DESIGN FOR our future

TU Delft

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: Leong 5714
initials: _____ given name: Josephine Zhen Nian
student number: _____
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. ir. Armagan Albayrak dept. / section: HCD, AED
** mentor: Dr. ir. Arjo Loeve dept. / section: BME, 3ME
2nd mentor: Paul van den Hoven
organisation: Netherlands Forensic Institute
city: The Hague country: The Netherlands

comments (optional)

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.

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

APPROVAL PROJECT BRIEF

To be filled in by the chair of the supervisory team.

chair Dr. ir. Armagan Albayrak date - - 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: nvt EC

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

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

( ) YES all 1st year master courses passed

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

ID4070

Master Variant for Engineers

name K. Veldman date 24 - 05 - 2022 signature Kristin Veldman Digitally signed by Kristin Veldman Date: 2022.05.24 11:21:39 +02'00'

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: (★) APPROVED ( ) NOT APPROVED

Procedure: ( ) APPROVED (★) NOT APPROVED

- the missing course ID4070 (4EC) should be finished before the green light meeting

comments

name Monique von Morgen date 07 - 06 - 2022 signature

Initials & Name Leong 5714 Student number

Title of Project Design of a dispenser for crime scenes and laboratories

Design of a dispenser for crime scenes and laboratories — 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 20 - 04 - 2022 — - - — end date

INTRODUCTION **

Please describe, the context of your project, and address the main stakeholders (interests) within this context in a concise yet complete manner. Who are involved, what do they value and how do they currently operate within the given context? What are the main opportunities and limitations you are currently aware of (cultural- and social norms, resources (time, money,...), technology, ...).

Forensic investigators from the Netherlands Forensic Institute (NFI) and the police search for and collect evidence at crime scenes, which includes trace evidence (or transfer). According to the theory of Locard's Exchange Principle, microscopic debris on the surface of objects will transfer to each other when they make contact. These "traces" can help identify who they came from and thus potentially link a perpetrator to the crime scene, or a victim to a perpetrator (Bisbing, 2006).

Trace transfer may be described in different ways: active, where the direct trace transfer occurs during the crime itself, and secondary, where the transfer is unrelated to the crime event. An example of secondary transfer is investigator-mediated transfer, or contamination, where the investigator is an unwitting vector who transfers their own DNA to the crime scene or transfers DNA from one part of the crime scene to another (Gill, 2014). One such incident is the case of the death of Gareth Williams where DNA from the investigating officer was found on said subject's hand due to contamination at the scene. This caused the investigation to follow a misled direction and the credibility of the evidence found by the relevant company was called into question (Israel, 2022).

Therefore, in order to prevent this from happening, forensic investigators at the NFI will regularly clean and disinfect the tools used to handle and collect evidence. They generally achieve this with (dry) special wipes and disinfectant (see figure 1). The process is as follows:

- Open the box of wipes and take one
- Place the wipe on the push-dispenser cap of the disinfectant-filled bottle
- Push down to dispense the disinfectant and moisten the wipe
- Use the wipe

There is the concern that there is a risk of trace contamination during this process because the wipes are piled up and the bottle is physically touched, although the intent is to prevent this exact problem from occurring. Furthermore, the same cleaning tools are used in the laboratories at the NFI. Trace contamination from forensic tools is not an uncommon incidence and has been proven to happen from the point of their manufacture and throughout the entire investigative process (e.g. at the forensic laboratory, during autopsy) (Balk, 2015). The aim of this project will be to redesign the disinfectant and wipes dispensers to be contamination-safe. They will be referred to in the singular form for simplicity's sake. The dispenser must adhere to the strict conditions at crime scenes and be ergonomically sound for the forensic investigators. It will also be validated in its use context.

References

Balk, C. (2015). Reducing Contamination in Forensic Science. Themis: Research Journal Of Justice Studies And Forensic Science, 3(1). doi: 10.31979/themis.2015.0312
Bisbing, R. (2006). Trace Evidence in the Real Crime Laboratory. The Forensic Laboratory Handbook, 265-290. doi: 10.1385/1-59259-946-x:265
Gill, P. (2014). Misleading DNA Evidence. doi: 10.1016/c2013-0-01382-5
Israel, S. (2022). Evidence contaminated in spy in bag case. Retrieved 19 April 2022, from https://www.channel4.com/news/dna-evidence-contaminated-in-case-of-mi6-spy-found-in-bag

