given up quite quickly. We had not really thought about this beforehand, but realised that the users obviously would need some sort of feedback during the game not just after.

When we played a game ourselves without commenting on why we did as we did, the interviewees understood how the game was supposed to be played just by watching. This was important, because we now knew that having an animation showing a normal gameplay was a useful way of instruction. In that way learning of game rules could be based on model learning [11, p. 125], where users learn by watching how others do it.

Both interviewees complained about the current game time which was 3 minutes. They proposed 1 minute, but we felt that it was too short. Sixty seconds would not be enough to properly build an array of words, especially when you had played the game a few times. We reached a compromise with 2 minutes, but this would require further testing. As for the visual timers the interviewees could not decide between the cake timer and digital timer. They both have drawbacks. The cake timer is more visual appealing, but it only gives a vague sense of how much time is left, while the digital timer is boring, but gives an exact idea of how much time is left.

The “starpower” functionality was intuitive for both our users. They would have tried to build a word over it as they understood it gave some sort of bonus. However, they thought the “starpower” was only valid for the lettered tile that was situated directly over it, but our idea is that the entire score is multiplied. We will need to have some visual feedback to communicate this.

The free area was a good idea, but the interviewees would not necessarily use them because of the limited time. They thought it was more important to build as many words on the board as possible.

Two good ideas emerged during this interview. The first was the fact that our two users wanted a reset functionality. They would not have the patience to wait until the timer was finished to start a new game. We thought about this for a while and we felt that 2 minutes was a sufficiently short time to wait. If nothing else, it is still possible to play the entire round until the time is up. Our opinion was that a reset functionality was not very important at this stage, but it would be implemented later if there was a demand for it.

The second idea was that words that had a meaning read both forwards and backwards would give double points. We really liked this idea and it could be implemented as an advanced function that users could explore as they gained experience with the game.

Third interview

Our third interviewee did not see the Scrabble connection initially. He tried to create different words on the board and waited for feedback. When we explained how the animation would work he understood the concept and started to create words in the Scrabble vein. He also immediately understood how the “starpower” worked. It seems like this functionality is intuitive and interesting.

To this user we introduced two new functionalities. The first was the high score list. He thought this functionality was very important as it gave incentive to play several times. The “must reach the top” mentality is very powerful in games. The second functionality was the rotating lettered tiles concept where the unused tiles moved around the board. Our user really liked the idea and said that the game would be much more interesting and fun with it. It also causes more stress which he liked. However, he would like to have an option where he could save tiles so that they did not escape. This fit well with out “free area” concept.

When asked about what kind of timers he preferred, our interviewee did not really care. Both the digital timer and the cake timer would work. He dismissed the bomb and fuse though.

In summary, we did not gain any new ideas from this user, but our belief in our concept was strengthened by the fact that he understood the game quickly and really liked it.

Opportunistic Evaluation Results

- The game is not intuitive enough on its own. We thought using letter tiles and a grid as a game board would lead people to adapting rules from the original Scrabble, but this was not evident. We need to incorporate written rules or an animation that visualizes how the game is played.
- Three minutes per game may be too long, however this is easier to test when we have a digital prototype.
- The users need feedback from the game during the game and not just after. This is especially important when the players are not that familiar with the rules.
- The “starpower” functionality was intuitive, everyone seemed to understand that they should build words over them to gain a bonus, but it was unclear exactly what the bonus did. This needs to be communicated during or after the game.
- If the tiles should move around the table, some users wanted a free area where spare tiles could be placed. But some were unsure if they would actually use these spaces if the time pressure was high. This needs to be tested further. The users seemed a little sceptical to the movement, but stated it could make the game more challenging in a positive way.
- Restart functionality might be needed.
- A High score list was important. Must be able to see how good others have played, and be able to state your own name for the list.
- Being able to build words in any direction got negative feedback. It felt cluttered and confusing for the users. May be too hard to follow when under pressure. We find this aspect as a dead end for the time being.

