FONTYS UNIVERSITY OF APPLIED SCIENCES HBO-ICT: English Stream

**Process Report**

**Modular epidemiological hospital efficiency simulator**

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# **Global Work division**

|  |  |  |
| --- | --- | --- |
| **Action** | **Who** | **Status** |
| Documentation | The team | Completed |
| GUI design | The team | Completed |
| Heat map | The team | Completed |
| Update records of patients | Elahe Seyedkabirian & Amin M.Jahromi | Completed |
| Add patients to rooms | Elahe Seyedkabirian & Edgaras Spiridonovas | Completed |
| Update hospital status | Amin M.Jahromi | Completed |
| Update capacity of rooms  and add patient based on  capacity of each room | Elahe Seyedkabirian | Completed |
| Live charts | Edgaras Spiridonovas | Completed |
| Save / load | Mateusz Ulas | Completed |
| Update Staff | Danas Jusys | Completed |
| ORM testing | The Team | Completed |
| Heat map improvements | The Team | Completed |
| Save/load improvements | Edgaras Spiridonovas & Mateusz Ulas | Completed |
| Policies | Elahe Seyedkabirian & Amin M.Jahromi & Danas Jusys | Completed |
| Reduced application lag | Danas Jusys | Completed |
| Documentation improvements | The Team | Completed |
| Policies improvement | Elahe Seyedkabirian & Amin M.Jahromi | Completed |
| Testing improved features | The Team | Completed |
| Unit Testing | Edgaras Spiridonovas & Mateusz Ulas | Completed |
| Process Report | Elahe Seyedkabirian & Danas Jusys | Completed |
| Final presentation | Amin M.Jahromi | Completed |
| Plan meeting | Amin M. Jahromi | Completed |
| Recovery death count, pdf report | Danas Jusys | Completed |
| Create minutes & agenda | Elahe Seyedkabirian & Mateusz Ulas | Completed |

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# **Weekly work division**

## **Week 1**

|  |  |  |
| --- | --- | --- |
| **Action** | **Who** | **Status** |
| Work division | The team | Completed |
| Create draft of project plan | The team | Completed |
| Start researching on covid\_19 hospital system | The team | Completed |
| Plan meeting | Amin M. Jahromi | Completed |
| Create minutes & agenda | Elahe Seyedkabirian & Mateusz Ulas | Completed |

## **Week 2**

|  |  |  |
| --- | --- | --- |
| **Action** | **Who** | **Status** |
| Add MoSCoW table | Danas Jusys | Completed |
| Create Concept version of URS | The team | Completed |
| Update concept version of project plan | The team | Completed |
| Research the to-be implemented algorithm/application | The team | Completed |
| Plan meeting | Amin M. Jahromi | Completed |
| Create minutes & agenda | Elahe Seyedkabirian & Mateusz Ulas | Completed |

## **Week 3**

|  |  |  |
| --- | --- | --- |
| **Action** | **Who** | **Status** |
| Create concept version of plan for iteration 1 | Elahe Seyedkabirian | Completed |
| Update MoSCoW table | Danas Jusys | Completed |
| Add Gantt chart | Edgaras Spiridonovas | Completed |
| Add UML | Amin M. Jahromi | Completed |
| Add sequence diagram | Mateusz Ulas | Completed |
| Plan meeting | Amin M. Jahromi | Completed |
| Create minutes & agenda | Elahe Seyedkabirian & Mateusz Ulas | Completed |

## **Week 4**

|  |  |  |
| --- | --- | --- |
| **Action** | **Who** | **Status** |
| Create wireframes | Elahe Seyedkabirian & Amin M. Jahromi | Completed |
| Update MoSCoW table (more specific) | Danas Jusys | Completed |
| Update Gantt chart | Edgaras Spiridonovas | Completed |
| Design pattern | Amin M. Jahromi | Completed |
| Add deliverables / non deliverables to project plan | Mateusz Ulas | Completed |
| Create use cases | The team | Completed |
| Add work division to iteration 1 plan | Elahe Seyedkabirian | Completed |
| Plan meeting | Amin M. Jahromi | Completed |
| Create minutes & agenda | Elahe Seyedkabirian & Mateusz Ulas | Completed |