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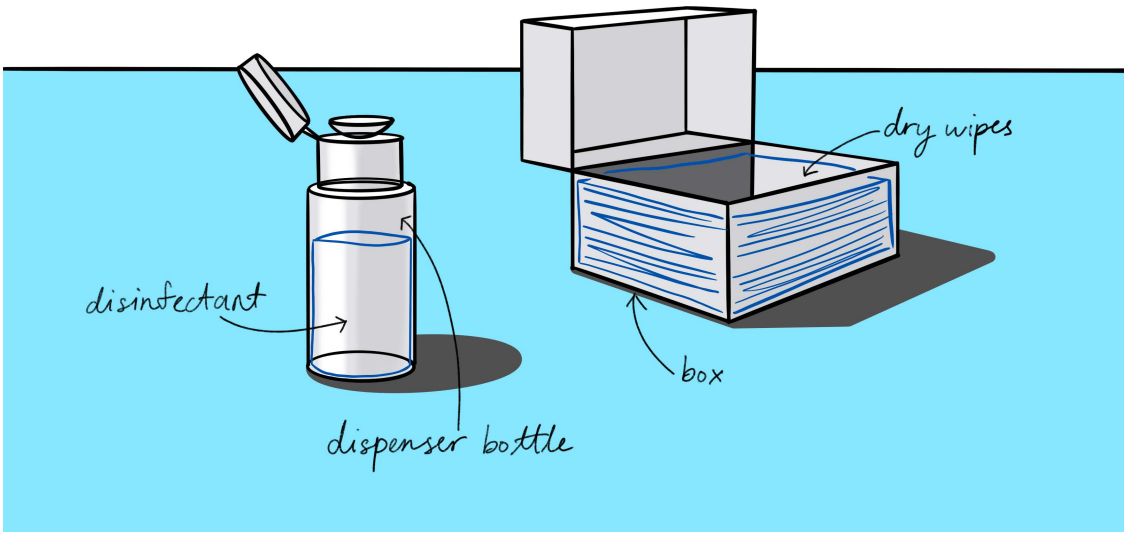


image / figure 1: Illustration of the current products used

TO PLACE YOUR IMAGE IN THIS AREA:
- **SAVE THIS DOCUMENT TO YOUR COMPUTER AND OPEN IT IN ADOBE READER**
- **CLICK AREA TO PLACE IMAGE / FIGURE**

PLEASE NOTE:
- **IMAGE WILL SCALE TO FIT AUTOMATICALLY**
- **NATIVE IMAGE RATIO IS 16:10**
- **IF YOU EXPERIENCE PROBLEMS IN UPLOADING, COVERT IMAGE TO PDF AND TRY AGAIN**

image / figure 2:

PROBLEM DEFINITION **

Limit and define the scope and solution space of your project to one that is manageable within one Master Graduation Project of 30 EC (= 20 full time weeks or 100 working days) and clearly indicate what issue(s) should be addressed in this project.

The problem with using the current products to dispense and moisten wipes is that the process requires the use of both hands and many steps. As trace transfer occurs due to contact, there is a high risk of contamination occurring. Furthermore, there is no set procedure for how tools should be cleaned and thus the process varies from user to user. These users are forensic investigators, who work at crime scenes, and forensic scientists, who work in laboratories, from two different institutions: the NFI and the police. One challenge of this project will be to determine whether the working environment and the individual user affects usage of the dispensers (current scenario). This would include finding out about user workflow, user background, environmental factors such as cleanliness, and frequency of use.

Another challenge is that the design solution must be suitable for both crime scenes and the laboratories which means that the similarities in requirements for both contexts should be integrated. However, there could be opposing points and in that case, the crime scene context takes precedence because it is not sterile like a laboratory environment. Thus, more care is required to ensure that the design solution remains contamination-safe.

Apart from that, when considering the scope of this project, a dispenser(s) must be designed which means that any other solution that does not require this irrelevant (e.g. removing traces effectively from the current dispenser). Also, for the new design, the wipes and disinfectants used currently must not be changed or altered in any way. Lastly, the focus will be on users in the Netherlands and not the rest of Europe.

ASSIGNMENT **

State in 2 or 3 sentences what you are going to research, design, create and / or generate, that will solve (part of) the issue(s) pointed out in "problem definition". Then illustrate this assignment by indicating what kind of solution you expect and / or aim to deliver, for instance: a product, a product-service combination, a strategy illustrated through product or product-service combination ideas, ... In case of a Specialisation and/or Annotation, make sure the assignment reflects this/these.

Design and validate a device for dispensing and moistening (with disinfectant) wipes.

The assignment will begin with defining the current scenario via research, such as user interviews and observations, with the aim of understanding why and how the problem occurs. The product journey will be mapped out to have a visual overview of what the users experience and so that issues can easily be pinpointed.

Then, the focus will shift to designing a new dispenser concept with multiple prototyped iterations based on the research insights. One purpose of the prototypes is to determine whether a part(s) works physically and another is to validate the ergonomics by testing with users where necessary. Finally, at the end of this design process, the main aim should be achieved as well: reducing trace contamination, or the risk of. Additionally, the design will include considerations for materials selection, as they can have certain implications (i.e. the type of surface will affect how long DNA will persist on the object (Goray, Mitchell & Oorschot, 2010)), with manufacturing method(s) so that the product is viable.

