



Sound Map for a Changing Landscape

CS 410 PROFESSIONAL WORKFORCE DEV I.

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Meet Team Turquoise



Aamr Ibrahim

Aamr is a transfer senior undergraduate in ODU. His hobbies are reading, writing, and hanging out. He's from Sudan, Khartoum and born in NC. He lived and studied in Dubai for 19 years before transferring to ODU. After graduating, he is going to do some research to fit for his job



Brandon Bedner

Brandon is a senior at ODU currently pursuing an undergraduate degree in Computer Science and has recently landed a position as a Junior Computer Engineer working on real-time systems for state governments around the country. He expects to complete the degree within the year, but raising a rambunctious toddler might slow down that goal.



Benjamin Johnson

Benjamin is a Senior at ODU who is currently in a Linked Program working towards both his Bachelor's and his Masters. In his free time, he likes spending time with his family, exercising, and playing chess.



Christian Woodington

He is honored to work on this project to promote ODU and graduate in Spring 2024. On his free time he enjoys fishing, nature walks, and exploring new technology.

Meet Team Turquoise



Evan Goldberg

Aspiring software developer. Hobbies center around coding projects and outdoor activities such as snowboarding and hiking.



Patrick Meagher

Former pilot launch operator for the Maryland Pilots in Virginia Beach, VA.



Kori Fogle

Kori Is a Software Developer juggling work and two majors full-time. In his free time he likes to watch anime, draw and make music.



Prestin Bell

Prestin is a Computer Science student at ODU and at 25 years of age. He is a fan of all the major sports leagues being a fan of the LA teams as he is from Southern California. He lived outside the US before as his dad was in the Navy. He has two cats and a dog but loves all animals.

Meet Team Turquoise



Thomas Reynolds

Senior at ODU. In his free time he enjoys programming and playing soccer.

Who is the Project Mentor?

" I'm an artist, and I'm coming from a perspective where I'm always thinking about meaning." - Brendan Baylor

Baylor, B. (2023, May 22). CS 410: Sound Map for A Changing Landscape. personal.



www.brendanbaylor.art

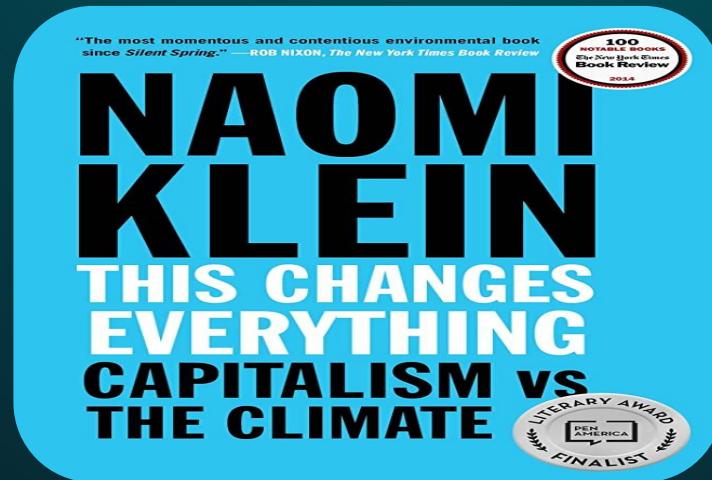
Inspiration for this Project

Signs on the Line (2017)



Baylor, B. (n.d.). Brendan Baylor Art. Retrieved from <https://www.brendanbaylor.art/>

Naomi Klein's This Changes Everything



(Klein, 2014)

Rising Sea Levels

- Erosion
- Flooding
- Salt Contamination
- Habitat Destruction



(Pilkington, 2020)



(Amy E. East, 2022)

Climate Change

- Reduced Glacial Ice
- Changes in Precipitation
- Drought Risk
- Wildfires



(2020, December 16). *How is Modern Climate Change Affecting Landscape Processes?*



(Kaminski, 2023)

Problem Background

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- Lack of Engagement
- A Changing World
- Records

"We're not motivated to do things if we don't think they matter or we don't feel connected to them."

