A data enabled participatory design approach to address the barriers to the adoption of the mymobility platform

Nikita Arora

Master Thesis

ZIMMER BIOMET · TU Delft · Data-Centric Design

Appendix

The appendices of this report can be found in a separate document.

The following appendices are included:

A. Project brief

B. Conference ideas generated

C. Journey of a joint replacement procedure

D. Observation from shadowing

E. Sketches from shadowing

F. Ideation per horizon

G. Co-creation planning

A. Project Brief

TU Delft

IDE Master Graduation Project

Project team, procedural checks and Personal Project Brief

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

- Student defines the team, what the student is going to do/deliver and how that will come about
- Chair of the supervisory team signs, to formally approve the project's setup / Project brief
- SSC E&SA (Shared Service Centre, Education & Student Affairs) report on the student's registration and study progress
- IDE's Board of Examiners confirms the proposed supervisory team on their eligibility, and whether the student is allowed to start the Graduation Project

STUDENT DATA & MASTER PROGRAMME
Complete all fields and indicate which master(s) you are in

Family name	Arora	7026	
Initials	N		
Given name	Nikita		
Student number	[redacted]		

IDE master(s)	IPD ☐	Dfl ☐	SPD ✔
2nd non-IDE master			
Individual programme *(date of approval)*			
Medisign	✔		
HPM	☐		

SUPERVISORY TEAM
Fill in he required information of supervisory team members. If applicable, company mentor is added as 2nd mentor

Chair	Richard Goossens	dept./section	Human-Centered Design
mentor	Jacky Bourgeois	dept./section	Sustainable Design Engineering
2nd mentor	Thomas Spring		
client:	Zimmer Biomet		
city:	Delft, South Holland	country:	Netherlands
optional comments			

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

! Chair should request the IDE Board of Examiners for approval when a non-IDE mentor is proposed. Include CV and motivation letter.

! 2nd mentor only applies when a client is involved.

APPROVAL OF CHAIR on PROJECT PROPOSAL / PROJECT BRIEF -> to be filled in **by the Chair** of the supervisory team

Sign for approval (Chair)

Richard Goossens - IO

Digitally signed by Richard Goossens - IO
Date: 2024.02.23 12:29:54 +01'00'

Name R.H.M. Goossens Date 23-02-2024 Signature

CHECK ON STUDY PROGRESS

To be filled in **by SSC E&SA** (Shared Service Centre, 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 _____ EC

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

★	**YES**	all 1st year master courses passed
	NO	missing 1st year courses

Comments:

Sign for approval (SSC E&SA)

Robin den Braber — Digitaal ondertekend door Robin den Braber Datum: 2024.03.01 07:37:20 +01'00'

Name Robin den Braber Date 01-03-2024 Signature

APPROVAL OF BOARD OF EXAMINERS IDE on SUPERVISORY TEAM -> to be checked and filled in by IDE's Board of Examiners

Does the composition of the Supervisory Team comply with regulations?

YES	★	Supervisory Team approved
NO		Supervisory Team not approved

Comments:

Based on study progress, students is ...

★	**ALLOWED** to start the graduation project
	NOT allowed to start the graduation project

Comments:

Sign for approval (BoEx)

Monique von Morgen — Digitally signed by Monique von Morgen Date: 2024.03.19 11:35:01 +01'00'

