

Undergraduate Thesis Prospectus

**Class Scribe: A Modern Approach to Note-Taking**

(technical research project in Computer Science)

**Tech Companies' Response to Tech Addiction Critics**

(STS research project)

by

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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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## **General Research Problem**

*How can dependence on mobile devices be reduced?* About 82% of Americans now own smartphones (Pew Research, 2019); American smartphone users spend an average of 3 hours and 10 minutes on their device each day, a 9-minute increase from 2018 (Wurmser, 2019). The rise in device usage makes it imperative that we consider the risks of overuse. Mobile device overuse is associated with mental health conditions such as depression, ocular diseases, musculoskeletal problems, and dysfunctions in daily life (Ding & Li, 2017). In 14% of fatal distracted driving crashes, mobile phone use was implicated (NCSA, 2018). Excessive mobile device usage is a hazard to users and those around them.

## **Class Scribe: A modern approach to note taking**

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 smart pens 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

### **Tech companies' response to tech addiction critics**

*How are tech companies responding to accusations that they exploit tech addiction?*

Former tech employees have exposed addictive software design practices by US tech companies. In a 2016 poll, Common Sense Media found that 50% of teenagers felt addicted to their mobile devices, while 59% of parents felt that their children were addicted (CSM, 2016).

Some experts attribute overuse of technology to an underlying condition, such as anxiety, depression or attention deficit disorder (Ladika, 2018). Others suggest app developers apply psychology to increase usage. Montag et al. (2019) linked application elements to “classic psychological/economic theories such as the mere-exposure effect, endowment effect, and Zeigarnik effect, but also to psychological mechanisms triggering social comparison.”

Major participants include tech companies, former tech employees, the Center for Humane Technology, the Campaign for a Commercial-Free Childhood, and Stanford Students Against Addictive Devices. To protect their business, tech companies respond to public perceptions that they exploit users through tech addiction. At the Google I/O conference in 2018, Google CEO Sundar Pichai said “It’s clear technology can be a positive force, but it’s equally clear that we can’t just be wide-eyed at the innovations technology creates” (Coren, 2018). He then introduced Google’s Digital Wellbeing software, which is to curb excessive device use. Tech companies’ initiatives to fight tech overuse deflect attention from their practices that promote tech overuse.

Critics of tech companies include some former tech employees who exposed exploitive software design practices. In an interview with Axios, former Facebook president Sean Parker claimed Facebook was deliberately “exploiting a vulnerability in human psychology” (Allen, 2017). Another critic of tech companies, The Center for Humane Technology, is a nonprofit that favors enforceable standards in software design. Tristan Harris, the founder of the nonprofit, demands “new ratings, new criteria, new design standards, new certification standards” to prevent addictive software design (Bosker, 2017).

The Campaign for a Commercial-Free Childhood, a nonprofit advocacy, opposes child-targeted marketing, and seeks to reduce the time children spend on phones. In a letter to the American Psychological Association, more than 50 psychologists representing the organization claimed “These techniques employed without children’s or their parents’ knowledge or consent increase kids’ overuse of digital devices, resulting in risks to their health and well-being” (Anderson et al., 2018). Stanford Students Against Addictive Devices is a student-led group that is pressuring tech companies to introduce mobile device features that would combat technology

overuse and their addictive design principles. The group says: “iPhones are our gateway to addictive services, so Apple is uniquely capable of helping us curb our dependence,” arguing that the company has failed “to take common sense steps to address the issue” (SSAAD, 2019).

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