DESIGN FOR our future

TUDelft

IDE Master Graduation
Project team, Procedural checks and personal Project brief

This document contains the agreements made between student and supervisory team about the student's IDE Master Graduation Project. This document can also include the involvement of an external organisation, however, it does not cover any legal employment relationship that the student and the client (might) agree upon. Next to that, this document facilitates the required procedural checks. In this document:

- The student defines the team, what he/she is going to do/deliver and how that will come about.
- SSC E&SA (Shared Service Center, Education & Student Affairs) reports on the student's registration and study progress.
- IDE's Board of Examiners confirms if the student is allowed to start the Graduation Project.

🅑 **USE ADOBE ACROBAT READER TO OPEN, EDIT AND SAVE THIS DOCUMENT**
Download again and reopen in case you tried other software, such as Preview (Mac) or a webbrowser.

STUDENT DATA & MASTER PROGRAMME
Save this form according the format "IDE Master Graduation Project Brief_familyname_firstname_studentnumber_dd-mm-yyyy".
Complete all blue parts of the form and include the approved Project Brief in your Graduation Report as Appendix 1 ! ⓘ

family name	Verhoeven
initials	A.J. given name Pim
student number	4398866
street & no.	
zipcode & city	
country	
phone	
email	

Your master programme (only select the options that apply to you):

IDE master(s): ( ) IPD   ( ) DfI   (★) SPD

2nd non-IDE master: _____

individual programme: ___ - ___ (give date of approval)

honours programme: ( ) Honours Programme Master

specialisation / annotation: ( ) Medisign

( ) Tech. in Sustainable Design

( ) Entrepeneurship

SUPERVISORY TEAM **
Fill in the required data for the supervisory team members. Please check the instructions on the right !

** chair	Dr. Zoltan Rusák	dept. / section: SDE
** mentor	Ir. Sander Mulder	dept. / section: DOS
2nd mentor		
	organisation:	
	city:	country:

Chair should request the IDE Board of Examiners for approval of a non-IDE mentor, including a motivation letter and c.v.

🅑 Second mentor only applies in case the assignment is hosted by an external organisation.

comments (optional)

🅑 Ensure a heterogeneous team. In case you wish to include two team members from the same section, please explain why.

Procedural Checks - IDE Master Graduation

TUDelft

APPROVAL PROJECT BRIEF
To be filled in by the chair of the supervisory team.

chair ___Dr. Zoltan Rusák_____ date _01. 10. 2021_ signature _____

CHECK STUDY PROGRESS
To be filled in by the SSC E&SA (Shared Service Center, Education & Student Affairs), after approval of the project brief by the Chair.
The study progress will be checked for a 2nd time just before the green light meeting.

Master electives no. of EC accumulated in total: ___21___ EC

Of which, taking the conditional requirements
into account, can be part of the exam programme ___21___ EC

(x) **YES** all 1st year master courses passed

( ) **NO** missing 1st year master courses are:

List of electives obtained before the third
semester without approval of the BoE _____

name ___C. van der Bunt_____ date _11 - 10 - 2021_ signature ___CB___

FORMAL APPROVAL GRADUATION PROJECT
To be filled in by the Board of Examiners of IDE TU Delft. Please check the supervisory team and study the parts of the brief marked **.
Next, please assess, (dis)approve and sign this Project Brief, by using the criteria below.

- Does the project fit within the (MSc)-programme of the student (taking into account, if described, the activities done next to the obligatory MSc specific courses)?
- Is the level of the project challenging enough for a MSc IDE graduating student?
- Is the project expected to be doable within 100 working days/20 weeks ?
- Does the composition of the supervisory team comply with the regulations and fit the assignment ?

Content: (V) **APPROVED**   ( ) NOT APPROVED

Procedure: (V) **APPROVED**   ( ) NOT APPROVED

new readable planning and explanation why there is no company mentor involved approved

comments

name ___Monique von Morgen_____ date _26 /10 /2021_ signature ___MvM___

Initials & Name _A.J. Verhoeven_____ Student number _4398866___

Title of Project ___Prototyping for AI interaction: Increasing the adoption of AI systems___

Prototyping for AI interaction: Increasing the adoption of AI systems project title

Please state the title of your graduation project (above) and the start date and end date (below). Keep the title compact and simple. Do not use abbreviations. The remainder of this document allows you to define and clarify your graduation project.

start date   13 - 09 - 2021   14 - 02 - 2022   end date

Throughout the design process, designers experience challenges when designing for Human-AI Interactions (see figure 1). During my studies, I saw designers (including myself) go through the design process to create services, products and/or strategies, and adding an AI element to it in the late stages without real validation.

