

**NUSone**

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# 01 Project Proposal

## A Consolidated E-learning Experience

Currently, NUS students lack a platform that consolidates the different avenues and tools in which they engage in for e-learning and as a result, they are inconvenienced in having to navigate various disconnected platforms such as NUSmods, LumiNUS, NUSmail, Teamup Chat, Edurec and so on. In an endeavour to consolidate these tools into one holistic e-learning platform, we aim to focus on improving the video conferencing, file retrieval and messaging aspects of the experience. By integrating Zoom, LumiNUS, NUSmods, and Teamup Chat, we hope to improve a student's home-based learning (HBL) experience.

We plan to model our platform after the workplace productivity app, Microsoft Teams. Centred around video conferencing, file sharing/hosting, and messaging functionalities, the proposed feature list is as follows:

1. **Video conferencing**
2. **Instant messaging**
3. **File sharing**
4. **Scheduling**

## Target user group

The specific target user group for our system are **NUS university students** currently engaged with a desktop-computer-based interactive system to attend lectures/tutorial, collaborate with fellow students and obtain relevant information to carry out their assignments. This is currently done using various platforms such as Zoom, LumiNUS, NUSmods and Google Drive to name a few.

## Problems with current HBL solutions

With the advancement in technology and the surge in digitalisation, video conferencing systems no longer serve its primary role of remote communication where the sharing of ideas is contained to verbal and coordination cues alone. They have evolved to act as a tool that further supports the transmission of ideas through visual representations (shared screens), collation of views (comment box and reaction buttons) – which are especially helpful in facilitating large group discussion or collaboration amongst users.

However, for the use case of NUS students, the already fragmented administrative and academic experience of the student is being exacerbated by an increased reliance on and added complexity to a disconnected system.

Situating the experience in the scenario of a student attending a lecture/tutorial, there is a lack of an integrated system that consolidates the different platforms they are required to access to prepare for their online video conference lecture/tutorial; they often find themselves having to navigate between different platforms to obtain the necessary files, search for the upcoming conferencing sessions and gain access to the link for them.

In the case of remote learning, students would aim to obtain everything that they need for lessons under one platform. Rather than having the resources being allocated across the various platforms (for example, NUSMods for academic schedule, LumiNUS for file sharing and access to the links for the conference,

Zoom for video conferencing, and TeamUp chat for messages), a video conferencing platform with such tools integrated into its experience would help provide timely reminders (with directing buttons) to the upcoming conferencing sessions based on the student's schedule, a file hosting feature for lecturers to disseminate files to their students in preparations for class, and an always-on chat that students and educators can use to communicate during and outside of lecture.

Additionally, the current UI employed by Zoom is not tailored for the online lecture where information primarily flows from lecturer to student. We hope to redesign current aspects of video conferencing UI to account for the needs of all users (Lecturers and students) for the above use case, and in doing so, both facilitate an improved user experience when attending an online lecture and better mimic the experience of an in-person lecture.

## Modelled platforms

**Microsoft Teams** is a Workplace productivity tool for team collaboration. Users can use Teams to conduct Video conferences, send text/multimedia based messages (inclusive of file-sharing) and even access cloud storage for their files.

As a hub that leverages on Microsoft's existing Office 365 Suite of tools (Powerpoint, Word, Excel, Outlook), Teams integrates these commonly used work applications into the very platform that individual communicate with while at work; allowing for such .docx/.xls/.pptx files to be collaboratively opened and edited within the application.

Its similarity to our proposed design lies in how it allows for:

- **Cloud Storage:** A function that would be necessary for Educators to share relevant course materials with students. This supports the consolidation of relevant materials into a unified platform.
- **Scheduling:** Being integrated with Microsoft Outlook, scheduling a Video Conference is a seamless experience. The link to the video conference will be included in the event invite and afterwards be added to the user's calendar (on Outlook). When it is time for the video conference to begin, the video conferencing link will appear in the calendar event allowing users easy access. We hope to achieve this level of integration with the student's preferred calendar application in our designed solution, which has already been implemented in NUSmods with the .ics function.
- **Video Conferencing:** As a central focus on how HBL is being conducted, we aim to redesign the UI to better suit the use case faced by Educators and Students.
- **Chat and Teams:** An in-built chat facilitates communication during and after lecture and archives chat history for future reference, additionally the ability to create 'teams' with persistent chats and folders can be adopted for use in lecture/class groups with similar functionalities.
- **File-Sharing:** Sharing files via chat is as simple as a drag-and-drop in the chatbox, this facilitates the ad-hoc dissemination of files during, before and after the lecture.

We note that our use case would be slightly different as our proposed design would be a platform more focused on video conferencing and scheduling rather than giving equal consideration to the above two functions of text-based/multimedia messaging. However, in spite of the focus placed on redesigning the Video conferencing UI, we aim to provide a holistic experience for all NUS students, consider this our wishlist.

## 02 Methodology

We will be using **contextual inquiry** in our data collection methodology. In doing so we hope to gain insight into how our interviewees (NUS students) interact with their respective remote-learning applications, in particular, Zoom. The completed Statement of Informed Consent for Contextual Inquiry and the contextual inquiry logs are attached in Appendix A and Appendix B respectively.

### Contextual Inquiry

**Contextual inquiry** entails a semi-structured interview along with user observation *in situ* to obtain information about the context of use. Users are first asked a set of standard questions before observation and then observed and questioned while they work in their own environments or proceed in specific scenarios.

As users are interviewed in their own environments, the real-world data collected will prove exceedingly relevant to typical use cases amongst our target audience. Contextual inquiry is based on a set of principles that allow it to be moulded to different situations. This technique is generally used at the beginning of the design process and is good for getting rich information about work practices, the social, technical, and physical environments, and user tools.

The four principles of contextual inquiry are:

1. **Focus** - Plan for the inquiry, based on a clear understanding of your purpose
2. **Context** - Go to the customer's workplace and watch them do their own work
3. **Partnership** - Talk to customers about their work and engage them in uncovering unarticulated aspects of work
4. **Interpretation** - Develop a shared understanding with the customer about the aspects of work that matter

Through a semi-structured interview inclusive of *in situ* observation and face-to-face interviewing before/after the task (using Zoom for classes) is conducted, we hope to gain a better understanding of the difficulties that students face in:

1. **Planning their online class schedule** (i.e. Locating each classes' respective conferencing links)
2. **Preparing for an online class** (i.e. locating and downloading relevant class materials before and during their classes.)
3. **Participating in an online class** (i.e. Responding to questions in large lectures/tutorial, using the chat (also saving chat history), stepping away from their laptops)

### Rationale

This mode of data collection allows for the observations in subtleties in behaviour and non-verbal cues that one may not necessarily be aware of whilst interacting with that digital medium. We believe through **contextual inquiry**; we will be able to glean insight (direct and indirect) into how students approach HBL through video conferencing platforms as well as of various issues that surround this current environment of learning. In doing so, be able to inform our approach to the redesign of current video conferencing UIs and supporting platforms for HBL utilized by NUS students so as to allow for a more convenient, conducive, 'friction-free', and 'repairable' user experience for all.

Despite our position as target audiences as well, we believe contextual inquiry would enable us to test our assumptions, borne from personal experience, about current issues with HBL. This would be supported through our observations and post-observation interview where students share with us their experiences. From this, we would be able to gain a better understanding of their needs and the problem space, allowing us to better formulate our design solution to benefit both ourselves and others like us.

### Target audience

Fellow university students from NUS, who rely on an assigned video conferencing system to execute online lessons. We aim to discover the problems they face when planning, preparing and participating in HBL through their video conferencing system.

### Interview Questions

#### Before

1. Do you use a video conferencing platform for HBL? What video conferencing system(s) is utilized by your lecturers/TAs?
2. How do you feel about it (HBL+Video Conferencing platform)?
3. How do you prepare for your online lecture/tutorial?

#### During (to ask if there is a break provided to them)

1. What is your opinion on the efficacy of the procedure to perform different tasks (retrieving files related to lecture/finding zoom links/meeting ID)?
2. How are you feeling now? Why?
  - a. What about the online lecture/tutorial went well?
  - b. What about the online lecture/tutorial that did not go well?

#### After

1. How did you find the online lecture and what went well? How do you think online lectures/tutorials are different from in-person lecturers/tutorials? In what way, good or bad, please elaborate! How can it be improved?
2. How do you find the procedure of performing the different tasks (like retrieving files related to lecture/finding zoom links/meeting id)? Were there any difficulties faced? How can it be improved? Is there anything that you wish can be implemented to increase the usability/convenience in using the video conferencing system?
3. What are some problems, hiccups or limitations you face when having an online lesson through the video conferencing system? How did yourself or the prof/TA go about solving the issue? How did you feel about it?!

### Interview Script

1. Introduce yourself and **thank the participant** for attending the interview
2. Ask for permission to **record their verbal statement** of informed consent and to be recorded
3. Ask for **relevant information** (year of study, faculty, etc etc) and note the **context/environment** of the Inquiry.
4. Conduct a **pre-task** interview.
5. **Observe** users as they carry out their tasks (Planning, Preparing, and Participating in their online classes)
  - a. If not disruptive, **ask interviewees** for their current state of mind and thoughts about their

- current experience, note tonality and non-verbal body language in their replies.
- b. **Note the context / actions / unspoken information** (i.e. Do they look frustrated/stressed/bored? Did they panic? Do they look tired? Did at any point they looked like they enjoyed the lecture/tutorial? How long/how many actions did they take to retrieve the relevant materials? etc.etc.)
  - c. **Collect evidence of inquiry:**
    - i. Photograph of the interviewee in context (with consent)
    - ii. Screenshot of the UIs used in the observation
6. Conduct a **post-task** interview and ask interviewees if they have anything else **they want to add**.
  7. Thank interviewees for their valuable insight and avail yourself for any additional points they would like to raise in future.