Workshop 3

Before this workshop we created two low fidelity prototypes using plain paper. The first was a clean design using a 10x10 grid that was drawn on a table with letter tiles scattered around it. The other prototype was as the first but included the free area functionality and a paper formed like a donut to simulate the movement of the lettered tiles. Both are seen in the pictures below. In addition to this we had made two different count down timer mock-ups that could be displayed on a cell phone, and star power icons and turn tile icons that could be positioned on the table. We did not have the intention of testing two defined prototypes against each other, but rather test the different aspects of the game in different setups. Would circular movement of the tiles introduce the need for free areas where tiles could be placed temporarily?

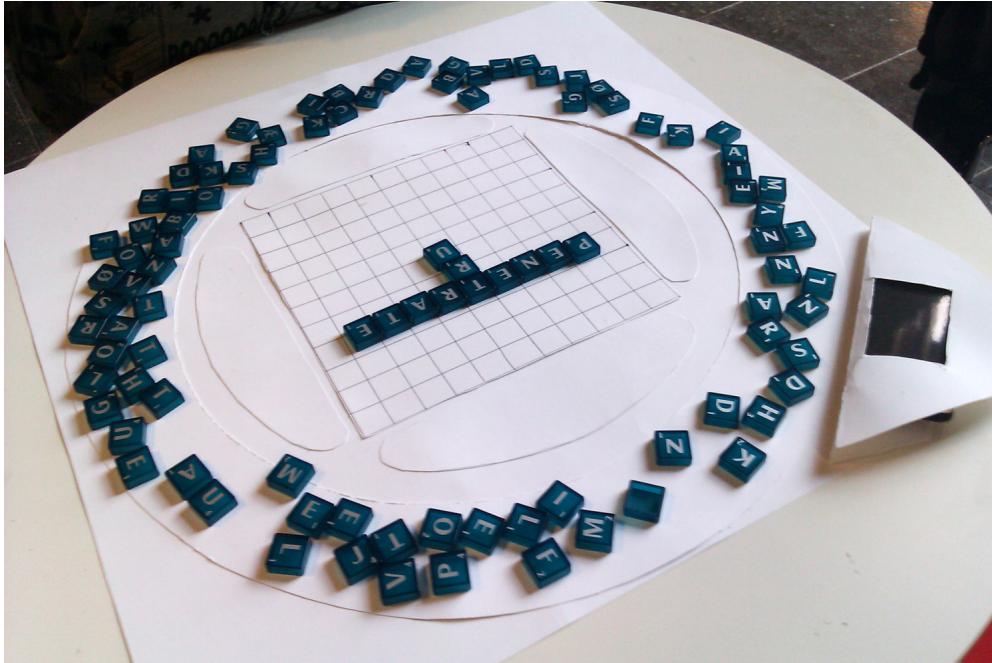


Figure 6: The paper prototype including turning tile area and free areas The cellphone to the right is used for displaying a count down timer

Goal, questions and evaluation approach

The goals of the workshop was to test and evaluate further the different aspects of the game functions and setups that where identified earlier. The result of this workshop would indicate which functionalities to prioritize in a high fidelity prototype and how they should function. To produce high fidelity prototypes is time consuming and we wanted to verify which functions that should be implemented and how the game play should be modeled before this. The questions we wanted answers on is stated later in this chapter together with the results. Evaluation of these questions where mainly done by introducing an aspect in the prototype and observe and ask how the participants interpret the intention and use of the functionality. Would they understand what to do? Would they interact with the game in the way intended? Together with this we asked open questions to access opinions on what the participants thought of the different aspects and the affective reactions to them. Does the circular motion of the tiles make the game more challenging in an entertaining way, or in an irritating way? We wanted the interviews to be more structured than in the second workshop with more focus on evaluation than on idea facilitation.

Place

We held this workshop at Vilhelm Bjerknes' Hus in the lunch hour one Thursday. The students here was a little outside our target user group , but at that day the IFI building was occupied by the Dagen@Ifi event. At the VB house the students mainly study scientific subjects and many informatics students have classes there. We thought it as a nice substitute for users of the IFI building since the user group seems to overlap. We positioned ourselves in the main area where we asked groups of people passing by if they wanted to participate in our project and give us constructive feedback. There were about 6 sessions that we completed, varying from

1 to 2 persons at a time. In each session we wanted to test both prototypes and ask the users questions that were related to different functionality in each prototype. We wanted to know if the users understood our concept intuitively and what they thought about the different functionalities in general. At this stage we had not decided on which functionality to include or discard for our final prototype so these next couple of interview sessions would give us valuable feedback.