According to Kurvinen et al. (2008) the primary aim of prototyping is to generate information for design processes and decision, and to explore and communicate hypotheses about the design and its context. Given that AI systems are highly context-sensitive (Engel et al., 2021), prototyping in these contexts could generate fruitful insights.

As of right now, designers do not really know how to prototype for AI systems, this is mainly due to the fluctuating nature of AI systems when it acquires new learning data (Yang et al., 2020). These difficulties are not limited to designers as companies are increasingly experimenting with AI solutions. Rowsell-Jones and Howard (2019) estimate that throughout 2022, 85% of AI projects will fail to meet intended targets and present inaccurate outcomes. These targets and outcomes can be caused by technological challenges, however, this is not always the cause. It's as important to align the way of working, structure and culture of a company for AI adoption (Fountaine et al., 2019, figure 2).

Combining the challenges with human-AI interactions for designers and in businesses to manage/adopt AI systems, sets up an interesting opportunity to develop an approach to account for these human-AI interactions through prototyping and improve adoption by minimizing negative interactions (barriers).

This project will be done within the COALA (COgnitive Assisted agile manufacturing for a LAbor force supported by trustworthy Artificial Intelligence) program. This program consists of 14 partners ranging from different universities and companies that aim to create a digital AI assistant to reduce labour shortage, reduce the cost of lost knowledge due to job change or retirement, and gather data on the factory floor. Within the program, there are four main objectives and I will be working on the third one: "Overcome barriers and reduce scepticism regarding the use of a voice-enabled DIA".

One of the program partners is a company with a factory in the Netherlands and Italy (Diversey). This company will be the focus of the design project. They have a digital tool to gather data about production line stoppages that is not being adopted right now. The DIA is introduced to improve data gathering, however, will this improve things or will there arise new/different adoption barriers? That is what I like to discover within this thesis.

The main focus will be to increase the adoption of COALA within the Dutch factory of Diversey. However, Diversey and COALA operate in many different contexts so by synthesizing an approach to discover Human-AI interactions and address change management could help Diservey, COALA, and even designers outside of the program as well.

The limitations would be the scope of the project, there are a lot of challenges and barriers that come with design with/for AI. Therefore, I want to concentrate on the challenges regarding Human AI interaction and not the technical aspect of AI like providing data, gather data, and cleaning data for learning purposes.

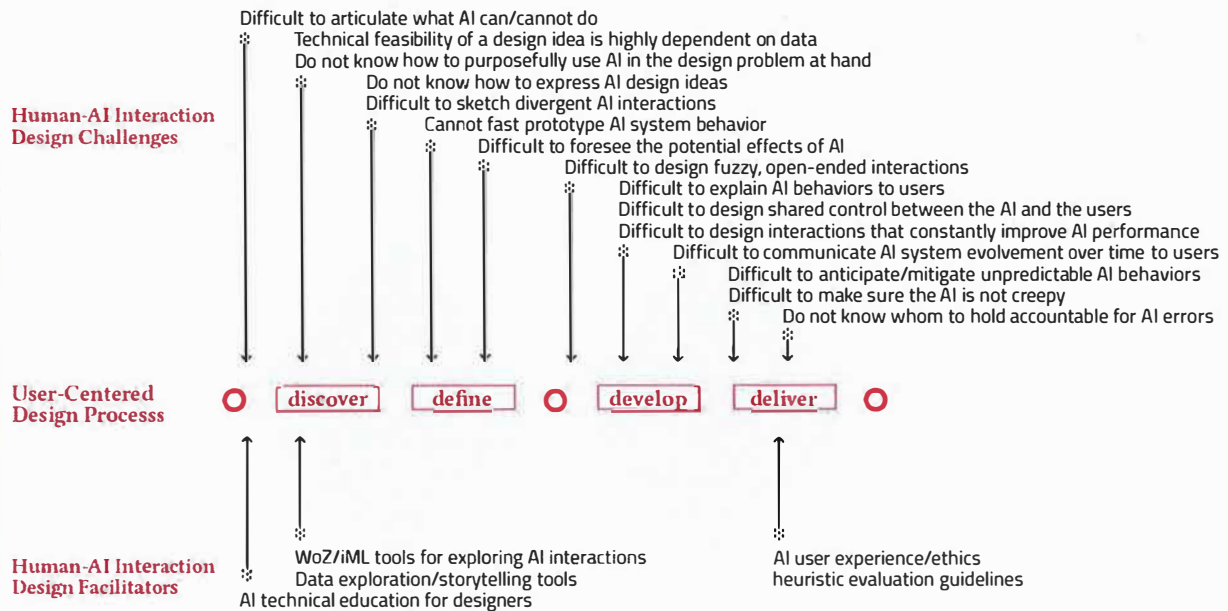space available for images / figures on next page

