Living and Working Tomorrow

The Wait

Afbeelding met speelgoed, tekenfilm, overdekt, sinaasappel

Automatisch gegenereerde beschrijving

*Figure 1. Generated by DeepAI*

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## **Chapter 1: Introduction**

*Chapter 1.1*

Today, technology has become an indispensable part of our daily lives by influencing many aspects of it. From the way we communicate to how we operate during work. However, amidst the vast developments within the field, there are still challenging issues at hand when maintaining a technological infrastructure. Upholding this system will be possible due to the fundamental shifts. There are interconnected tech trends for influencing the trajectory of IT in the future such as: innovation at the edge, a perpetual learning culture and IT as a service (Steve Van Kuiken, 2022). Numerous companies will benefit from these advancements if they apply these into their current regulations, similar to Just Eat Takeaway.com. JET facilitates online ordering, payments, and order fulfillments through a hybrid model in which the IT department plays a pivotal role. The IT department can be seen as the backbone of the company, as it is for many other businesses. That’s why, we want to prevent the IT department from getting distracted by redirecting their attention to the more complex matters at hand. When doing so, we want to educate employees on how to solve minor problems independently. Having IT as a service and combining this with an innovative idea such as an AI chatbot, you can encourage a perpetual learning culture amongst the employees. Evidence shows that in a similar study where an AI chatbot was made use of, the average accuracy score for participants using the chat bot was 0.69. A significantly higher rate than the web search engine's accuracy average score of 0.52. Furthermore, the average completion time was taken back from 7.32 minutes with the help of the search engine to a decreased time of 6.70 minutes with the chatbot (Ziang Xiao, 2023). Both findings indicate a more efficient approach to problem-solving without the reliance on external guidance, thereby benefiting companies such as Just Eat Takeaway.com.

JET, globally recognized as the most prominent online food delivery marketplace, operating across 20 various countries. Originally founded as Takeaway.com in 2000, the Dutch-based company underwent a transformative merger with Denmark-based Just Eat in 2001. With over 699,000 connected partners, JET provides customers a wide range of choices tailored to their preferences. Recently, the company has revealed a major internal challenge for 2024. About 10.000 Windows 10 users must undergo a mandatory software update to transition to Windows 11 as Microsoft ends support for Windows 10 in October 2025. Consequently, there will be an end to security updates which could then lead to security vulnerabilities. To safeguard JET’s systems for the upcoming years, Enterprise IT has decided to timely update employees’ devices. This requires every employee to hand in their devices at the service desk for a 30-minute update process during working hours. This results in a temporary downtime in which the employees are unable to execute their tasks. Hence, the client contacted us seeking a solution to utilize the 30-minute gap for an activity promoting Enterprise IT across its seven departments. This was also a good opportunity to fix the ongoing issue within the internal communication between the IT department and the employees.

Although Enterprise IT does not have a manual, technological knowledge is shared in a database. Our solution makes use of this database, which incorporates the most frequently asked questions into a step-by-step guide and combines it with a chatbot to resolve the problem without the help of the IT department. If a problem cannot be fixed with the chatbot, employees can use Enterprise IT’s existing portal that guides them through a wizard to report a problem. A ticketing system is used to make sure the request ends up at the correct department. Research indicates that the efficiency of ticketing systems can be improved by 35 percent if historical ticketing sequences are gathered to build a Markov model. A Markov model can be used to identify the social network around departments. This model can help a ticketing system recommending the departments that are most likely to solve an issue (Shao et al., 2008). We aim to introduce a chatbot that would use an advanced language model like GPT-3 to provide users with responses from pre-trained knowledge to answer their questions. We chose to implement an AI chatbot instead of a human-powered system due to the inefficient time usage. In a human-driven system, it is still necessary for personnel to engage with the users, thus diverting their time. Part of our objective is to reduce the time spent on issues by the IT employees to a minimum while maximizing the accuracy levels.

*Chapter 1.2*

We have formulated the following SMART goal to conclude our solution: In the wait time a chatbot will be introduced to the employees, this chatbot will help with decreasing the amount of minor IT problems (that can be solved with the manual) that are getting sent to the IT team by 30% to ultimately improve clarity in communication between the IT department and employees within the upcoming year.

## **Chapter 2: State-of-the-Art**

The problems: internal communication with the IT department and a 30-minute wait time during a software update are problems that other people also faced.

A study by the IDC into Oracle users showed that 80% of errors brought up to customer support can be attributed to user error (Singh & Anderson, 2022). Customer service must deal with these errors, which is very time-consuming. This causes the customer service team to get many messages, increasing the response time of the customer service team. This results in decreased communication between customer support and users.