## 03 Findings and Analysis

### Disjointed Experience

Firstly, users are plagued with the need to retrieve their resources from multiple sources, just to prepare for a single lesson. For example, this could be seen by how our interviewees were required to search for the Zoom Conference link for the lesson through their emails, while simultaneously downloading the relevant class documents from LumiNUS. The process of retrieving these resources also further frustrated users when the Zoom Conference links for different modules were observed to be inconsistently parked under different sources, causing users to navigate across different tabs under LumiNUS to search for the correct link.

Hence, we discovered that the users desired an integrative platform, for the purpose of easier retrieval of resources as well as the access to multiple functions that include file sharing, messaging and calendar scheduling -- a more holistic experience. This also addresses some of the different problems that they encountered, which included having to repeatedly log in to Zoom via SSO through the NUS Domain, not being able to locate lecture recordings and also losing the important details on the chat room after the end of a meeting.

### Limitations of Zoom's User Interface

We also realised that certain aspects of the video conferencing platforms employed by our participants, Zoom, evoked some forms of frustration upon them. One of the most significant being the lack of a structure for its "Speaker's View" and hierarchy in "Gallery View", that caused users to lose focus easily and experience "Zoom-fatigue". This was important for us to remember that in a remote learning setting, users are required to stare at their screens for long hours.

Furthermore, the "Raise-Hand" function on the Zoom platform, as feedbacked by our interviewees, was not noticeable and intuitive to use. Besides not being able to locate the function within the platform, users were also required to put down their hands manually (with no automation provided by the system) by clicking on the function again. The lack of visibility in this important function could potentially result in conversational breakdowns, as observed by our participants when certain speakers got too carried away in their utterances that they were not able to identify such essential non-verbal cues.

## Mixed Responses to HBL

Surprisingly, while we assumed initially that remote learning would be well-received given the greater convenience and time-saved in accessing classes, some participants feedbacked that they preferred having physical lessons to online ones and vice versa. Notably, these extraverted personalities tended to be distracted by the lack of physical accountability in real-life lessons and sought to forge meaningful relations with their classmates. Moreover, we were also intrigued when some of our participants did not find a major problem in the present system for performing tasks as they were very adaptable to the situations and challenges placed in front of them.

In terms of the functionalities of the users' present video conferencing platform, we also discovered that people tended to speak up more when allocated to various "Breakout Rooms", as compared to if they were placed in a physical lecture setting. This ironically rendered these "breakout rooms" to invite greater intimacy to the participants, despite the lack of verbal and non-verbal cues that were crucial in facilitating conversations.

## 04 Audience Personas and Scenarios

Before we move on to design the initial prototype, we sought to capture requirements through personas and scenarios, as elaborated below and illustrated in Appendix C. Personas are aggregated amalgamations of archetypal users of the product that we are currently designing for. They are often characterized by several components, such as their unique set of goals, behaviour, attitudes and even frustrations. Hence, their precise and rich details can help us see the personas as real potential users that we can design for. For instance, during the design phase, we can keep the personas in mind and ask ourselves questions such as "What would David do in this situation?". By doing so, we are able to design a product with the potential user in mind. For this project, we created two key personas, as shown below.

### Persona 1 - David

**Bio:** David is an architecture undergraduate currently in his penultimate year at National University of Singapore (NUS). He values his time and spends it wisely, prefers not having to travel back and forth to school daily for lessons. Additionally, he has a desktop at home and uses it to run the software for designing and modelling work. Hence, he prefers to have lessons conducted in a Home-Based-Learning (HBL) environment, with lectures and tutorials being held through video conferencing. He is therefore heavily reliant on Zoom to accommodate to his personal needs and facilitate a smooth working environment.

#### **Goals:**

- To complete school-related tasks efficiently without any fuss
- To minimize the time taken to perform tasks, such as not having to locate zoom links from different platforms

#### **Frustrations:**

- David finds himself having to log into the NUS domain every time to access the zoom session despite being logged into LumiNUS or NUS Outlook email
- David finds it hard to locate recorded zoom sessions as it can be found in multiple locations---- under Webcast, Multimedia and Conferencing (Expired), depending on where the Professor decides to upload it onto.



- David is disappointed as recorded lectures sometimes lack totality when the Professor forgets to resume recording after the break/ breakout session.

## Persona 2 - Cheryl

**Bio:** A first-year NUS student who is beginning her journey in FASS. Coming into an online semester, she has mixed feelings about HBL. Socially, she feels cut-off from her fellow classmates due to the lack of social interaction outside of class and feels that she is missing out on core aspects of the university experience. Despite valuing such social interactions, she appreciates the increased flexibility, convenience afforded, and time saved with HBL which allows her more time for leisure. She understands the necessity of such modes of learning but feels lost then trying to navigate the various platforms a typical NUS student uses (NUSmods, LumiNUS, etc). She wishes that the HBL learning experience could be one that is more intuitive, cohesive, and social.

### **Goals:**

- To attend online lessons without any inconveniences, and to be able to participate actively in class without major distractions
- To use a video conferencing system that has intuitive and well-placed functions

### **Frustrations:**

- She finds the interface of the current system confusing due to a lack of visibility of conferencing functions (such as the “Raise Hand” function). Furthermore, the lack of a “help” button, tooltips and platform orientation on the first launch serves to exacerbate her confusion
- She feels unengaged in tutorials/lectures due to excessive monologuing from other participants that along with a lack of structure in facilitating discussions negatively impact her ability to participate in discussions
- Being new to the video conferencing system, she often finds herself toggling between the different icons to locate the appropriate response buttons (like Raise hand function) as they were not very intuitive and quick to locate.
- She panics when LumiNUS crashes because this usually means that she would be unable to retrieve any resources or submit any assignments etc. (given the context that she also does not know any classmates well enough to ask for help)

## Scenarios

After coming up with the personas for our design, we came up with two scenarios; the first being the current use scenario that is based on our findings and analysis from the previous week, and the second being the proposed use scenario based on our proposed design. Scenarios are “informal narrative descriptions” that describe activities and happenings in a story. Thus, the scenarios generated would allow us to capture current behaviour based on our findings from the contextual inquiry conducted, and also to describe the behaviour of the same person with a potential new technology- in this case, our proposed design.

### Current

David wakes up for a full day of online classes and groans, his alarm clock has failed him once more and he has but 5 minutes to the start of class, one with a flipped classroom model. Hurriedly, he freshens up

and starts up his desktop. He tries to search for **the Zoom link throughout the Conferencing tab but it wasn't there**. He is already 5 minutes late.

Then he remembers that he has a quiz today. He **tries to email the TA and subsequently attempts to get help from his classmates, but there wasn't any response**. Panicking, he calls a classmate and begs him for the Zoom link. His classmate forwards him the link that was disseminated through email a few days before the test.

He is now 15 minutes late for class and 5 minutes late for the quiz. He manages to get hold of the password for the Exemplify quiz through the zoom chat after accessing the link. However, he struggles to answer the questions and he fails to finish it in time.

After a 10-minute break, the TA resumes class and begins soliciting responses to the assigned readings and pre-recorded zoom lecture. David is stumped. This is not the material that he remembers preparing for! He is called on to respond, everyone stares, he gives a weak excuse. His class participation takes a beating. A few moments later, he then realized that he had **mistakenly sourced for the reading from the wrong folder**. Instead of preparing for the reading that was under the folder of "Lecture Notes", he had prepared for another document under the "Additional Files" folder.

During the break, David puts his speed-reading ability to the test. He skims the reading faster than he ever has before and learns enough to respond to the TA's questions. Unfortunately, the questions never came. For the next half of the class, **exceedingly vocal students went on for 30-minute-long exchanges and he couldn't get a word in edgeways**. He grows **exhausted from the constantly changing "Speaker's View"** from all the avid participation. Class ends. David wants to go back to sleep but he has another class coming up afterwards.

## Revised

Now, all David has to do is to not close or shut down the unified portal.

Because when he wakes up, a **calendar notification** on both his desktop and phone reminds him of his upcoming lesson without having to search for it. This time, he is prepared for class as the **class materials are now categorised and sectioned neatly by its week**. The TA is also able to **place the assigned readings and resources in the integrated chat function to facilitate the discussions in class**. Even in the event of a technical hiccup, David is also able to communicate with his professors, TAs or friends immediately through the **chat for any troubleshooting or solutions**. As the chat is archived, he can retrieve any key information that he may have missed out easily.

Being well-prepared, he is better able to focus on the lesson. The redesigned video conferencing layout **reduces screen fatigue** and enables David to **focus on both the content presented and follow the discussion among his peers**. This keeps him on top of the class' progress and happenings. Moreover, class participation is **greater enabled through easily accessible response functions** and the **integrated chat feature**. David, alongside his classmates, is able to gain equal access to class participation, hence empowering him to participate actively, efficiently and with greater ease.

## 05 Conceptual Design and Initial Prototype

A video conferencing system, which will be titled as **NUSone**, will be **created to serve as a unified portal to offer a cohesive HBL experience to NUS students**. It will primarily serve as a video conferencing platform integrated with email, chat, files, notification and calendar features; to mitigate student's

frustrations in preparing and attending classes through video conferencing. NUSone will provide convenient access to lesson materials and scheduled conferencing links which helps to reduce the hassle of retrieving materials necessary for classes. It will also improve a user's experience during classes with visible response functions and personable video conferencing layout. The redesigned user interface will also provide stronger chat features to allow file sharing in facilitating class discussion and will ensure that the chat log remains traceable after the conferencing session or breakout session has ended.

**Link to Video demo:** [link](#), **Link to Miro prototype:** [link](#)

## Conceptual model

The **conceptual model** for NUSone will be a desk in a secondary school classroom. Similar to the desk in the secondary school classroom, the students are able to search for their materials through the 'files' icon on the toolbar akin to them accessing their materials through the files under their table. In addition, they are also able to get the materials through the chat box as opposed to directly getting the handouts from the teacher from their desk as the teacher walks down the aisles to hand over the handouts. Furthermore, NUSone will share the same classroom layout as a secondary school classroom where the host will have his screen singled out on the upper portion of the screen with the other participants' screen being lined up in rows at the bottom half of the screen just like how secondary school teacher takes the front of the classroom while students are seated individually in rows. The host is also seen with a bigger box as compared to the participants to illustrate the greater stage presence that the host has in leading the discussion, just like the top-down educational approach that secondary school students experience while seated at their desk in the classroom.