Initials & Name   A.J.   Verhoeven   Student number 4398866

Title of Project   Prototyping for AI interaction: Increasing the adoption of AI systems

introduction (continued): space for images

Human-AI Interaction Design Challenges

Difficult to articulate what AI can/cannot do
Technical feasibility of a design idea is highly dependent on data
Do not know how to purposefully use AI in the design problem at hand
Do not know how to express AI design ideas
Difficult to sketch divergent AI interactions
Cannot fast prototype AI system behavior
Difficult to foresee the potential effects of AI
Difficult to design fuzzy, open-ended interactions
Difficult to explain AI behaviors to users
Difficult to design shared control between the AI and the users
Difficult to design interactions that constantly improve AI performance
Difficult to communicate AI system evolvement over time to users
Difficult to anticipate/mitigate unpredictable AI behaviors
Difficult to make sure the AI is not creepy
Do not know whom to hold accountable for AI errors

User-Centered Design Processs

O | discover | define | O | develop | deliver | O

Human-AI Interaction Design Facilitators

WoZ/iML tools for exploring AI interactions
Data exploration/storytelling tools
AI technical education for designers

AI user experience/ethics
heuristic evaluation guidelines

image / figure 1: Mapped human-AI interaction design challenges by Yang et al (2020)

image / figure 2: 10 ways to derail an AI program (Fountaine, T., McCarthy, B., & Saleh, T., 2019)

Initials & Name   A.J.   Verhoeven   Student number 4398866

Title of Project   Prototyping for AI interaction: Increasing the adoption of AI systems

Central design challenge:
How can you improve the adoption of AI services by accounting for human-AI interaction barriers through
prototyping?

1) What aspects influence the adoption of an AI system and in what way?
2) How to assess what are the most prominent contextual factors that influence adoption?
3) How can Human-AI interactions be discovered through prototyping?
4) How can adoption barriers be prioritized and minimized?
5) How can the minimized barriers be integrated into the company and AI design?

Create a strategy for Diversey on how to minimize adoption human-AI interactions barriers through company and/or AI
changes and the management of these changes.

The end deliverable will be a strategy that will include:
- The possible barriers for adoption of the voice-enabled DIA and Diversey's context
- How to address these barriers in the early stages of the DIA
- How to integrate these changes into the company and the AI model over time

The final deliverable will be a strategy on how to tackle the discovered barriers, however, due to the fact that the
contextual and dynamic nature of AI systems these won't be the last barriers for adoption. That is why an extra
ambition would be to convert the process towards the strategy into an approach to discover barriers in new or other
contexts.