The excessive communication with the customer service was also a problem for Oracles customers (Software as a service companies). Oracle updated their customer support software to include tips and tricks so that users can diagnose and fix their own problems. This decreased the number of support tickets received by Oracles customers by 63% (Supangat, n.d.). This lets them save time on creating support content. They reported a 50% decrease in spending time on this. Another customer of Oracles customer support software reported back to them that they used to get 2500 tickets, and this was decreased by 300-500 tickets using Oracles software update.

Downtime is also a phenome almost all companies experience. A study by Vanson Bourne Whitepaper showed that 82% of companies across all sectors experience unexpected downtime. On average they experience this downtime 2 times per year (*Human Error Is More Common Cause of Unplanned Downtime in Manufacturing Than Any Other Sector, According to New Research*, n.d.). The aforementioned study shows that downtime (in any form) is a widespread problem across all companies in all sectors. Using downtime efficiently is important, because if not used efficiently, it can cost the company a lot of money. A 30-minutes downtime for a company with 10.000 employees could cost hundreds of thousands of euros.

In August 2019, IBM commissioned Forrester Consulting to conduct a study of 100 IT directors in large US enterprises to understand the reality of downtime at their organization. Unlike unplanned downtime, IT leaders can schedule, monitor and control planned downtime. This makes many companies belief that planned downtime doesn't result in significant business losses. However, the study indicates otherwise. On average the 100 IT directors estimate that planned downtime cost their organization 1.5 million dollars last quarter and 5.6 million dollars last year. Because of this, the schedule of planned downtime is important.

<https://www.ibm.com/downloads/cas/L57KW7ND>

During covid-19 almost everyone was working online at home. This resulted in less engagement with the company itself and the other employees of the company. Nisha Chanana and Sangeeta (2020) concluded that during the pandemic many companies were organizing engagement activities such as virtual challenges and competitions, online courses, appreciation sessions and communication exercises. This led to increased commitment and motivation within the company.

## **Chapter 3: Methods and Techniques**

In this project, we have used the Creative Technology design process outlined by Mader and Eggink (2014). This design process helps us come up with new ideas and solve problems using technology. The process consists of four main phases: ideation, specification, realization, and evaluation.

The purpose of the ideation phase is to provide a foundation for generating creative ideas to solve the identified problem. Using various brainstorming techniques, as many ideas as possible are produced to open up the design space.

The specification phase is focused on refining and specifying the generated concepts by setting clear requirements and design goals. The concepts will be narrowed down to identify the best solutions. The purpose of specification is to transition from conceptualization to implementation.

The chosen concepts will be transformed to prototypes in the realization phase. The right tools, technologies and methods are used to bring the ideas into reality. Iterative prototyping and testing are important components of this phase and will lead to continuous improvement.

In the evaluation phase the effectiveness of the solution will be evaluated. Feedback from the stakeholders will be gathered and the prototypes will be tested in real scenarios. Whether the design goals and requirements have been met, will be assessed as well. The insights that are gained from the evaluation can be used in the ideation and specification phases.

The Creative Technology design process offers an organized structure for technological projects. With this step-by-step method, issues and possibilities in the project can be tackled efficiently, with creating useful solutions for the needs of the users as goal.

## **Chapter 4: Ideation**

In this chapter, we first present the user needs and stakeholder requirements, which then serve as a basis for the brainstorming and selection of possible solutions. The needs and requirements are identified in the PACA-analysis, which is focused on the People, Activities, Context and Artefacts. Understanding the various stakeholders involved is crucial for a successful ideation process. Just Eat Takeaway has three primary categories of people: the client itself (JET), the users (employees and Enterprise IT) and the stakeholders (JET, employees and Enterprise IT).

**People**

Employees at Just Eat Takeaway aspire to an engaging experience while awaiting the Windows 11 update in the IT department's waiting room. They value efficiency, clear communication, and visual appeal. The employees, possibly less technically inclined, seek user-friendly interactions and straightforward information.

JET employees regularly run into minor IT problems, such as audio issues, malfunctioning cameras, and difficulty connecting to the company's Wi-Fi network. To solve these problems, the employees must contact Enterprise IT. They must file a ticket with a detailed description of the problem. Enterprise IT will require some time to investigate the issue, develop a solution, and then reach out to the employee. Throughout this duration, the employee may be unable to perform their tasks, resulting in the loss of valuable time.

A chatbot could help in this situation. It could assist the employee in identifying the precise problem and offering clear instructions for potential solutions. If the provided solution successfully resolves the issue, the employee would no longer need to contact Enterprise IT, thus saving time, and the employee can get back to work faster.

Potential limitations include different levels of technical proficiency among employees. Employees working in non-IT related departments may be familiar with navigating the Windows settings app but may lack the expertise to resolve driver-related issues or make changes in more advanced settings. The provided solutions should be understandable to all employees, necessitating detailed, step-by-step responses from the chatbot to guide them through the process effectively.