Baylor, B. (2023, May 22). CS 410: Sound Map for A Changing Landscape. personal.



Created with Midjourney

- Who is the most affected?
- Who has the loudest voice?



(Baylor, 2023, s. 16)

(Charles, 2022)

Problem Statement

"One of the things I'm excited about is the possibility that over time, we might be able to actually have these as records of climate change. Sea level rises, the sound of the sea coming closer to the inland, that kind of thing." -Brendan Baylor

Baylor, B. (2023, May 22). CS 410: Sound Map for A Changing Landscape. personal.



(Milman, 2019)



(Correia, 2018)

Current Gaps in Sound Exploration

1. Temporal Aspect
2. Geographic Context
3. Participation and Engagement

Image generated with Dall-E

Feasibility



Images generated with Midjourney

STATIC MAPS

VS.

DYNAMIC MAPS



1. Temporal Aspect



(Created with Midjourney)

Problem Characteristics



Past to the present

Time Square 1920



Time Square 2021



1. Temporal Aspect

Image: (Coyle, Associated Press News 2021)

Audio File: (Balcomb, The Sounds Of New York City, Circa 1920 2013)

Provide geographical context to sound recordings



2. Geographic Context

Created with Midjourney

- Who is heard?
- Accessibility
- Motivations



3. Participation & Engagement



Created with Midjourney

Who Is Heard?



Created with Midjourney

Accessibility



Created with Midjourney

Motivations



Created with Midjourney

Artifact and Normalization

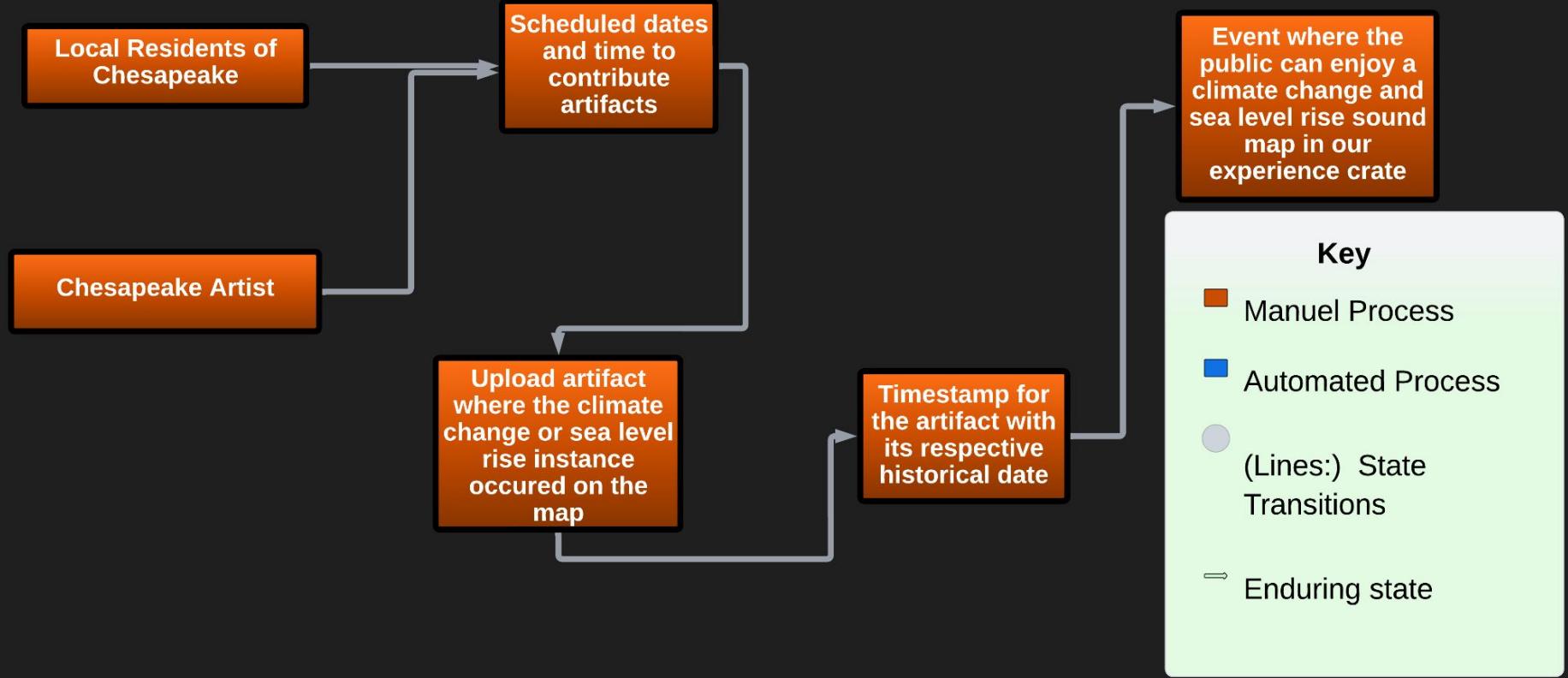
What is an Artifact ?

