PROJECT BY

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REPORT

Playful Interactions

GAMES & PLAY III

TU/e Toilet.University experience

INTRODUCTION

PLAYFUL INTERACTIONS

In this report we will guide you, our reader, through our design process of the elective DZC30 Games & Play III; Playful Interactions. The process is split up iin roughly nine chapters. Starting from Ideation all the way to our Reflections. Some phases are described over multiple pages. We hope you will enjoy reading about our thoughtprocess towards our final concept and working model TU:e. The new Toilet University experience, getting people to become more social and nudging into good behavior in a fun and interactive way!

CONTENTS

IDEATION

GENERATING IDEAS; BRAINSTORMING & ELABORATING

BRAINSTORMING 5 TOPICS

To come up with a concept, we performed a brainstorm about designing a playful experience on a restroom door, office chair, dinner plate or sports bottle. This in the form of mind maps per topic, generating as many ideas as possible. The ideas were to be discussed and selected on relevance, feasibility and personal interests to elaborate more. After performing this selection, we elaborated the ideas more and this resulted in three ideas which are highlighted in bold in the image on the left.

For these ideas, we explored opportunities by xperimenting quickly with Arduino and sketching scenarios.

01

CHOOSING ONE IDEA

After obtaining feedback on the ideas and performing an analysis on each concept, we chose to design a playful experience within the restroom; playing noughts and crosses against other restroom users. This direction would be fun to explore since it nearly interrupts one's experiences of personal space/time, which makes it awkward.

ELABORATED IDEA

Nowadays, people use the toilet as a little private time focussed on their phones which result in occupying the toilet for a longer time than needed. One of the goals of our concept is to influence the time spent on the toilet in a playful way. Since people often spent their time playing games that can take multiple minutes, a short game of nods and crosses might result in people spending less time on the toilet.

Also, the toilet experience can can be very awkward, for instance when your farts make a lot of sound. Fraley, B., & Aron, A. (2004) describe that a humorous experience influences the initial encounter. Things might be less awkward as you have had a shared humorous interaction before, such as playing nods and crosses.

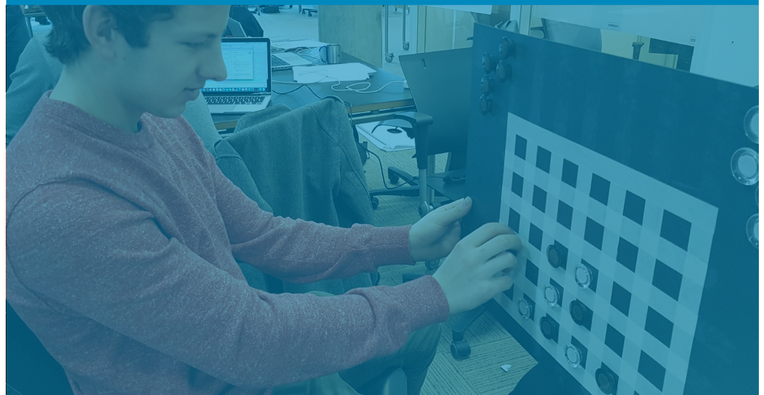
Another negative aspect of the toilet experience can be the mess. By creating a product that is attached to the door in front of the toilet, the user is motivated to leave the toilet seat down and take place before doing their business.

And the main goal of our design is to make the toiler a nicer place!

CONCEPTUALIZATION

DEVELOPING AN IDEA INTO A CONCEPT

02 If you want to go from idea to concept you have to come up with properties or something that you can experience. In this way you can convey your thoughts to other people at such a level that they could work with it to. To be able to test our concept and determine which functions can make the experience more playful, we created a low-fidelity paper mockup/'prototype'. The nods and crosses game were substituted for Connect Four game to allow more actions. Magnets were used to create an experience where the opponent is not visible but the tiles moved.



USERTESTS RULESETS

In order to find out how users would interact with the game and to find out what suits the best in the context, multiple rulesets were tested to determine which function should be implemented in our concept.

Out of these user tests could be conducted that the FLIP function and a 90 seconds per player should be implemented in our design since this improves strategical use and reduces the amount of time spend on the toilet.

3 MINUTES

Three minutes for the entire game had problematic design flaws. The design can very specifically determine the maximum duration of a game, which is very good. The problem is that it does not account for the time spent by each individual player. Players can therefore purposefully take the time hostage. This was not evident from the user tests. The players were not engaged with the time that much.

15 SECONDS PER PLAYER PER TURN

Fifteen seconds per player per turn fixes that main issue in the previous usertest. From this user test we concluded that fifteen seconds per player was too long. One of the main goals is to decrease the time spent on the toilet. Therefore, any excess time is too much!

5 SECONDS PER PLAYER PER TURN

Five seconds per player per turn was very fast-paced. One problem during the user test was the physical constraint in the paper prototype, which made this ruleset too fast for the game. Another issue was that the users are on the bathroom, and therefore they might miss a turn if they pay attention to bathroom business.

FLIP BOARD

The flip board ruleset is by far the most unique concept. It prevents the game from being one-directional and predictable. The flip ruleset is more likely to prevent draws as was also evident from the user tests. The main problem is that it can make the games longer, which we can also conclude from the user tests.