## **Week 5**

|  |  |  |
| --- | --- | --- |
| **Action** | **Who** | **Status** |
| Set budget and population input | Elahe Seyedkabirian | Completed |
| Application form design | Danas Jusys | Completed |
| Hospital layout with patients’ movements | Edgaras Spiridonovas | Completed |
| Update Design pattern and UML | Amin M. Jahromi | Completed |
| Set simulation time | Mateusz Ulas | Completed |
| Research algorithms | The team | Completed |
| Plan meeting | Amin M. Jahromi | Completed |
| Create minutes & agenda | Elahe Seyedkabirian & Mateusz Ulas | Completed |

## **Week 6**

|  |  |  |
| --- | --- | --- |
| **Action** | **Who** | **Status** |
| Work on algorithm | Elahe Seyedkabirian | Completed |
| Sort time, arrays | Danas Jusys | Completed |
| File savings implementation, research live charts | Edgaras Spiridonovas | Completed |
| Work on timing | Amin M. Jahromi | Completed |
| Simplify the UML (classes) | Mateusz Ulas | Completed |
| Plan meeting | Amin M. Jahromi | Completed |
| Create minutes & agenda | Elahe Seyedkabirian & Mateusz Ulas | Completed |

## **Week 7**

|  |  |  |
| --- | --- | --- |
| **Action** | **Who** | **Status** |
| Update capacity of rooms  and add patient based on  capacity of each room | Elahe Seyedkabirian | Completed |
| Drop the infection rate | Danas Jusys | Completed |
| Placed patients in rooms | Amin M. Jahromi | Completed |
| Update values | Mateusz Ulas | Completed |
| Live charts | Edgaras Spiridonovas | Completed |
| Work on heat map | The team | Completed |
| Plan meeting | Amin M. Jahromi | Completed |
| Create minutes & agenda | Elahe Seyedkabirian & Mateusz Ulas | Completed |

## **Week 8**

|  |  |  |
| --- | --- | --- |
| **Action** | **Who** | **Status** |
| Plan for iteration 2 | Elahe Seyedkabirian | Completed |
| Reduced application lag | Danas Jusys | Completed |
| Sequence diagram | Amin M. Jahromi | Completed |
| Save/load | Mateusz Ulas &Edgaras Spiridonovas | Completed |
| heat map improvements | The team | Completed |
| Policies | Elahe Seyedkabirian & Amin M. Jahromi | Completed |
| Plan meeting | Amin M. Jahromi | Completed |
| Create minutes & agenda | Elahe Seyedkabirian & Mateusz Ulas | Completed |

## **Week 9**

|  |  |  |
| --- | --- | --- |
| **Action** | **Who** | **Status** |
| Heat map improvements | The team | Completed |
| implement spread rate | Danas Jusys | Completed |
| Custom heatmap | Danas Jusys | Completed |
| Save/ load improvement | Mateusz Ulas & Edgaras Spiridonovas | Completed |
| Plan for iteration 3 | Mateusz Ulas | Completed |
| Sequence diagram | Amin M. Jahromi | Completed |
| Policies improvements | Amin M. Jahromi & Elahe Seyedkabirian | Completed |
| Testing improved features | The team | Completed |
| Plan meeting | Amin M. Jahromi | Completed |
| Create minutes & agenda | Elahe Seyedkabirian & Mateusz Ulas | Completed |

## **Week 10**

|  |  |  |
| --- | --- | --- |
| **Action** | **Who** | **Status** |
| in design document explain policies/rules and put references for them | Elahe Seyedkabirian | Completed |
| Reduced application lag | Danas Jusys | Completed |
| UML | Amin M. Jahromi | Completed |
| description of classes and methods | Amin M. Jahromi & Mateusz Ulas& Elahe Seyedkabirian | Completed |
| Sequence diagram | Amin M. Jahromi & Mateusz Ulas& Elahe Seyedkabirian | Completed |
| extension for file saves | Mateusz Ulas | Completed |
| unit tests | Edgaras Spiridonovas | Completed |
| use case diagram before use cases | Amin M. Jahromi | Completed |
| Policies | Elahe Seyedkabirian & Amin M. Jahromi | Completed |
| Recovery death count, pdf report | Danas Jusys | Completed |
| Plan meeting | Amin M. Jahromi | Completed |
| Create minutes & agenda | Elahe Seyedkabirian & Mateusz Ulas | Completed |

