*ECS661U*

*User Experience Design*

*Coursework 2:*

*Re-designing Higher Education Technology*

*Varnika Vaid*

Part 1: Conceptual Design

During the ethnographic study, I found several issues the students had with lecture recordings due to QReview. These included  
a) Unavailable recordings due to a lack of QReview in every classroom.  
b) Concepts written on whiteboards being hard to interpret due to handwriting size.  
c) Interrupted recordings due to not noticing the cameras disconnecting till too late.  
d) Unclear Audio in recordings due to professors walking away from stationary mics.  
e) Inaccurate Transcripts due to QReview’s software, Echo365.  
To solve these issues, I have designed an enhanced system that improves the professor’s ability to record lectures, this being the user activity, thereby improving lecture recordings. The system is called ReLive.

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Description automatically generatedEvery device of the ReLive System will be available in every classroom, thus solving issue a). To solve issue b), the ReLive System will begin by utilizing ReLive Cameras.

**Figure 1.1.** ReLive Camera Front View

The Cameras have a Zoom Lens, allowing the Cameras to zoom in and out on whiteboards. Different size rooms will contain different quantities of Cameras, with a maximum of 3 for the largest rooms.

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**Figure 1.3.** Large Rooms ReLive Cameras

**Figure 1.2.** Small Room ReLive Camera

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Description automatically generatedTo control the ReLive Cameras and utilise their features, the professor will use the ReLive Wristwatch. Both the Camera and Wristwatch are Bluetooth Compatible, allowing the latter to automatically connect to and control the former. The recording commences when the Camera is turned on and ends when it is turned off. The Wristwatch is touch-operated, thus using touch input. The process to use the ReLive Wristwatch alongside the Cameras to solve issue b) has been explained in **Figures 2.1** to **2.4**.

**Figure 2.3.**  
ReLive Wristwatch “Camera Settings” and “Zoom Settings" Mode

**Figure 2.2.**  
ReLive Wristwatch “Camera Selection” and “Camera Settings" Mode

**Figure 2.1.**  
ReLive Wristwatch “Pin-Code” Mode

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**Figure 2.4.**  
ReLive Wristwatch “Return” and “Battery" Icons

When the Wristwatch connects to the Camera through Bluetooth, it will detect the amount of them in the room and display that many in the “Camera Selection” mode. If there are multiple Cameras, Camera 1 will always be the Camera on the leftmost side from the Professor’s perspective and Camera 3 on the rightmost.

A solution to issue c) is the ReLive Wristwatch’s notification system. The first facet of this is the visual notifications on its screen, which use visual outputs, the main examples of which can be seen in **Figure 2.5.**

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**Figure 2.5.**  
ReLive Wristwatch Visual Notifications

The second facet of the ReLive Wristwatch’s notification system is its haptic and audio notifications. The Wristwatch contains a vibrating motor and beeper, which activate when a notification occurs, thereby alerting the professor and causing them to look at the Wristwatch to read the notification. The beeper is audible only to the professor and so will not resemble other notification systems such as a fire alarm. It is also not loud enough to feature in recordings, which would disrupt the experience.

The ReLive Wristwatch is also accessible to visually impaired professors, through the “Voice-Over Mode”, which uses touch inputs through its screen and buttons, and audio outputs through its speaker, as explained in **Figure 2.6.**

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**Figure 2.6.**  
ReLive Wristwatch Back View

When in “Voice-Over” mode, the Wristwatch provides the visual notifications in **Figure 2.5** alongside audio notifications. To begin with, the haptic and audio notifications from the beeper will activate. This is further beneficial should the notifications occur whilst someone is talking i.e., the professor or the class. Once the professor is alerted, they tap the notification in the centre of the screen and take the necessary steps, such as turning the camera back on.

To solve issues d) and e), the ReLive System utilises the ReLive Headset. It uses touch inputs through its buttons and visual and haptic outputs through its vibrating motor and green indicator light, as explained in **Figures 3.1** and **3.2**, alongside its other features.

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**Figure 3.2.**  
ReLive Headset Side-View 2

**Figure 3.1.**  
ReLive Headset Side-View 1

The recording commences when the Headset is turned on and ends when turned off. By being a wearable device, the Headset is an effective solution to issue d), as the constant proximity of the Mic to the professor prevents any information from being unheard.

The ReLive System includes a Tutorial Pamphlet, located on the professor’s desk in every classroom, compared to QReview, which has an explanation pamphlet on the door, which is easy to miss. The pamphlet explains the complete logistics and details of the system, which Camera is Camera 1 in a large room, as well as the instructions on how to use each ReLive device. A digital version will also be available via a QR Code, alongside options for Visually Impaired Professors, such as a Braille Pamphlet and an audio recording of the explanation available via a 2nd QR Code. Thus, the ReLive System solves the issues students had with lecture recordings due to QReview effectively.