**Activities**

The waiting period becomes an opportunity for a rewarding experience, provided the interactive chatbot efficiently engages users with relevant information and perhaps offers productive distractions during the wait.

The pace and rhythm of interactions with chatbot should align with the time available to provide a smooth experience. Attention-grabbing features are essential during the update process. The chatbot should be visually attractive to maintain the users’ focus and interest. The interaction design must be intuitive and easy-to-use to make sure all employees can use it, regardless of the technical expertise.

**Context**

The environment can impact the overall satisfaction of the employees. An engaging environment, both physically and digitally, can contribute to a positive experience. The chatbot will be used in the waiting room of the IT department at the Just Eat Takeaway headquarters in Amsterdam. This room is approximately 100 square meters in size. It is located between the elevators and the IT office rooms. There are several high-top tables, along with armchairs and a coffee machine, creating a more relaxed environment for IT employees to work in. In general, this space is relatively quiet, although it can become somewhat distracting around breaktime.

**Artefacts**

A display can be placed in the waiting room, to inform the employees about the progress of the Windows 11 update, as well as providing a digital manual for using the chatbot.

**User requirements**

Accessibility: The chatbot interface must be easily navigable for all employees, including those with limited technical proficiency. It should offer clear instructions and intuitive features to guide users through the problem-solving process effortlessly.

Visual Appeal: The design should incorporate elements that capture attention and maintain engagement during the 30-minute wait period. Consideration should be given to branding and it should stand out in the waiting room to attract attention effectively.

Efficiency: The chatbot must provide quick and efficient assistance, minimizing wait times by promptly extracting all relevant information and offering solutions. Responses should be clear yet detailed, ensuring employees receive timely help.

Intuitiveness: Interaction with the chatbot should be intuitive and user-friendly, requiring minimal effort from users to access and utilize its features. Clear prompts and straightforward language should make communication smooth and easy to understand.

Adaptability: The chatbot should be flexible to accommodate the various ways employees phrase their inquiries or specify their problems. It should be capable of understanding and responding effectively to different levels of technical expertise among users, providing personalized assistance tailored to individual requirements.

Reliability: The chatbot must consistently deliver accurate and helpful responses, ensuring employees can rely on it for resolving IT issues promptly.

If these requirements are met, the chatbot can improve the experience of employees dealing with IT-problems significantly. This should help them get back to work faster and make their 30-minute wait more productive.

**Brainstorming**

During our ideation sessions, we utilized a range of brainstorming methods to foster creativity and collaboration. This included idea sharing, dot voting, and the How-Now-Wow matrix. We began by generating ideas using post-it cards, with one card representing a technology and the other an action. This was a good start for our brainstorming session. After generating ideas, we used dot voting to identify the most promising solutions. Every person could vote for two ideas.

The three selected ideas included: implementing a chatbot, offering a crash course on IT problem-solving, and showcasing the current projects of the IT department. Using the How-Now-Wow matrix, we categorized these solutions based on their feasibility and impact, helping us to pinpoint the most achievable and impactful solution (figure 2). Another round of dot voting was conducted to select the final solution, ensuring alignment with our project goals.

A computer and papers on a table

Description automatically generated

*Figure 2, Brainstorm session.*

**Final concept**

Our final plan involves implementing a chatbot to handle small IT problems independently, without needing assistance from the IT department. If a problem is too difficult or the chatbot can't solve it, it will pass the issue to the IT department. Additionally, the chatbot will have a noticeable appearance to attract attention in the workplace.

**Scenarios**

We used scenarios to illustrate the potential applications of the chatbot. These scenarios showcase how the chatbot can address real-world problems encountered by JET employees. It provides us insights into the functionality and the user interactions with the chatbot. Each scenario starts with an introduction to the user and its goals. Then the interactions between the user and the product will be discussed. And after that we will look at how context and events influence made our product work in certain ways.

The first scenario that could arise during usage is a JET worker that has a microphone that is not working when this person joins a meeting. Instead of making a trip to the IT department and having to reschedule the meeting this person can contact the chatbot and see if the bot can fix the problem in a timelier manner than the trip to the IT department would so that the meeting can start with just a slight delay.

This user will navigate over to the chatbot on their pc and send a message along the lines of: "Hey JET Bot, I just joined a meeting, but the person I'm having a meeting with doesn't hear me. Can you fix this for me." The chatbot will respond with a list of things the user can try before making the trip to the IT department. This response will look something like: "Hey Linda. I am sorry to hear you are having problems with your microphone. Have you tried unmuting yourself? You can do this with Alt+A on zoom and Crtl+Shift+M on teams. If you are unmuted in your meeting software, have you tried pressing FN+F5 to unmute the microphone in your laptop."