## Interface metaphor

The **interface metaphor** will be the same as that mentioned in the conceptual model, as the functions that students can carry out through NUSone is similar to the actions that a student carries out by their secondary school desk, with them being virtual.

## Interaction type

The **interaction type** for NUSone will involve instructing, responding and manipulating. Instructing is carried out when the user clicks on the icons and tabs (based on what it represents or portrays) to prompt the system to bring him to the page that he wanted. Furthermore, instructing is also carried out when the user prompts for a delivery of material from the system when they send messages or documents through the chat. Responding is carried out when the system makes reference to the calendar feature on the schedule of the user and instinctively reminds them of upcoming conferencing sessions through the pop-up notification. Manipulating is carried out as the user is able to carry out functions such as drag and drop function for file sharing.

## Interface type

The **interface type** for NUSone is a Graphical User Interface, with the utilisation of Icon Designs through the vertical toolbar on the left-hand side of the platform. Pictograms that represent applications, objects, commands, and tools, are opened or activated when they are clicked on. A basic Menu Design is also utilised as tabs are nested within the icons on the toolbar, where pages and files will be made accessible to the user upon clicking them.

## Initial Prototype

The initial prototype aims to address issues such as difficulty in locating links to conferencing sessions, lack of integration of the different platforms, lack of visibility of response function, lack of backup of chats and screen fatigue from poor layouts. The problems are addressed as seen in the storyboard below:

### 1. Difficulty in locating the link to the session

A pop-up notification as seen from the top right-hand corner of the screen is synced with the Calendar and will direct students to their upcoming sessions. The search bar can also help the students in retrieving their conferencing links (refer to Figure 1).

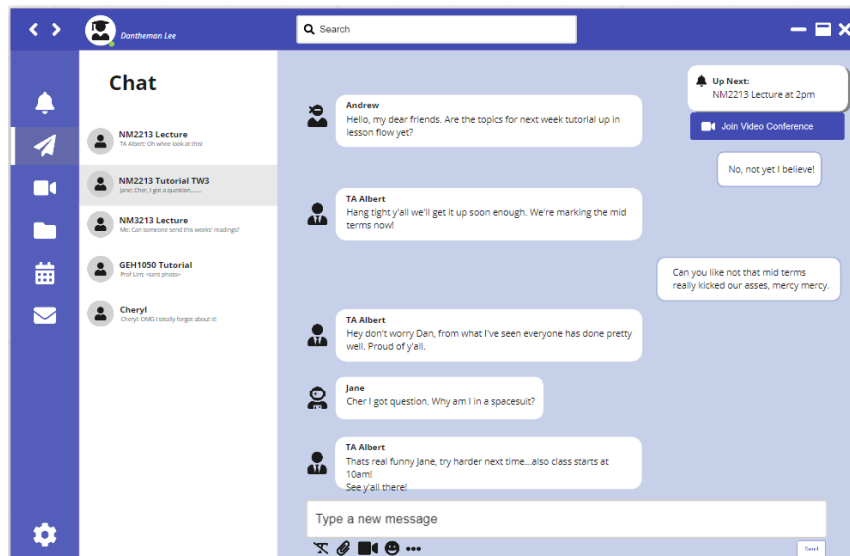


Figure 1: Pop-up notification for an upcoming session

### 2. Lack of integration of different platforms

Features such as Calendar and the lesson materials are incorporated into the platform (refer to Figure 2 and Figure 3). Integration is further enhanced through the chatbox where both the host and the participants can send documents directly through the chat to facilitate the discussion (such as clarifying or disseminating information), rather than having to access other portals individually to retrieve the file for reference (refer to Figure 4).

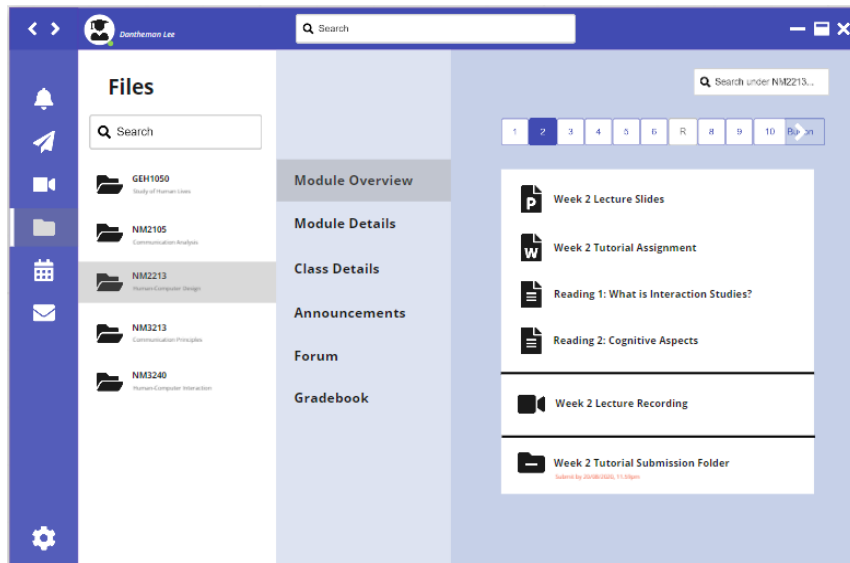


Figure 2: Lesson materials integrated into NUSone

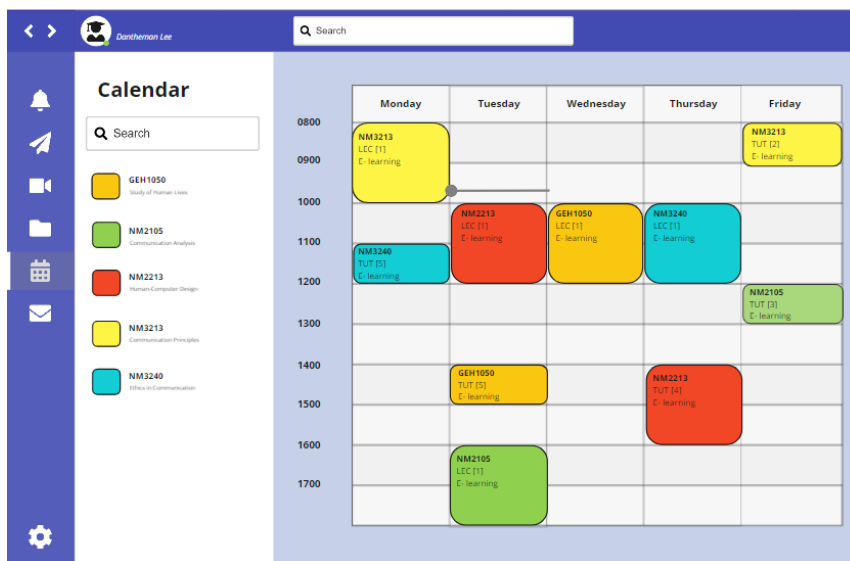


Figure 3: Calendar integrated into NUSone

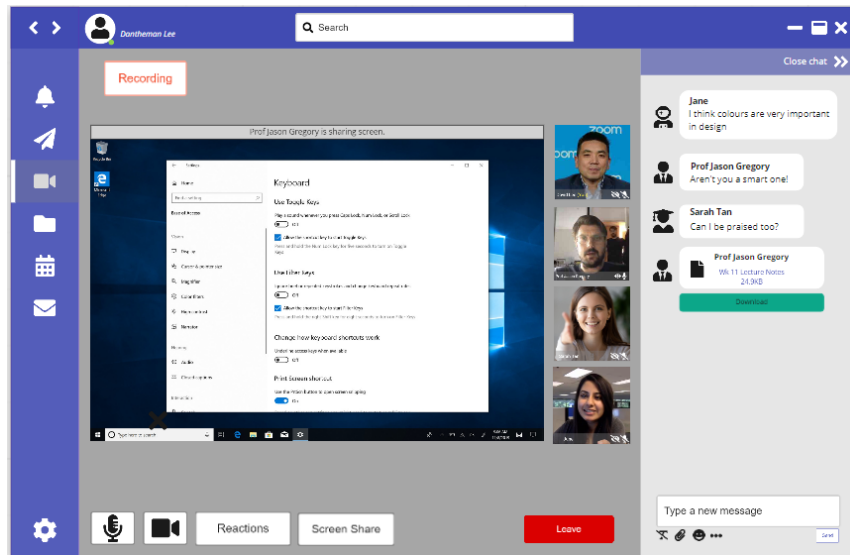


Figure 4: Sharing of lesson materials through the chat

### 3. Lack of visibility of response function

The response function of the current video conferencing system is not very visible to users as it is embedded within another icon and might not be intuitive for users to locate. As such, a “Reactions” button, capturing the popular response functions such as the “Raised hands” function, is located directly in the toolbar of the video conferencing screen (refer to Figure 5).

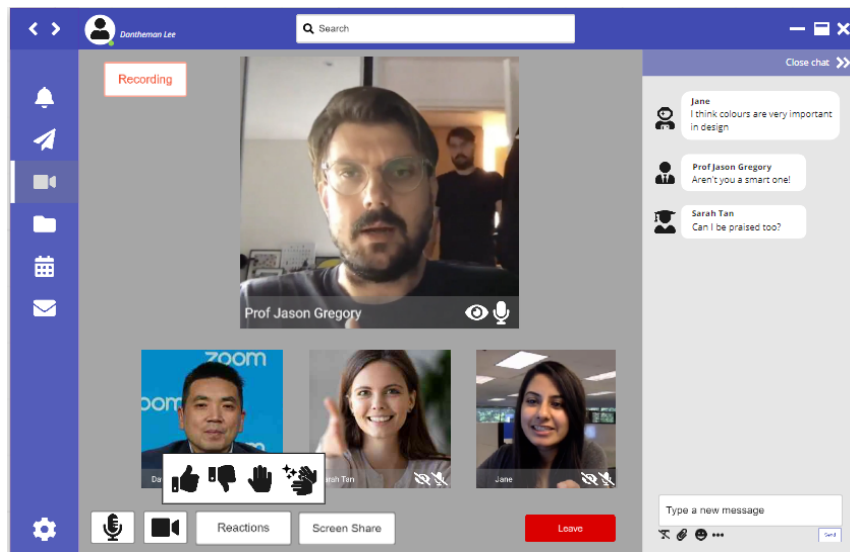


Figure 5: Increased visibility of response function

### 4. Lack of backup of chats from conferencing sessions

The chat during the session is also integrated into the main chat function (the tab with a paper aeroplane icon located at the vertical toolbar at the left-hand side of the screen) as illustrated in Figure 6.