Name Monique von Morgen Date 19/3/2024 Signature

introduction (continued): space for images

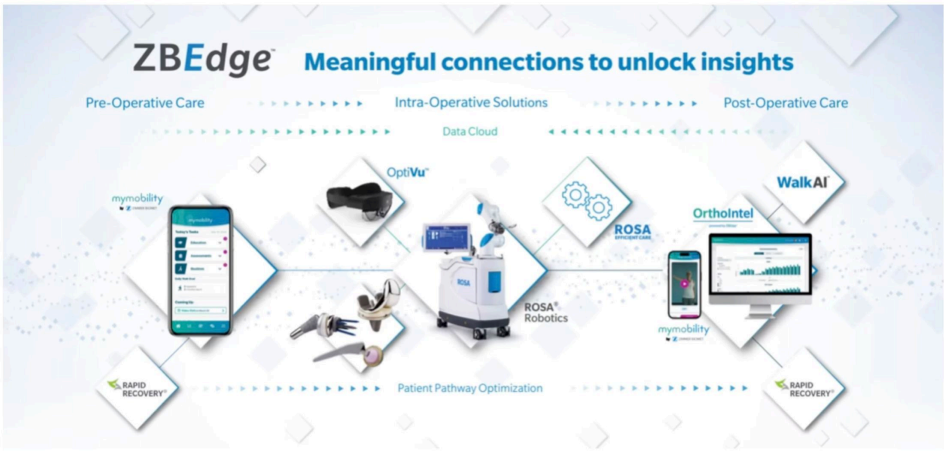


Figure #1: ZB Edge suite of solutions

Multiple metrics are tracked across the following categories:

Mobility/Functional Data Collected
- Patient Steps
- Flights of Stairs Climbed
- Stand Hours
- Exercise Completion
- Shoulder Range of Motion***

Gait Quality Data
- Gait Speed
- Double Support Percentage
- Step Length*
- Speed Ascending/Descending Stairs*
- Asymmetry*

Additional Data Collected
- Falls Detection*
- Sleep*

Heart Rate Data Collected
- Average Resting Heart Rate
- Average Walking Heart Rate
- Heart Rate Variability
- VO2 Max*

Engagement Data Collected
- Exercise Adherence
- PROMs Adherence
- Education Adherence
- Patient-reported Pain Management Tracking**
- Patient-reported Narcotic/Non-narcotic Tracking**

* Data available separately upon request
** via patient-reported data via time check-in surveys through the app
*** Available only to iPhone 10 or higher users, using iOS 14 or newer, or Android users with ARCore.

Figure #2: mymobility data collected from Zimmer Biomet

Personal Project Brief – IDE Master Graduation Project

Name student Nikita Arora **Student number** 5768721

PROJECT TITLE, INTRODUCTION, PROBLEM DEFINITION and ASSIGNMENT

Complete all fields, keep information clear, specific and concise

Project title Creating a strategy for improving adoption of an orthopaedic platform in the EMEA market

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

Introduction

Describe the context of your project here; What is the domain in which your project takes place? Who are the main stakeholders and what interests are at stake? Describe the opportunities (and limitations) in this domain to better serve the stakeholder interests. (max 250 words)

This project is with Zimmer Biomet, a global leader in the area of orthopaedic implant solutions and the Data Centric Design Lab (DCD) at TU Delft.

The DCD Lab develops tools and methods to facilitate the use of behavioural data as participatory design material. Zimmer Biomet approached TU Delft to help assess the Health Economic Value(HEV) of a digital solution that they provide, called Mymobility, with a focus on the EU region.

Zimmer Biomet & mymobility:
The company offers a comprehensive range of orthopaedic products, including joint replacement solutions for the hip, knee, and shoulder replacement procedures . In 2017, Zimmer Biomet accounted for 20.3 percent of the worldwide orthopaedic MedTech revenue market, with North American marking 2/3rd of their total revenue.

To address the needs of various stakeholders in the digital care pathway in joint arthroplasty, Zimmer Biomet has developed ZBEdge. A platform that encompasses all the solutions that Zimmer has to offer. mymobility is one part of these solutions, with a patient-facing and a clinician-facing solution. This platform connects providers with their patients for pre-operative engagement, postoperative check-ins, and remote monitoring of metrics, such as mobility and gait quality, exercise adherence, and heart rate.

Zimmer approached the DCD lab and an SPD student to help them understand how to measure the value of this solution to make data-driven decisions, giving them recommendations for a successful adoption in the EU region.

➔ *space available for images / figures on next page*

Problem Definition

What problem do you want to solve in the context described in the introduction, and within the available time frame of 100 working days? (= Master Graduation Project of 30 EC). What opportunities do you see to create added value for the described stakeholders? Substantiate your choice.
(max 200 words)

Zimmer Biomet believes that, given the value of the mymobility solution, adoption could be much higher in the EMEA region. Since they have been in the industry for over 90 years, they are sitting on a lot of data points from the joint replacement patient journey. Through my project, I wish to undertake a data informed (Funk et. al. 2024) approach to identify the critical barrier of adoption for mymobility and the missing values and unmet needs of the stakeholders.