Ninety seconds per player

90 SECONDS PER PLAYER

adds more strategical use of the time spent by the players. This ruleset can specifically determine the maximum duration of the game, without restricting the time spend during a turn. Players are more careful with the time spend during their turn. They are more aware and care more about the time factor in the game.

PLEX CARDS

03 EXPLORING POSSIBLE EXPERIENCES

When looking at the PLEX Cards (Playful Experiences Card), multiple experiences seemed relevant and applicabke regarding our vision and context. We chose five of them that we wanted to implement in our design such that our system elicits multiple, different experiences. These experiences are listed below. Note that the last two are elicited relatively less than the first three.

- Captivation
- Challenge
- Competition
- Subversion
- Humor

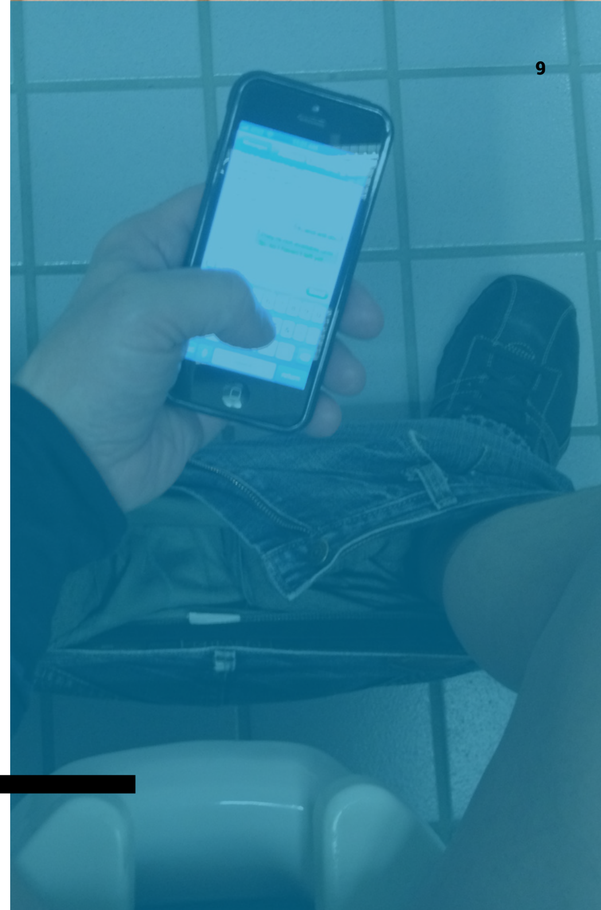
According to a study done in 2000 (Pashler & Harris, 2000) abrupt changes in an environment (like lights or displays) are very likely to draw someone's attention. Based on this, we chose for an LED display for our final design to enable captivation.

Since our system requires two players to play the game, it also elicits competition. Players compete with each other by pressing the buttons to fill an empty spot with their color to win the game.

Next to that, the game also elicits challenge. Even though the number of possible moves are limited, an opponent can be unpredictable and fill a spot that a player had not anticipated. This unpredictability requires both players to be strategic about their moves and makes the game itself more challenging

Subversion and Humor are experiences that can be elicited by our system, they will only be through an indirect manner. The design of our system does not specifically elicit these experiences, rather than the context it is placed in.

Some social norms are broken because of the system's context. Any non-standard interaction in the bathroom, which is often experienced as a private space, breaks social norms to a minimum. Because of our system's designed audience experience, which allows the audience to mess with the player's' game of which the players have no control, it does elicit humor. However, humor will mainly be experienced by the audience through our "shit-button".



PROTOTYPING

DESIGNING SYSTEM ARCHITECTURE

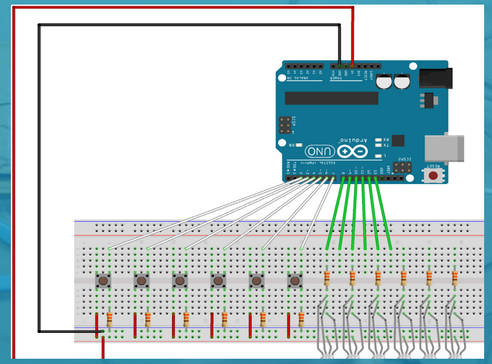
04-1

MECHANICAL STRUCTURE

The mechanical structure of our system facilitates multiple experience goals. However, actually playing the game, elicits the best experiences.

The system makes use of 2 consoles, one for each toilet door. On the outside, an audience display is placed to include the (waiting) audience in the experience. When a button is pressed during a player's turn, an LED will light up in that person's corresponding color. Every column of lights has its own corresponding button. This mapping allows for the most efficient programming and the user can intuitively know what to do in order to play the game. The prototype at this moment, doesn't show yet what game can be played on it. In order to do show this, an aesthetic design should be made that somewhat hints the game that could be played on it.

To design a more fun experience and influence the time people spend on the toilet, we will add a timer that shows that each player has 90 seconds per game in total. This timer is a servo-motor that gradually moves counterclockwise (resembling time going down). This timer speeds up the game and creates a more challenging experience.