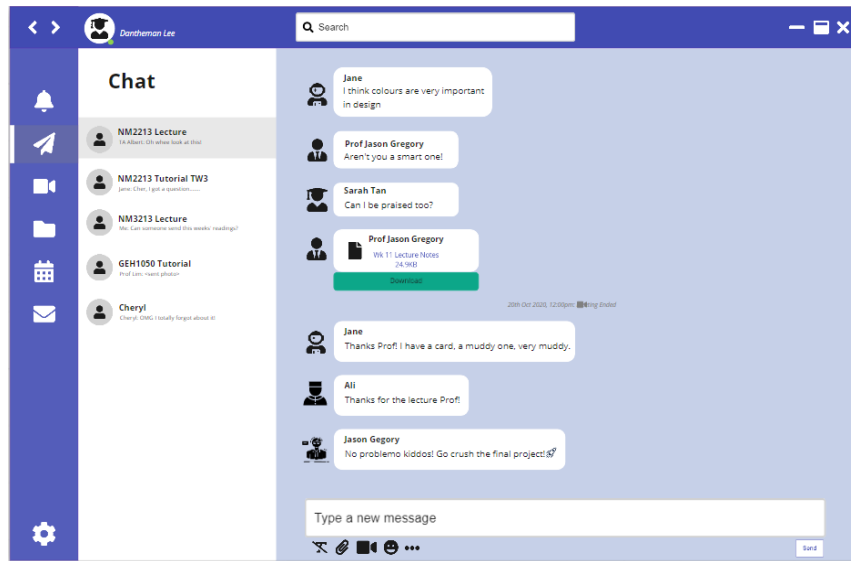


Figure 6: Integrating chats from the conferencing session into the main chat function

##### 5. Screen fatigue by poor layout

Screen fatigue results from the constant flickering of the speaker's view, whenever there is a change in the speaker. In light of reducing screen fatigue for users, a minimalist layout will be adopted, where the speaker's box will be outlined with a white border to indicate that he is speaking (refer to Figure 7).

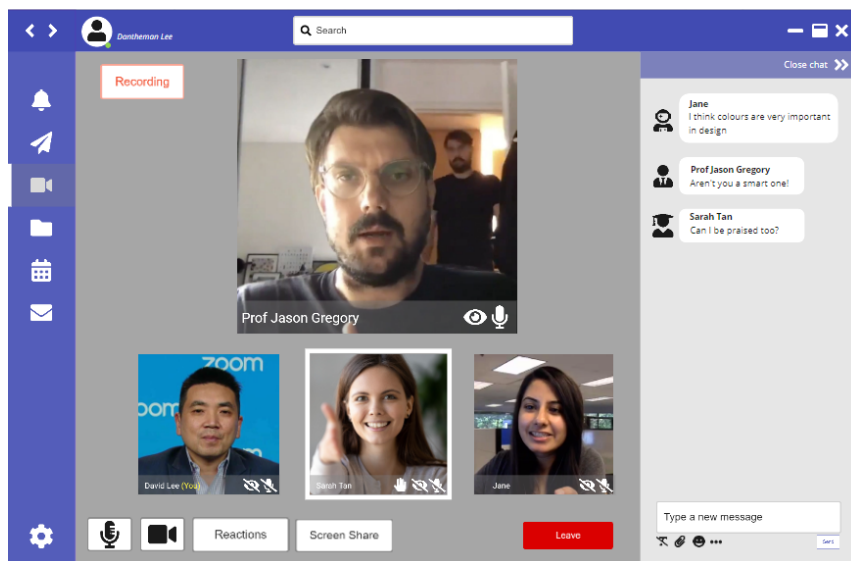


Figure 7: Minimalist layout to reduce screen fatigue

## 06 User Testing and Evaluation

For User Testing and Evaluation, we adopted a prototype and tester roles as described in a lecture to conduct user testing with 4 NUS students, ranging from Y2-Y4 in their natural context, reflective of realistic usage of the system. The user testing procedures were run remotely, via Zoom, due to the need to maintain social distancing. The completed Statement of Informed Consent for User Testing and the user testing logs are attached in Appendix D and Appendix E respectively.

Before the user testing was carried out, Informed consent was collected and a briefing was given before the usability test was conducted, followed by a qualitative interview. The tester was therefore responsible for briefing the participants, giving them the task sheet, guiding them to carry out the tasks by reading and thinking aloud, and observing and noting down the actions taken by the participant. Meanwhile, the prototyper operated the Miro prototype and updated them based on the reactions of the participant. The list of procedures carried out, and the tasks that were given to the participants, are shown below.

### Procedure

1. Introduce yourself and **thank the participant** for attending the interview (Tester), start the screen share (Prototyper)
2. Ask for permission to **record their verbal statement** of informed consent and to be recorded
3. Ask for **relevant information** (year of study, faculty, etc etc)
4. **Run through TASKS**
  - a. Remember to **ask for the rationale** for actions to accomplish tasks that are unexpected
  - b. Try to get participants to **talk you through their train of thought** as they navigate the prototype.
  - c. Takedown observational notes for each task, noting how participants **respond to the interface encounter and resolve problems** that may arise
5. Ask participant if they have anything else **they want to add**
6. Thank participants for their valuable insight and avail yourself for any additional points they would like to raise in future.

### Task Sheet

1. You've finally got a module you've appealed for (GES1021) please adjust your calendar to include the new lecture slot, GES1021 LEC[1].
2. You are preparing for an upcoming online lesson later today. The lesson would require you to retrieve certain files and readings from the system. Retrieve NM2213 Reading 1.
3. NM2213 Lecture is starting soon, please join your lecture!
4. Professor calls for comments, time to get that class participation down!
5. Professor requests students to use the "Raise Hand" function instead as the chat box is being flooded. He will call upon them when it is their turn to answer the question.
6. Professor calls for you to respond, and he reminds all students to put down their hands once they have spoken.
7. You are now required to share your screen and present your findings from the readings assigned.
8. Your Prof has shared a document in the chat, and you need to download it for reference.
9. You need to upload a document into the chat for the class to see.
10. The lecture has ended, and everyone is thanking the Prof. Show your appreciation to him!



11. You have forgotten to download a file that was specifically shared through the chat earlier on. Please attempt to retrieve the files.

## Findings

### Locating files (Task 2)

Participants have been observed to face some issues when asked to perform task 2. Those that opted to locate the file via the files tab have highlighted their **expectation that files would be organized as per their modules in LumiNUS**. Hence, this illustrates that there could be a **learning curve** for users. Only 1 out of 4 participants utilized the search function to locate the files, although this participant located the file with significantly less trouble. The lack of use of the platform search function may highlight its **lack of visibility**.

### Video conferencing tab lacks organisation (Task 3)

The participants were tasked to join an upcoming lecture for NM2213. Some participants were seen to be searching for the **conferencing link manually before the pop-up notification pops up at the side of the screen**. Upon accessing the conferencing page, the participants were seen to be taking some time to locate the tab to the conference. Some stated that the **layout in the conferencing tab looks cluttered** with many codes looking to be similar as there are a few different “NM” modules.

### Responding to the Professor’s question (Task 4)

Initially, participants have been observed to not utilize the “Raise Hand” function under the “Reactions” button, but instead **chose to type their response in the chat or speak up using the mic**.

### Raise and Put down hand (Task 5 & 6)

When asked to use the raise hand function some participants **fail to put down their “hands”** after speaking even after being explicitly reminded to do so. Participants had some **difficulty identifying certain icons** and their respective **functions** and use to complete certain tasks.

### Identifying Icons (Task 7 & 9)

Some icons are not read to be representative of their functions. For example, the **“Paper clip” icon is noted to be not very representative** of adding a file attachment (Task 7). Participants are seen to look for an upload button and some even clicked on the “...” button to locate the icon. Participants also cited that while **locating a previously uploaded file via lecture/tutorial chat, the “Paper Aeroplane” icon** is often confused for the Telegram icon. Participants also commented on the **“format text” icon** faces a similar predicament, but this is due more to the limitations of the icon library in Miro.

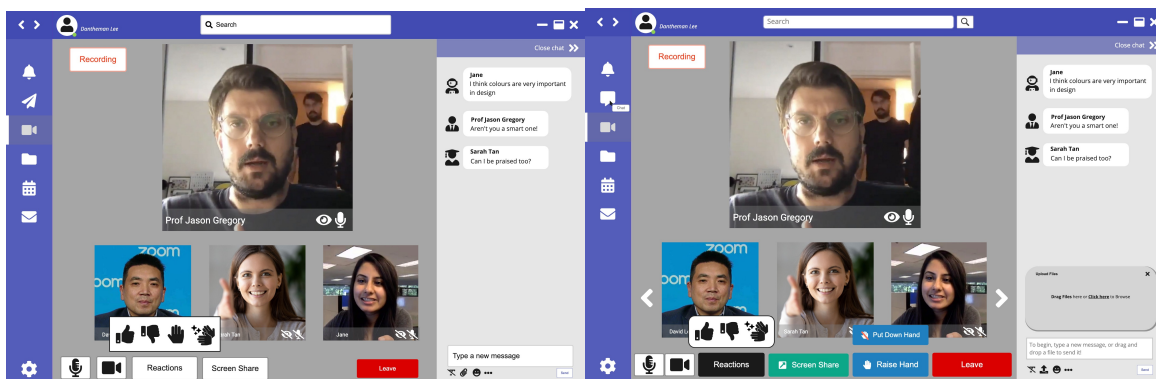
## 07 Redesign & Heuristic Evaluation

After gathering the feedback from the user evaluation, we came up with the Proposed Prototype revisions as listed below. Subsequently, we adopted the technique of heuristic evaluation as a means to assess the system. Heuristic evaluation involves a set of guidelines, as well as independent critiques of a system based on common heuristics (usability principles). Nielsen's 10 usability heuristics guideline is utilised, where the problems, specific heuristics violated, and its severity rating are identified and are listed in Table 1 below.