The ReLive System is an effective Multimodal system as it supports communications through multiple modes and modalities.[[1]](#footnote-1) These communications take the form of 2 interactions, those being public, when the professor is recording the lecture whilst communicating with a classroom, and private, when the professor is recording thus communicating with a single student. The ReLive System is designed to enhance private interactions, subsequently improving public interactions. The process to enable private interactions begins with multiple input modalities. The first input modality is “speech”, utilised by the mode of the Headset. The ReLive System is system-oriented, meaning it can extract and convey meaning automatically.[[2]](#footnote-2) This occurs through the mode of the Headset, which extracts meaning from the input modality of “speech” and conveys it into the second input modality of “text”. The final input modalities are “gestures”, “writing” and “movement” through the mode of the Cameras. The input modalities are then processed through multimodal input integration using fusion. The central processing occurs, converting the input modalities into the application of a lecture recording. When accessed by the student, it is processed through multimodal output distribution using fission and converted into the output modalities of “video”, “audio” and “text”, thereby enabling private interaction.

The ReLive System utilises a level of Ubiquitous computing, as the professor interacts with multiple computers, the Cameras and Wristwatch, which are, albeit not invisibly, embedded in the environment of the classroom and wirelessly communicating with each other.[[3]](#footnote-3) However, the System is not pervasive as the professor is able to switch off all devices after use. The system also utilises Mobile and Wearable Computing, through the Headset and Wristwatch, as they move during use and are worn by the professor.[[4]](#footnote-4)

The ReLive System design is aesthetically pleasing, due to its colourful devices, and modern, with its devices resembling other modern devices such as the Apple Watch. The System improves the social aspect of the activity of recording lectures since the Mic enables both the live and recording audience to better hear the professor whilst the Camera allows the recorded audience to better see the concepts written by the professor. It is also more entertaining for both audiences to see the professor uses different devices, thus making the lecture more appealing. The system is also relatively private, as the Wristwatch and Camera are only accessible through the Pin-Code. The System is also private for both audiences as only authorised students can access both versions of the lectures.

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Part 2: Analysis

In traditional cognitive models, such as the HCI model, the focus is primarily on perception, memory, and processing within the human mind.[[5]](#footnote-5) However, developments have been made for a model which has the goal of both aiding human cognition and reducing cognitive load; the Distributed Cognition model.[[6]](#footnote-6) The DC model functions on the idea that systems larger than an individual have cognitive properties in their own right that cannot be reduced to the cognitive properties of individual persons[[7]](#footnote-7). The DC model can thus be used to analyse the design of any system by considering its’ unit of analysis, memory representations, information flows and processing. As such I will conduct a DC Analysis for the ReLive System.

The first step in DC Analysis is to define the unit of analysis. The unit of analysis includes the people, artefacts and environment needed to perform the tasks of the system.[[8]](#footnote-8) The unit of analysis for the ReLive System thus includes the Professor, who is the primary user, the Students watching live, the Student watching the recording, the ReLive Cameras, the ReLive Wristwatch, the Professor’s Email, the ReLive Headset, the Tutorial Pamphlet and all its versions, the Classroom Whiteboard, the Classroom and QMPlus.

The second step in DC Analysis is to define memory representations. These are both internal and external representations of memory which must be remembered to perform the tasks of the system.[[9]](#footnote-9) The different memory representations, both internal and external, can be seen in **Figure 4.1** and **Figure 4.2.**

|  |  |
| --- | --- |
| **Internal (Professor’s mind)** | **External** |
| 1. Checking the Tutorial Pamphlet for the ReLive Devices’ Instructions. | 1. The ReLive Devices’ Instructions on The Tutorial Pamphlet. |
| 2. Email account login details for the Pin-Code. | 2. The Pin-Code in the Professor’s Email. |
| 3. Switching all ReLive devices on at the start of the Lecture. | 3. Camera On/Off displayed by the Green Indicator Light on the ReLive Camera. |
| 4. Adjusting the ReLive Headset to an appropriate Volume. | 4. Key Concepts displayed on the Whiteboard during the Lecture. |
| 5. Knowledge of appropriate moments to zoom onto the classroom Whiteboard. | 5. Various Notifications are displayed on the screen of the ReLive Wristwatch. |
| 6. Knowledge of appropriate response to each notification from the ReLive Wristwatch and ReLive Headset. | 6. Various Notifications are provided by the Green Indicator Light, Vibrating Motor and Beeper on the ReLive Headset. |
| 7. Switching all ReLive devices off at the end of the Lecture. | 7. The Complete Lecture Recording on QMPlus for the recording audience. |

Diagram

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**Figure 4.2.**  
Memory Representations Diagram

**Figure 4.1.**  
Memory Representations Table

The third step in DC Analysis is to define information flows. This essentially details how the memory representations are propagated, or in more simple terms, what information and how it flows between memory representations and the system to perform the tasks of the system.[[10]](#footnote-10) In the ReLive System, this is as follows;