For the stakeholders of the problem mymobility is trying to address, I bring value by reducing the patient anxiety pre-op and enhancing the patient outcomes post-op(Home, 2022), addressing the problem of clinicians being poorly informed of patient outcomes(Hossain et al, 2015) and therefore contributing to lowering the burden on the healthcare system overall(Alexander et al, 2023).

For the Data Centred Design lab, this project can be a case-study of how data-enabled design(Funk et. al. 2024) can be practiced in the domain of healthcare and the barriers you may encounter.

With this project, using mymobility as a case study I hope to publish a set of recommendations for designing data-

Assignment

This is the most important part of the project brief because it will give a clear direction of what you are heading for. Formulate an assignment to yourself regarding what you expect to deliver as result at the end of your project. (1 sentence) As you graduate as an industrial design engineer, your assignment will start with a verb (Design/Investigate/Validate/Create), and you may use the green text format:

To design a data-informed roadmap for the implementation of mymobility in the UK-Benelux region along with a set of guidelines for design & implementation of similar platforms in healthcare.

Then explain your project approach to carrying out your graduation project and what research and design methods you plan to use to generate your design solution (max 150 words)

1. Assess the health economic value using the Health Technology Assessment (HTA) framework
2. Service safari to create a Customer journey. Organise a bodystorming session with the participants (stakeholders), provide sensitizing material
3. Studying the user engagement on an Online Health Community forum for joint-replacement/ orthopaedics to map patient expectations
4. Consumer Research Methods/ Questionnaires for various stakeholders
5. Service blueprint
6. Co-design system map (for mymobility) + stakeholder analysis (with support from Zimmer Biomet)
7. Gathering data of usage of mymobility platform (Summative Evaluation - Usability test)
8. Desirability , Viability, Feasibility assessment for the service
9. Use Health Psychology frameworks from HCI to analyse the user behaviour, (Plan usability studies with participants)

Project planning and key moments

To make visible how you plan to spend your time, you must make a planning for the full project. You are advised to use a Gantt chart format to show the different phases of your project, deliverables you have in mind, meetings and in-between deadlines. Keep in mind that all activities should fit within the given run time of 100 working days. Your planning should include a ***kick-off meeting, mid-term evaluation meeting, green light meeting*** *and* ***graduation ceremony****. 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 course activities).*

Make sure to attach the full plan to this project brief.
The four key moment dates must be filled in below

Kick off meeting	15th February, 2024
Mid-term evaluation	22nd April, 2024
Green light meeting	12th June, 2024
Graduation ceremony	16th July, 2024

In exceptional cases (part of) the Graduation Project may need to be scheduled part-time. Indicate here if such applies to your project

Part of project scheduled part-time	
For how many project weeks	
Number of project days per week	

Comments:

Motivation and personal ambitions

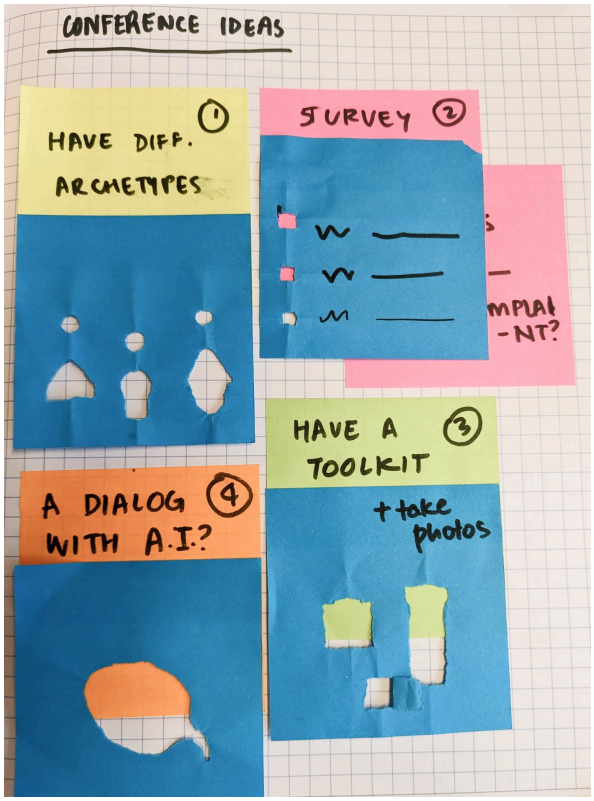
Explain why you wish to start this project, what competencies you want to prove or develop (e.g. competencies acquired in your MSc programme, electives, extra-curricular activities or other).

