# Design Support Documents
# Team 6: Infectious Disease Cellular Automaton

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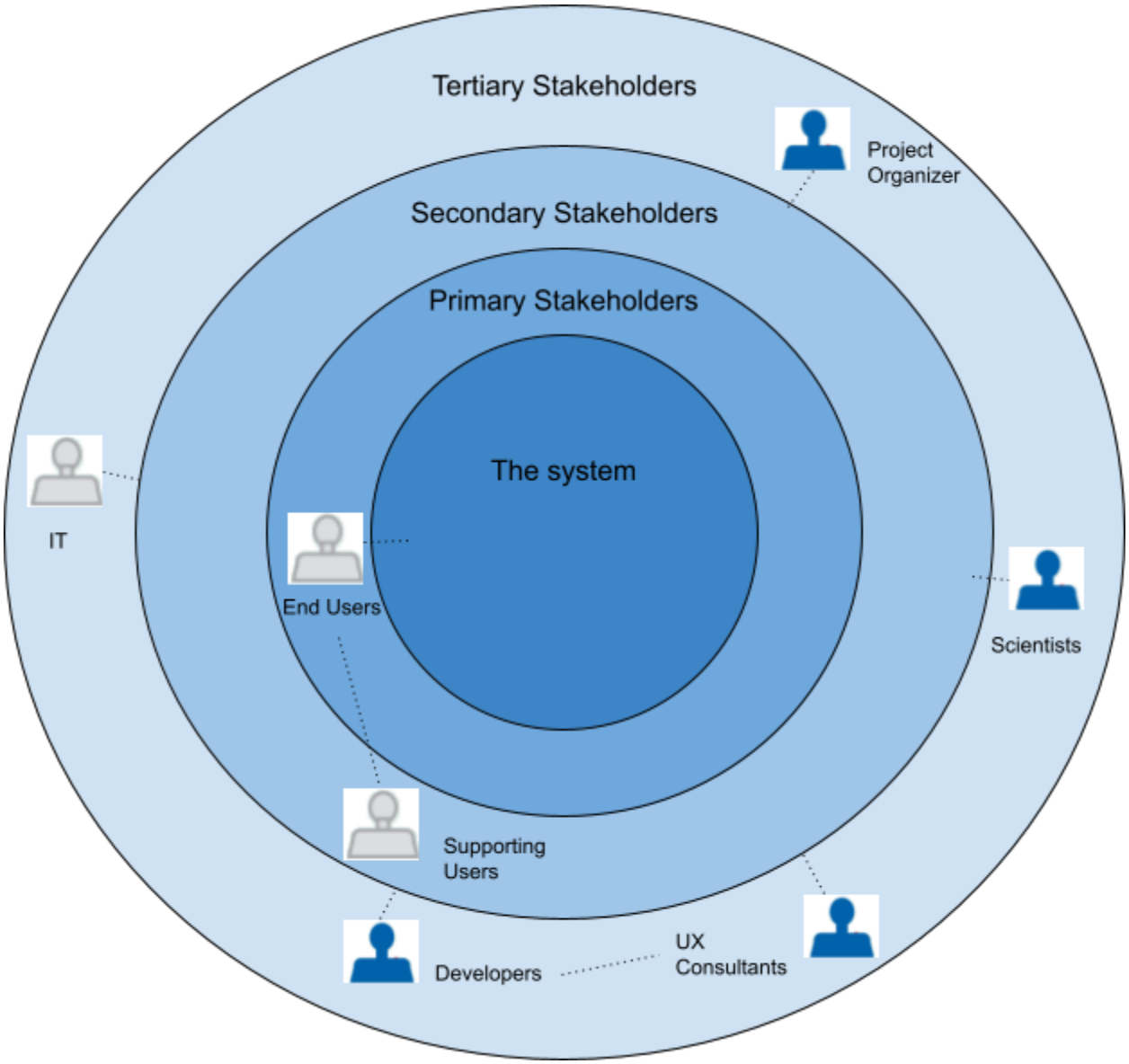
**The system:**