- Speaker icon: Audio/Soundscapes
- Image icon: Images/Artwork
- Video camera icon: Videos/News Reports
- Experiences icon: Experiences
- File icon: (MP3, JPEG, WAV, TIFF)

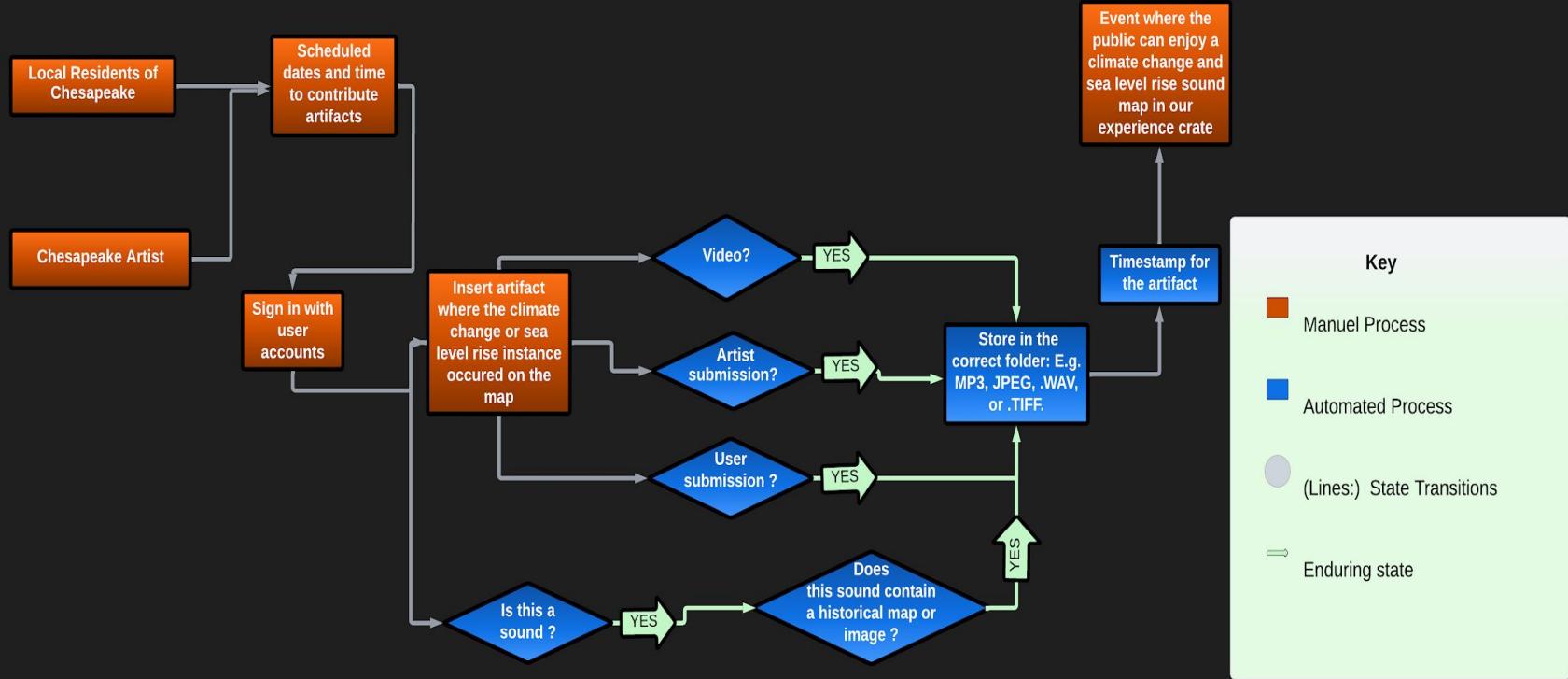
What is Normalization?

