

Enhancing Accessibility of Electronic Theses and Dissertations

Introduction

Old Dominion University, in cooperation with the University Libraries at Virginia Tech (VT), requests a 1-year \$127,231 planning grant from the National Leadership Grants for Libraries program to support the exploratory phase of enhancing the accessibility of electronic theses and dissertations (ETDs) for blind and low-vision (BLV) library users. This planning project supports *Goal 3: Improve ability to provide broad access*, and aligns with the *Objective 3.1: Advance digital inclusion*. The limited accessibility of present ETDs pose a significant barrier to BLV users' academic and professional pursuits, hindering their ability to engage with scholarly research and contribute to their respective fields. Towards addressing this issue, in this planning project, we will conduct exploratory user study with diverse BLV participant groups to uncover in-depth: (i) the exact nature of accessibility barriers faced by BLV users when they interact with ETDs; (ii) the interaction behavior and strategies of BLV users in ETDs; and (iii) the BLV users' needs and preferences regarding ETDs. An advisory board of accessibility experts from both universities' educational accessibility offices and non-profit organizations such as the Lighthouse Guild and the National Federation of the Blind will guide the design, recruitment, and ethical conduction of the study. The study data will be analyzed to produce: (i) accessibility guidelines tailored for ETDs; and (ii) design requirements for future assistive technologies to increase accessibility of ETDs.

Project Justification

It is estimated that there are 253 million people with visual impairments worldwide, including 36 million people who are blind (NIH). In the United States alone, there are approximately 32.2 million adults with vision loss (AFB). Blind and low vision (BLV) people are attending college at higher rates than ever before, yet their academic achievements are not comparable to those of their peers without disabilities (Schuck et al., 2019). A contributing factor to this discrepancy in academic outcomes is the limited accessibility and usability of digital learning resources including complex scholarly articles such as ETDs. As higher education attainment is known to significantly improve employment outcomes for blind and low vision people (McDonnal and Tatch, 2021), it is important for BLV people to be able to engage in scholarly activities with the same ease and efficiency as their peers without disabilities. Therefore, there is a need to improve the accessibility and usability of scholarly digital content such as ETDs.

Addressing this need will first require an understanding of the present experience of BLV users with ETDs, the exact underlying accessibility/usability issues, and the user preferences and needs regarding potential solutions. The planning grant will therefore be used to fund this preliminary investigation whose outcomes will help inform the design and development of future assistive technology solutions to improve accessibility of scholarly content. The project activities and outcomes will therefore contribute towards improving the ability of libraries and archives to provide broad access to its information (Goal 3). The project specifically targets digital inclusion (Objective 3.1), by promoting equitable access to digital scholarly content in libraries for BLV users.

Project Work Plan

The plan will consist of the following sequence of three major activities:

User study planning (3 months). This activity will include planning the study design (e.g., within-subject vs. between subjects, contextual inquiry vs. usability analysis), apparatus, conditions or treatments, representative study tasks, selection of library ETDs for tasks, experiment procedure, subjective interview questionnaires, objective metrics, and data analysis methods. These planning tasks will be done in close consultation with accessibility experts from both ODU's and VT's internal educational accessibility offices, as well as with experts from external non-profit organizations such as The National Federation of the Blind and The Lighthouse Guild, NY.

User study with BLV participants (6 months). After finalizing the setup of the study, a diverse group of up to 100 BLV persons will be recruited over the next six months to participate in the study, again with the assistance of internal and external organizations. IRB approval will be obtained to conduct the study. The study will be conducted in person; however, the study location may vary throughout the six months to accommodate partici-

pants' preferences and availability. The primary location of the study will be at ODU Libraries; however, we will also make two trips each to the National Federation of the Blind and Lighthouse Guild to accommodate BLV participants in the Baltimore-Washington and NY/NJ/CT tristate areas.

Data Analysis and Reporting (3 months). The objective metrics collected will be analyzed using both descriptive and inferential statistics. Subjective data will be analyzed using both natural language processing and qualitative analysis methods. Specifically, we will use grounding theory-based open-coding and axial-coding methods to iteratively go over the qualitative data and uncover BLV users' pain points, user behavior patterns, user needs and preferences, etc. The team will then use the study findings to design accessibility/usability guidelines for ETD, and also interface design requirements for future accessibility solutions.

The collaborative efforts of the five co-PIs (Dr. Vikas Ashok (ODU, Computer Science), Mr. William Ingram (Associate Dean and Executive Director for IT in the VT University Libraries), Dr. Jian Wu (ODU, Computer Science), Dr. Sampath Jayarathna (ODU, Computer Science), and Ms. Tonia Graves (ODU, Librarian), in this grant proposal bring together a diverse range of expertise, contributing to the strength and comprehensiveness of the project. Dr. Ashok's expertise is in accessible computing, and he will be in charge of supervising all the project activities. He will also closely supervise a graduate research assistant who will conduct the study and collect data. Mr. Ingram and Ms. Graves will jointly lead the study planning activity, leveraging their deep knowledge of digital libraries and ETD management. Dr. Wu's expertise is in natural language processing and content analysis, and he will be in charge of conducting the qualitative analysis of subjective data from participants. Dr. Jayarathna will supervise the analysis of objective data that includes gaze information, tapping into his broad knowledge in eye tracking and data analytics. The full team will meet remotely via a teleconferencing software (e.g., Zoom) once at the start of every month to track progress and make adjustments to the plan if needed, and will also meet in person at the end of each major project activity to assess if it was successfully completed as per the plan.

Project Results

The planning project will yield a comprehensive white paper that addresses: *Accessibility/usability barriers in ETDs.* A comprehensive report of BLV users' pain points while interacting with ETDs. This will shed light on the current status of ETD accessibility in libraries and therefore illuminate avenues for future accessibility improvements. *BLV interaction behavior with ETDs.* A thorough understanding of how BLV users navigate and forage information in ETDs. This information is valuable for assistive technology developers to design tailored solutions for convenient BLV interaction with not only ETDs but also other long scholarly documents such as books having complex layouts similar to ETDs. *Accessibility guidelines for ETDs.* The guidelines based on study findings will inform ETD authors and publishers on how to create more inclusive ETDs that provide equitable access to users with visual disabilities. *Design requirements for ETD accessibility solutions.* The requirements will inform future efforts to improve accessibility of ETDs, for example, developing and implementing new accessible user interfaces for ETDs.

We will document all project results—accessibility barriers, behavior patterns, accessibility guidelines and design considerations derived from the study data analyses. We will also document the study setup information to ensure replicability of our work. All documentation will be made publicly available in the form of a project white paper, journal articles, and conference presentations, and shared with the library and archives community to promote the adoption of inclusive practices in ETD accessibility.

Budget Summary

IMLS funds will be used for this project on Salaries and Wages, Travel, Human Subjects, Student Support, and a Subaward to Virginia Tech. Salaries and Wages include summer effort for PI Dr. Vikas Ashok, and Co-PIs Ms. Tonia Graves, Dr. Jian Wu, and Dr. Sampath Jayarathna. There will be one master's level GRA. Total Salaries and Wages amount to \$39,393. Total Fringe request is \$3,257. Total request for travel is \$8,000. Total request for Human Subjects is \$5,000. Total request for GRA tuition is \$9,970. Total request for subaward to Virginia Tech is \$17,638. There is also an Indirect cost rate of 60% MTDC for a total of \$43,973. Total project costs: \$127,231.