COMPONENTS
- Multiple resistors and wires
- smoothing capacitors
- RGB LED strip (90 LEDs total; 30 LEDs per display)
- 4 Player turn LEDs
- 15 Push buttons
- Arduino Uno
- 2 Servos
- Constraints

ADVANTAGES
- Easy to program LED-strips to look like the actual game
- Push buttons give physical feedback that they are pushed in (clicking sound)
- Lights draw attention to them, which allows for inviting users to play the game
- Height of the system stimulates people to sit down on the toilet
- There are options realizable for wireless connectivity

CONSTRAINTS
- Limited time; players only get 90 seconds per game to stimulate fast-paced gameplay. This also creates challenge.
- One "Flip" per player; this stimulates players to create strategic gameplay.
- No visualized thinking; the players are not able to see the opponent's thought process as one would with regular "Connect Four". This does create more challenge however.

PROTOTYPING

04-2

DESIGNING SYSTEM ARCHITECTURE

AESTHETICS

To make our system inviting for use and play, we designed the console and audience display. For TU:e, we were inspired by Nintendo's "Wii U" and the original "Connect Four". We tried to use the same color scheme as the original "Connect Four", to make the players aware of the game they will play.

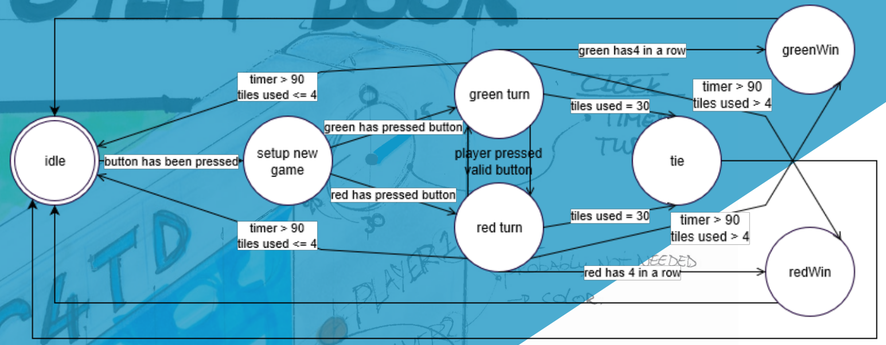
We used an LED-matrix to captivate players even more and tried to make the interface as intuitive as possible. For example, the buttons are slightly sticking out, to hint that they can be pressed.

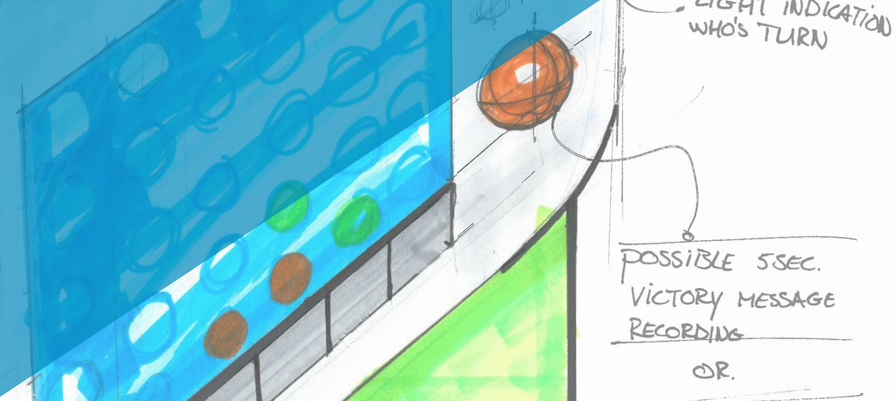
We also implemented an idle, animated state to show that the system is on and working. When a player presses a button out of curiosity for example, the game will start and the other player's turn will start. This is also visualized with an LED that lights up in the player's color whose turn it is.

TECHNICAL RULESET

The game requires two players, who are both occupying one toilet each. On the doors insides the stalls, a console is placed. To create an audience experience, there is also an audience display placed outside the stalls, that shows the game live.

The players play in turns, during these turns they need to get four spots in a row filled with their color, either horizontally, vertically or diagonally. By pressing the button under the columns, players can fill spots with their color.
Every player gets 90 seconds per game. When the turns switch, the time limit of the former player will pause. When the time runs out, the player will lose.
By using Arduino, we realized this ruleset. In the diagram to the right the system's state chart is shown.





MIDTERM

FEEDBACK MOMENT HALFWAY

During the mid-term presentation, we presented one functional player console of our game system. It consisted of a square piece of MDF with an LED matrix fixed to it and a set of buttons that were placed in a breadboard. We were able to play a preliminary version of our game with the classic connect-four ruleset.

As it lacked an outer casing, we received feedback concerning the aesthetic influence a casing has on a user's interactions. However, we did have a preliminary casing design sketch.

