Prospectus

Class Scribe: A Modern Approach to Note-taking
(Technical Topic)

User Configuration of Microsoft Xbox One/Kinect
(STS Topic)

By

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October 31st 2019

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On my honor as a University student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments.

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Introduction

Today's college lecture halls are a healthy mix of note-taking during verbal lecture, collaborative projects, exams, and hands-on interactive experiences. These pillars of learning have and will continue to exist for centuries, and the digital revolution has mostly transitioned each pillar into the 21st century without contention, except for note-taking, which remains a fragmented aspect of the educative experience. This is because students are choosing different methods for taking notes (Morehead et al., 2019) when one size may in fact fit all.

Collaboration in person has seamlessly been replicated via video calls, group chats, and file sharing systems. Examinations can be delivered through a digital medium with no loss of assessment. Hands-on experience in the physical sense can be inexpensively and effectively replicated via a digital medium as well, as is prevalent in the heavy use of simulation software in lab settings. Note-taking is one element of the class which, depending on the choice of the student, varies wildly in functionality and effectiveness. This is because there are several, differing options available to the student. Among them are tablets, laptops, smart pens/ notebooks, and traditional pen and paper. Within the first two options lies a plethora of software, each with different philosophies regarding the art of note-taking, resulting in more fragmentation (Summers, 2019). In the case of the laptop, it is even reported that more usage positively correlated with lower class performance ("Laptop use in classrooms", n.d.).

Focusing only on the technical project would ignore the social aspects of the problem that need to be addressed for such a device to be implemented and succeed. As the problem is socio-technical in nature, it requires a solution that attends to both technical and social aspects. Otherwise, such a device would be subject to the same fate as those it competes with: a mere

option among many rather than the status quo. Through development of an overhead paper note scanner that can also record and transcribe lecture audio, we are able to produce a technical solution that blends the power of digital note-taking with the retention and familiarity of physical note-taking without any distractions. After achieving understanding of the concerns, habits, and preferences of our target users, we configure the idea of a student that must be taken into account when designing technology for that student. Failure to do so when developing a student-oriented note-taking solution would result in a device that falls short of their specific and strict needs.

Below I outline a technical process for the development of this device and utilize the STS framework of user configuration to analyze how the Microsoft Kinect/Xbox bundle failed due to the company's misunderstood configuration of the idea of its customers.

Technical Problem

Development of the overhead paper note scanner, which I will refer to as "Lamp" in this document, begins with recognizing the weaknesses of the competing note-taking utilities and incorporating solutions to them. Pen/paper note-taking is prone to missing minute details and nuanced info in favor of summarization due to the relative slowness of handwriting; tablets lack the zero input lag of physical note-taking while introducing distractions (Paul, 2013); laptops by virtue of allowing incredibly fast input push students to transcribe a lecture rather than retain information (Staff & Doubek, 2016) and also distract neighboring peers (Sana, Weston, & Cepeda, 2012) in the attempt to multitask (Mueller & Oppenheimer, 2014); and smartpens limit users to using certain paper and pen types. There is no clear winner in terms of the best method for note-taking, with shortcomings present in each method alongside any benefits.

Lamp looks to solve these shortcomings in various ways. Through a camera positioned in the head of the Lamp, student notes are constantly photographed throughout lecture. A far-field microphone acts as a lecture recorder, with the audio later transcribed into searchable text for later review. These are the basic pillars of this technology: capture, record, and digitize.

The on-board Raspberry Pi (a form of computer) collates these inputs and uploads them to a server accessible via a web application by the student later when studying their notes. This web app automatically organizes student notes by classroom and chronology, shows the transcribed audio associated with each lecture, and even displays a history of each page, allowing students to scroll through and see what was being said exactly by the professor at the time of writing a certain sentence or drawing a stroke on the paper.

It is of utmost importance that the experience of using Lamp is invisible to the user beyond logging into it to identify who they are (a process done by a near field radio frequency scanner on-board that reads the student ID card). We strongly believe the actual act of learning within a classroom should be free of distraction and extraneous tasks non-essential to the process of learning itself. The classroom is a place of absorption and initial exposure, a critical foundation that later is expanded on via the explicit use of digital supplements that go beyond pen and paper. The forcefulness of handwriting combined with the assurance that the lecture audio is being kept offers a clear advantage over keyboard note-taking, where a compromise is made to copy everything, harming long term memory retention (Paul, 2013). There is no behavioral change to adapt to the technology, and no friction in any process (such as a start or stop button to record, a next page button to scan, batteries to charge, or a Facebook tab one click away).