This system will primarily consist of an app that will simulate the spread of an infectious disease. There will be a set of rules that apply to a world at each time step to simulate the movement of people and the spread of the virus through surfaces and spaces. The app will be highly customizable, with parameters for many things such as how easily the virus spreads, how masking will affect its spread, and how it behaves on different surfaces, as well as the ability for users to build different worlds. Users should be able to save the state of their work so they can return to it later, which will require a database portion of the system. This app will be used for teaching at the middle school level. Teachers will need to be able to access the saved states for their students. Users will primarily use Chromebooks or iPad tablets to access the app.

**Stakeholder Onion Diagram:**



**Stakeholders' Short Descriptions:**

**End Users (Primary):** The end users will be middle school students. They may have a variety of technical experience and will be using the system to learn about the spread of infectious diseases.

**Supporting Users (Secondary):** These users will be the middle school teachers that are using the system to teach the end users about infectious diseases. They may or may not use the system directly, but have a direct interest in the end users' use of the system.

**Developers (Tertiary):** The developers are the undergraduate students developing the system.

**UX Consultants (Tertiary):** The UX consultants are the graduate students consulting with the developers.

**Scientists (Tertiary):** The scientists are the developers' clients. They came up with the initial description and specifications for the system and communicated them to the developers.

**Project Organizer (Tertiary):** The project organizer is the professor of CS4760/5760 who brought together the developers, UX consultants, and scientists to start the creation of the system.

**IT (Tertiary):** IT will provide and support the hardware that the deployed system will run on.

**Stakeholder Goal-Influence Table:**

| Stakeholder | Goal | Influence |
|---|---|---|
| End Users | Understanding infectious diseases | System needs to have clear lessons and be simple to use |
| Supporting Users | Teaching infections diseases to students | System needs to allow teachers to view their students' progress and provide some helpful guidance information |
| Developers | Experience developing a full project for a client | Will determine (in part) the technology used for development and are primarily responsible for completion of the project |

| | | |
|---|---|---|
| UX Consultants | Practice and experience with user interface design | Will influence the developers' use of good UX practices and contribute to ease-of-use |
| Scientists | Make a difference in the local community | Will push for project completion and quality |
| Project Organizer | Help the scientists make a difference | Will push for project completion and quality |
| Project Organizer | Teach developers and UX consultants about the design and development process | Will influence the system with good design and development practices |
| IT | Facilitate the deployment of the system | Will limit the technology that can be used for deployment but will enable long-term hosting of the finished project |

**Summary of the Stakeholder Goal Influence Table:**

The most important goal is for the primary stakeholders, the end users, to gain an understanding of infectious diseases and how they spread. In order for them to achieve this goal, the system needs to be developed to have clear lessons and takeaways, and to be simple to use, so as not to bury the lessons behind technological frustration. It is important to note that not all end users will have a lot of experience with technology, so the system should be accessible to diverse populations. The same is true for the secondary stakeholders, the supporting users. These users are the teachers that will be guiding the primary stakeholders as they use and learn from the system. Not all teachers will have the ability to answer technical questions from the students, so some form of help button or tutorial should be implemented to assist the students. The supporting users have the goal of teaching their students about infectious diseases, so the system will need to support a teacher account that can monitor the progress of its associated student accounts. The teacher interface should also be easy to use.

The developers and UX consultants have fairly similar goals: to gain project experience in their respective roles. The developers will influence the technology used for development and will ultimately have the final say on the functionality and implementation of the system. The UX consultants will work closely with the developers to influence their interface design practices to conform to the requirements of the primary and secondary stakeholders.

The scientists are the stakeholders that initially brought the idea to light with the goal of making a difference in the local community. This creates an emotional investment in the project, making the scientists likely to push for project completion and quality. They also may have an internal image of what the finished system will look like and will influence the developers to design and develop a similar system. The project organizer brought together the scientists,

developers, and UX consultants to form the project team. The project organizer's first goal is to help the scientists make a difference in the community, so they will also push the developers to finish a quality product. The organizer's second goal is to teach the developers and UX consultants about the design and development processes, so they will also influence those stakeholders to use good design and development practices.