The chatbot has the information that the user will only use zoom and teams, because those are the two meeting software's JET uses. The chatbot will also know that the company issued laptops have a manual mute button that can be disabled using FN+F5. This allows our chatbot to give tricks to the user that apply to them.

The second scenario that could arise during usage is a JET worker that logs in to their outlook account in the morning and doesn't see anything in their email or Calendar even though there were meetings planned the day before. The user first asks the chatbot if there is an easy solution.

This user will navigate over to the chatbot on their pc and send a message along the lines of: "Hey JET Bot, I just logged in to my outlook, but all my emails are gone, and my Calendar is wiped." The chatbot will respond with what may be causing the problem and how the user could fix this. This response will look something like: "Hey Jeroen. I am sorry to hear you are having problems with outlook. Did you check if you logged in with the correct account? You can check the email of the account by pressing the profile icon on the top right of your screen." The user will check this and see that they are indeed in the right account. After seeing this they will report this back to the bot in a message like: "Yeah, I checked and I'm in the right account." This looks to be something outside the scope of the chatbot so the chatbot will let this be known to the user in a message like this: "If you are in the correct account, then there is unfortunately nothing further I can suggest other that contacting IT support so they can have a look at it. Good luck!"

The chatbot doesn't know any other tips and knows that data related to accounts and other online services are handled by level 3 IT support so it will refer the user.

**Chapter 5: Specification**

**5.1 System overview**

Our system level 0 system diagram (with our product as a black box) can be seen in Figure 3. The input JEBOT will take is speech and the output of the JETBOT is speech and a user interface. This means that JEBOT is a conversational robot that will also guide the user more with a user interface since it can be hard to make it clear to the user that their input was heard by the bot without using a user interface.

Afbeelding met schermopname, tekst, lijn, Lettertype

Automatisch gegenereerde beschrijving

*Figure 3, level 0 system diagram of JETBOT.*

The level 1 system diagram (black box divided as subsystems) of JETBOT can be found in Figure 4. There are 4 subsystems inside the black box from level 0; a speech to text model, a large language model, a text to speech model and a custom python function. The speech to text model will decode the speech coming into text so it can be processed within the JETBOT. The text coming out of the speech to text model is then fed into the large language model. This is the big brain of the JEBOT it will take in what the user said, some previous things the users said in this conversation and some background information. This all will combine in the LLM and give us a response in the form of text. This text is then fed into the text to speech model and the custom python function. The text to speech model will turn the response from JETBOT into an audio signal so JETBOT can talk back to the user. The custom python function will display the prompt the user gave JEBOT and the response from JETBOT.

Afbeelding met schermopname, diagram, lijn

Automatisch gegenereerde beschrijving

*Figure 4, level 1 system diagram of JETBOT.*

**5.2 Requirements**

JETBOT has four functional requirements. The first is that JETBOT must be able to understand human speech. This is essential for the JETBOT to help solve IT problems since without knowledge about the IT problem (which is only provided by human speech) it cannot help the user in solving the problem. The second functional requirement is that JETBOT must be able to provide solutions to IT problems when given a clear context. Without this requirement the users will always go to the IT helpdesk and never consult JETBOT since the solutions from JETBOT are not useful enough. The third functional requirement is that JETBOT must be able to communicate its solutions with the user. This is because without a clear way of communicating the solution developed by JETBOT, it will not be easy to try it. And the fourth and last functional requirement is that JEBOT must have clear indications about what it is doing so the users know if the bot is working on their request or for example not available. Without this clear communication it is almost impossible to use JETBOT without having a mental model that is fairly accurate to the way JEBOT works internally.  
JEBOT has one non-function requirements. JETBOT should also be able to use voices with accents as an input since Just Eat Takeaway is a diverse company with a lot of different people with different accents.

JEBOT could contain a way to mute the microphone, so I would be able to respect the user’s privacy, this is however not a top priority since JETBOT will be placed in a public space and the raw microphone input is never stored, only the converted speech is stored in an offside server.

JEBOT won't not contain images as an input or output. This could be beneficial in for example showing a user where they can find a setting, but this would add a lot of complexity which could decrease the reliability of JETBOT. JETBOT also won't contain any way to look back on previous chats you had with JEBOT. This is a shame because it could help you remember what you did last time when you ran into the same problem and fixed it, but this would risk the privacy of the users.

## **Chapter 6** **: Realization**

After a thoughtful consideration of all of our previous conceptions, we had finalized on the idea of creating an interactive AI chatbot within a physical embodiment. The whole process of the chatbot interacting with the employee by listening and talking back is shown on a screen which has been attached to the front of the body. This screen was one of the components we have used from a deconstructed laptop. The motherboard of this laptop was used to run the whole system. Furthermore, to make it interactively process information, we have implemented a speech recognition software into our system to give it the ability to listen and respond alongside of its chatting abilities. The input -speech- would get noticed through a microphone connected to the motherboard and generate an output in the form of text and speech with the help of a speaker. To soften its rough exterior and incorporate one of the first set of user requirements, we made an effort to give it a friendly appearance by attaching a screen displaying eyes onto its head. We animated the eyes into making them blink with the aim of giving it a human touch. By applying the vibrant orange color onto its entire body with spray paint, aligning it with the aesthetic of JET.com, we satisfied the user requirement of it being eye catching.