- Target icon: Converting artifacts into a consistent format.
- FFmpeg icon: FFmpeg: Audio and Video conversion
- ImageMagick icon: ImageMagick :Image conversion

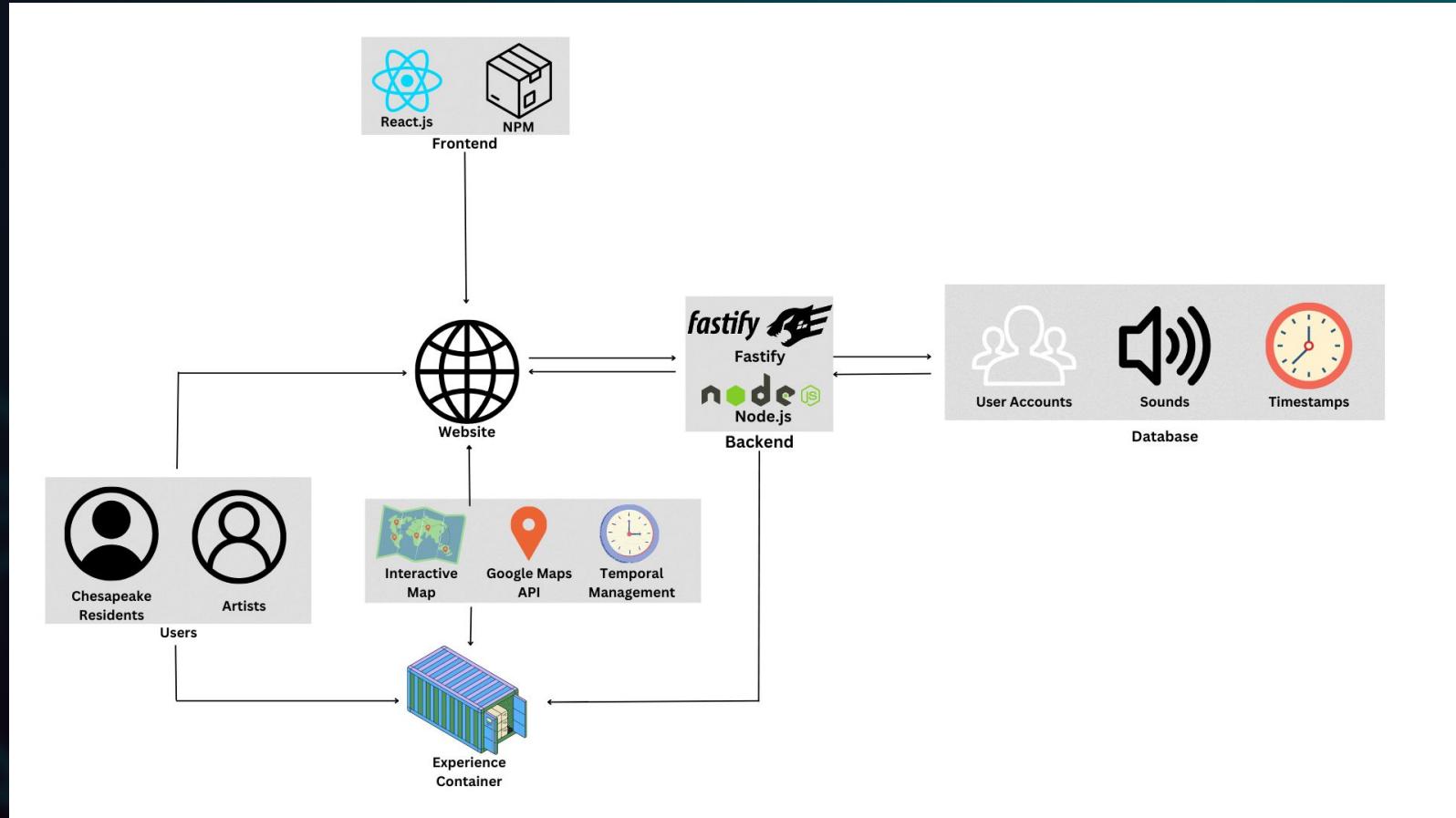
Current Process Flow

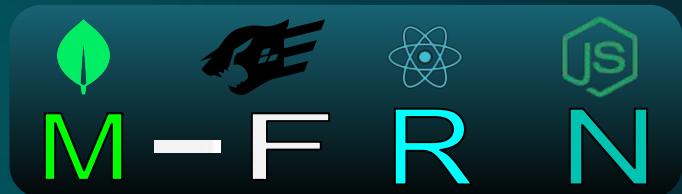


Solution Process Flow