Optionally, describe whether you have some personal learning ambitions which you explicitly want to address in this project, on top of the learning objectives of the Graduation Project itself. You might think of e.g. acquiring in depth knowledge on a specific subject, broadening your competencies or experimenting with a specific tool or methodology. Personal learning ambitions are limited to a maximum number of five.
(200 words max)

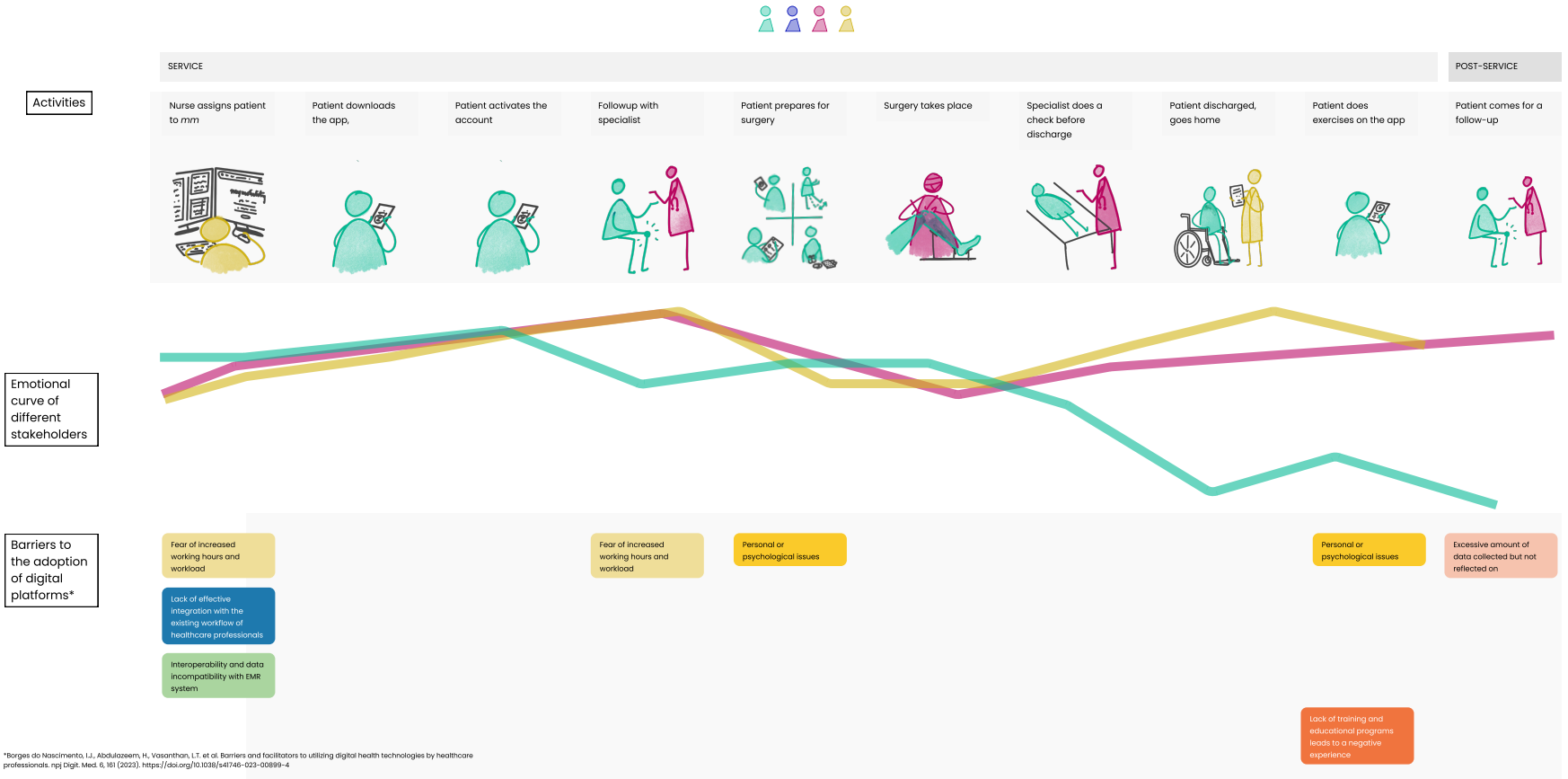
As an SPD student, (almost) ready to start working in the industry, I want to utilise this opportunity to strengthen my toolkit of methods that I can use in the industry as a design strategist working in healthcare. The following are some of my learning goals that I hope to achieve by the end of this project.
1.Understand roadblocks in the implementation/adoption of digital solutions in Healthcare technology. Understanding regulations surrounding data-driven/ AI solutions (there is a lot of work happening on this recently and I want to use this opportunity to stay up to date with it) (EUDAMED & GDPR)
2.Test the skills and methods I have learnt during the course (with guidance) to see how strategy can be designed.
3.Stages involved in assessing health economic value of service/ product propositions & methods that are well suited to do the same (HTA)
4.EMEA implementation hurdles and understanding the high market acceptance in the US market
5.Working with professionals who may give me more clarity on the role I can hold in the industry. That is, in the intersection of healthcare professionals, engineers, policy professionals, CEOs and other stakeholders.