The outer casting of the chatbot consisted of laser cut pieces of plywood, after it being modeled in Fusion360 as seen in Figure 5. For the components to fit precisely into the body, accurate measuring was needed. By making the hole for the screen slightly smaller it gave us the option to screw the screen into place instead of taping it down.



*Figure 5, JETBOT design in fusion.*

The software component used for programming the chatbot was written in the coding language python as we found it necessary for importing the ChatGPT and speech to text API’s (Application Programming interface). To implement a GUI (Graphical User Interface) in python we needed Pygame to animate the movements. The whole process of the interface was designed in Adobe Illustrator, to display the chatbot listening and processing the data. With the help of Pygame, these graphics were turned into animations which formed the entire software, making it a responsive and interactive design.

## **Chapter 7: Evaluation**

During the research of our project, we had established that the IT department was getting an overload of minor IT problems making the internal communication untidy. To improve upon this, we wanted to educate the employees by introducing a chatbot that can assist them with their difficulties. That’s why we had set up the following goal: In the wait time a chatbot will be introduced to the employees, this chatbot will help with decreasing the amount of minor IT problems that are getting sent to the IT team by 30% to ultimately improve clarity in communication between the IT department and employees within the upcoming year. In order to keep the usability as best as possible, we had decided to focus on the following two aspects: effectiveness and efficiency. Our chatbot needed to be effective to replace the IT department's assistance, by helping and guiding the employees into fixing their issue. To make this process as efficient as possible, we had implemented a set of prompts that will help to specify their problem. Doing so will not only reduce the amount of time our chatbot spends on helping them, but also saves time in getting an understanding of their issue. An example of such a prompt is asking for the model of the device they’re using, so that the chatbot can tailor its solution depending on that certain type.

One of the dependent variables that we have measured during our user testing is the completion time of a task. By comparing the two times, one from before the chatbot and one after utilizing it we could see if the process had gone by faster. Reducing the completion time was relevant to us because, as said in our goal, we wanted to keep the time wasted on the minor problems to a minimum so that the IT department can focus their attention on the more important matters at hand. To measure the time after, data would be collected internally by the chatbot and stored into different categories in an Excel file. We obtained statistics on their current completion time from our client to establish the comparison. Furthermore, the independent variable is the system of handling IT problems which consists of 2 levels. Level 1 is the “control” setup, representing the IT department current management and their ticketing system. Level 2 is the “experimental” setup, introducing our chatbot. The relevance of this comparison is to determine whether our chatbot resulted in more efficient IT support more while maintaining quality. However, to draw an accurate conclusion, we also had to consider confounding variables. The confounding variable that may obscured our results were the previous interactions with AI chatbots and their opinion about them, or the number of times they had visited the service desk and their satisfaction of it. Additionally, we also want to determine how the user experience is for the employees. Whether they are satisfied with how the chatbot handles their problems or if they would prefer stopping by the IT department instead. To handle this, employees filled out a short questionnaire alongside the consent form during the 30-minute wait (see appendix), before using the chatbot and after to assess their experience. The questionnaire consisted of questions such as: asking about the IT service desk, how frequently they run into IT problems, and other relevant points. This helped us in determining which assistance they preferred.

During the user testing we reflected upon the focus points of our goals which are: completion time and user experience improvement. At the first round of user testing, we started off by giving them an information letter about the study, alongside a consent form that they filled out before starting the user testing. The employees received a list of tasks (see appendix), this consisted of three challenges that had to be solved with the chatbot. The first challenge presented a low difficulty problem, the microphone malfunctioned during a team’s meeting. Following this, was the second challenge posing a mid-difficulty problem where the keyboard language was mistakenly set to Russian instead of English. Thereafter was the third challenge involving a problem beyond the chatbot’s scope, namely attempting to turn the laptop on, however it was not able to get it to work at all. This resulted in a hardware-related issue, thus a ticket was created for further assistance from the IT department. Multiple people took turns and tried to solve these problems, however it didn’t go as flawlessly as we had anticipated. Despite encountering some challenges in the interaction between the employees and the chatbot, the minor problems were eventually solved in a faster way than before. Afterwards the questionnaire was filled in to provide feedback to us. We observed positive feedback on the setup of the robot, as people were stopping by and taking a peek at how the study was done. Alongside side of the positive feedback, we also had received some improvement points such as improving the eyes of the chatbot, changes in the animation, and faster processing. We held a second round of user testing to improve upon these points and evaluate the new results. Within the second round, we made the employees fill in the consent form by scanning a QR code that would direct them to a google form. This google form contained the same informational letter and the questionnaire as well. Afterwards, we had given the employees 5 different level 1 problem scenarios for them to solve (see appendix). One by one, the employees tried to fix the prewritten issue with the assistance of the new and improved chatbot, after solving the issue they had to rate the interaction with JETBOT in the google form. The second round went well in comparison to the first round of user testing. Positive feedback that we received were nicer graphics, the ease of using a QR code, and a detailed step-by-step response given by JETBOT. However, there was a minor issue during the testing. The issue being that when we tried to run the code for JETBOT, it didn’t immediately listen to the employees resulting in restarting the system. Further improvement points that we received were to work on making it more humane by e.g. changing the robotic voice, as well as an even faster processing time and better listening abilities to make it inclusive for everyone to use.