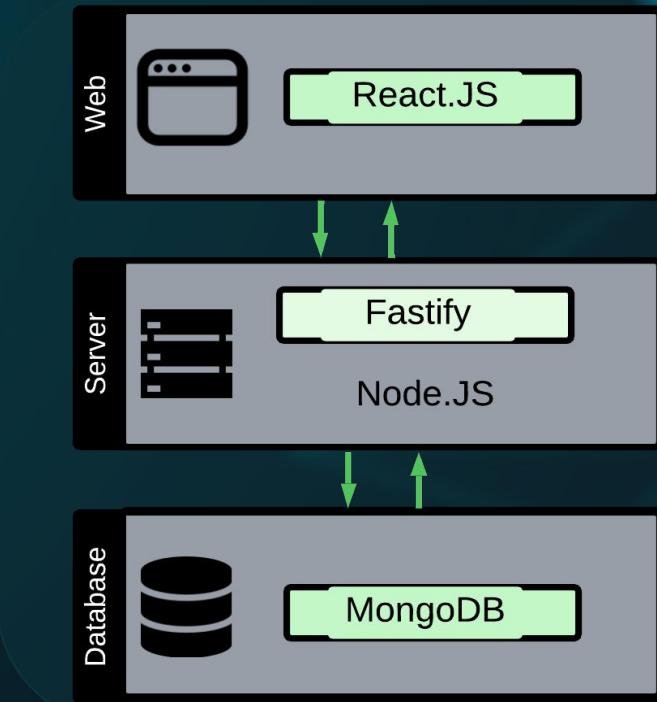


Major Functional Component Diagram





- **M**ongoDB: NoSQL database
- **F**astify: Lightweight web framework
- **R**eact: User Interface library
- **N**ode.JS: Server-side JavaScript





IDE: VS Code



Version control: Git (GitHub)