### Proposed Prototype Revisions

#### **Improve visibility of Search, Raise Hand and File Upload functions**

Firstly, the “Raise Hand” icon was removed from the “Reactions” tab in our initial prototype and placed as a separate function itself in our revised prototype (as seen in Figure 8). This ensures that users are able to locate this essential function quickly. Next, we also inserted a greyed-out message above the chat (see Figure 8) to allow users to “drag-and-drop” any files for smoother file-sharing. Lastly, the design of the Search bar (see Figure 8 and 9) was also altered to improve its visibility and to enable more engagement from users.



*Figure 8: Video Conferencing page before redesign (left) and after redesign with revised icons and functionalities (right)*

#### **Improve Icon selection (Chat, Share screen, etc)**

With icon recognizability being one of our main problems, we made revisions to some of the icons on our interface to reduce confusion as much as possible. These include our Chat icon, Upload icon and Share Screen icons as seen in Figure 8.

#### **Organization of Conferencing Links**

Conferencing information could be sorted into tabs based on the module code and further colour coded to match the colour of the blocks in the timetable as seen in Figure 9.

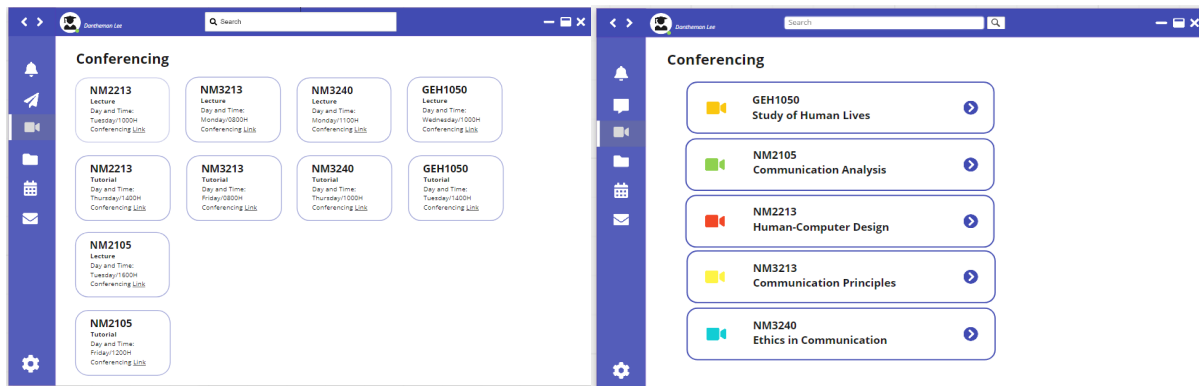


Figure 9: Conferencing page before redesign (left) and after redesign with more organization and colour contrast. (right)

Table 1: Heuristic evaluation for the revised prototype

No.	Brief Description of Issue	Heuristics Violated	How Common?	Hard to Overcome?	On-off or Persistent?	Perceived Seriousness	Overall Severity	Proposed Solution
1	A student will not know what their position in Queue is, and approximately when they will be called on to speak after they have used the raised hand icon.	1	1	0	2	0	0	Add a 'queue counter' visible to students to know where they are in the queue
2	Icons are not as universally recognizable as expected, even after allowing for hover to view icon description, users might not be able to navigate the system effectively.	2, 4, 6	3	3	4	2	3	1) Conduct user testing to elucidate the more widely recognized icons for various platform functions 2) Explore the use of 'hover to view' tooltips and relying on users gaining familiarity with the platform.
3	Users might not be used to having to manually "put down hands".	4,6	3	2	3	3	2	The "Put Down Hand" button will flicker at the 1 min mark after the hands is raised
4	Missing function to <u>schedule conferencing session</u> under the video icon	2,4	4	1	4	4	4	Create a page before the current conferencing page to allow the user to choose to create a conferencing session or to view conferencing session
5	Chat functions are not clearly thought out/ made visible. Excessive functions are included under the "..." icon for the meeting chatbox.	5, 8	3	1	2	2	2	Remove the "..." icon in the meeting chatbox, rethink necessary functions and the icon representing them

6	Design fails to account for lecture scenarios when the number of participants may exceed 50 individuals	8	2	1	4	2	2	In an event that there is an overwhelming number of attendees, our original structure with the enlarged “speaker’s view” on top would remain, with smaller windows of the attendees below it. We may choose to restrict to 30 attendees (plus one speaker) maximum per page so that the overall conference page would not appear too cluttered. Different pages of attendees would be accessible with the arrows in our redesigned prototype.
7	Design is unable to ensure the consistency in layout design when a user begins to screen share	4	1	0	3	1	1	Maintain the same layout as the default video conferencing layout. The host’s shared screen should remain central, with the host’s face right beside it, while the participant’s faces would be below.
8	Unnecessary for users to click into each module code to access a secondary page with links to (lecture and tutorial) conferencing. Additionally, there is too much blank space in both conferencing pages	4, 7, 8	2	1	3	1	2	Secondary conferencing page can be integrated into the main conferencing page through a mouseover, to utilize the excess space on the left of the main conferencing page
9	The search feature may not be well utilized due to both the lack of visibility and opacity to its functionality	3, 6, 7	1	3	3	2	2	Increase the size of the search field to ensure prominence. However, experienced users will be able to locate the search function regardless of size.
10	Missing undo icon for text input fields. Missing delete/edit message functionality.	9	2	0	1	1	1	Include said icon. Add in right-click functionality ‘delete/edit message’
11	Lack of read receipts and message sent timestamps.	1	1	0	1	1	1	Include both features in the form of a ‘read’ message and timestamp
12	Lack of error message windows for error scenarios. Missing FAQ page.	5, 10	3	0	2	2	2	Include a “help” button/“?” icons which address FAQs, as well as a simple manual guide for users, in addition to onboarding users on the

								first launch with a guided walkthrough
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## 08 Conclusion

We envisioned NUSone, an integrated HBL platform for the remote NUS student, to be an antidote to a disconnected HBL experience. In consolidating and redesigning the different platforms and functionalities, i.e. video conferencing (Zoom), File sharing (LumiNUS), persistent chat (TeamUP), and scheduler (NUSmods); we aimed to provide a more cohesive and integrated experience for our peers that both addresses their pain points of increasing reliance on the current HBL systems, while also enhancing their ability to prepare, participate with their classes and others.

Having only iterated twice on our prototype (User testing and Heuristic evaluation), we acknowledge the limitations present in our designed solution. Despite maintaining its suitability in addressing the numerous pain points faced by participants (Educators and Students) in HBL, deeper research into the problem space occupied by fragmented NUS platforms and many further rounds of user evaluation is required before NUSone is remotely relevant to a real-world context.

In a way limited by the functionality of the prototyping platform, the duration of the design cycle and our relative inexperience in the fields of UX/UI, we believe that our experience in this module, like the knowledge acquired through this exercise, would prove invaluable in our future pursuits, academic or otherwise.

## 09 Appendix

### Appendix A: Statement of Informed Consent for Contextual Inquiry

#### **STATEMENT OF INFORMED CONSENT**

Students from the module NM2213 Introduction to Human-Computer Interaction Design in the Department of Communications and New Media, National University of Singapore are conducting interview, observations and/or “cultural probe” sessions in order to understand how people make use of videoconference. This information will be used to inform the design of user interface components as part of a class project exploring ways to better support video conferencing.

There are no benefits to you for participating, other than perhaps helping to contribute to the design of better videoconferencing systems. We hope that the project will benefit users of such systems. This research poses no risks to you other than those normally encountered in daily life. All of the information from your session will be kept confidential. Your data will have a number associated with it. Any audio recorded during the session will be transcribed as part of our notes, and will be deleted immediately after transcription. Any photographs taken during the session will not include any identifying information or images of your face. Any materials (“probes”) that you submit will have any potentially identifying information removed before it is used as part of the project. During the project, data may be used for class presentations and report submission. After the project is completed, we may save the notes, photographs and materials for future use by ourselves or our lecturer, but your name or any other identifying information will not be included.

Your participation in this research is voluntary, and you are free to refuse to participate or quit the interview, observation and “design probe” sessions at any time.

If you have questions about the research, you may contact the module lecturer, Alex Mitchell, at 6516-3021, or by email at alexm@nus.edu.sg.

You may keep a copy of this form for reference.

The details of this study were explained to me by:

Investigator Name: Lee Jun Yan Sean

Date: 10/10/2020

I have read the above project description. I agree with the terms and hereby consent to participate in the study.

I agree / ~~do not agree~~ to audio recording during the session

I agree / ~~do not agree~~ to photo taking during the session

Participant Signature: 

Participant Name (please print): Dennis Chan Jia Wei

Date: 10/10/2020

## STATEMENT OF INFORMED CONSENT

Students from the module NM2213 Introduction to Human-Computer Interaction Design in the Department of Communications and New Media, National University of Singapore are conducting interview, observation and/or “cultural probe” sessions in order to understand how people make use of videoconferencing. This information will be used to inform the design of user interface components as part of a class project exploring ways to better support videoconferencing.

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If you have questions about the research, you may contact the module lecturer, Alex Mitchell, at 6516-3021, or by email at alexm@nus.edu.sg.

You may keep a copy of this form for reference.

The details of this study were explained to me by:

Investigator Name: Choo Weibin

Date: 12 October 2020

I have read the above project description. I agree with the terms and hereby consent to participate in the study.