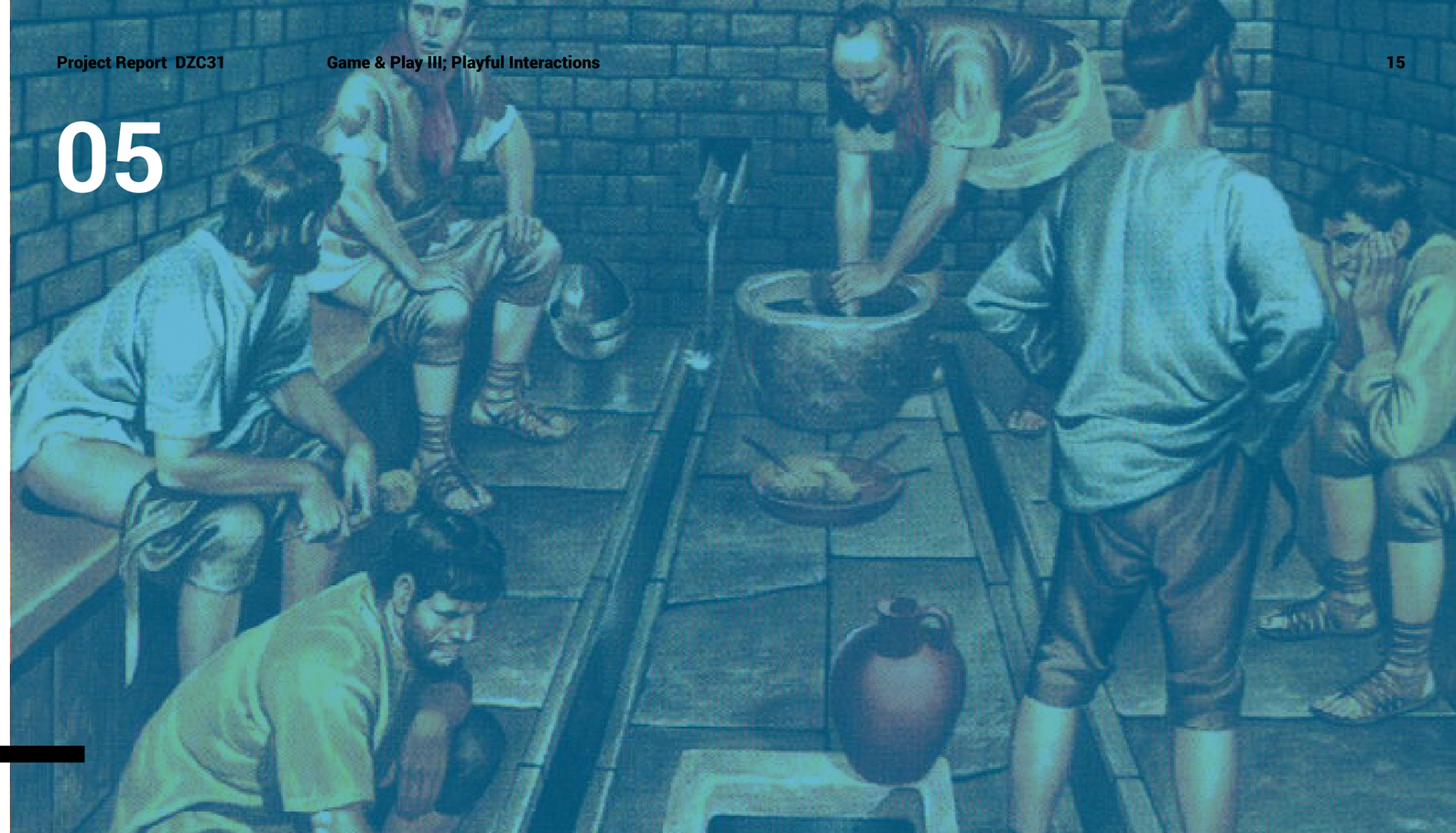
Furthermore we heard minor concerns regarding hygiene. We had thought of using rubber pads on buttons or using some form of gesture-based input that doesn't require touching the console.

We still had to perform some user tests in the actual context of the public bathroom as well, because interactions with the prototype would differ based on the context.

In our presentation we did not discuss our use of the Lenses of Play cards regarding stages of play enough, nor did we think about our audience experience enough.

We were told that we were on the right track despite these issues. We had a humorous context and our idea was very feasible, we just had to make it more context specific as the concept of remote connect four could fit into any context at that point.

05



FINAL ITERATION

WORKING TOWARDS THE FINAL CONCEPT

06-1

After the midterm presentation we sat down to iterate on the concept by incorporating some of the mid-term feedback into it. Our major flaw lied in the lack of specificity for the public bathroom context. This proved to be difficult. Affecting circumstances in the bathroom stall, for example turning off the lights, releasing the door lock or opening the door, seemed most obvious to us but also rather impractical and unfeasible. Playing sounds was an option we were thinking about as well, but realizing it seemed unfeasible, since we did not want to Wizard of Oz it.

We had also started thinking about the audience experience. Our original idea to create for an audience experience was to simply have a display where the audience could watch the match while waiting for their turn. However this did not provide any audience participation so we came up with several ways the audience could influence the game.