Testing Framework: Jest



CSS Framework: Bootstrap



Containerization: Docker



Container Orchestration: Kubernetes



Testing REST APIs: Postman



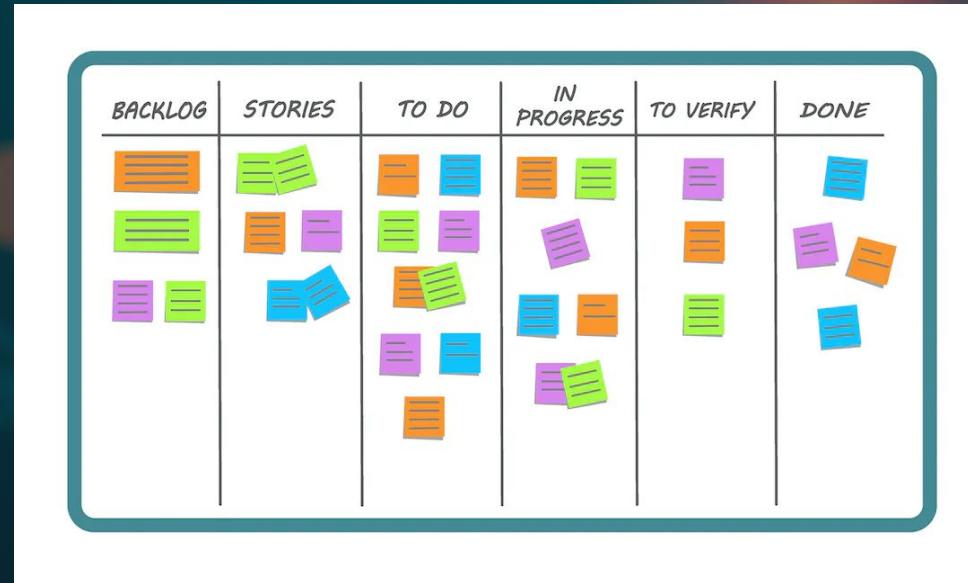
Documentation Tool: Swagger

Agile Slide



Our traditional approaches:

- Adaptability
- Customer Focus
- Faster Time-to-Market
- Reduced Risk



(iStock, 2018)

Identify & describe the customer

A combination of artist and local residents of Chesapeake that want to record their experience and artwork as historic artifacts.



Chesapeake Bay Foundation. (2021, April 1). Save the Bay, Save the Planet. Chesapeake Bay Foundation. Retrieved from <https://www.cbf.org/blogs/save-the-bay/2021/04/save-the-bay-save-the-planet.html>

Identify and describe the end user

Future residents will understand the following:

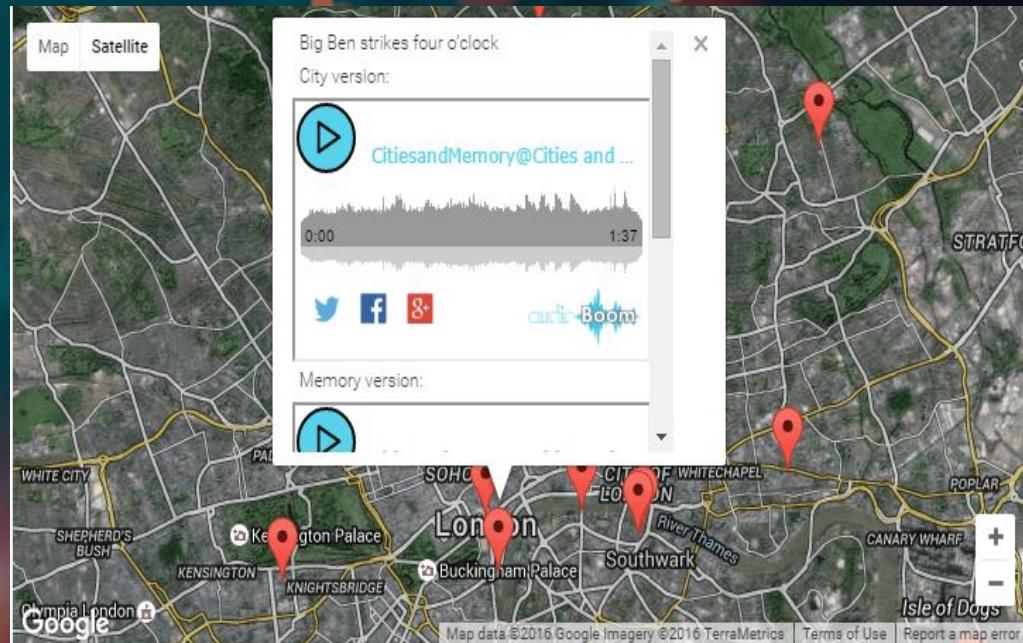
- Landscape Change
- Environmental Impact
- Conveying the Fragility of Ecosystems
- Encouraging Sustainable Practices
- Uniting the Community
- Raising Awareness of Environmental Challenges
- Inspiring Connection with Nature