By the end of my thesis, I hope to graduate as a confident Strategic Designer with a clear understanding of the positions I can hold in the industry.

B. Conference ideas generated



C. The journey of a joint-replacement procedure (contd.)



*Borges do Nascimento, I.J., Abdulazeem, H., Vasanthan, L.T. et al. Barriers and facilitators to utilizing digital health technologies by healthcare professionals. npj Digit. Med. 6, 161 (2023). https://doi.org/10.1038/s41746-023-00899-4

C. The journey of a joint-replacement procedure

PRE-SERVICE

Activities	Patient feels pain, looks online for some info about joint pain, treatment etc.	Patient goes to the GP: assessment is conducted	Patient referred to specialist	Patient meets with specialist, does assessment	specialist orders tests	Patient goes to get tests done	Patient shared test results	Patient scheduled for surgery
								
	ZB visits hospital							

Emotional curve of different stakeholders

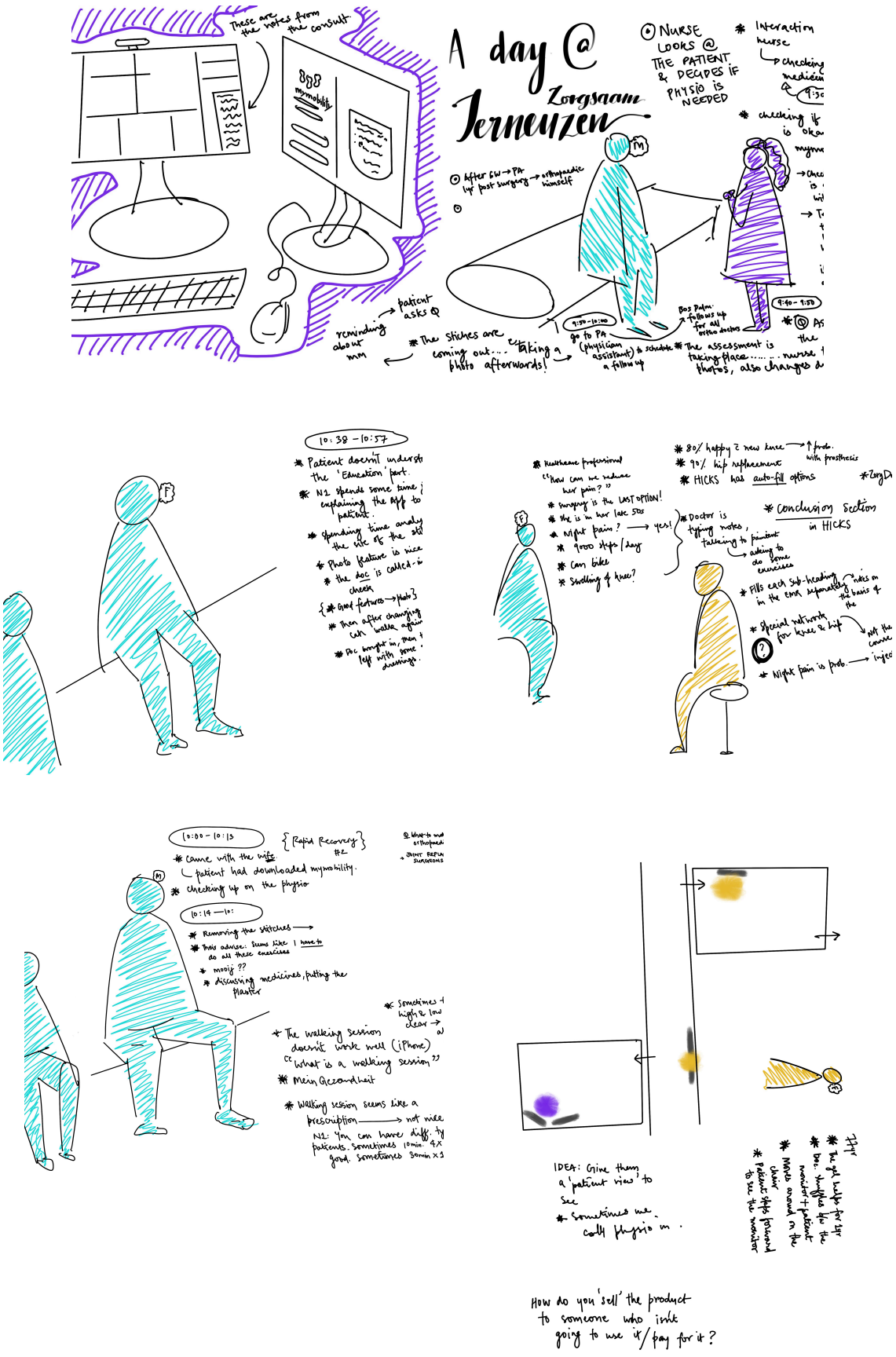
Barriers to the adoption of digital platforms*