The first idea was to take the flip function from the players and give it to the audience. Since we liked the game mechanic and the added layer of complexity for the players, it was decided to come up with more ideas for the audience to participate; for instance an extra flip button.

The second idea was to move all columns into one direction, meaning either one column would be pushed outside the grid freeing a column on the other side in case of a horizontal movement. Or, in the case of a vertical movement would turn up the pressure on the game by adding a row on the bottom or relieving pressure by deducting a row from the bottom.

The third idea was to randomize the grid, changing every decision the players had made up until that point. This would make the game a lot less predictable for everybody, but we thought this might give the audience too much influence on the game.

This gave rise to a discussion whether we wanted the audience to have a big influence or not, because as the audience influence increases the players lose their control over the game. During a coach meeting where we laid out our new ideas, we learned that this power trade off would very much play into the context of the public bathroom. A powerful audience influence would emphasize the vulnerability of the player positions, as they could do very little while sitting on the bathroom with their pants on their knees whenever the audience decides to influence the game.

This newfound insight gave rise to the “shit button” a button the audience could use to exert influence on the game, but instead of having a set function it would randomly act out one of our ideas. This keeps audience influence dynamic and prevents partisanship, which makes it fairer for the players.

FINAL ITERATION

WORKING TOWARDS THE FINAL CONCEPT

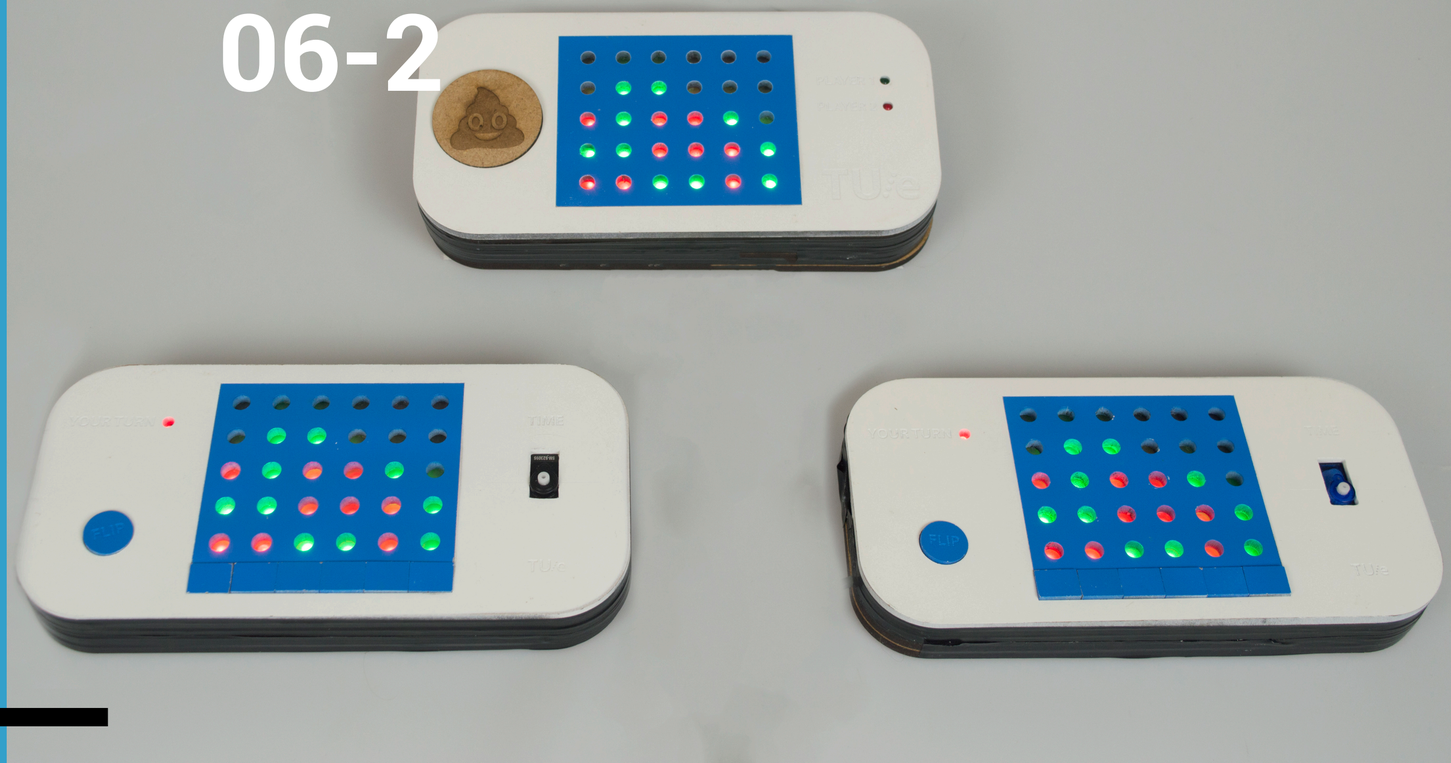
For our final prototype we decided to make use of a laser cutter. This meant first digitally designing the separate parts that would form the outer casing but also the internal structure of the hardware, the buttons and our logo. After the parts were ready, we spray-painted the front white and the buttons and grid blue.