The Sun. (n.d.). Ever wondered what intro lyrics to The Lion King song Circle of Life actually mean? The Sun. Retrieved from <https://www.thesun.co.uk/living/1546055/ever-wondered-what-intro-lyrics-to-the-lion-king-song-circle-of-life-actually-mean/>

Solution Characteristics

- Interactive Sound Maps
- Geographic aspect
- Historical Audio Recordings
- Visual Documentation
- Spatial Audio Technology
- User Interaction
- User-Generated Content
- Educational Narrative



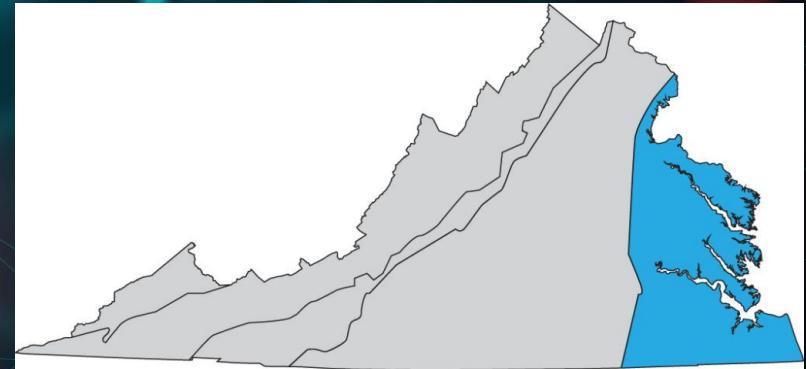
Listen to the World: Global Sound Map from Cities & Memory. Brilliant Maps.
(2023, March 3). <https://brilliantmaps.com/sound-map/>

Solution Characteristics (What it Will Not Do)

- Operate outside of the Tidewater Region
- Take donations for climate change charities
- Reduce global warming directly
- Propose policy on climate change



(Weston, 2017)



(Vistas of Virginia, 2023)

Solution Characteristics (What it Will Do)

- Show the landscape change over time
- View artist created content and viewer submissions
- Search for content in the archive
- Allow submissions to the archive



(Arch20)

Digital Archive

- Artist Created Content
- User Submissions
- Archival Materials
- Sound and image
(.WAV, .TIFF, .JPEG, MP3)



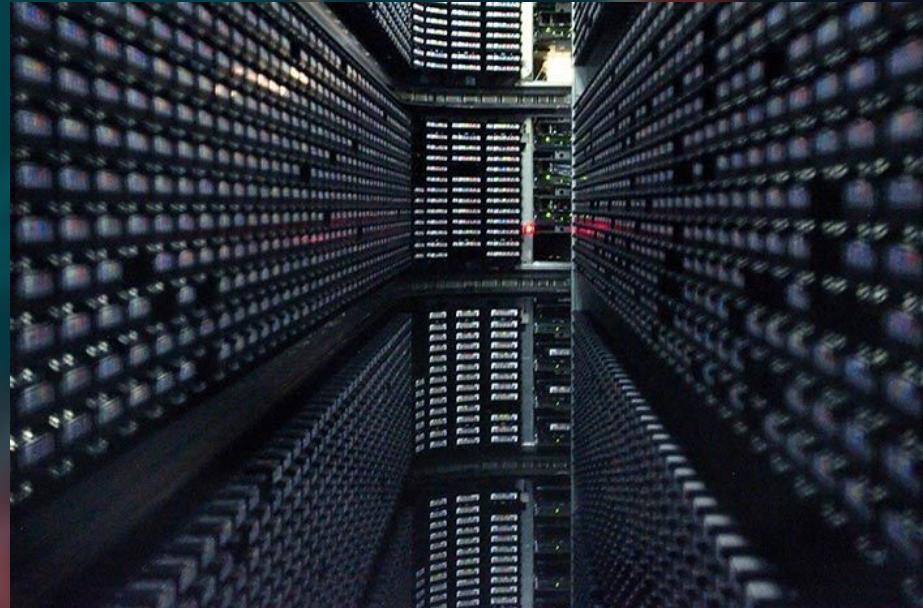
(Brooks, 2021)



(Tiff file 2014)

Summer 2023

Feasibility



(Sheridan, 2018)

Team Turquoise

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Solution Statement

Our solution is an interactive sound map that charts the impact of climate change on the Tidewater Region, blending historical and user-submitted audio-visual content for a more comprehensive understanding.