Figure 7: From a break in the third workshop in the entrance hall at Vilhelm Bjerkes house

Initial Reaction

We started the interviews by simply explaining to them that what they saw was a prototype of a multi touch table standing somewhere in the new IFI building, and asked them what they would do when they approached the table and saw our application running on it. For this purpose we showed them our first prototype. We observed that most users would try to make words with the tiles that were scattered around the board grid. However, just like during our first interview session in workshop 2, the users did not intuitively understand the point of creating the words on the grid. The most interesting behaviour was that one person thought that the application was some sort of search engine. Only one of the interviewees took the Scrabble connection and started creating words, while all the others made words on the grid that was separate from each other. Everyone we talked to wanted some indication on how the application was supposed to work. These findings told us that it is appropriate to add a little animation that is playing while table is idle to show how the game is supposed to be played.

Testing the Timers

The next thing we wanted to get feedback on was which type of timer the user felt was the easiest and most comfortable to keep track of. At this stage we had narrowed it down to two types of timers, the standard digital timer and the cake timer. The digital timer was well received

and just about everyone one we asked felt that it was easy to see how much time they had left compared to the cake timer and also less disturbing. The cake timer on the other hand was less successful. It was not instantly perceived as a countdown timer, one person though that it was some sort of indicator that was telling the user how many tiles were occupied. Those who understood that it was a timer felt it was not very informative and that they had to guesstimate how much time they really had left and as a result of this they got stressed and could not enjoy the game. This leads us to believe that a digital timer would work best and be well received by users.

Demo Clip and Star Power

After we had let the participants test the prototype without any sort of assistance or knowing what the application would be, we showed them a little demo animation which was just a clip of us playing the game. The clip was supposed to illustrate how the game was supposed to be played. By showing this clip the basic games rule became quite obvious to the users and those who did not think of the resemblance to Scrabble could certainly see it now. When they now understood how to play the “star power” concept was introduced. We visualized this functionality by putting a piece of paper shaped as a star with the text “2x” inside it on one of the squares in the board grid. The most common reaction was that they would try to make words over the “star power” to claim it, whether it gave double points for the letter or word was unclear to all of them. One case where one thought that the “star power” symbolized that you had build the same word twice. When we mentioned that the “star power” would increase the grand total by the amount indicated by the number it was more tempting to try go for the “star power” for everyone.