The final stakeholder is IT at Michigan Tech. They will work with the project organizer and the developers to facilitate deployment of the finished system. They will enable long-term hosting of the project, but will have specific technology available for use, which will limit the technology that can be used.

**Personas:**

**Houghton Middle School Student**

**Angela Heikkinen - Primary Stakeholder**


Age: 13
Height: 5'2"
Weight: 98 lbs
Left handed

Angela is an avid 7th grade student at Houghton Middle School. She gets straight A's and is very excited to learn about infectious diseases and how to prevent their spread. She is very familiar with the use of technology in education, and her entire class has iPads for simulations like this. She is a very hands-on and visual learner, perfect for simulations!

**Hancock Middle School Student**

**Michael Tamminen - Primary Stakeholder**


Age: 12
Height: 5'0"
Weight: 92 lbs
Right handed

Michael is in 6th grade at Hancock Middle School. He has recently been going through some difficulties at home and has been acting out in school and not very focused on learning. His school does not have as high of a budget, so he is not very familiar with technology and may need a lot of support to effectively use the simulation.

**Hancock Middle School Teacher**

**Ruth McLeod - Secondary Stakeholder**


Age: 82
Height: 5'7"
Weight: 140 lbs
Right handed

Mrs. McLeod has been a teacher at Hancock Middle School for nearly 50 years. When she first started teaching the most sophisticated technology in her classroom was a chalkboard. She is very excited to be using a fancy simulation to teach her students about infectious disease, but she's a bit worried she won't be able to help her students if they encounter issues.

