Implementing Voice Assistant features in Human Resource Management to Help Business Analysis (Technical Report)

Dissecting the Infrastructure, Impacts, and Potential Behind Non-Fungible Tokens (STS Report)

A Thesis Prospectus In STS 4500 Presented to The Faculty of the School of Engineering and Applied Science University of Virginia | Charlottesville, VA In Partial Fulfillment of the Requirements for the Degree Bachelor of Science in Systems Engineering

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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:

Human Resource Management (HRM) Tools are vital for understanding the everyday metrics that a company can use – everything from employee availability, overall revenue and profits, to understanding key performance indicators which can provide a status check to the company's health. These tools went from manually tracking paystubs on paper to becoming web applications that leverage the massive increase in computing systems we have today. Developers of these tools now understand that in order to further innovate in this field, providing usable applications for business analysts is important to making HRM tooling.

With the advent of mobile devices, the UX paradigm has shifted to using Siri, Alexa, and other voice assistants. This usage of voice recognition is available for employees and general users (for example, an employee asking "how much is my pay stub for this period"); however, using voice assistant to increase usability in prospective or real-time applications is limited or unheard of. The technical topic aims to find the most productive use of voice assistants in HRM tools by applying context aware data analytics to aid business intelligence efforts; the aim is to provide a paradigm to create HRM tooling that can be most applicable and useful for business analysts. The technical topic discusses specifics in how a voice assistant can be designed to foster improved user experiences for business intelligence analytics.

Advances in availability of computing devices and speed of networks has also led to many advancements in computing infrastructure. New protocols and architectures have been developed to manage how millions of devices interact with each other. Among the many paradigms, blockchain systems have seen massive popularity in recent times. This new protocol connects many devices together to individually create tokens that are known across every device in the system, through specific implementations such as the Ethereum Blockchain Protocol.

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This technical backing allowed for unique tokens to be paired with pictures and traded using cryptocurrency – these entities are known as Non-Fungible Tokens, or NFTs. Some artists are majorly profiting from minting and selling NFTs within blockchain networks; those who have seen such profits laud the benefits of this new paradigm as a new form of digital ownership. However, these tokens have come under controversy as many claim the ownership of NFTs as valueless. For this reason, the STS topic will explain the design choices behind blockchain and NFT infrastructure as well as where the technology stands in the status quo. The topic will then go on to analyze the impacts these choices have on the properties of NFTs and how these unique tokens establish a new form of ownership.

Technical Topic: Implementing Voice Assistant features in Human Resource Management to Help Business Analysis

There is a current push for human resource management systems (HRMS) to deliver useful business analytics. The current technologies are lacking these capabilities, as mentioned in the 2017 Gartner survey, "Pervasive business intelligence remains elusive, with BI and analytics adoption at about 30% of all employees." Being able to improve the user experience of business intelligence tooling in any platform can help provide wider usage and a competitive advantage in the HRMS market. With this reasoning, this project aims to improve the user experience when conducting business intelligence research on available HRMS tooling.

The goal of the project is to conceptualize a system that utilizes a Voice Assistant feature within HRMS to efficiently deliver audible data insights to users and improve the overall user experience. The Voice Assistance feature will successfully communicate key data points to the user in a digestible way, catalyzing informed business management decisions. The Voice Assistant will formulate information readily accessible to users at the command of a simple

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question, such as "How is my company doing?" or more detailed questions like "How much does it cost to hire another employee?" Ultimately, the new features of the application will optimize the data analysis workflow for users of the system with hands-free capabilities.

The use-case for this project will center around data analytics for business owners and managers. The data used to provide insights will come from internal key performance metrics such as employee information, time logs, payrolls, and other reports. Succeeding the primary user, overarching components of businesses as a whole will be within the scope of this project. In order to answer generic questions, Voice Assistance will be able to quantify and communicate a company's status based on internal data. Furthermore, the scope of this project will extend to how companies might relate to each other by computing how the client's company is performing in comparison to competitors using industry averages.