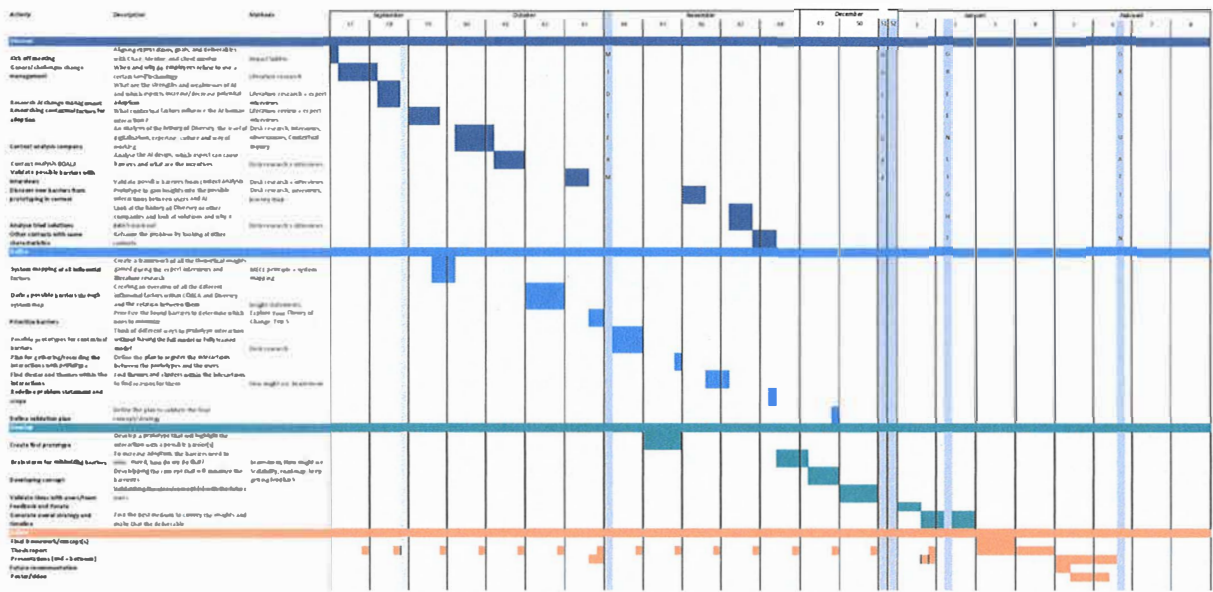The project will be a success when the acceptance of working with a digital (AI) tool is raised for the operators

start date   13   - 9   - 2021   14 - 2 - 2022   end date

The Gantt chart is listed above. The most important dates for the Gantt chart are Midterm (1-11), Green light (11-1), Gradution (week 6), and the holiday weeks (week 51 & 52). The planning describes the following approach:

1. Build a framework from literature research and expert interviews as an overview of factors that influence the degree of adoption.

2. Fill the contextual factors in from the AI design, company and societal trends through context analysis into the framework

3. Use the filled in framework as a starting point for potential barriers and prototype with/for AI to discover Human-AI interactions

4. Validate barriers or determine new barriers for adoption of the AI system from the prototyping insights and develop a new frame for adoption strategy.

5. Develop a concept to minimize the most prominent barriers for adoptions and validate the concept through interviews and prototypes

6. Generate a strategy for the AI and company changes to increase adoption of the AI service

(7. Transform the framework to an approach for other contexts)

Initials & Name   A.J.   Verhoeven   Student number   4398866

Title of Project   Prototyping for AI interaction: Increasing the adoption of AI systems

TUDelft

Motivation
Throughout my studies, I've explored the digital field of data and programming through electives, my own business, and my minor. However, it still feels like I don't exactly know where to start and how to assess whether AI is a viable option during a design project within the given context. If this is the case for me (given my interests and experience with data and programming) then I can't imagine being the only one. Therefore I want to explore prototyping with/for AI so I can gain insights into the desirability and viability

Competences subject (AI):
- Understanding of the underlying technology
- Research background is different values created through AI
- Created insights from minor Machine Learning algorithms
- Created a reinforced learning model during a minor

Competences design:
- Able to manage different stakeholders and understanding their motives.
- Apply design methods in research
- Convey insights in an understandable and structured way
- Validate found insights

Personal development/ambitions:
- Be vulnerable and share my work to learn from it, instead of trying to make it perfect before sharing
- Being comfortable in uncharted and abstract territory and learn to keep working when the next steps are unclear
- To set achievable goals and being content with them
- Improve storytelling capabilities of conveying a strategy/future vision
- To find a generalizable way to account for Human-AI interactions through prototyping (Framework or approach)

This approach could help with:
1) Addressing the changement of introducing an AI system/service
2) Validation of a concept adoption (service, strategy product etc) that has an AI aspect to it
3) Risk assessment throughout the life cycle of a AI-enabled service or product

Yang, Q., Steinfeld, A., Rosé, C., & Zimmerman, J. (2020, April). Re-examining whether, why, and how human-AI interaction is uniquely difficult to design. In Proceedings of the 2020 chi conference on human factors in computing systems (pp. 1-13). | Fountaine, T., McCarthy, B., & Saleh, T. (2019). Building the AI-powered organization. Harvard Business Review, 97(4), 62-73. | Engel, C., Ebel, P., & van Giffen, B. (2021). Empirically exploring the cause-effect relationships of AI characteristics, project management challenges, and organizational change.

Initials & Name   A.J.   Verhoeven   Student number 4398866

Title of Project   Prototyping for AI interaction: Increasing the adoption of AI systems