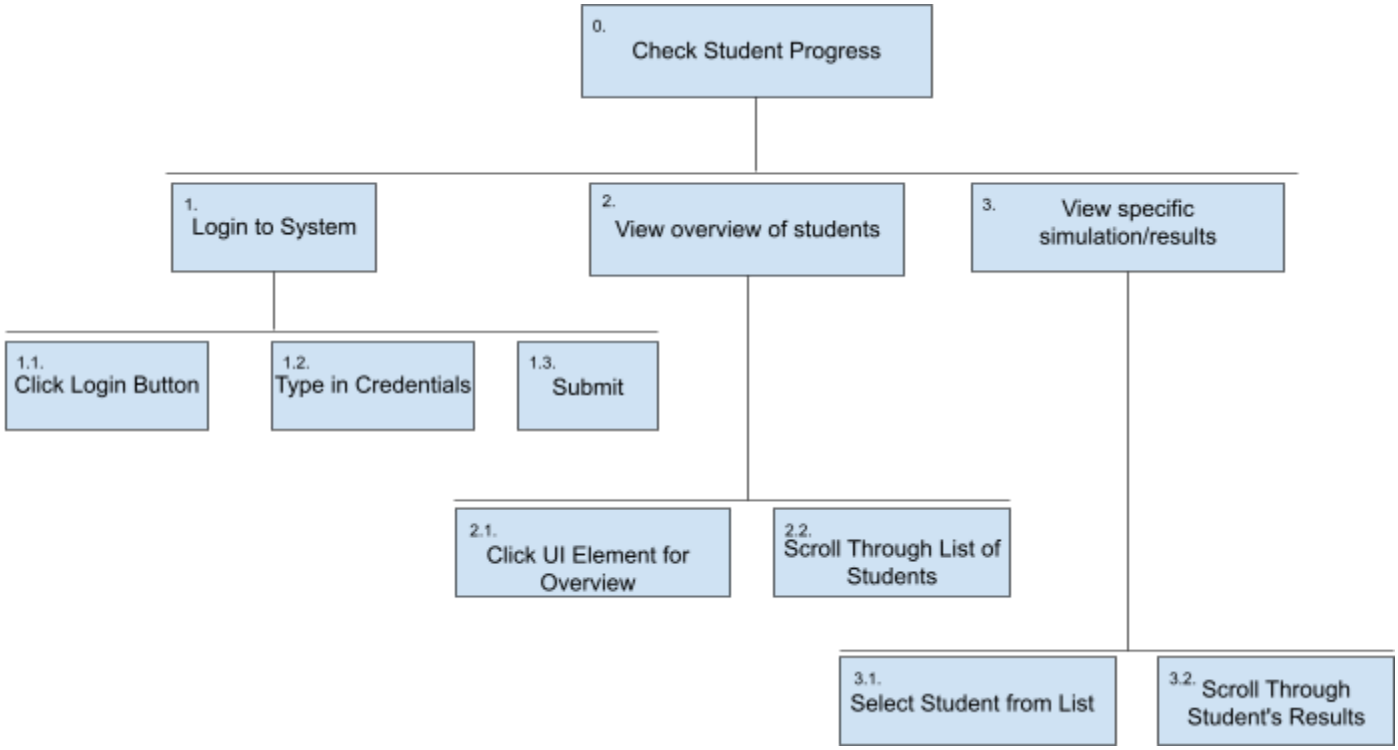
**Houghton Middle School Teacher**

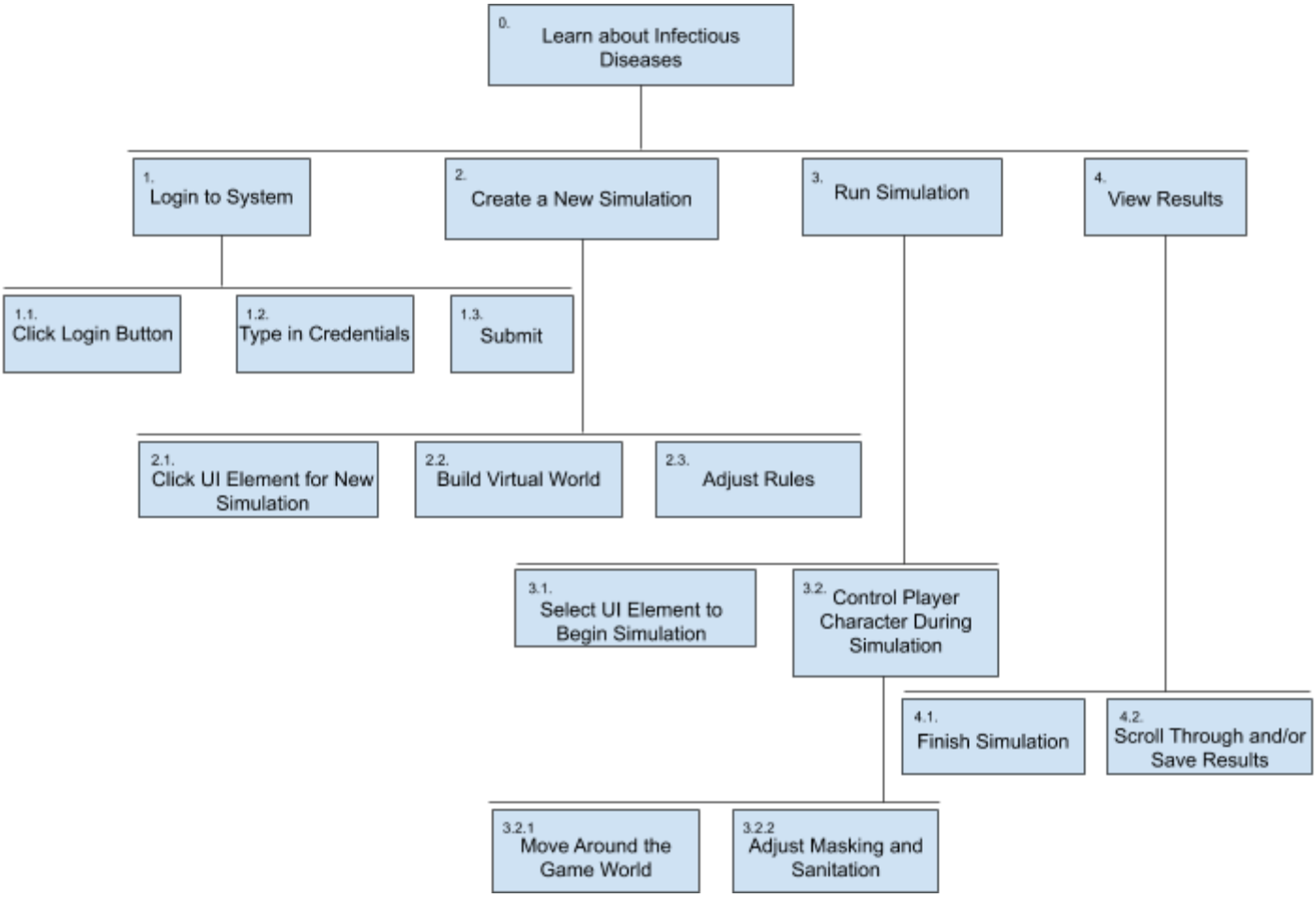
**Steve Isaacson - Secondary Stakeholder**