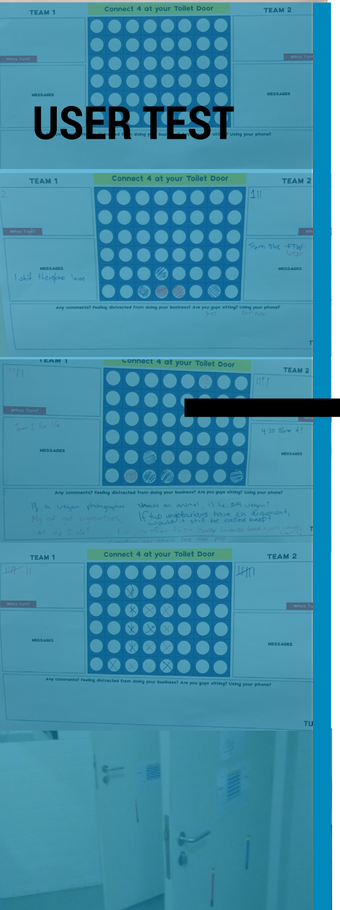
After installing the hardware into the prototype we noticed that the light coming from the LED matrix was too bright so we put a fitted piece of opaque plastic under the grid face.

There were also thoughts about using different buttons for a more elegant tactile feedback because clicking was the only interaction a user has with the game. We had first thought of using arcade style buttons, but these turned out to be too bulky for our consoles. Thus we decided adapting the buttons we already had. We put a strip of foam under the buttons to damp the click sound and motion and also widen the range of this motion. This had an added benefit of pushing the buttons outward to distinguish them from the main frame.

The whole game system is controlled by a single Arduino powered by a single 9 Volt battery. The Arduino was placed inside the audience display because of the central position relative to both player consoles. The components of the consoles were fixed onto a prototyping board with a 5 wire cable between each console and the audience display. After soldering all the components onto the boards we glued all parts together except for the audience display's backplate to allow access to the Arduino and battery.

We then finally wrapped the consoles and display in black electrical tape to smoothen out the sides and applied hook and loop fasteners to the back to fixate the system on the toilet walls.
With this setup we performed a final user test to evaluate our system's usability and user experience.





USER TEST

07-1

TESTING THE SYSTEM IN CONTEXT

One thing to keep in mind when designing systems or products is that whatever you think or assume to be working does not have to be interpreted by the actual user in that way. In order to validate this in context user tests are done. This helps to uncover potential problems and if you do this in an early stage this could help you to prevent mistakes from happening and saves you time, energy and money.

As a quick small probe to uncover would potentially use in context of our concept, we chose to do a static paper version of connect four. Also included were a score count text box and a message text box. Below was a comment box for general comments. This small test showed the value of going into context quickly and the potential of a small game on the toilet. However no real conclusions and insights on our concept could be drawn from it, we could see that people are willing to participate and things as hygiene and privacy do not prevent this.

TEST SETUP

The designs were placed in context to be able to perform an actual user test. In the main hall of the LaPlace building at the Eindhoven University of Technology, the male bathroom consists of two toilets located next to each other. Two consoles were mounted to the doors and the audience display was placed between the doors, similar to the final presentation as can be seen below.

PARTICIPANTS

When a person entered the bathroom and took place on a toilet, one of us took place on the other toilet and initiate a game by placing a tile in the game. In almost all cases, people participated in the game. One time a person did not, since he was standing and did not face the console. Afterwards, the participants were mailed a survey about the experience.

Since we tested during the TU/e exam period, the LaPlace building was less crowded than usual. To be able to get a lot of users to test and hopefully fill in the survey, we needed to approach people to ask to participate in our user test. This changes the spontaneity of the event but allowed us to obtain more insights.

'Wow! I did not expect this when entering the bathroom.'

USER TEST 07-2

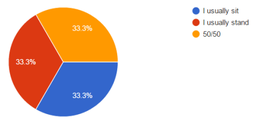
RESULTS & CONCLUSIONS TEST

TEST PARTICIPANTS

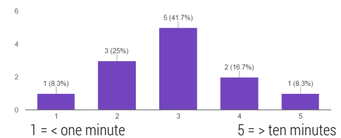
Twelve participants of the user test filled in the survey. The user test was performed at the entrance of a male bathroom located at the Eindhoven University of Technology, therefore eleven participants were males and one was a female. All participants were between eleven and thirty years old. This setup was chosen since one of our goals is to motivate people to sit down on the toilet and therefore male participants are more relevant.

TOILET USAGE RESULTS

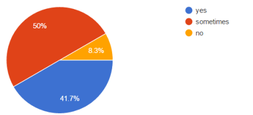
Do you mainly use the toilet sitting down, or standing? (12 responses)



How long do you usually spend on average per toilet visit? (12 responses)



Do you normally use your phone while you're on the toilet? (12 responses)

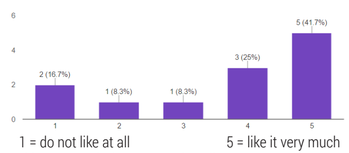


TOILET USAGE CONCLUSIONS

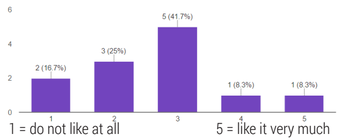
No shocking conclusions can be conducted from the survey. It confirms that the majority of the users spends multiple minutes on the toilet using their phone.