## **Week 11**

|  |  |  |
| --- | --- | --- |
| **Action** | **Who** | **Status** |
| compare results of 2 simulations | Danas Jusys | Completed |
| Improve use case diagram | Amin M. Jahromi | Completed |
| Prepare final presentation | Amin M. Jahromi & Elahe Seyedkabirian | Completed |
| Process Report | Elahe Seyedkabirian & Danas Jusys | Completed |
| Improve unit tests | Edgaras Spiridonovas & Mateusz Ulas | Completed |
| Plan meeting | Amin M. Jahromi | Completed |
| Create minutes & agenda | Elahe Seyedkabirian & Mateusz Ulas | Completed |

**Minutes**

## **Week 1**

**Date: T**uesday 25-02-2020

**Time:** 11:00AM – 11:45AM

**Location:** Room R1\_2.70

§ **Attendees**

o Amin M Jahromi, Danas Jusys, Edgaras Spiridonovas, Elahe Seyedkabirian, Mateusz Ulas, Andrius Kuprys

§ **Attendees Not Present**

**Agenda**

· **Opening**

· **Introduction of application**

· **Come up with a proposal for an application**

· **Discuss our topic**

· **Discuss project idea (functionalities of the application)**

· **Closing**

**Agreements**

· Work division

· Create draft of project plan

· Start researching on covid\_19 hospital system

· Plan meeting

· Create minutes & agenda

**Week 2**

**Date: T**uesday 25-02-2020

**Time:** 11:00AM – 11:45AM

**Location:** Room R1\_2.70

§ **Attendees**

o Amin M Jahromi, Danas Jusys, Edgaras Spiridonovas, Elahe Seyedkabirian, Mateusz Ulas, Andrius Kuprys

§ **Attendees Not Present**

**Agenda**

· **Opening**

· **Discussing project plan**

· **Discussing the concept idea of application**

· **Closing**

**Agreements**

· Add MoSCoW table

· Create Concept version of URS

· Update concept version of project plan

· Research the to-be implemented algorithm/application

· Plan meeting

· Create minutes & agenda

**Week 3**

**Date: T**uesday 03-03-2020

**Time:** 11:00AM – 11:45AM

**Location:** Room R1\_2.70

§ **Attendees**

Amin M Jahromi, Danas Jusys, Edgaras Spiridonovas, Elahe Seyedkabirian, Mateusz Ulas, Andrius Kuprys

§ **Attendees Not Present**

**Agenda**

· **Opening**

· **Discuss project plan**

· **Discuss URS**

· **Discuss concept of application**

· **Closing**

**Agreements**

· Create concept version of plan for iteration 1

· Update MoSCoW table

· Add Gantt chart

· Add UML

· Add sequence diagram

· Plan meeting

· Create minutes & agenda

**Feedback**

· Parameters to specify by user: budget, population, number of doctors & nurses

· Get proposal (after simulating) of the best number of doctors and equipment to get the hospital work the most efficient

· Have textboxes mandatory/or not (specified by tick boxes) for parameters

· URS document and project plan should be separated

· Plan for iteration 1 – description of what will be implemented (more details during the next meeting) – add Gantt chart and describe iteration 1

· use cases – all from MUST list, in total 6 use cases, in URS document - MoSCoW, use case diagram(optional but appreciated) with MUST and SHOULD requirements, use cases, functional – non-functional requirements and GUI wireframes(sketches), later class diagrams and sequence diagrams later in different document

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## **Week 4**

**Date: T**uesday 10-03-2020

**Time:** 11:00AM – 11:45AM

**Location:** Room R1\_2.70

§ **Attendees**

o Amin M Jahromi, Danas Jusys, Edgaras Spiridonovas, Elahe Seyedkabirian, Mateusz Ulas, Andrius Kuprys

§ **Attendees Not Present**

**Agenda**

· **Opening**

· **Discuss project plan**

· **Discuss URS**

· **Discuss design of application**

· **Closing**

**Agreements**

· Create wireframes

· Update MoSCoW table (more specific)

· Update Gantt chart

· Design pattern

· Add deliverables / non deliverables to project plan

· Create use cases

· Add work division to iteration 1 plan

· Plan meeting

· Create minutes & agenda

**Feedback**

· Work on MUST requirements during iteration 1

· Work division report – with percentages – who did what

· Dependencies in Gantt chart – translate the current state of it, split tasks into phases – add to plan for iteration 1

· MoSCoW – short description in table, map of objects as separate elements in the table related to our project, MUST requirements need to be implemented, SHOULD for better grade, the elements should be more specific(split requirements), shorter descriptions – add MoSCoW to the URS document

· User should be able to redesign the layout of hospital before starting the simulation. For now – be able to bring the patient and heal him (simple functionality)