Age: 38
Height: 6'2"
Weight: 205 lbs
Right handed

Mr. Isaacson started teaching at Houghton Middle School last year. It has been tough with the pandemic, but he has a degree in Computer Science so it was fairly easy for him to make the switch to remote teaching. He recently heard of a simulation that could help teach his students about infectious diseases and is eager to try it out. He hopes that it runs well on mobile devices since all of his students have school-issued iPads.

**Hierarchical Task Analysis:**






**Summary of the Hierarchical Task Analysis:**

The first hierarchical task analysis shown above depicts a workflow for a secondary user (a teacher) that has a goal of checking on their students' progress. This gets broken down into the tasks of logging into the system, viewing an overview of their students, and then viewing a specific student's simulation and results. Logging into the system is broken into the actions of clicking a login button, typing in credentials, and submitting. Viewing an overview of the students has actions of clicking a UI element or menu option for the overview and then scrolling through the list of students. They also may be able to view some summary statistics in this screen. The final task of viewing a specific student's simulation or results requires the actions of selecting a student from the list and then scrolling through the readout of that student's results.

The second hierarchical task analysis depicts the workflow for a primary user (a student) trying to learn about infectious diseases. They will also log into the system with the same actions as the secondary user. They will then create a new simulation by clicking on the UI element for it, building the virtual world, and adjusting the rules of the world. To run the simulation, users will select a UI element and then control the player by moving around the game world (with clicks) and adjusting their masking and sanitation. Once they are finished they

will view results by selecting to end the simulation and then scrolling through and saving their results. An alternate workflow would be to save the simulation part-way through instead of completing it and viewing the results.

## Appendix:

### Scientist Meeting Notes 1/19/21:

- Main idea will be very similar to Conway's game of life (playgameoflife.com)
    - Large set of rules that dictate how the virus spreads through the world
    - Will be far more customizable
        - Students able to build their own world, adjust parameters, modify rules
- Will be used primarily in middle school classrooms
- Users can move players around the world instead of just observing
- Users should be able to login to save their progress, teachers to see their students' progress
- Scientists will send team documents on the mathematics behind Conway's game of life
- Should have a summary after each simulation of what occurred
    - How successful was the player character at evading the virus?
- Development technology up to the team

### Scientist Meeting Notes 1/26/21:

- Could be multiplayer but probably not in the scope of this class
    - Instead have players and NPCs
- User can put on autopilot if they want
- Google OAuth should work for the majority of UP schools
- iPads and Chromebooks are the main target platforms
    - Will need to ensure functionality on Chrome and Safari at minimum
- No existing UI mockups exists
    - If there is a paper prototype by next meeting we should bring it
- Parameters should be binary to simplify, instead of a gradient