

Thesis Project Portfolio

**Context-Aware Recommendation Via Interactive Conversational
Agents: A Case in Business Analytics**

(Technical Report)

**User Experiences with Voice Assistance: How Voice Assistance Effects User Interactions
with Applications and Information Delivery Systems**

(STS Research Paper)

An Undergraduate Thesis

Presented to the Faculty of the School of Engineering and Applied Science
University of Virginia • Charlottesville, Virginia

In Fulfillment of the Requirements for the Degree
Bachelor of Science, School of Engineering

Livia Kimche

Spring, 2022

Department of Systems Engineering

Table of Contents

Sociotechnical Synthesis

Context-Aware Recommendation Via Interactive Conversational Agents: A Case in Business Analytics

User Experiences with Voice Assistance: How Voice Assistance Effects User Interactions with Applications and Information Delivery Systems

Prospectus

Sociotechnical Synthesis

The technical report conducted through means of the Capstone project and the STS research paper are both centric to voice assistance technology. The technical portion was focused on the client problem of efficiently delivering data insights to clients through their mobile and desktop application. The vehicle for solving this problem was determined to be a conversational voice assistant. Working to optimize user experience, the voice assistant was designed, prototyped, and tested. The STS research paper was aimed to clarify which user experience factors are the most influential in the user adoption of voice assistance technology. The knowledge of how the sociotechnical relationship between users and voice assistants can affect whether they actually use available voice assistants. Both portions help create a better understanding of voice assistance technology.

Currently, there is a lack of accessibility to digestible analytics from the Human Resource Intelligence Systems (HRIS). On such systems, users can gather business information using a desktop computer or a mobile device, but finding needed information can prove to be difficult. There have been efforts to ameliorate such problems through offering features such as flexible dashboards, customizable data reports, PDF exportation, and notification systems. While these features improve the usability of HRIS, there is still room for improvement in information delivery, report generation, and user experience. Voice assistants and recommendation systems can help improve HRIS by allowing users to efficiently reach key insights which are relevant to the needs of their organization. This research proposes a pipeline where a conversational voice assistant will communicate with the user to navigate the HRIS, alongside suggesting reports and metrics often searched by similar users and companies in their industry. Users can obtain company wellness indicators based on relative key performance indices (KPIs) and historical

performance. These insights will allow the user to highlight the weaknesses of their business, and come up with solutions to boost their performance. Successful implementation of these systems should allow HRIS to be more accessible to users, especially to those with visual disabilities. This pipeline will also increase efficiency for the user, as having a conversation with a voice assistant to retrieve information from the system can decrease user frustrations and screen time. The recommendation system will deliver helpful insights before the user even knows they are looking for them. Overall, this system will improve the user experience of retrieving meaningful information and data insights available within their HRIS.

There is currently inaccessibility to digestible analytics from the Human Resource Intelligence System (HRIS) client-company partnered on this Capstone Project. Users are currently able to gather business information from a desktop computer or a mobile phone, but there is not any verbal communication between the user and the device. Nor is there access to nonvisual information. There has been work done by the client company to deliver visual analytics and offer helpful features like a flexible dashboard, customizable reports, PDF exportation, and notification systems. There is still room for improvement in areas like information delivery, report generation, and user experience. Voice assistants and recommendation systems can help improve HRIS by allowing users to efficiently extract the key insights relevant to the needs of their organization. This project proposes a pipeline by which a conversational voice assistant will help the user to navigate the HRIS, and suggest reports and metrics often searched by similar users and companies in their industry. Recommendations for the user will result in helpful insights before the user even knows they're looking for them. The expected results from these application updates will include a more inclusive interface by proposing audible insights and navigation capabilities. The updates will also increase efficiency

for the user and minimize screen time. Overall, this system will improve the user experience of retrieving meaningful information and data insights available within the HRIS. It is also expected that the voice assistance and recommendation pipeline can be transferable to other systems to optimize user experiences.

When tied all together, the technical report and the STS research paper were able to complement each other in creating value. The Capstone project introduced understandings of the backend, technicalities, and implementation of voice assistants. The STS research paper focuses on how voice assistance technology can best be adopted and appreciated by users. I was able to learn a lot about there can be reasons for users to neglect a technology even if they're aware that the technology exists. I learned that there are important design factors that impact how a technology interacts and influences with society. These design factors can be critical to the users' trust and attitude towards a technology. I was also learning about coding and building voice assistants on the back end while researching for the STS paper, which provided very useful background knowledge of the technology and how it currently exists in society. By doing both projects simultaneously, I was able to better design the back end and prototyping of the voice assistant to accomplish goals of optimizing user experience. By doing so, this is promoting widespread adoption of the technology and further profiting the client company. Beyond the scope of the Capstone project, these discoveries can be implemented to all kinds of systems and further promote user accessibility to interfaces from their devices by using a conversational voice assistant. These takeaways would not have been made if both projects had been done individually.