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## **Week 5**

**Date: T**uesday 17-03-2020

**Time:** 11:00AM – 11:45AM

**Location:** Online

§ **Attendees**

o Amin M Jahromi, Danas Jusys, Edgaras Spiridonovas, Elahe Seyedkabirian, Mateusz Ulas, Andrius Kuprys

§ **Attendees Not Present**

**Agenda**

· **Opening**

· **Discuss functional requirements we are going to implement**

· **Discuss Gantt chart**

· **Discuss design of application**

· **Closing**

**Agreements**

· Set budget and population input

· Application form design

· Hospital layout with patients’ movements

· Update Design pattern and UML

· Set simulation time

· Research algorithms

· Plan meeting

· Create minutes & agenda

**Feedback**

· Plan for iteration 1 and URS doc is good for now,

· leave general ideas in Gantt chart, describe specific tasks outside of Gantt chart(explanation),

· we can have different types of patients

· Work on UML class diagram and coding during week 5, Update wireframes/GUI in URS in week 11-13, important & helpful

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## **Week 6**

**Date: T**uesday 24-03-2020

**Time:** 11:00AM – 11:45AM

**Location:** Online

§ **Attendees**

o Amin M Jahromi, Danas Jusys, Edgaras Spiridonovas, Elahe Seyedkabirian, Mateusz Ulas, Andrius Kuprys

§ **Attendees Not Present**

**Agenda**

· **Opening**

· **UML and visualization classes**

· **Rooms to fit in Windows Form**

· **Usage of Unity/C# Windows Form**

· **Timing and algorithms for people coming in and out in the simulation,**

· **Simulation complexity and expectations**

· **Feedback on demos**

· **Questions**

· **Closing**

**Agreements**

· Work on algorithm

· Sort time, arrays

· File savings implementation, research live charts

· Work on timing

· Simplify the UML (classes)

· Plan meeting

· Create minutes & agenda

**Feedback**

· It would be “nice” to slow down application to see what’s happening and fast-forward as well.

· It would be enough to see live charts and information about patients, doctors, rooms along with simulation – focus on it and keep it simple, GUI is a bonus

· Make UML simpler

· GUI doesn’t have to be complicated, changing colors in “rooms” is enough for now

· Requirements for iteration 1**:** Function that generates how fast people are getting infected(simulation method(s) and calculations with an algorithm), how many people are waiting for free space in hospital, put patients in rooms and with doctors we can heal patients, modify parameters

**Week 7**

**Date: T**uesday 31-03-2020

**Time:** 11:00AM – 11:45AM

**Location:** Online

§ **Attendees**

o Amin M Jahromi, Danas Jusys, Edgaras Spiridonovas, Elahe Seyedkabirian, Mateusz Ulas, Andrius Kuprys

§ **Attendees Not Present**

**Agenda**

· **Opening**

· **Application regarding iteration 1 – progress with it so far, expectations**

· **features to add**

· **Algorithm to use**

· **Closing**

**Agreements**

· Update capacity of rooms

· and add patient based on

· capacity of each room

· Drop the infection rate

· Placed patients in rooms

· Update values

· Live charts

· Work on heat map

· Plan meeting

· Create minutes & agenda

**Feedback**

· Change colours of rooms based on number of patients (interactive overview) + Budget & patients should not get below 0

· implement quarantines/lockdowns

· Implement some kind of animation (heat map of a region based on time, colors changing based on pending patients (how busy is the hospital))

· try implementing X days fast-forwarding on the simulation

· General discussion: Moving objects are not needed, Unity is not needed

## **Week 8**

**Date**: Wednesday 22-04-2020

**Time:** 11:00AM – 11:45AM

**Location:** Online

§ **Attendees**

o Amin M Jahromi, Danas Jusys, Edgaras Spiridonovas, Elahe Seyedkabirian, Mateusz Ulas, Andrius Kuprys

§ **Attendees Not Present**

**Agenda**

· **Opening**

· **Present proof of concept**

· **give a small presentation about project (simulation),**

· **discuss challenges, decisions made.**

· **Show demo of working prove of concept.**

· **Discuss the progress and changes.**

· **Discuss URS**

· **Discuss design document**

· **Q/A**

· **Closing**

**Agreements**

· Plan for iteration 2

· Reduced application lag

· Sequence diagram

· Save/load

· heat map improvements

· Policies

· Plan meeting

· Create minutes & agenda

**Feedback**

· create sequence diagram in design document to explain our algorithm

· generate, save, load report summary

· Plan for iteration 2 + in week 13 plan for iteration 3 (to discuss)