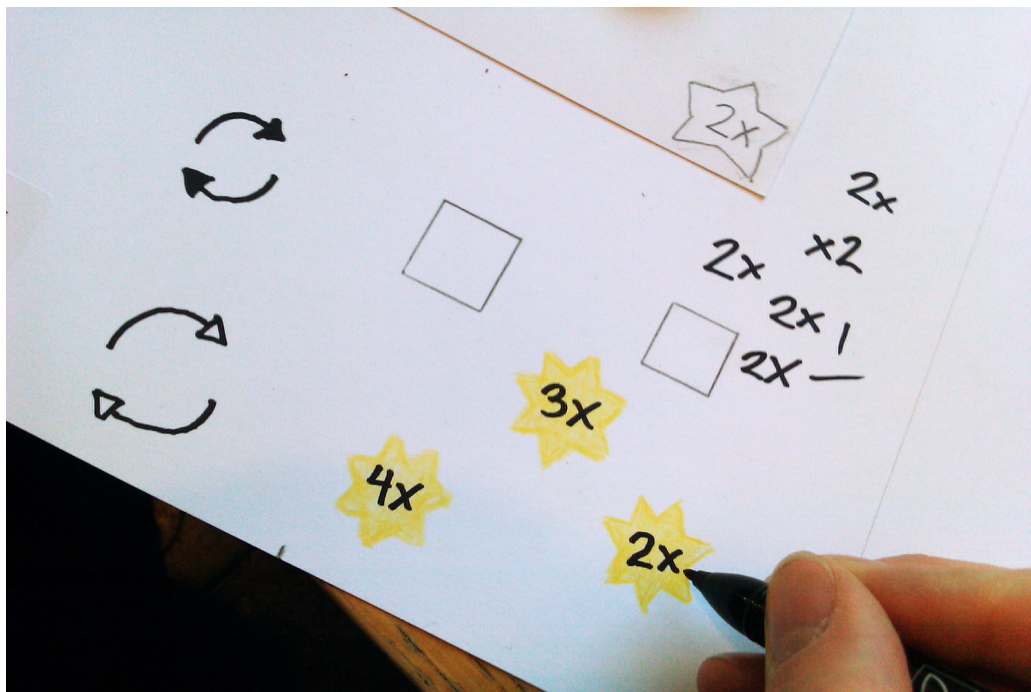


Figure 8: Details of the star power symbols and turn table symbols used in the paper prototype

Moving Tiles

At this point we showed our users the second prototype which is more advanced than the first one. We simulated lettered tile movement by having a “paper donut” that we moved around the board grid slowly during the game. Our participants were a bit split on this concept. About half of our interviewees thought it would be challenging and very exciting, since you might lose track of tiles and have to look harder to find what you’re looking for. On the other hand, some thought it was slightly annoying and unnecessary and would have liked to have the option to turn movement on/off as they please. We really like the idea of having the unused lettered tiles move around so we are unlikely to remove the functionality from our plans. It also serves a purpose where tiles on the other side of the touch table eventually reaches the user. However, when we have implemented the game digitally we will have a new test round to see if the concept is viable or not.

Free Areas

When we introduced the moving tiles we already had in mind that some users would find it slightly annoying that they can’t “save” any tiles for later use, so we introduced another feature, free areas that are placed between the grid and the letter tiles. Tiles that are moved in to a free area would cease to move and thus they can be used for storing tiles that the user would like to work with. The use of the area seemed to vary a lot from just saving most common used letters to not saving any letters at all because the users felt that they had too little time. Making whole words in the free areas before putting them on the grid was mentioned a couple of times as well. Another interesting thing was that after seeing the free areas on each sides as shown above(PIC above), one interviewee found it natural to try to get friends to come and join. We also asked people if they would have liked the free areas to be placed somewhere else but the consensus was that if free areas were to be used, this was the most logical place to have them.

Rotating the First Tile

The last thing that we wanted to find out was what people would do if they placed the first tile onto the grid and it appeared upside down. The common reaction was that they thought they would be standing on the wrong side of the table and would therefore have moved around to the other side of it to play. There was however some people who reacted differently, one interviewee just rotated the tile so it was facing the same way they were standing without thinking too much about it, which is just what we wanted to see. To help out, we placed a small piece of paper showing an image of two arrows forming a circle underneath the first tile, this led to some people rotating it while others still didn't understand that it was possible to do so.

New Ideas

During our sessions in this workshop our users came up with a few new ideas that we had not previously thought of. For example one user mentioned that it would be fun to have other bonuses such as extra time for completing long words or use letters that are not often used. Building a word over the “star power” could also give extra time instead of bonus points. It is also possible to have several types of “star power” to make the game even more interesting and challenging. One user mentioned that he would like to rotate the circle of unused tiles himself instead of it moving automatically. However, this serves a problem when several players are cooperating because when a player rotates the circle he sabotages for his teammates.

Nothing is yet set in stone and we might or might not include these ideas. We will definitely have a look at them and discuss whether to include some of them in our high fidelity prototype.

Evaluation

Evaluation and design are closely integrated in user-centered design which was one of our project goals. Bruce Tognazzini tells us why it is important to evaluate our design: *“Iterative design, with its repeating cycle of design and testing, is the only validated methodology in existence that will consistently produce successful results. If you don’t have user-testing as an integral part of your design process you are going to throw buckets of money down the drain.”*[10]. While money was not a part of the equation in our project, time certainly was. The quote can ring true for time as well as money, so it was something for us to consider.