Reference
Goray, M., Mitchell, R., & Oorschot, R. (2010). Investigation of secondary DNA transfer of skin cells under controlled test conditions. Legal Medicine, 12(3), 117-120. doi: 10.1016/j.legalmed.2010.01.003

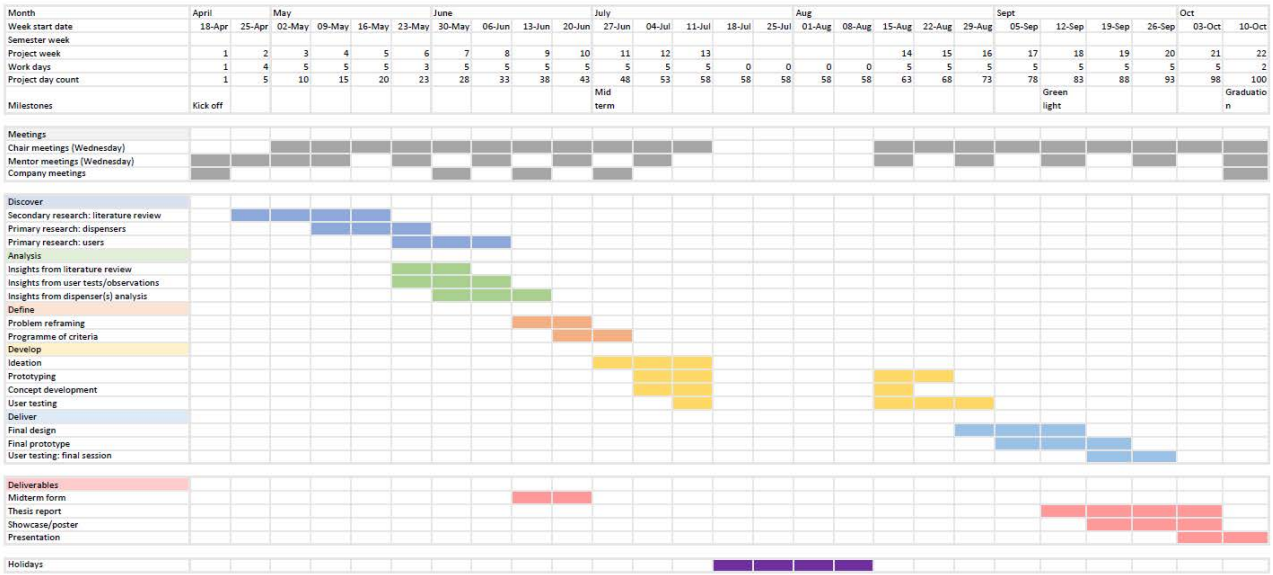
Initials & Name Leong 5714 Student number

Title of Project Design of a dispenser for crime scenes and laboratories

PLANNING AND APPROACH **

Include a Gantt Chart (replace the example below - more examples can be found in Manual 2) that shows the different phases of your project, deliverables you have in mind, meetings, and how you plan to spend your time. Please note that all activities should fit within the given net time of 30 EC = 20 full time weeks or 100 working days, and your planning should include a kick-off meeting, mid-term meeting, green light meeting and graduation ceremony. Illustrate your Gantt Chart by, for instance, explaining your approach, and please indicate periods of part-time activities and/or periods of not spending time on your graduation project, if any, for instance because of holidays or parallel activities.

start date 20 - 4 - 2022 - - end date



This project will follow the double diamond design process format. It will start with research of relevant literature (e.g. dispenser design, procedures at crime scenes, how traces are detected). Primary research will be conducted with users to find out the current user scenario, such as questionnaires and interviews. Then, this research will be analysed so that the problem can be framed and approached correctly.

The ideation phase should start at mid-term. At this stage, the iterative process of ideation, prototyping and concept development will happen in sprints. There will be 2 iterations and then the final design which will all be tested with users in order to validate and improve the concept. Finally, the project will be presented in the report, poster and presentation.

Holidays: 18th July - 15th August

Initials & Name Leong 5714 Student number

Title of Project Design of a dispenser for crime scenes and laboratories

MOTIVATION AND PERSONAL AMBITIONS

Explain why you set up this project, what competences you want to prove and learn. For example: acquired competences from your MSc programme, the elective semester, extra-curricular activities (etc.) and point out the competences you have yet developed. Optionally, describe which personal learning ambitions you explicitly want to address in this project, on top of the learning objectives of the Graduation Project, such as: in depth knowledge a on specific subject, broadening your competences or experimenting with a specific tool and/or methodology, ... Stick to no more than five ambitions.

Motivation
After completing a mechanical engineering bachelors and currently studying for my product design masters, I think that this project would be a good test to see how I can use the skills I have learned. For instance, I learned to design for 3D printing and injection molding at my previous university and it would be interesting to design for manufacture at masters level. Furthermore, I would like the opportunity to work on a project where building a physical product is the focus as opposed to creating concepts.

Personal ambitions
The skills that I would like to further develop during the course of this project are:

1. Setting up and conducting ergonomics tests
2. Design for manufacture
3. Product presentation, such as graphic design or rendering

FINAL COMMENTS

In case your project brief needs final comments, please add any information you think is relevant.

Initials & Name Leong 5714 Student number

Title of Project Design of a dispenser for crime scenes and laboratories