· Final version of URS document and design document

· Update version of work division report

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## **Week 9**

**Date**: Tuesday 05-05-2020

**Time:** 11:00AM – 11:45AM

**Location:** Online

§ **Attendees**

o Amin M Jahromi, Danas Jusys, Edgaras Spiridonovas, Elahe Seyedkabirian, Mateusz Ulas, Andrius Kuprys

§ **Attendees Not Present**

**Agenda**

· **Opening**

· **Heatmap**

· **Load, generate and save report functionality**

· **Documentation**

· **Closing**

**Agreements**

· Heat map improvements

· implement spread rate

· Custom heatmap

· Save/ load improvement

· Plan for iteration 3

· Sequence diagram

· Policies improvements

· Testing improved features

· Plan meeting

· Create minutes & agenda

**Feedback**

· Implement quarantine measures to reduce infection/severity

· implement parameter for spread rate

· specify population size for different cells in the heatmap (custom heatmap)

**Week 10**

**Date**: Tuesday 21-05-2020

**Time:** 11:00AM – 11:45AM

**Location:** Online

§ **Attendees**

o Amin M Jahromi, Danas Jusys, Edgaras Spiridonovas, Elahe Seyedkabirian, Mateusz Ulas, Andrius Kuprys

§ **Attendees Not Present**

**Agenda**

· **Opening**

· **Load, and save report functionality with serialization**

· **Documentation**

· **Further features**

· **Closing**

**Agreements**

· in design document explain policies/rules and put references for them

· Reduced application lag

· UML

· description of classes and methods

· Sequence diagram

· extension for file saves

· unit tests

· use case diagram before use cases

· Policies

· Recovery death count, pdf report

· Plan meeting

· Create minutes & agenda

**Feedback**

· extension for file saves

· explain policies/rules and put references for them

· unit tests - 4 for now. Iteration 3: 8 methods to test in total in the application

· Remove system diagram

· UML document with description of classes and methods - what do they do & how

· use case diagram before use cases

· sequence diagrams (x8),

· remove sketches of GUI

· Recovery death count, pdf report

## **Week 11**

**Date**: Tuesday 05-06-2020

**Time:** 11:00AM – 11:45AM

**Location:** Online

§ **Attendees**

o Amin M Jahromi, Danas Jusys, Edgaras Spiridonovas, Elahe Seyedkabirian, Mateusz Ulas, Andrius Kuprys

§ **Attendees Not Present**

**Agenda**

· **Opening**

· **Uploading community map via csv file**

· **Generating reports**

· **File extensions demo**

· **Unit tests**

· **Sequence diagrams**

· **UML class diagram**

· **Documentation**

· **Closing**

**Agreements**

· compare results of 2 simulations

· Improve use case diagram

· Prepare final presentation

· Process Report

· Improve unit tests

· Plan meeting

· Create minutes & agenda

**Feedback**

· Prepare final presentation

· Create process report

**Process report on assumption chain throughout the project**

Quite likely there are only very few living humans that are not aware of the global pandemic. Events that every single one of our team members have experienced, including you the reader, so far have had greatly impacted global life. It could be said that simultaneously to pandemic and resulting regulations we have been nurturing a tool, our own version of impact estimator. Following paragraphs will detail internal team decision tree justification during the entire process.

In summarizing the first iteration of the project it could be said that our goal understanding changed in parallel to ever growing virus influence. Essentially the entire first month was spent on internal considerations on whether we should approach the project from the deep dive of only hospital as our main target simulation interest. Indeed, it is suitable to attempt to define a closed highly regulated environment through descriptive object fields, as there are a variety of elements to a typical hospital unit. We have introduced ourselves to the following topics in more detail: safety equipment (googles, respirators, shields, gowns, gels and etc.), various machinery (CT-scanners, X-Ray machines, thermal cyclers, breathing support machines), some of the terms and regulations (transmission, symptoms, quarantine, lockdown policies), actual hospital procedures (safe work times, staff information of the first new modular hospital in Wuhan). We have even looked at one of the very first reports on illness development statistics that came from over 30 doctors (reference 1) back in January. Having said that initial research has introduced an element of individual vision to every team member, that tore the team into few pathways, as to how the process should grow.