- Personal or psychological issues
- Excessive amount of data collected but not reflected on
- Excessive amount of data collected but not reflected on
- Interoperability and data incompatibility with EMR system
- Lack of training and educational programs leads to a negative experience

*Borges do Nascimento, I.J., Abdulazeem, H., Vasanthan, L.T. et al. Barriers and facilitators to utilizing digital health technologies by healthcare professionals. npj Digit. Med. 6, 161 (2023). https://doi.org/10.1038/s41746-023-00899-4

D. Observations from Shadowing

E. Sketches from the shadowing



F. Ideation per horizon

Horizon 1

How might we get more patients to login to the App?

How might we improve your experience of the App?

Patient enrolments

Encourage peer-peer learning → provide incentives to colleagues to support in onboarding

Use AI to digitise patient forms

Patient enrols themselves, nurse only asked to check

Give the decision making tool for nurses (reduces bias)

Patient onboarding

Offer patient engagement through a questionnaire

Have a manual/ Ad-hoc version (fill forms → upload online)

Kiosk for login at clinics

Feature enhancement

Change messaging feature to note-feature

mm collects . first patient concerns → then directs to a solution
→ Hospital
→ ZB
→ Other

Filter patient notes + triage them

Show time-taken for each task

AI chatbot for support regarding login/ activation etc.

Share FAQ of recent complaints and how to solve them

F. Ideation per horizon (cont.)

Horizon 2

Specialist: ?
Nurse: ?
Rehab team: ?

What incentives do the stakeholders want?

Presenting success stories of digital-transformat ion

Focus on the knowledge ZB has in joint replacement

Showing hospitals a personalised dashboard for testing/ demo

Showing them in a tangible way the patient benefits

Show the ecosystem advantage over competition

→ Are there ecosystem advantages? If not, suggest some

Have a dummy account for doctors, nurses → can create using AI

Self-learning/ 'how-to' videos
OR
An app to show you how to engage with the platform

Give discounts on ZB services

Clearly show benefits "incentives"

→ Are there incentives? If not, suggest some

Train MRs for demo-ing for *mymobility*

Allow communicat ion b/w care-team members through *mymobility*

ZB compiles all the insights generated from the mm app into a **health diary**

What data we can collect **VS** what would you like?

F. Ideation per horizon (cont.)

Horizon 3

How might we (ZB) provide an experience tailored to your needs?