## **Chapter 8: Discussion and Conclusion**

*Chapter 8.1, Discussion*

The problem of our problem was a downtime of 30 minutes due to a mandatory software update of all the devices used at the company. The client needed a solution for utilizing the wait, so that they can use the downtime to promote their brand and fix the internal communication.   
Our solution was to introduce a physical chatbot in the 30-minute waiting time. In this way the employees would get to know the chatbot and get to know how to interact with it to improve the internal communication.

At the beginning of our project we had formulated the following SMART goal: In the wait time a chatbot will be introduced to the employees, this chatbot will help with decreasing the amount of minor IT problems (that can be solved with the manual) that are getting sent to the IT team by 30% to ultimately improve clarity in communication between the IT department and employees within the upcoming year.

During the project we adjusted our SMART goal into: In the wait time a chatbot will be introduced to the employees, this chatbot will help with decreasing the amount of minor IT problems that are getting sent to the IT team by 30% to ultimately improve clarity in communication between the IT department and employees within the upcoming year. The reason for this change was that open AI (what we used for our chatbot) could only have external inputs up to 30.000 characters and the manual was well over that limit by 300.000 characters. We also implemented the following side goal: ‘Create interest in the JETbot.’. The side goal was formulated because we found out that our client was already working on a chatbot internally, so we would much rather promote what their working on and focus on how to introduce it and get users to start using it that focussing on developing a good chatbot.  
The results of our evaluation were the following. The completion time of a minor IT problem before was set on an average of 2.7 days. With the chatbot the completion time is on average 5 minutes. Also the chatbot was a real eye catcher during the user studies. Furthermore, there were a couple of problems: No excel file for the data, no real ticketing system within the chatbot and most of the time the chat bot couldn’t hear the employees well enough.

*Chapter 8.2, Conclusion*

In general, the JETbot did what we expected it to do. It reduced the completion time of minor IT problems and improved the communication between the IT department and employees. Besides that, a couple of other things worked the way they should have. The JETbot was eye catching, everyone that passed by stopped and was curious about its functions. It got a lot of attention from everyone. Most of the time the chatbot came with good and functional answers.

Additionally, there were also things that did not work the way we expected. Most of the time the JETbot could not understand the employees. The employees talked to fast, too quiet or were too far away from the microphone. Consequently, leading to a lot of misinterpretations of the JETbot. In the first user study the screen of the robot broke on the way to our client, this resulted in a lagged screen recording on the robot during the testing. Besides that, the JETbot was actively listening the entire time which led to misinterpretations. Lastly our test problem situations did not work perfectly due to unstable Wi-Fi connections. In the future we can make the test problems harder to solve and a little bit more realistic. To conclude the chatbot did not work the way it was supposed to work. In the questionnaire the following 2 questions were asked: ‘How would you rate your visit(s) to the IT department?’ and ‘How would you rate your conversations with JETBOT?’. We hoped to see the rating of the conversations with the JETbot increase to level or overtake the ratings of the IT department. Sadly, this wasn't the case, the ratings of the JETbot were 1.5 point under the IT department. This can be explained, because we did our user testing with +- 10 people form the IT department itself. Some people see the JETbot as a robot that is going to take over their jobs. Besides that, we implemented a side goal during the project: ‘Create a lot of interest in the JETBOT. ‘. Just Eat Takeaway was working on a real chatbot themselves, so during the project we implemented the side goal. In this way when the real chatbot is available the employees are already aware of the chatbot and something in mind with its capabilities. In the side goal we succeeded, as we said earlier there was a lot of interest in the JETbot.

*Chapter 8.3, design recommendations*

The design of the chatbot was overall good. The screen on the JETbot had a clear layout and it was eye catching. Also, the head of the JETbot (with moving eyes) was a good addition, we got a lot of positive feedback. Based on the evaluation we changed the placement of the microphone. Before the microphone was inside the chatbot, but we placed it in front instead. This way we hope that there will be less misinterpretations because the employees will know where to talk. Besides that, the design of the JETbot was successful.