Only the hospital as a main simulation object idea was expanded to include for surrounding settlements. Both tutor/client and a wing of team members were suggesting a greater element of abstraction to include a community that would interact with the mentioned hospital. Having arrived at this assumption angle our team has approached the second iteration. It should be noticed that iteration one and two intersection during the process was also marked as a memorable moment for the team. One initially active team member had assumed certain expectations that had resulted in her not being able to continue the process with us. Edgaras said that he sees it when you read the chat, if you read this - why didn’t you say goodbye? Perhaps the entire second iteration was spent with each team member generating ideas and looking forward to functional requirement improvements. We have outgrown our initial targets by week 5. During iteration two every team member has produced a variety of implementation commits, and the codebase was molded by the next maintainer to an individual sense of development.

Iteration two also marked a shift towards visualization palettes. We have provided sketches from third week onwards and have produced at least three different sets that were iteratively improved upon. We presented a hospital bird view layout that was dismissed by the tutor/client, then the initial tabular implementation from the wireframes with curves (just as flatten the curve messaging was being broadcasted) that was again dismissed by the tutor/client. At this point a requirement was formulated that had brought some true confusion to the project. A heatmap idea was introduced. This method of representation and subsequently following council use case narrative was finally formed. Every active team member had attempted to provide their implementation of the community and the hospital representation in the heat maps. Probably everyone remembers those 45-minute chat sessions on how exactly to proceed towards this requirement.

A presentation to tutor/client and another student team had marked transition to late iteration two. At this point our team had adapted the duet requirement implementation tactic. In weekly small task-based subgroups we had repeatedly added content. Although we had an extensive Gantt chart with over 30 targets, we soon came to realize that in the face of fast changing momentum, we had an emerging understanding. Looking back at it, our team had adapted a truly agile sense of designing and developing. We have arrived at iteration three with yet another gui form of the application. With heat maps finally being present, we could crystalize the tutor/client requirements of being able to provide custom defined population areas, for as long as they were shaped into squared matrices, and comparative summary rapport generation, which we swiftly provided. A typical user interaction can come up with a scenario if population distribution is even, but also supporting custom population in the community distribution maps.

At this point in time, during the last - third iteration, we had started to finally look at testing of our codebase. A task-based dispatch team implemented a range of tests. Every document as is described in the study document (reference 2) was provided in certain form to the tutor/client during one of the many meetings. Including report documents, that showcased simulation failure and success scenario instances. One task-based dispatch team had implemented four kinds of strategy pattern-controlled simulation lockdown parameters. These simple radio button selections resulted in ever stricter policies in the sense of internal element interaction. Team members had provided reasoning why there are multiple nested randomized chains that require a set of properties for the transmission to occur. For instance, the number of people one person could potentially interact with greatly decreases under strict lockdown policy. However, to the effort of team members we achieved a situation, where after the initial relaxed approach to spread a selection would greatly affect the rate, but could be potentially yet again reverted if the user again issues reduced lockdown effect policy. We wanted to keep the idea of resurgence in mind.

Finally, once the process and main considerations are mentioned and the reader now has the context, focus can be directed towards main internal application assumptions. Our application requires two parameters: budget and population, the minimum information that is needed to provide an estimate whether the budget would suffice to withstand the surge in cases. Our application is not limited to these selections, as user can specify a range of other parameters, such as herd immunity size (a percentage at which society gets over virus), doctor and nurse presence in the society (a qualification practitioner percentage from total population), population density, and overall culturally wide interaction variable ranging from close and remote cultural types. Once a variation of required and optional parameters is provided, two main objects can be created, that represent previously described hospital and community objects. Based on current lockdown policy (No policy, herd immunity, mild, and strict policies) a timer executes some operations on given intervals. There are societal events, when community members dwindle and spread the virus amongst the surrounding, and the sequence is called by a first timer.

Second timer calls for patients to reach out towards the hospital, that normally result in that patient’s hospitalization, given the condition they have contracted the virus within that community. Under the condition that there are running personnel, a doctor for ten patients and at least two nurses for each doctor to assist and carry out concrete tasks, the healing process begins. We assumed that young people can be dispatched usually and in many cases after around 3 days, for as middle aged personnel after almost a week, with lastly old [over 65] patients rather by pure chance getting through it or not. Hospital object provides information to visualization elements, the heat maps, and the curve graph. All of which can be in the instance of automatically generated comparative report, that summarized every simulated aspect in this third iteration, into a user-friendly report.