Customising experiences

Send accounts a form to fill their preferences for the App

ZB has 2 parts to the App:

1. **Hospital**: personal
2. **ZB**

ZB also offers a service to summarise the booklet of the hSP

Send accounts a form to fill their preferences for the App

personalised dashboard for nurses(colour etc.)

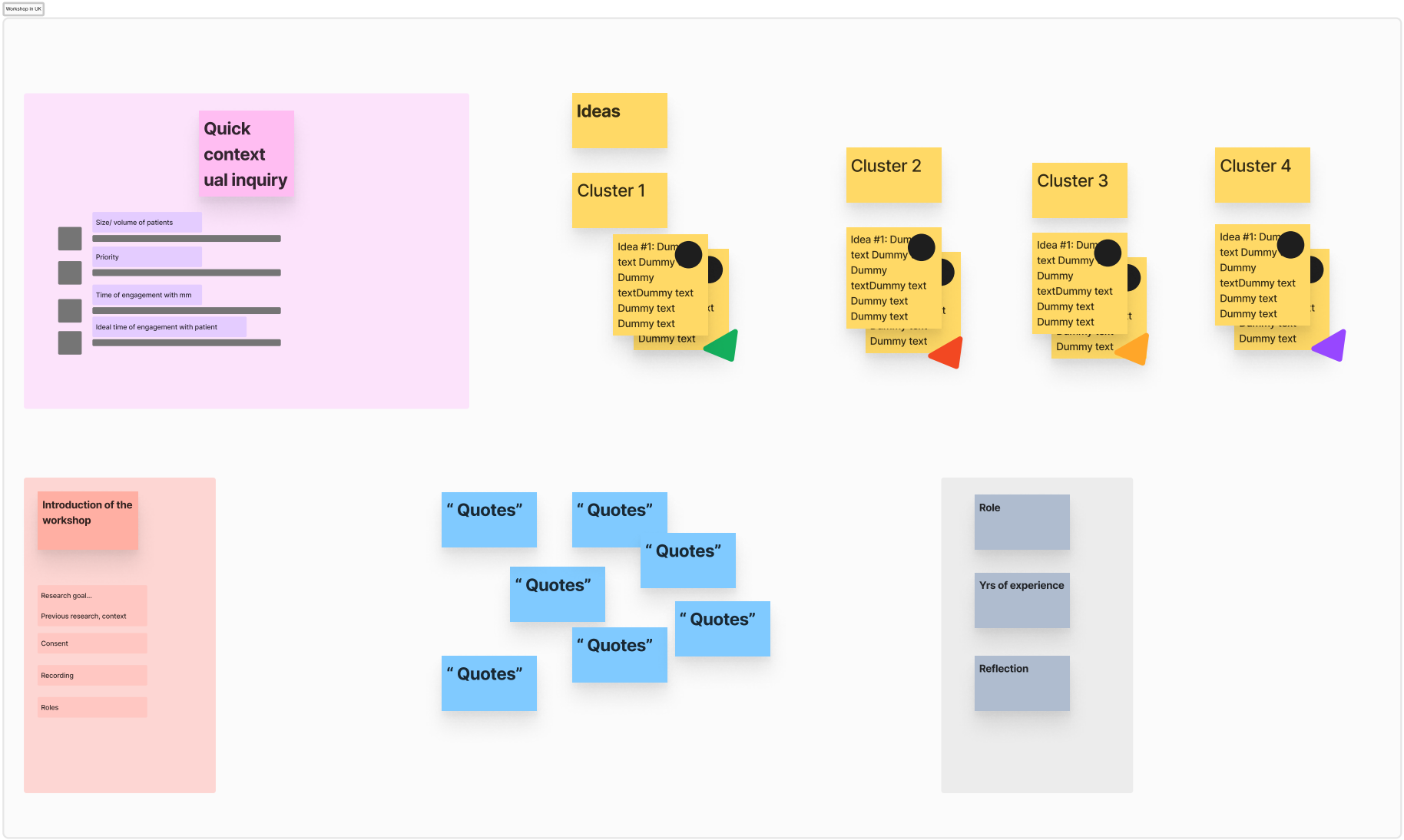
ZB has 2 parts to the App:

1. **Hospital**: personal
2. **ZB**

Offer (like Rapid Recovery) a shadowing service to hospital (to understand context)

What would you like to know prom patients? (data to reflect on)

G. Co-creation planning



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