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**Appendix**

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| **List of tasks Introduction JETBOT (The wait)**  **Instructions on trying JETBOT**  **Getting to know each other:**   * Decipher the name of the robot (Hint: Talk to the robot). * After getting the name of the bot try to decipher what the purpose is of the robot. * Give the robot some background information (For example: The type of laptop you are using or your depth of its skills).   **Solving problems with JETBOT:**   * Solve the problems on laptop 1:   + Join the meeting on the laptop labeled with a 1.   + Try communicating with the other person in the meeting. * Solve the problems on laptop 2:   + Try to visit the justeattakeaway.com website. * solve the problems on laptop 3:   + Try to turn on the laptop.   **Ending the conversation:**   * Try deciphering where you can find the chatbot after the 30-minute wait. |

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| **Questionnaire Introduction JETBOT (The wait)**  **Current situation:**   * How frequently do you encounter minor IT problems?   Afbeelding met tekst, schermopname  Automatisch gegenereerde beschrijving   * How frequently do you successfully resolve your IT issues?   Afbeelding met tekst, schermopname  Automatisch gegenereerde beschrijving   * How frequently do you visit the IT department for assistance on IT problems?   Afbeelding met tekst, schermopname  Automatisch gegenereerde beschrijving   * How often has the IT department been able to fix your issue(s)?   Afbeelding met tekst, schermopname  Automatisch gegenereerde beschrijving   * How would you rate your visit(s) to the IT department?   Afbeelding met tekst, schermopname  Automatisch gegenereerde beschrijving   * How likely do you think it is that a chatbot will be able to assist you with your IT problems?   Afbeelding met tekst, schermopname  Automatisch gegenereerde beschrijving  **Post-interaction feedback:**   * How likely do you think it is that you will have contact with the JETBOT again?   Afbeelding met tekst, schermopname  Automatisch gegenereerde beschrijving   * How would you rate your conversations with JETBOT?   Afbeelding met tekst, schermopname  Automatisch gegenereerde beschrijving   * What was a feature you liked about JETBOT?   \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_   * What was a feature you disliked about JETBOT?   \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_   * Do you have any suggestions/creative ideas on how to improve JETBOT?   \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |

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| **Information Letter**    We invite you to participate in a research study for “The Wait” for Just Eat Takeaway. In this study we will introduce a chatbot that assists with minor IT problems. We aim to investigate the effectiveness of this chatbot in relieving the IT department from an overload of questions they are currently receiving. This overload causes a mess within the internal communication. Thus, our goal is to reduce this overload and therefore enhance operational efficiency. We welcome your participation and are available to provide further details and answer any questions you may have.    We will start off by asking you to start a conversation with the chatbot, taking approximately 5 minutes. Following this, we will present you with problem-solving tasks of varying levels of difficulty. The first 4 minutes will focus on low difficulty problems, followed by 5 minutes of mid difficulty problems and concluding with 6 minutes of high difficulty problems. This will add up to 15 minutes for this part. Altogether, this session will take around 20 minutes. We will greatly appreciate you spending a few minutes to fill out a short questionnaire, which will provide valuable feedback for us to improve our chatbot. In total, your participation will require about 30 minutes of your time.    We hope to gain deeper knowledge about human-robot interaction, thus information from this study may benefit people if the chatbot implementation works. In addition, it will improve the interaction between individuals and AI. The risk of participating is that you will get audio/video recorded and deletion of them cannot be guaranteed. This is a research project that has been approved by the module coordinator of the Creative Technology course. As a participant, you are free to withdraw from the study at any point and can also choose to refuse to answer questions without providing a reason.    During the conversation, personal information will be collected such as your name or location, as you are interacting with the chatbot. The purpose for this is to introduce yourself to the chatbot. You have the right to request access to, modify or deletion of personal data.  Your data will be used for our research to deepen our understanding of how employees interact with the chatbot, which will help us to improve the chatbots performances. Your information may be shared outside of the study team and may be kept indefinitely to be used for further research or archival purposes. However, we cannot guarantee that it will not be published even though it is not our intention to do so. This research data may be retained indefinitely.    If you have any further questions, the contact details of the project leader is: Elif Özen, [e.ozen@student.utwente.nl](mailto:e.ozen@student.utwente.nl). To file a complaint, you can reach out to the Secretary of the Ethics Committee Information & Computer Science: [ethicscommittee-CIS@utwente.nl](mailto:ethicscommittee-CIS@utwente.nl). |