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# **Mark justification**

We worked in an iterative manner and after every single regular meeting with the tutor we applied and developed discussed features. We outgrew our MoSCoW list by week 4, by introducing a variety of new requirements and functionality that should be present in the product. It should also be noted that we picked up a *novel* *challenge* and showed our proactive attitude in developing a unique product, something that we did not have a reference for from the previous ProCP projects. For almost all of the deliverables, we have met the deadlines and successfully delivered. After every feedback, we structured our documentation in the right way. We defined our domains, and justified the software solution during the meetings, for the strategies we took whilst prototyping, designing and making co-creation activities, and later tested our ideas, and compared them to the requirements. UML standards were applied in the Design Document. According to the work division, I believe it is possible to tell that our group worked equally, and spent the expected amount of hours on the project. About the weak points, our meeting minutes weren’t systematically made, and we are aware of that. In the few sentences above I mention that almost all of the deliverables met the deadline because we missed one deadline for the UML diagram that we weren’t certain how it is supposed to look in our case. Considerations can be raised on the quality of application, maybe it could be said that it is not ‘the launch ready’ application. But considering team size project development in accordance to the taught design principles, we believe that our efforts deserve a score of 9.

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# **Individual reflections**

## **Amin**

Strong/Weak traits that affected the project

After using Java and python i did not put much time into C# Therefore using it for a long term project was tricky at the beginning.

On the other hand using knowledge obtained from OOD1 and DPR made me able to evaluate code in my head and the relation between components and objects in a clearer way.

As an initial idea we wanted to use unity which was not the brightest idea. I found out that learning unity is not my cup of tea maybe because of my personal preference in choosing technology and the sector of industry I want to be involved in.

As an initial idea we wanted to use unity which was not the brightest idea. I found out that learning unity is not my cup of tea maybe because of my personal preference in choosing technology and sector of industry i want to be participated in. opening my eyes to the fact that what i really want to pursue as a developer in industry was a huge plus to this project ,I would say

Learning moments from the project

Remembering C# syntax was a good start for a short run of 2 weeks.in particular serialization and save functionalities was a good re-learning process.

This project and working with this team had 2 great objective plus its programming side.First of all it gave me the courage to think outside of the box and apply my knowledge to current situation.As situation with covid-19 got worsened and even before heating Europe our team agreed to work on a novel topic and form it in a way that met the criteria for this module.

Hence,during quarantine without physical connection with our teammates,the importance of teamwork in a more structured and remote way was shown to me . It helped to prepare myself for other opportunities without thinking about location and distances affecting the decision.

Evaluation of spent effort

Overall time spent on the project was completely worth it.As mentioned before even the time spent on unity for a part that never used in the final product helped to shape my skill set in order to be prepared for working environment and how to deal with issues coming along the way within the team.

Improvements for the next project (what could you do better next time)?

What bothered me the most was that GUI was not appealing and could be much better.Besides UX,i would put more time to clear the subject first and put more time on research on technologies and design before coding. Maybe that was the problem with unity in the first place. We accepted to do something that we had no knowledge or experience in which led to a loss of almost two weeks which could be spent on more features and/or UX.

Expect these, i think this application has the potential to be a web app and be used by the public.it might be like what john hopkins university website was offering or even as a part of a whole for a pandemic management system for leaders and authoritie .

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## **Danas**

Strong/Weak traits that affected the project

It was a very strange semester indeed. Despite this we were pursuing an interesting topic, and had regular rather long meetings both between ourselves and with client/tutor. Almost every team member, despite those who had left us in the middle of work, had committed to the project and were bringing new idea suggestions and implementations. I feel like this project was done in a truly iterative manner, as we have provided not one, but actually few implementations that were rejected, or that we were asked to improve upon. Looking back at it, we have achieved our MoSCoW list requirements, and also implemented what our tutor/client has requested during the work process. I am happy that this allowed me to grow as a developer, strengthening the planning skills, but also teaching how to adjust to new requirements.

It was not always easy, I must admit. Sometimes we had heated conversations, but internally we have come up with ways to divide tasks into small subgroups and work on several fronts simultaneously. We do have an extensive code base that is rising from research that we gathered during the spread of the pandemic, as well as tens of tests, and of course a full body of documentation in accordance to timely requirements from the course book.

Learning moments from the project

As I was studying design patterns and other 10 courses in parallel to ProCP I had realized how important designing variation actually is. Good early choice indeed means a lot down the road of the process. Of course some of the more intermediate and perhaps even advanced object oriented language concepts were also at the center of my learning attention, as I dived into various visualization and complexity considerations. Similarly to what has been stated before, I feel like this project allowed me to grow as a developer.