Riley is the owner of Small Biz. Co., he manages a team of 6 people that help him run his business. He uses Paychex as a tool to help manage HR, payroll, and benefits for Small Biz. Co.



Riley is planning a meeting with investors of the company this Thursday, and he needs to give them a company report. He is hoping to receive some capital from them to help Small Biz. Co. hire a new team member.

"How is Small Biz. Co. Doing V



Riley wants to know how his company is doing generally, and he wants to know quickly because the meeting is only a few days away. He has a very busy schedule and doesn't have too much time to spend getting a wholistic report.



On his way home, Riley decides to use the Flex Voice Assistance Feature to ask his Apple Watch, "How is my company doing?"

Riley is then able to get a snapshot of his

company's report. He is also able to easily scroll down on his watch to email or text the full report to the email or phone number associated with his Paychex Account, or to any of his contacts.



Riley is then able to use his exported copy of the Paychex Report describing "How his company is doing" to explain to his investors that Small Biz. Co. is doing well but could use funds for another team member. The wholistic report as a part of Riley's excellent pitch convinces all three investors to give more capital to Small Biz Co for the software system.

Figure 1: Storyboard to demonstrate a use-case a user can have with a Voice Assistant.

By the end of this project, the team hopes to deliver a Voice Assistance prototype that will give key insights about the company and supplement the data analytics workflow. For example, managers can request for an executive summary of their company's status without needing to open the application. This project can be scaled from analytics deliverables to navigation of the system using Voice Assistance. With functional Voice Assistance, the user can begin to trust the assistance to verbally navigate the system and make impactful business decisions on the go. Externally, these technologies would be breaking ground in the HRMS market and could grow to be adopted by other companies for similar purposes.

STS Topic: Dissecting the Value Propositions, Impacts, and Infrastructure Behind Non-Fungible Tokens

Mike Winkelmann, known under the pen name as "Beeple," made national headlines after selling a collage of his digital artwork for a sum of \$69 million dollars, which stoked curiosity and confusion; this record-breaking transaction occurred through the blockchain network as a non-fungible token, commonly called an NFT. The big spender now gained ownership of this art; however, due to the nature of the blockchain network, this picture was publicly available to be viewed, copied, and pasted. This begs the question: if anyone can access this picture, why spend money on it? Is spending money on an openly available picture truly a valid form of ownership? Answering these questions can help understand how a new digital marketplace can exist in the future, and test assumptions around the definition of property, ownership, and authorship in relation to the growth of technology.



Figure 2: *EVERYDAYS: THE FIRST 5000 DAYS* – "Winkelmann began to post a new work of art online everyday since May 1st, 2007. Until January 7th, 2021, Winkelmann created 'a new digital picture every day for 5,000 days straight."" (Christie's, 2021)

NFTs are created and maintained on a large distributed and decentralized computing system, with data being processed and maintained on a public blockchain network. Distributed computing systems consist of many computers communicating with each other using network protocols to divide and spread computing needs among the separate machines. After the processing tasks are completed, the separate outputs must be merged back together to make sure there is consistency in the overall system state; this process is known as consensus. However, by maintaining consensus, every machine within the network has equal access to the data. In addition, if one or several computers go down, the overall system is still able to run. Decentralized systems allow every device in the network to have the same permissions to alter the shared data store in specific ways. Centralized systems, on the other hand, have the authority to designate certain systems with specific privileges. Since this access is universal across the network, this allows many users to participate within the network. By extension, since NFTs are on a distributed and decentralized network, anyone who has the technical capability can become a part of the system and view all images within the system.

More specifics on how data is organized and permissions that each actor has are defined by the Ethereum Blockchain protocol. In general, "the blockchain is designed to hold immutable information once data is committed to the chain...in which data is logically structured as a sequence of smaller chunks (blocks)" (Knirsch et al., 2019). Actors in the system can add blocks, which takes computational effort to do so; once a block has been added, the actor is provided a token. The Ethereum protocol is capable of assigning unique tokens (using a *smart contract* feature implemented in this protocol) to various types of digital media, to which actors can trade tokens with the Ethereum currency. Smart contracts also allow for the owner's information to be integrated into the token itself. Additional aspects of smart contracts include providing "original creator resale royalties," and allowing the artist to determine the scarcity of the art (Ethereum, 2021).