I agree / ~~do not agree~~ to audio recording during the session

I agree / ~~do not agree~~ to photo taking during the session

Participant Signature: 

Participant Name (please print): Jaedyn May Wei Lin

Date: 12 October 2020

## STATEMENT OF INFORMED CONSENT

Students from the module NM2213 Introduction to Human-Computer Interaction Design in the Department of Communications and New Media, National University of Singapore are conducting interview, observation and/or “cultural probe” sessions in order to understand how people make use of videoconferencing. This information will be used to inform the design of user interface components as part of a class project exploring ways to better support videoconferencing.

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If you have questions about the research, you may contact the module lecturer, Alex Mitchell, at 6516-3021, or by email at alexm@nus.edu.sg.

You may keep a copy of this form for reference.

The details of this study were explained to me by:

Investigator Name: Lee Xin Rong

Date: 9/10/20

I have read the above project description. I agree with the terms and hereby consent to participate in the study.

~~I agree~~ / do not agree to audio recording during the session

~~I agree~~ / do not agree to photo taking during the session

Participant Signature: Guo

Participant Name (please print): Guo Ting

Date: 09/10/20



## STATEMENT OF INFORMED CONSENT

Students from the module NM2213 Introduction to Human-Computer Interaction Design in the Department of Communications and New Media, National University of Singapore are conducting interview, observation and/or "cultural probe" sessions in order to understand how people make use of videoconferencing. This information will be used to inform the design of user interface components as part of a class project exploring ways to better support videoconferencing.

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Your participation in this research is voluntary, and you are free to refuse to participate or quit the interview, observation and "design probe" sessions at any time.

If you have questions about the research, you may contact the module lecturer, Alex Mitchell, at 6516-3021, or by email at alexm@nus.edu.sg.

You may keep a copy of this form for reference.


Investigator Name: Muhd Irsyad Bin Abdul Aziz

Date: 10/10/20

I have read the above project description. I agree with the terms and hereby consent to participate in the study.

I agree / ~~do not agree~~ to audio recording during the session

I agree / ~~do not agree~~ to photo taking during the session

Participant Signature: 

Participant Name (please print): Muhd Syazwan Menzies Bin Muhd Syafie Charles Menzies

Date: 10/10/20

## Appendix B: Contextual Inquiry Logs

Interviewer:

Irsyad

Before

- *Miro (for collaborative work), Zoom (for viewing lectures/tutorials), Discord (to disseminate announcements)*
- *Links are usually either on luminus or email, not consistent across all modules. Sometimes some of the links are recycled over the weeks*
- *Very comfortable and convenient, lots of time saved (don't have to travel etc)*
- *Depends on the topic of the lecture. Sometimes, not much preparation is done beforehand if its a familiar topic (that is already learnt in poly)*

During

- *Interviewee was having lunch while watching the lecture. Was in a very relaxed state.*
- *Passively participating by just listening, not really engaging in discussions. Class part wasn't really a big concern for interviewee*
- *Interviewee muted his microphone on zoom and was instead casually conversing with his classmates on discord halfway throughout the lecture*

After

- *Mild inconvenience but not that bad. But still prefers HBL by a landslide due to convenience*
- *No consistency across different modules. Would help if everything is standardized.*
- *Prof/TA facing technical issues. An example is when interviewee was required to take a test on luminus but luminus crashed. Prof/TA sent the questions via email instead and students had to answer within the time allocated.*

Other insights

- *Students are usually in the comfort zone of their own homes, and they may take short breaks more often*
- *Surprising discovery: Interviewee isn't too bothered by the mild inefficiency of the current systems. While he feels that having an integrated system would be beneficial, he feels that it may not be too feasible to design such a system.*
- *A workaround of not being able to find the zoom links is to simply ask from their friends*

## Interviewer: Weibin

### Before

Do you use a video conferencing platform for HBL? What video conferencing system(s) is utilized by your lecturers/TAs?

- Zoom

How do you feel about it (HBL+Video Conferencing platform)?

- Better than going for physical lectures -- more focused with lesser distractions [surprising to me].
- Able to go back to recordings if you miss out anything.
- Sometimes cannot catch what the teacher is saying -- when the computer hangs or the teacher disconnects -> unable to go back to repeat.
- Very easy to zone out.
- Somehow aids discussion better (through breakout rooms).

How do you prepare for your online lecture/tutorial?

- Download lecture slides and take some time to understand what is taught and the gist of the lesson beforehand.
- Don't do readings usually due to lack of time.
- Uses OneNote to take down notes (after downloading the lecture slides to this).

### During (Observations)

- TA was going through the Word Doc (while sharing her screen) and she was constantly scrolling non-stop. She felt frustrated because the TA tended to scroll past the important details or some parts and she would miss out those (unable to take picture or screenshot in time).
- Tended to zone out during lessons sometimes.
- Sometimes frustrated because she could not understand what the TA was talking about, or when she was sharing "useless" stuff.
- At times, she attempted to unmute her mic to class part but the TA would call someone else at that moment -- she mutes herself back.
- Felt awkward and pressured when a teacher asked a question and nobody answered for quite a while despite her prompts. She is conflicted at the same time also because she doesn't want to constantly participate in fears of appearing "too proactive".
- Ate lunch during the lesson - tried to adjust her screen to not show that she is eating.
- Placed her phone at the screen of the laptop so that she would be seen as though she is looking at her laptop and not at her phone.

### After

How did you find the online lecture and what went well? How do you think online lectures/tutorials are different from in-person lecturers/tutorials? In what way, good or bad, please elaborate! How can it be improved?

- **GOOD**

- Names were always on Zoom (easy identification) and TA is able to tell if students are attentive or not (through camera).
- Ability to screenshot what the TA/prof is writing down on the screen, virtual board or doc, while physical lessons sometimes have information that can only be shown in class.
- When a teacher asks something, students can easily search answers and responses quickly on Google.
- Save time on travelling; better planning of time.
- Breakout rooms -- easier mobility and accessibility for discussions.
- Online setting -- more daring to answer questions, compared to being in front of a live audience in a lecture-setting.
- Raise-hand function a good feature.

- **BAD**

- Teachers not equipped with relevant skillsets to use the computer or navigate around softwares; often experience technical issues.
- Students lose out and miss out on some important details in class if they experience technical issues or maybe accidentally leaving the class. -- teacher cannot stop the lesson for you.
- Some students seem to be more daring to input comments or contributions that do not add value to the discussions at times.
- Real life tutorial would be less silent, inviting more interactions than in the virtual context.
- Uncertainties -- not able to discern certain cues and gestures that could be better detected in a real-life setting.

How do you find the procedure of performing the different tasks (like retrieving files related to lecture/finding zoom links/meeting id)? Were there any difficulties faced? How can it be improved?

- There were not really a lot of difficulties [surprising?]
- Just that meeting IDs had to be found either in Luminus or in Emails.
- If LumiNUS crash, lags or doesn't load -- this may evoke a bit of panic to her. But naturally her first response is to quickly ask her friends for the meeting ID or the resources.

What are some problems, hiccups or limitations you face when having an online lesson through the video conferencing system? How did yourself or the Lecturer/TA go about solving the issue? This could be a physical or emotional aspect.

- When the TA couldn't share her screen, she got another student to share for her.
- Technical hiccups sometimes took up a long time in the class (10 minutes).
- Students would express certain questions, happenings or observations in the chat box (over a hiccup) but sometimes the teacher would overlook them.
- People often stuck in the waiting room.
- Going straight into breakout rooms for some lessons but no one feels obliged to talk.

**Slide Deliverables**

## **2. What was the most important thing you discovered? (cornerstone to the project)**

Meeting IDs are inconsistently presented through different platforms (email and LumiNUS). Hence, if LumiNUS crashes or lags, students are plagued with the inability to access their resources.

Teachers seem to kind of overlook chat box messages, where students usually express certain questions, opinions or problems.

Breakout room function provides easy mobility and accessibility for discussions, invites more participation than real-life context.

At times, she attempted to unmute her mic to class part but the TA would call someone else at that moment -- she mutes herself back. (video conferencing system does not really afford such conversational cues that we are used to)

*(Side Note (maybe not relevant): Students lose out and miss out on some important details in class if they experience technical issues or maybe accidentally leaving the class. -- teacher cannot stop the lesson for you.)*

## **3. What was the most surprising thing you discovered? (anything unexpected/ insightful/ anomaly)**

Respondent felt that it was better to attend physical lectures than online lessons as she feels that there are "lesser distractions".

To her, there were not a lot of difficulties in using the video conferencing platforms employed by NUS.

There seems to be a stark discrepancy in the ways different students interact with the video conferencing system -- where there are times that students would not respond despite the teacher's prompting a question in tutorial; but there are also many instances where students seem to be more daring to provide input in class that does not really value-add to the conversation.

**Interviewer: Xin Rong**

Interviewee: Y3, female ME undergraduate

Before

**1. Do you use a video conferencing platform for HBL? What video conferencing system(s) is utilized by your lecturers/TAs?**

Yes, Zoom & Microsoft Teams.

**2. How do you feel about it (HBL + Video Conferencing platform)?**

Easy to use (good usability) except it might be troublesome as students need to log into the domain every time. Compared to FTF, it is more convenient but causes students to be less involved in participation as mic is muted and video is off.

**3. How do you prepare for your online lecture/tutorial?**

Look at NUSMods for timetable, look at module outline for contents, download notes from LumiNUS, look for zoom link under Conferencing in LumiNUS and from Outlook inbox (depending on how the tutor chooses to disseminate the info).

During

**1. How are you feeling now? Why?**

Everything is under control, feeling relaxed, don't feel any pressure to participate.

Lack of social presence as camera is off for many of the participants, including the interviewee (personal activity cannot be seen/tracked by the host and other participants in the session)

**1a. What about the online lecture/tutorial went well?**

Able to enlarge the shared screen to look at the contents that are smaller (Zoom-in function).

Able to give short and quick responses using the raise hand function.