Evaluation of spent effort

From the day one I was fascinated and very much captivated by this topic. As the time went on, and I have realized that, although being very severe, it did not pose a catastrophic threat as could be assumed initially. Nevertheless due to the fact that it was a custom proposition, I felt a need to attend to this matter and to prove to myself that I can postulate ideas and work and finalize those ideas, in a group of likeminded students.

Improvements for the next project (what could you do better next time)?

It can not be stressed enough, how important planning and responsibility distribution is. Although overall I am happy with the project, I feel as if in the next one that I will do, there should not be so much variation and interpretation. As a team we should be on the same page from the square one. Here it seemed that purposefulness deviated from what we had planned originally. Lastly I would like to say thank you to a tutor, who had found a lot of time for our meetings, and was aware of every project detail.

**Edgaras**

**Strong/Weak traits that affected the project**

One of the weakest traits that affected the project would be the virus situation, because of that we had unusual experiences that caused communication problems. However, despite that our work division was strong and overall, we managed to get through the communication issues with sharing screens and help each other.

**Learning moments from the project**

Improved my teamwork, I applied my teamwork knowledge from ProP project by working with more people. However, there is still space for improvement. I have learned working in online circumstances. I had to find a lot of information and learn how unit testing works from scratch. This way I have also improved my research skills.

**Evaluation of spent effort**

During the project I did my best and helped out my teammates if needed. I tried to research and communicate with my teammates to solve tasks that were given.

**Improvements for the next project (what could you do better next time)?** For next time I would choose a better research question and be more aware of what requirements we are asked and how long it might take to implement them, mostly if it is something I am not familiar with.

## **Elahe**

Strong/Weak traits that affected the project

From my point of view missing one group member and online conversations were the strong traits in this project. Communication is an important factor for team work, it is difficult when the team members can not have face to face meetings. It took some time for us to get used to online communication and learn how to deal with a variety of perspectives. Listen to each other's ideas , negotiate and discuss them and finally make a decision that everyone is satisfied with.

Learning moments from the project

During the project I had a chance to develop my knowledge in programming c#Creating a heat map, documentation and researching it also helped me to improve my communication skills for example how to explain my ideas, listen carefully to others, how to discuss problems and try to solve them, how to plan and manage time, how to divide tasks. that can be useful throughout my future career

Evaluation of spent effort

Every group member was involved in project activities, group meetings and discussions. Everyone spent a lot of time and effort completing all tasks on time and up to standards.

Improvements for the next project (what could you do better next time)?

Next time I would spend more time on planning, brainstorming, researching and designing. In order to have a better picture of what I am going to implement and avoid redoing and changing during the implementation.

## **Mateusz**

Strong/Weak traits that affected the project

The strongest trait that affected the project was indisputably teamwork, despite difficulties that we had to face – online studying, and one less team member, our group shared the same temper and one goal, that is to finalize and succeed in the project. I can only point out one weak trait that affected the project, that is to find common ground, and agree on one decision, we had to work efficiently and progress with development, which in overall we did, but during this process, I, like my fellow team members, faced issues with discussing every functionality, and agreeing on one solution because everyone had a different view on them, which sometimes resulted in one person developing one functionality without the rest of the group knowing how it works, and not fully concur on it.

Learning moments from the project

During the first weeks, I learned how to work with dapper, despite not using databases in the final product, that definitely will help me in the future. The biggest subject that I learned during the project, in my opinion, is unit testing, I started studying it from scratch and then applying it to the project. Together with the group I studying and applied the knowledge about diagrams and heat maps, improved my ability to prepare documentation, especially the sequence diagrams. I improved my systematicity with preparing notes and agendas during the project. On top of that, I believe that I improved my critical thinking while improving the software solution and documentation, and teamwork despite the online working.

Evaluation of spent effort

I, like the rest of my group, spent a lot of time, and as efficiently as I could, developed the unique software solution, meeting the deadlines, with relevant documentation, which could be observed during the meetings, in the git commits, and in the google documents.

Improvements for the next project (what could you do better next time)?

There are always things that I could improve, such as preparing meeting minutes every week from the meeting notes, that would definitely help us define what improvements are expected and what we agreed on with the tutor (in around week 7 we lost the systematicity in these documents), and possibly the communication and agreeing on one solution during the developing phase.

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