By being able to attribute an origin to the pictures, this means all pictures have a form of attribution to an original source. Since these tokens can be exchanged with having publically viewable transactions, this gives a feeling of ownership to those that spend the money on having the token. This poses questions on the definition of ownership itself. Why does it matter to spend money on a digital picture if this is freely available? What exchange of value occurs if this information is already freely available?

Michael Heller details how ownership can be seen through a framework of a story, where different actions can determine who the owner is – one such action is possession: "Possession is nine-tenths of the law...It's mine because it's attached to something mine." (Berube, 2021). The psychological phenomenon underpinning feelings of possession is known as the endowment effect: people "tend to value items that they own more highly" (The Decision Lab, 2021). It

should be noted that this feeling is shown to translate to the digital realm as well: people "can become instantaneously attached to a digital service" (Fritze et al., 2018).

Using Heller's framework, simply having the token within an individual's wallet, gives that feeling of possession to those that subscribe to the cryptocurrency and blockchain network. With many people subscribing to this system, this results in a natural marketplace to occur, which many large organizations are bullish on; for example, Facebook's recent name change to Meta was driven by the belief that "many physical things you have today that could just be holograms in the future," as detailed in the Founder's Letter (Zuckerberg, 2021).

For many, this can be a strange paradigm shift from the open internet as information is always freely available. Openly available resources can be depreciated in value due to a phenomenon known as the *tragedy of commons*; in the digital space, this references that the over consumption of digital resources causes the resources themselves to become undervalued (Gupta et al., 1997). In Nobel-Prize winner Elinor Ostrom details that ameliorating the tragedy of commons happens through community users creating a form of self-governance (Angela, 2010). The decentralized blockchain network fits this role within the context of digital systems.

Heavy critiques can be made of the NFT system, namely in consideration of the bubble that surrounds the price of these tokens, as well as the massive energy cost incurred by minting NFTs. The current interest and excitement behind NFTs is reminiscent of the dot-com bubble that existed prior. Many internet agencies that existed during the dot-com bubble had overly high valuations, but the underlying technology of the Internet defined ages to come. As it stands right now, NFTs have similar patterns and could stand to have the same trajectory in their impact on how society uses technology.

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Most importantly, NFT systems create massive environmental impact that the; notably, "a single NFT's footprint is equivalent to a EU resident's total electric power consumption for more than a month, with emissions equivalent to driving for 1000Km, or flying for 2 hours" (Akten, 2021). Research is being done into various methodologies of reducing this footprint, such as Ethereum's efforts to move to an Eth2 protocol (2021), but there is clear evidence that NFTs impose a significant environmental cost.

Research and Methodology:

The STS Topic will be approached from understanding the foundational infrastructure of NFTs; namely, the features inherent to distributed, decentralized, and Ethereum blockchain protocols will be used to establish the properties that Non-Fungible Tokens retain. The STS Paper will delve further into the *smart contract* feature of Ethereum, as many defining properties stem from here. In addition, further research will be done to establish the relations between the endowment effect and NFTs, as well as using the tragedy of commons framework to help understand the role NFTs can play in how society interacts with technology. In addition, critiques against NFTs will be further explored and strengthened in order to facilitate a more sound discussion on the complexities inherent within Non-Fungible Tokens.

Conclusion:

The technical topic will involve creating a prototype of a voice assistant that can process questions into responses for key-performing indexes or development of reports and executive summaries to provide insight into a company's performance. Namely, this can help improve the experience of conducting ad-hoc business intelligence research for a company.

The STS topic will examine the underlying economic and social systems in place to evaluate the position NFTs can have in society. In addition, the current status quo and

implementation concerns will be examined in order to reach a conclusion as to how this technology can best impact society.

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