TU:E CONCEPT RESULTS

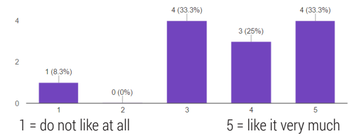
What do you think about playing (competitive) games on the toilet in general? (12 responses)



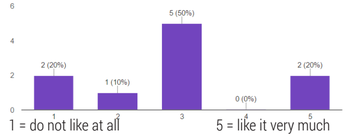
Did you like the "Flip" button? (12 responses)



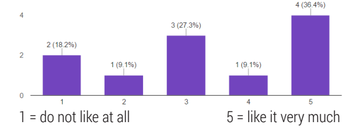
How would your rate playing TU:e on the toilet? (12 responses)



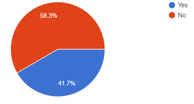
Did you like the "Shit" button? (10 responses)



What do you think about the spectator screen outside of the bathroom stalls? (11 responses)



Were you aware of the "Flip" function? (12 responses)

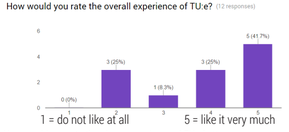


TOILET USAGE CONCLUSIONS

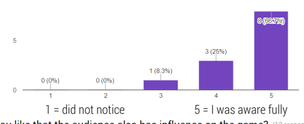
Out of these results, we can conclude that the majority of the users would love to play TU:e during their toilet visit. Regarding the results of the survey and the conversations during the user test, connect four in it's basic state seemed to be complex enough. Although the users are not convinced, we think the extra functions are of added value since it was their first time interacting with our design and we expect the extra functions will be implemented over time.

TU:E EXPERIENCE RESULTS

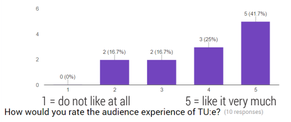
How would you rate the overall experience of TU:e? (12 responses)



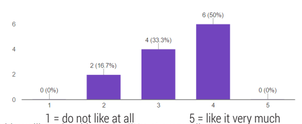
Were you aware of playing against another toilet user? (12 responses)



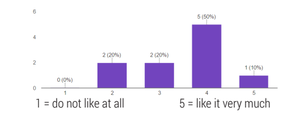
How would you rate the player experience of TU:e? (12 responses)



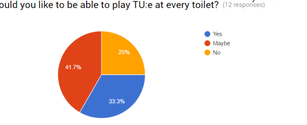
Did you like that the audience also has influence on the game? (12 responses)



How would you rate the audience experience of TU:e? (10 responses)



Would you like to be able to play TU:e at every toilet? (12 responses)

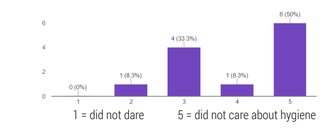


TOILET EXPERIENCE CONCLUSIONS

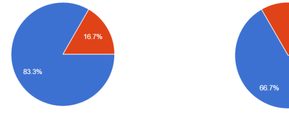
We can conclude that the majority of the users likes the concept of Toilet University: experience, but not everyone is convinced of being able to play this at every toilet and allowing the audience to influence the match.

TU:E PLAY RESULTS

To what extent does hygiene prevent you from playing TU:e? (12 responses)



Did you play TU:e during your toilet visit? / Did you know how to beat your opponent? (12 responses)



TOILET PLAY CONCLUSIONS

Out of the results can be concluded that the users will understand how to play the game and hygiene does not bother them enough to prevent them from playing the game.

FUTURE

PLANS AND IMPROVEMENTS

08

A few interface suggestions follow from the user tests. Both the ‘flip” and the “shit” button need improvements to increase the satisfaction and experience of using them. The “flip” button is not needed to elicit an experience, but is there for the strategic depth of the game. The “flip” button does successfully prevent draws from happening. In the user tests, not a single game ended in a draw. The main problem was that the players were unaware about the constraints of the “flip” button. The “flip” button can only be used during the player’s turn and once per game. One improvement is to add visual feedback for the different states of the “flip” button. Green when usable, orange when it is not your turn and red when you have used the flip button. Users were also not aware of the interaction of the“flip”. One way to improve the interaction of the “flip” on the game is to add visual animations. These animations will give both the audience and players an idea how the “flip” is affecting the board and when the “flip” is happening.

The “shit” button currently does not elicit the experience we designed it for, which was humor. First off, the “shit” button suffers from the same feedback problem that the “flip” button has. Simple light feedback could already improve this as is suggested with the “flip” button. One of the problems is that it’s not clear for the players when the audience presses the “shit” button. It ends it being confusing than funny. The “shit” button should also have animations so that players can identify what’s going on. Combine a funny animation with funny audital feedback and the “shit” button might become humorous.