**1b. What about the online lecture/tutorial that did not go well?**

Interviewee sometimes need to unmute to ask questions as the Professor seems to be unable to see the questions asked by the students through the chat box.

Raise hand function under 'Participants' is not very accessible/ intuitive to locate.

Toggled around a few icons to locate it

After

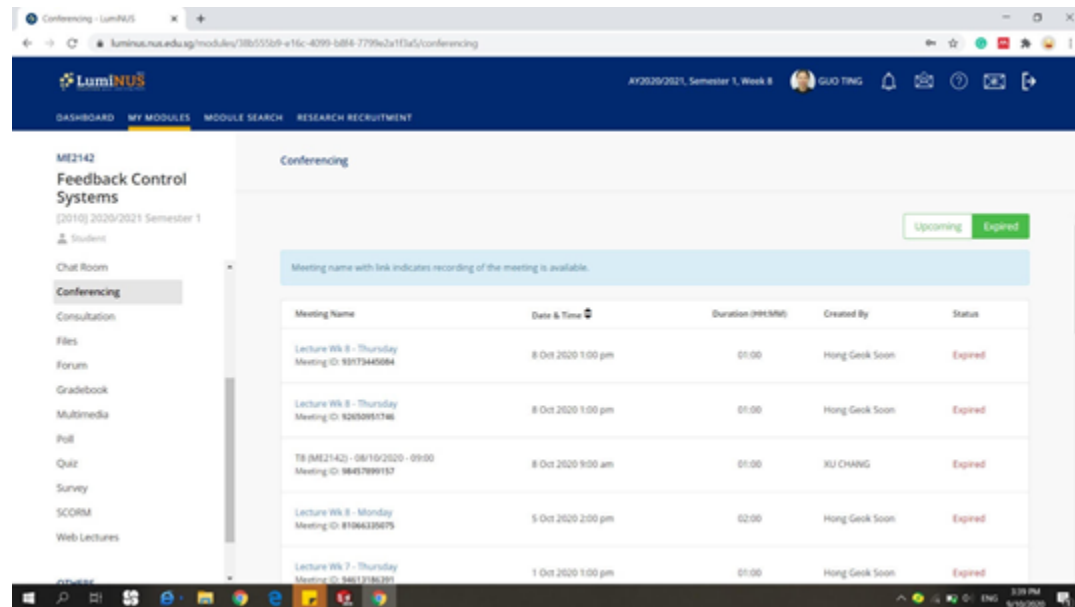
**1. How did you find the online lecture and what went well? How do you think online lectures/tutorials are different from in-person lecturers/tutorials? In what way, good or bad, please elaborate! How can it be improved?**

Online video conferencing is not as good as FTF as it is easier to get distracted due to the external environment.

**2. How do you find the procedure of performing the different tasks (like retrieving files related to lecture/finding zoom links/meeting id)? Were there any difficulties faced? How can it be improved?**

Troublesome to locate the zoom links for the different sessions as it is provided through various channels (through Outlook, LumiNUS under Conferencing). Probably sync zoom with LumiNUS so that the sessions can be seen on the homepage of Zoom.

Hard to locate recorded zoom sessions as it can be made available under Webcast, Multimedia, Conferencing (Expired). Probably can consolidate it in a single icon on the homepage of Zoom.



**3. What are some problems, hiccups or limitations you face when having an online lesson through the video conferencing system? How did yourself or the Lecturer/TA go about solving the issue? This could be a physical or emotional aspect.**

Multiple links for the same timing. Professor sent out an announcement on LumiNUS to direct students to the correct one. Probably can create a message box to remind the user (host) when they try to create more than 1 link for a single time slot.

Professor forgot to press record after the break/ breakout session. Professor gave a short recap after resuming his recording. Probably can create an option for the host to set/ select the duration to pause the record when he presses the pause button.

**Slide Deliverables**

**1. What was the main question you needed to answer about your target user group and their current practice? (based on what you want to know from the users)**

The problems, hiccups or limitations that NUS students face when planning, preparing and participating in online lessons through the video conferencing system.

## **2. What was the most important thing you discovered? (cornerstone to the project)**

Procedure of retrieving information from different sources is not very efficient as it is currently done across NUSMods, LumiNUS and Outlook (can probably sync zoom with LumiNUS so that the sessions can be seen on the homepage of Zoom).

Raise hand function under 'Participants' is not very accessible/ intuitive to locate.

Video conferencing is not as good as FTF as it is easier to get distracted due to the external environment (video conferencing system not captivating enough? Can explore colour contrast to make interface catchier?).

Students will need to log in from the school domain every time to access the Zoom session, despite being logged in in LumiNUS/ Outlook email (access not synced?)

## **3. What was the most surprising thing you discovered? (anything unexpected/ insightful/ anomaly)**

Students find it hard to locate the recorded zoom sessions as it can be made available under Webcast, Multimedia and Conferencing (Expired). Probably can consolidate it in a single icon on the homepage of Zoom.

The host is able to create multiple links for the same timing and follow-ups are done on a separate platform through the LumiNUS announcement. Probably can create message box to remind user (host) when they try to create more than 1 link for a single time slot and create notification system for users on zoom (participants who join the wrong meeting can be notified directly that they are in the wrong meeting)

Host tends to forget to resume recording after the break/ breakout session. Probably can create an option for the host to set/ select the duration to pause the record when he presses the pause button.



## Interviewer: Sean

Age: 22

Faculty: NUS FASS

### Before

1. Do you use a video conferencing platform for HBL? What video conferencing system(s) is utilized by your lecturers/TAs?
  1. Yes. Primarily Zoom.
2. How do you feel about it (HBL+Video Conferencing platform)?
  1. It's a necessity due to the current restrictions but an in-person lecture would have been better. It's also a mess seeing we have to engage with NUSmods LUMInus, Zoom and outlook in HBL. These systems are in no way integrated into each other...
3. How do you prepare for your online lecture/tutorial?
  1. Do pre-lecture and tutorial homework readings downloaded of LUMInus (it lags at times). I have my academic schedule loaded in google cal from NUSmods, however this schedule does not have the Zoom links, I sometimes have to manually add them for repeating lectures/tutorials, I mean supposing the lecturer does not change the link....
  2. LumiNUS made particularly confusing by how some lecturers and TA don't categorize their lecture/tutorial information appropriately

### Notable Contextual actions:

- Interviewee expresses frustration about how the whole HBL system is so confusing.

### During

1. How are you feeling now? Why?
  1. Mostly tired, there's a class part component in this tutorial and everyone is trying to speak. I couldn't find the right time to do so.
  2. What about the online lecture/tutorial went well?
    1. Besides that part about the class part it went okay. TA tended to monologue, maybe cos he can't really read out expressions, some students did not turn on their webcam.
    2. Most students also have this tendency..
    3. It was good I could still listen in to the lecture when away from the computer
    4. The breakout room was pretty conducive, it's been the case of most mods. Not sure why but people then to speak more easily in the breakout room as long as one person opens the conversation.

3. What about the online lecture/tutorial that did not go well?
  1. People monologue too much
  2. Feel like I'm getting half the lesson, I began to be more easily distracted
  3. Staring at a screen is strangely super tiring

Notable Contextual actions:

- Interviewee puts on TWS earphones and turns off her webcam as she pays a visit to the washroom.
- She is visibly frustrated as she unmutes herself to speak but someone speaks up first, the TA does not call on her to voice her thoughts.
- Interviewee is distracted by her phone and other distractions on her laptop.

After

1. How did you find the online lecture and what went well? How do you think online lectures/tutorials are different from in-person lecturers/tutorials? In what way, good or bad, please elaborate! How can it be improved?
  1. It's as good as it gets. In person is much more engaging and less limiting as there is a greater sense of interactions between students and lecturer/TA. But it's nice to be like looking at a person (limited by the number of screens Zoom can show) rather than looking at the back of their head, strangely more personal exp...
  2. Also I'm not sure of where to pay attention to sometimes, zoom cycles thought who's speaking too fast, sometimes I pin but I rather see who is speaking at that point.
  3. However the breakout rooms function seems to fulfil its purpose better than splitting people into groups IRL.
  4. Trying to improve communication... the lecturer/TA sometimes uses the audience actions in zoom like 'tick, cross and raise hand' it's hard to find before I was familiarized with the platform, also you have to click on the 'raise hand' icon once more to put it down, that doesn't make sense and this has confused many a TA/Prof.
  5. This class the TA pays close attention to chat and people speaking summarizing the key takeaways of the class but I imagine for larger lectures it may be hard for the TA/Lect to pay attention to the influx of messages, imp points can be lost in the flood of messages also one's.
    1. Also the chat is tied to the video conference, the messages are lost after, maybe sth like Microsoft teams there is a chat for a video conf..can be adopted?
2. How do you find the procedure of performing the different tasks (like retrieving files related to lecture/finding zoom links/meeting id)? Were there any difficulties faced? How can it be improved?

1. Mentioned before but everything is so separate and people use LUMInus differently. In the time I;ve worked before the firm used Microsoft's workplace tools, everything was integrated, conferencing sessions were automatically scheduled to the calendar after an invite with the link and relevant files included by the event organizer, we can also share files in the conference chat. I think that was pretty convenient if that can be adopted that would be great
3. What are some problems, hiccups or limitations you face when having an online lesson through the video conferencing system? How did yourself or the Lecturer/TA go about solving the issue? This could be a physical or emotional aspect.
  1. This tutorial went fine but in previous lectures, there was a point where 5 people tried speaking at once and they couldn't decide who to go first. The lecturer had to call names.
  2. Some technical difficulties are sometimes experienced, dropouts, screen share froze etc, nothing much can be done there I feel.

Notable Contextual actions:

Besides previously articulated frustrations there is a sense of wish fullness when describing how the HBL system can be a more integrated seamless one.