As a minimum viable product, we will produce one working lamp and a companion web app. The following are our requirements in the form of user stories:

- As a student, I will be able to sign up for a Class Scribe account through the web app
- As a student, I will be able to enroll my ID to my Class Scribe account through Lamp
- As a student, I will be able to sign into my Class Scribe account on Lamp (after ID enrollment) and on the web app
- As a student, once I sign into Lamp I will have it scan my notes and record the lecture audio around me
- As a student, I will be able to see my scanned notes on the web app, hear lecture audio, and read the transcription of that audio
- As an administrator, I will be able to assign a class, classroom, meeting time, and lamp serial number through the web app

STS Problem

Launched in 2013, the Microsoft Kinect for Xbox One was positioned as the future of human-computer interactions in the home entertainment sphere (Hollister, 2013). Packed with features such as fast voice controls, hand gesture control, facial recognition, heartbeat detection, infrared TV remote control, and the ability to see in complete darkness, there was no shortage of use-cases Microsoft envisioned for the device, with an extensive strategy for developers to fill in gaps they left behind (Nelson, 2013). Despite selling one million units in the first 24 hours (Kain, 2013), the Xbox One's Kinect is considered a failure evident by Microsoft's complete

discontinuation of the product (Henry, 2017) and removal of support for it on the newer Xbox models (Madan, 2018).

The most widely understood reasons for Kinect's failure are often stated to be the price, privacy concerns, and lack of widespread game-support (Swider, 2014). While these are all valid and sensible, I believe that this view that the Kinect itself was flawed as a product is an incomplete analysis of its failure. When viewing Kinect through the science, technology, and society (STS) concept of user configuration, where designers define the identity of supposed users (Oudshoorn & Pinch, 2003, p.6), it becomes clear that Microsoft developed the Kinect for a different user than the one it had to sell to.

In this case, Microsoft envisioned the Kinect to be an always-on center of your living room experience acting as the gateway to movies, television, gaming, and social internet experiences (Xbox Wire Staff, 2013). The designers assumed that customers of Xbox, predominantly a brand centered exclusively around gaming, would be interested in a device that would oversee their entire home entertainment experience, through voice controls and integrations into their TV and smart devices. Microsoft's demotion of their voice assistant as the default on Xbox in early 2019 appears as evidence that active usage of the feature was minuscule enough to warrant its removal, another sign that it misunderstood its users (Kaser, 2019).

The type of user that the Kinect was configured for was one that appreciated the ease of a unified technological ecosystem in their home, open to voice controls despite privacy concerns, and did not object to a technology giant attempting to control every aspect of their entertainment experience if it meant there were clear user-facing benefits in their approach. Disregarding user configuration when analyzing the Kinect would lead one to believe it failed only due to the

mistakes that Microsoft implicitly acknowledged by rectifying them by unbundling it from the Xbox and removing mandatory always-on connectivity (Schreier, 2013).

Through the lens of user configuration, it becomes clear that the Kinect failed because the user identity it was designed in mind with was an entirely different user from the one it marketed to. Moreover, the lack of user configuration in the analysis of Kinect would lead one to entirely dismiss the technical aspect of the project that made its way into the wildly successful Amazon Echo devices. This is a family of products launched only a year after the Kinect and as of early 2019 have sold 100 million units (Matney, 2019). The key to the Echo's success here compared to the Kinect, both products that boast similar voice controlled home ecosystem technologies, is proper user configuration. I argue that without this understanding of user identity, it would remain mysterious why one technical solution failed when another in a similar vein has enjoyed unprecedented success, highlighting the importance of understanding the target user configuration and designing a technical solution with that understanding front and center.

Conclusion

Our work sits at the intersection of technology and education. Through the development of Lamp, a note-scanning audio-recording technology, we plan to achieve the best possible note-taking flow possible, taking favorable aspects of the very technologies it serves to supersede and doing away with the flaws. A technical solution is meaningless in the vacuum of its existence, which is why developing a stringent user configuration to enable easy adoption and acceptance is necessary. Analysis through user configuration of why Microsoft's Kinect failed helps deepen understanding of how certain products are mismatched with the customers they are marketed to,

ultimately leading in their failure despite being technically forward-thinking and potentially impactful.

This understanding of the social problem of mismatched user configuration combined with our technical project should enable us to build a solution that is welcomed, accepted, widely used, and effortlessly adopted. To achieve our maximum learning potential as individuals, it is important to evolve with the times and technologies, a philosophy we have heeded in every other aspect of our lives. However, we have fallen short with evolving education for our students, the individuals that eventually advance onwards and build the society that becomes the future we all inevitably head towards.

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Word Count: 1900