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| **Consent Form for Creative Technology - LWTP**   |  |  | | --- | --- | | ***Please tick the appropriate boxes*** |  | | **Taking part in the study:** | **Yes** | **No** |  | | * I have read and understood the study information, or it has been read to me. I have been able to ask questions about the study and my questions have been answered to my satisfaction. | □ | □ |  | | * I consent voluntarily to be a participant in this study and understand that I can refuse to answer questions and I can withdraw from the study at any time, without having to give a reason. | □ | □ |  | | * I understand that taking part in the study involves filling in survey questionnaires used for data-measuring/comparing purposes and is completed by me. * I understand that taking part in the study involves being observed by the researchers and the observed behaviour gets written down as notes. * I understand that taking part in the study involves me getting audio/video recorded. * I understand that the deletion of the recordings after a certain period can’t be guaranteed and they may be retained for an indefinite duration, used for further research and or archival purposes. | □  □  □  □ | □  □  □  □ |  | | **Use of the information in the study:** | **Yes** | **No** |  | | * I understand that information I provide -results from the study and questionnaires- will be used for research outputs e.g. a research-report. | □ | □ |  | | * I understand that personal information collected about me that can identify me, such as [my name or where I live], will not be shared beyond the study team. * I agree that my information can be used in research outputs. | □  □ | □  □ |  | | * I agree that my information can be quoted in research outputs. * I agree that my real name can be used for quotes. * I agree to be audio/video recorded. * I consent to the use of the audio/video recording featuring me as part of a progress-documentary. * I agree to the documentary being publicly screened or shown to others. | □    □  □  □  □ | □  □  □  □  □ |  | | **Future use and reuse of the information by others:** | **Yes** | **No** |  | | * I understand that the information that I provide won’t be used for commercial purposes. * I consent to the information I provide being accessible to individuals authorized by the researchers. This may include potential use by others for research or educational purposes. * I give permission for the information that I provide, and the audio/video recordings that contain me to be archived so it can be used for future research and learning.     **Signatures:**    \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Full name of the participant Signature Date      I have accurately read out the information sheet to the potential participant and, to the best of my ability, ensured that the participant understands to what they are freely consenting.  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Full name of the researcher Signature Date      **Study contact details for further information:**  Elif Özen (Project leader) Andrea Papenmeier (Course-module coordinator)  e.ozen@student.utwente.nl a.papenmeier@utwente.nl  **Contact Information for questions about your rights as a Research Participant:**  If you have questions about your rights as a research participant, or wish to obtain information, ask questions, or discuss any concerns about this study with someone other than the researcher(s), please contact the Secretary of the Ethics Committee Information & Computer Science: [ethicscommittee-CIS@utwente.nl](mailto:ethicscommittee-CIS@utwente.nl) | □  □  □ | □  □  □ |  | |

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| **Scenarios – UT2**  John, an employee at Justeattakeaway.com, sits down at his desk, he opens the calendar application on his Lenovo ThinkPad to check his schedule for the day. Confusion clouds his face as he realizes that his calendar is empty, no sign of any meetings or appointments. He shortly thinks about what to do and decides to ask the chatbot for further assistance on this matter. How can we solve this?   1. Figure out the name of the chatbot. 2. Help John fix this issue.   Sarah, a new team member at Justeattakeaway.com, logs in from her Acer Chromebook into a Google meet. To her frustration, she realizes that her microphone is unexpectedly muted, hindering her ability to contribute to the meeting. She notices that within the meet, her microphone is turned on, but her colleagues still aren’t able to hear her. Puzzled about why this might be, she decides to ask the chatbot for help.   1. Figure out the name of the chatbot. 2. Help Sarah fix this issue.   Alex, an employee of Justeattakeaway.com, logs into their Dell XPS, ready to start their day. However, upon typing their first email, they notice something unusual – the language settings seem to have switched to Russian. Frustration mounts as Alex attempts to navigate the menus, but with no success. Luckily, he can walk over to the chatbot for aid.   1. Figure out the name of the chatbot. 2. Help Alex fix this issue.   At the Justeattakeaway.com headquarters, there is Nico, an employee who uses a Microsoft Surface to work on. As he navigates through the interface, he notices something peculiar - every action he takes on the laptop is accompanied by a voice describing his steps. From opening applications to typing emails, the laptop seems to be narrating his every move. To remove this function, he needs guidance from the chatbot.   1. Figure out the name of the chatbot. 2. Help Nico fix this issue.   Nina, a dedicated employee, fires up her Lenovo ThinkPad laptop to tackle the day's tasks. As she begins navigating through her emails and documents, she notices something unusual—every color on her screen has been inverted. Icons that were once blue are now orange, and text that was black now appears white against a dark background, the colors have been inverted. Nina realizes she has to acquire assistance from the chatbot in order to turn the colors back to original.   1. Figure out the name of the chatbot. 2. Help Nina fix this issue. |