## Appendix C: Audience Personas

### David



"I want a fuss free video-conferencing system that facilitates my learning and productivity at home"

**Age:** 24

**Job:** Student

**School:** National University of Singapore

**Dept/Year:** Department of Architecture/4

Organized

Practical

Values Time

#### Goals

- To complete school-related tasks efficiently without any fuss
- To minimize the time taken to perform tasks, such as not having to locate zoom links from different platforms

#### Frustrations

- Troublesome to locate zoom links for the different sessions as it is provided through various channels
- Frustrated that there are multiple links for the same timing and that follow up directions are done on a separate platform instead (through LumiNUS announcement), which he is unable to map instinctively to.
- Hard to locate recorded zoom sessions as it may be found in multiple locations; under Webcast, Multimedia and Conferencing (Expired)
- Frustrating to log into the NUS domain every time to access zoom sessions despite being logged into LumiNUS through Zoom

#### Bio

David is an architecture undergraduate who is currently in his penultimate year in National University of Singapore (NUS). As someone who values his time and spends it wisely, he prefers not having to travel back and forth to school every single day for lessons. Additionally, he has a desktop at home that is capable of running the various softwares required for his designing and modelling work. Hence, he prefers to have lessons conducted in a Home Based Learning (HBL) environment, where lectures and tutorials are held remotely through video conferencing systems such as Zoom. He is therefore heavily reliant on Zoom to accommodate to his personal needs and facilitate a smooth working environment.

### Cheryl



"I want a video-conferencing system that is simple and intuitive to use. Having added features would be good as well!"

**Age:** 21

**Job:** Student

**School:** National University of Singapore

**Dept/Year:** Faculty of Arts and Social Sciences/1

Outgoing

Sociable

Organized

#### Goals

- To attend online lessons without any inconveniences, and to be able to participate actively in class without major distractions
- To use a video conferencing system that has intuitive and well placed functions

#### Frustrations

- She finds the interface of the current system confusing due to a lack of visibility of conferencing functions (such as the "Raise Hand" function). Furthermore the lack of a "help" button, tooltips and platform orientation on first launch serves to exacerbate her confusion
- She feels unengaged in tutorials/lectures due to excessive monologuing from other participants that along with a lack of structure in facilitating discussions negatively impact her ability to participate in discussions
- Being new to the video conferencing system, she often finds herself toggling between the different icons to locate the appropriate response buttons (like Raise hand function) as they were not very intuitive and quick to locate.

#### Bio

Cheryl is a first-year NUS student who is beginning her journey in FASS. Coming into an online semester, she has mixed feelings about HBL. Socially, she feels cut-off from her fellow classmates due to the lack of social interaction outside of class and feels that she is missing out on core aspects of the university experience. Despite valuing such social interactions, she appreciates the increased flexibility, convenience afforded, and time saved with HBL which allows her more time for leisure. She understands the necessity of such modes of learning but feels lost then trying to navigate the various platforms a typical NUS student uses (NUSmods, LumiNUS, etc). She wishes that the HBL learning experience could be one that is more intuitive, cohesive, and social.

## Appendix D: Statement of Informed Consent for User Testing

REMOVED

## Appendix E: User Testing Logs

### **Interviewer: Irsyad**

1. Interviewee was looking for a “files” tab after clicking on a module under the files button. I think it's probably cause student is not used to the overview layout (that is used for our module, where everything can be found under overview)
2. When asked to answer the prof’s question, the interviewee decided to just sound off using the mic, instead of using the “raise hand” button under the reactions.
3. Interviewee mentioned that when trying to share a file on the chatbox, the clip button isn’t very intuitive. He tried to look for an upload button and under the “...” button instead.
  - a. However he agrees that “drag and drop” function is a lot more convenient then having to “attach a file” via a button
4. When asked to check for his chat archive, interviewee thought of clicking the “conferencing” button instead to access the past recorded lectures.
  - a. Upon letting him know that he can click on the “telegram” button to access the chat instead, he felt that the button isn’t really very intuitive and suggests using a “text bubble” as an icon instead
5. Overall, interviewee felt that our system would make his life a lot easier as everything is more convenient when they are located under the same system
  - a. He also feels that an integrated system would reduce the chances of data getting leaked, if everything is localised under one system it's probably easier to maintain and protect the data
  - b. He asked for the functionality of the main search button on the top
  - c. He felt that the icons used on the side bar are fine, but without labels, some of them may not be very intuitive. He suggested the “labels” to appear upon hovering the mouse over the icons

### Interviewer: Weibin

- [Question 2] Under the files tab, the user was not able to immediately detect the correct section to look under. Hence, her first instinct was to press the first few sections (in chronological order) to look for the right tool.
  - Minor point: Our question also did not specify which week to look under.
- [Question 3] Minor point: Our question did not specify which lecture to look for, hence if the notification did not come out, the user did not know which lecture to press.
- [Question 4] User's first reaction was to type in the group chat when she had a question. But eventually, she realised that there was a Reactions function and made use of that.
- [Question 10] User does not know how to "clap hands" under the main chat function.

### General Pointers and Comments:

- The user generally enjoyed the process and navigation. She found our icons used to be universal enough to understand the functions of the toolbars etc.
  - She did suggest to change the "chatbox" icon because it resembles more like Telegram, and so if people do not use Telegram they might not be able to recognise the icon.
- The user appreciates the compilation of the various platforms into one larger interface. She also suggested that the "announcement" page can input those tasks or upcoming deadlines that we see on our LumiNUS home page because she heavily relies on that for reminders.
- The user also enquired about the functionalities of the chat -- while she recognizes that being able to save it now becomes a lot easier, she also wonders if those messages being sent privately to other people would be saved in the main chat.

**Interviewer: Xin Rong**

Interviewee: Guo Ting, Y3 Mechanical Engineering undergraduate

Main problems identified in the prototype

- Interviewee hesitated for a moment after she was tasked to upload the document into the chat. Upon asking why she hesitated, she was looking for an upload button in the chat and upon second thought she realised that that can be done by sending an attachment to the chat. (Unable to bridge the gulf of execution, probably can use an upload icon instead?)
- When asked to locate the conferencing links manually, the interviewee clicked on the files tab before clicking on the video conferencing tab. She said that she thought that the video conferencing tab is for creating a zoom session and see the video conferencing link as “learning resources” that’s why she looked under the folder tab.
- It took her a few seconds to locate the conferencing link for the lecture slot for NM3240. She spoke that the conferencing page looks a little cluttered and looks quite confusing with multiple codes starting with “NM”. She mentioned that the links can probably be better structured into tabs for the various modules.

## Interviewer: Sean

### List of Tasks

1. You've finally got a module you've appealed for (GES1021) please adjust your calendar to include the new lecture slot, GEH1021 LEC [1].
  - a. Goal: Calendar successfully modified.
    - i. Participant actions: Demonstrated competency in this task went to the calendar icon, typed in the relevant module code and added GEH1021 LEC [1] to their calendar.
2. You are preparing for an upcoming online lesson later today. The lesson would require you to retrieve the assigned reading from the system named "NM2213- Reading 1: What is Interaction Studies?".
  - a. Goal A: Participant to locate and download files/readings/slides for class from the files tab
  - b. Goal B: user search function to locate files
    - i. Participant actions: User opted for this line of action instead, likely to have taken less time than navigating the various panes in the 'files' folder.
3. You receive a notification that the lecture is starting, please join your lecture!
  - a. Goal A: Join lecture with notification
    - i. Participant actions: User used the notification to join the lecture when it popped up.
  - b. Goal B: Join lecture through conferencing screen
    - i. Note: Participant noted that Conferencing screen would be useful as an alternative means to locate conferencing details if the notification does not show up.
    - ii. Participant also question how updated this details will be (i.e. if lecturer is to change the conferencing link etc.)
4. Professor calls for comments, time to get that class participation down! / You have a question for the prof!
  - a. Goal: Use reaction: Hand raise
    - i. Participant actions: Participant did not immediately locate hand raise function under the reaction button. (Visibility of this action could be made clearer). Participant had no issues recognizing raise hand function once it is revealed via click/mouseover reactions button.
5. You are now required to share your screen with the powerpoint and present your findings from the readings assigned.
  - a. Goal: Use the screen share function and select the appropriate screen to share
    - i. Participant actions: Participant did not immediately locate share screen function (Cited that he was looking for an icon), but located it shortly after (could use familiar icons and colours for easy identification).



- ii. Participant initially clicked on the wrong screen and shared the screen of Netflix. After hastily correcting his actions he instead shared his desktop screen and had to open the powerpoint screen separately to ensure that his was sharing the correct screen. (Suggestion to differentiate each screen more clearly with possible categorization of apps (Entertainment/productivity/....)?)
- 6. You need to upload a document into the chat for the class to see.
  - a. Goal: Upload a document into the chat.
    - i. Participant actions: Clicked on the 'attachment' icon to upload a file. Suggested to enable a drag and drop feature (Suggestion make the drag and drop feature more visible by including this functionally as a message in the chatbox. 'To being type a message or drag and drop a file to send it!')
- 7. Your Prof has shared a document in the chat, and you need to download it for reference.
  - a. Goal: Download document sent in the chat.
    - i. Participant actions: Participant has no issue downloading uploaded document, download button was clearly visible.
- 8. You have forgotten some details that are covered in the discussion over the chat during the session. Backtrack the chat log by accessing the in-built chat function located in the toolbar on the left hand side of the interface.
  - a. Goal: Go to the main chat function.
    - i. Participant actions: Participant expressed appreciation that the chat history from the call is easily accessible through the always-present chat for the lecture. Highlighted convenience for having every function on one platform.
- 9. Lecture has ended, and everyone is thanking the Prof.
  - a. Goal: Use reaction: Clap Hands OR Use chat function: Type in a "thank you" message
    - i. Participant actions: Performed action but noted applause action was not very visible (change applause icon?)

#### Participant comments:

Felt that the overall concept of the app made sense but found the exceedingly manual means of conducting user testing very jarring (tester had to manipulate the app to act in a desired way after receiving user functions), the Wizard of Oz methodology was too visible and may have interfered with a user's train of thought.

Noted that the video conferencing screen looked quite unpolished and in a sense not reflective of a lecture as a lecture will have more than three participants. Added that the design should leverage learned actions and already recognized icons to aid in transference of user habits.