Evaluation is the process of collection information about users’ experience when interacting with a prototype or a computer system. Using this information correctly can help improve the systems design. There are three main ways to approach evaluation; usability testing, field studies and analytical evaluation. It is normal to combine two or more of these approaches when evaluating a system or prototype. In our case we held two workshops which can be said to be a merge of usability testing and field study, where the first workshop was more of a usability testing and the second workshop was more of a field study. A field study is a study of the users in their natural environment where they act as they normally do, while usability testing is a study where the users are taken out of their natural environment into for example a laboratory where distracting elements are removed to make the users focused on their task.

In our first workshop we invited a selection of users into a quiet room in the IFI building. Here we presented them with our idea and our first prototype. During this session we asked the users questions related to how they liked our idea, what they like about it and what they did not like about it in a semi-structured form. We also asked them to try the prototype while we observed what they did.

In the second workshop session we set up a stand at Wilhelm Bjercknes Hus with a pen and paper prototype we had made. Here we could observe the users in their natural environment and in a place which is similar to where the finished product is supposed to be. In this session we let the users experiment with the prototype we had made and asked them questions like in the previous workshop, however the focus was more on how the users interacted with the system than the questions. Nevertheless, the questions we asked gave invaluable answers.

It is clear that in both workshops we used the main methods of evaluating a system which are observing the users, asking the users questions and let the users test the system. What we have not done is talking to experts, neither have we conducted an analytical evaluation of our prototype.

After the workshops we held we had learned a lot and had to analyze the results from the

interviews and what we had observed during them. Based on what the users said they liked and did not like about our prototype we made a list of the most features that we would include in our high fidelity prototype. If we had more time we would have liked to hold more workshops where we showed our users our high fidelity prototype and evaluate it further to make a better system in the end.

The High Fidelity Prototype

After evaluation of the third workshop we started on developing a high fidelity prototype that could be used in further user testing. The final product was intended to run on a multi-touch table that currently stands in an office in the InterMedia department. This table is said to support the languages C++ and ActionScript 3.0 (Adobe Flash). Since we had little experience with C++ and Flash is a recommended platform for prototyping[9] we decided on developing the prototype using Flash and ActionScript 3.0. Benjamin had done some initial work on this and set up a SubVersion server for the project, so that everyone could work updated files and commit new functionality after it was tested locally. We reviewed and agreed on the current class structure and divided functionality aspects between us.

At this stage in the process, and the advanced interaction aspects taken into account, we found it necessary to develop a *high fidelity prototype*. The different aspects of the game would be hard to test further if movement of the tiles and word recognition were not implemented well. Based on this the prototype turned out to be a *vertical prototype*, where the core functionality where developed in detail but other functions where not supported. Functionality like a turn-able table, highscore, free areas, demo clip and the graphical layout where therefore not prioritized and postponed for later development. We hope to complete the prototype so it may be presented and used when the multi-touch table is placed in a public environment in the new IFI building in the spring of 2011. In this way the prototype could also be described as an *evolutionary prototype*, since the final product probably will contain parts of the currently developed prototype.