As we were unable to correctly user test the audience experience due to a lack of participants, we have used theory of the last essay to analyse the audience experience. TU:e’s current design is only ideal for bathrooms that have two stalls, since it does not support multiple paired bathroom stalls. One improvement would be support for multiple bathroom stall pairs, which will result in multiple spectator displays. Multiple displays can be designed to function as *multiple interactions* from the stages of interaction (Michelis & Müller, 2011).

Another way to improve the audience experience, is to get rid of the secretive interface and transition to an *expressive interface* (Reeves, 2005). This would allow for opportunities for triangulation, which is not possible with a *secretive interface*. An *expressive interface* could be achieved by using real-time gesture-based input to influence the display. This would create opportunities for games with more interaction between the audience and the player (which is limited to one button now). Real-time gesture-based input allows for more zones, such as a *notification zone,* or different stages of interaction zones, such as an *implicit or subtle interaction zone.* One disadvantage is that bathrooms have limited amount of space available. Gesture-based input would also be more hygienic than pressing buttons for the players inside of the toilet stalls.

To increase the level of interaction of passer-by’s, TU:e could improve on the visual and auditory representation of passer-by’s movement. A *gesture-based interface* as mentioned above is one way to achieve that. Another is to add auditory queue for the audience to draw their attention. Auditory cues could also improve on the communication between players and audiences.

“So next time someone complains that you have made a mistake, tell him that may be a good thing. Because without imperfection, neither you nor I would exist.”

-Stephen Hawking-

REFLECTION

LOOKING BACK, LESSONS LEARNED

09

When we first started brainstorming ideas we did not consider mechanics, dynamics and experiences. We simply thought of the function and purpose of our design in different scenarios. The course guided us through the design process to help us answer the main questions. What experience do we want to elicit, social components, object interactions, behavior development, mechanics, aesthetics and dynamics. As a group we've learned to analyse all of these for our concept in the context of playful design. We've constantly been iterating and adjusting our prototype to suit our concept.

There's only one way to get a good impression whether your concept and designs are in line with the desired playful experience and which is testing with real people. During the design process we have had three user tests for different reasons. The first user test was to identify the best rule set for the game. The second user test was conducted to analyze the hygiene aspect of the game. Only in the last user test we were able to test our final design and observe the playful experience it elicits. This was too late to evolve the final design even more.

Therefore, one improvement for our design process would eigther be more user tests or more scenario sketching. It would be most practical to test our concepts and iterations right away. There are a few restrictions that made this difficult. The bathroom in itself was a difficult place to have good user tests. Designing the Arduino setup was time consuming, which made it difficult to test our design during that period.
Another improvement would be to cuse qualitative research rather than a quantitative research method such as a survey. We thought that a survey would be quick and easy and therefore convenient to use (as we did not want to hold up people for too long), but with a quantitative research you don't have to hold them up at all. Qualitative research is also richer in information and therefore contains more details, which would suit our user test more. This would have contributed more to our final design.

PERSONAL REFLECTION EMRE
A very interesting course that is very different from the first two courses of games and play. I had a lot of fun designing a playful experience for everyday context that would stand out from the rest. I've learned to constantly improve our concept and design based on multiple principles. My group members were motivated and convivial to work with. I'm very satisfied with our final prototype!

PERSONAL REFLECTION PLEUN
In hindsight, this elective has been a very playful one, obviously. We pushed ourselves to the boundaries of what we normally wouldn't do since it would be too weird to do. This was satisfying to do and not be too serious. On the other hand I think we put in some professional attitude which resulted in a fun, however good worked out process and end model. Overall lesson; just do it!

PERSONAL REFLECTION DAAN
My vision as a designer is inspired on the Fun Theory and I always wanted to create just a playful experience. Solving not a very relevant problem as 'people peeing standing' stimulated everyone's creativity and motivation to create TU:e and lead to a very smooth process, since everyone liked what we were doing. Implementing methods as PLEX cards helped strengthening our experience and therefore our design, I believe.

PERSONAL REFLECTION POL
From this course, I learned to focus on the experience of a playful design. I learned to use inspirational papers or frameworks, such as the Lenses of Play or the PLEX cards, for an iterative design process. I learned about the MDA-model for gameplay and how to use this to design a playful experience. I also learned to play with the attributes of the design's context when designing such an experience.

PERSONAL REFLECTION MING
The playful nature of the elective was a first for me. The playfulness of the assignment allowed us to be as creative and humorous as we wanted, while still learning about the theory behind designing games and delivering a convincing prototype. The most surprising lesson for me was to think about the relation between the players and the audience rather than the environment around the player to make the concept more context specific.

PERSONAL REFLECTION PATRICK
As the most skillful programmer I was in charge of coding. Of course, this wasn't new for me. However, working together within a multidisciplenary team on a real, physical product was, since I mainly work on computer/software design. Making iterations of our design thaught me to be critical of my own work. I'm very pleased with how our product turned out in the end, codewise and aesthetically.

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APPENDICES

APPENDIX A: CODE
Our code is included in the .zip folder on Canvas
Code retrievable from:
https://drive.google.com/file/d/0B3D098fFlTuXMVZlYmhhOHFVSGM/view?usp=sharing