1. The Professor receives the ReLive Devices’ instructions either using visual outputs through the physical or digital Tutorial Pamphlet, using touch outputs through the physical Braille Pamphlet, or using audio outputs through the Digital Audio Recording.
2. The Professor inputs login details for their email account using touch inputs through the keyboard.
3. The Professor receives the Pin-Code for the ReLive Wristwatch using visual outputs from the computer screen.
4. The Professor inputs the Pin-Code into the ReLive Wristwatch using touch inputs through the screen.
5. The Professor receives Notifications of the Camera turning on using Visual outputs from the Green Indicator Lights of the ReLive Camera
6. The Wristwatch receives Notifications from the Cameras via Bluetooth.
7. The Professor receives Notifications of the Recording Commencing, Battery Low or Camera Disconnecting using visual outputs, from the screen, audio outputs, from the speaker or beeper, and haptic outputs, from the vibrating motor.
8. The Professor receives Notifications of the Headset turning on, Recording Commencing or Battery Low using visual outputs, from the Green Indicator Light, and haptic outputs, using the vibrating motor.
9. The Professor gives Key concepts of the Lecture using the visual output and text outputs, from the Whiteboard, and audio output, using the Headset.
10. The Professor records Key concepts of the Lecture using visual inputs, from the Wristwatch zooming the Cameras on the Whiteboard, and audio and text outputs from the Headset.
11. Diagram

    Description automatically generatedThe Lecture Recording is received by the QMPlus Student using visual output, text output and audio outputs.

**Figure 5.1.**  
Information Flow Diagram

The final step in DC Analysis is to define processing. This is how the memory representations are then transformed or computed, which can be both internal and external, to perform the tasks of the system.[[11]](#footnote-11)

In the ReLive System, Internal Computation is as follows:

* The Professor must determine the best form of Tutorial Pamphlet to understand the devices.
* The Professor must determine which Camera must be zoomed in based on the location they’ve written the Concepts.
* The Professor must determine how best to explain the concepts to the student.
* The Professor must calculate how fast they must teach if the Headset or Wristwatch have a low battery.

In the ReLive System, External Computation is as follows:

* The Headset must interpret the speech input and convert it to text.
* The Wristwatch must interpret which Camera the Professor has selected and which Zoom level they’ve selected.
* The Wristwatch must interpret which option a Visually Impaired Professor has selected in “Voice-Over” mode after double-tapping.

After conducting the DC Analysis, I realised that the information flow could be interrupted by the devices, if not left to charge properly overnight, turn off midway, especially if lectures are done consecutively for multiple subjects. As such, solutions must be found. In terms of the Wristwatch, it can be placed on the table to charge and still remain functional to control the Cameras and receive notifications. The professor must stay aware of any notifications so must stay near enough to it that they can see or hear the notifications. In terms of the Headset, it can come with a battery pack that connects to the Headset, which the Professor can carry around whilst giving the lecture.

Whilst a DC Analysis allows us to see how the memory and information are processed within the ReLive System, it can often be too focused on the artefacts. As such, an analysis which focuses on the human subjects and their motivations could provide further insight into the ReLive System. This could be done using Activity Theory Analysis.

If I were to do an AT Analysis, I would first identify the basic model, which would be as follows:

**Activity:** Record a Lecture effectively using the ReLive Devices.  
**Actions:** Control the Devices and Change Settings Using the Devices.  
**Operations:** Touching the Wristwatch Screen, Pressing Buttons on the Wristwatch, Speaking into the Headset and Pressing Buttons on the Headset.

Diagram

Description automatically generatedThe next stage would be to create an AT diagram, as follows:

**Figure 6.1.**  
Activity Theory Diagram

I would then discuss the potential contradictions based on the diagram of this analysis. Some primary contradictions could be that the professor lacks the knowledge for the activity or that the devices malfunction. Some secondary contradictions could be that the professor’s desire for a good lecture recording may preoccupy the professor, adversely affecting the lecture, or that the professor is unable to use the devices due to not reading the pamphlet or not receiving the email.

This shows that whilst the DC Analysis gave feedback regarding the artefacts of the ReLive System, an AT Analysis could provide critical feedback for human users and their relationship with the ReLive System which would not be seen during the DC Analysis.

**Word Count:** 1115

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1. L. Nigay and J. Coutaz, *A Design Space for Multimodal Systems: Concurrent Processing and Data Fusion*, (1993), p.172. [↑](#footnote-ref-1)
2. *Ibid.*, p.172. [↑](#footnote-ref-2)
3. B. J. Rhodes et al., *Wearable Computing Meets Ubiquitous Computing: Reaping the best of both worlds*, (1999), p.1. [↑](#footnote-ref-3)
4. C. J. Ford, *Ubiquitous Technology: Lecture Slides*, QMPlus, (2023), p.13. [↑](#footnote-ref-4)
5. C. J. Ford, *Distributed Cognition: Lecture Slides*, QMPlus, (2023), p.16. [↑](#footnote-ref-5)
6. J. Preece et al., *Interaction Design: Beyond Human-Computer Interaction*, (2019), p.98. [↑](#footnote-ref-6)
7. E. Hutchins, *Cognition in the Wild*, (1995), p.226. [↑](#footnote-ref-7)
8. Ford, *Distributed Cognition*, p.19. [↑](#footnote-ref-8)
9. *Ibid*., p.19. [↑](#footnote-ref-9)
10. *Ibid*.p19. [↑](#footnote-ref-10)
11. *Ibid.,* p.19. [↑](#footnote-ref-11)