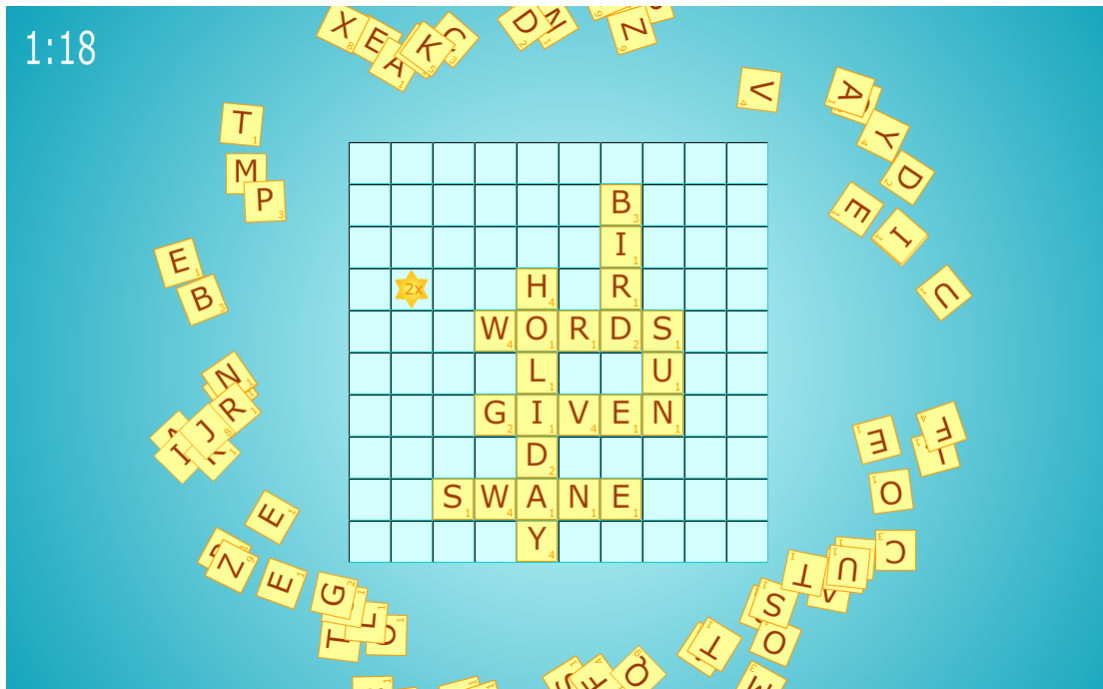


Figure 9: The game board from the current prototype

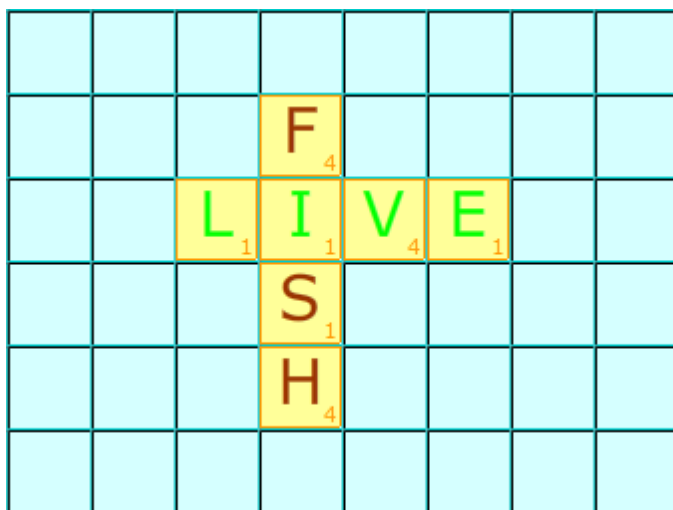


Figure 10: When a user place a tile that forms a valid word the tiles flash green to give feedback of the correct action to the user

The following functionality has been implemented in our high fidelity prototype:

- Can drag and drop the letters onto the board grid
- The letters rotate around the grid
- Feedback during gameplay. When a correct word is made the letters will flash
- Starpower functionality. If the users build a word over a starpower they get a multiplier for their entire score
- Total score count at the end of game. A window will pop up showing the score
- Timer doesn't start until the first letter is touched



Figure 11: Siamek demonstrating how the game should be played on the multi touch table

The current version of the prototype was recently tested on the multi-touch table. We managed to display it and interact with it using a mouse, but could not get the multi-touch interaction to function. We now hope to find more documentation on how flash applications need to be coded to support multi-touch interaction on the current hardware.

Future Work

As we have completed the implementation of our prototype in Flash and Actionscript 3, the next step would be to test it on different users. Doing this will allow us to get feedback from our user group so we can improve our prototype even further. We will ask our users general questions like how they like the current visuals, if they think the 2 minute time limit is sufficient for one game, how fast they think the unused letters should rotate around the grid and so on. Also, we would like to know what additional functionality they would like to have that we have not yet implemented.

While we talk to our users we also need to implement further planned functionality such as the

high score list and support for multi-touch. Currently, our prototype only works with a mouse, but with the correct API for multi-touch in flash this can be done quite easily. Perhaps our talks with the users will bring some additional functionality as well.

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