(Rosenfield, 2022)



(Xiaozhen, 2020)

Software Features

1. Functionality
2. Usability
3. Reliability
4. Performance
5. Security
6. Maintainability
7. Scalability
8. Testability



Rocky Mountain College of Art + Design. (n.d.). Animation Online. Retrieved from <https://www.rmcad.edu/academics/animation-online/>

Functionality

- Sound Map Display
- Content Viewing
- User Contribution
- Content Management
- Search and Filtering
- User Interaction and Feedback
- Responsive Design
- Error Handling and Logging

Feasibility

Usability

Usability aspects to focus on:

- Intuitive User Interface
- Adjust layouts & content to provide an optimal user experience.
- Allow dynamic rendering of UI based on user interaction.
- Create components that respond immediately to changes in state.
- Ability to quickly and accurately retrieve information based on user-defined criteria.



React will be essential for:

- Efficient UI Updates
- Responsive Design
- Guided User Onboarding
- Clear Feedback and Notifications
- Efficient Search and Filtering

Feasibility

Reliability

Reliability aspects to focus on:

- Error Handling and Logging
- Data Backup and Recovery
- Data Validation and Integrity
- Exception Handling
- Scalability and Load Balancing
- Version Control/ Deployment



IntelliSense

Intellisense will be essential for:

- Displaying information about method parameters.
- Showing quick information about variables, functions, and types when hovering over them.
- Automatically importing or suggesting imports for missing dependencies.

Quick File Access

File Compression
(and Encoding)

Load Balancing

Multiple Sizings

Security

Content Moderation

Automated Content
Moderation

User Accounts

Firewalls

Feasibility

Maintainability

MongoDB can regularly release updates and security patches to address any vulnerabilities and improve performance

This allows us to also, to name a few:

- Code Modularly
- Error Management
- Continuous Integration/Deployment
- Version Control
- Documentation
- Monitoring/Logging Servers

Scalability with MongoDB



- Distributed Database: Accommodate large data volumes and concurrent users.
- Sharding: Improve speed and performance with data partitioning.
- Automatic Replication: Enhance data availability and recovery.
- Flexible Data Model: Adapt and evolve with changing business requirements.

Scalability with Docker & Kubernetes



- Easy application packaging
- Resource isolation



(Created with Midjourney)



Kubernetes

- Automated deployment and scaling
- Self-healing mechanisms
- Service discovery and load balancing

Feasibility

Testability

The software should be designed with the following items in mind

- Separation of concerns/divide and conquer
- Simple, concise code
- Inheritance and aggregation for mocking
- Reliability
- Validity

Indirect Competition

- NOAA
- Policy Advocacy
- Public Exhibition
- Citizen Science Initiatives
- Environmental Education Programs



Fox 29. (n.d.). How Captain Planet Inspired an Environmental Movement. Fox 29. Retrieved from <https://www.fox29.com/news/how-captain-planet-inspired-an-environmental-movement>

Competition Matrix

		Direct Competition			
		Changing Landscapes	Snapchat	SoundPrint	HowLoud
Features	Sound Map Display	×	×	×	×
	Descriptors	×		×	
	User Contribution	×	×	×	
	Content Management	×	.		
	Search and Filtering	×		×	×
	Responsive Design	×			×

Risks

1. Technical
2. Security
3. Customer
4. Legal



Centraleyes. (n.d.). What is Risk Mitigation? Centraleyes. Retrieved from
<https://www.centraleyes.com/what-is-risk-mitigation/>

Technical Risks

- 1. Potential design
- 2. Implementation
- 3. Interface
- 4. Verification
- 5. Maintenance problems



Dynu Systems. (2023, February 26). How to Host an Email Server If ISP Blocks Port 25. Dynu Blog. Retrieved from <https://www.dynu.com/en-US/Blog/Article?Article=How-to-host-email-server-if-ISP-blocks-port-25>

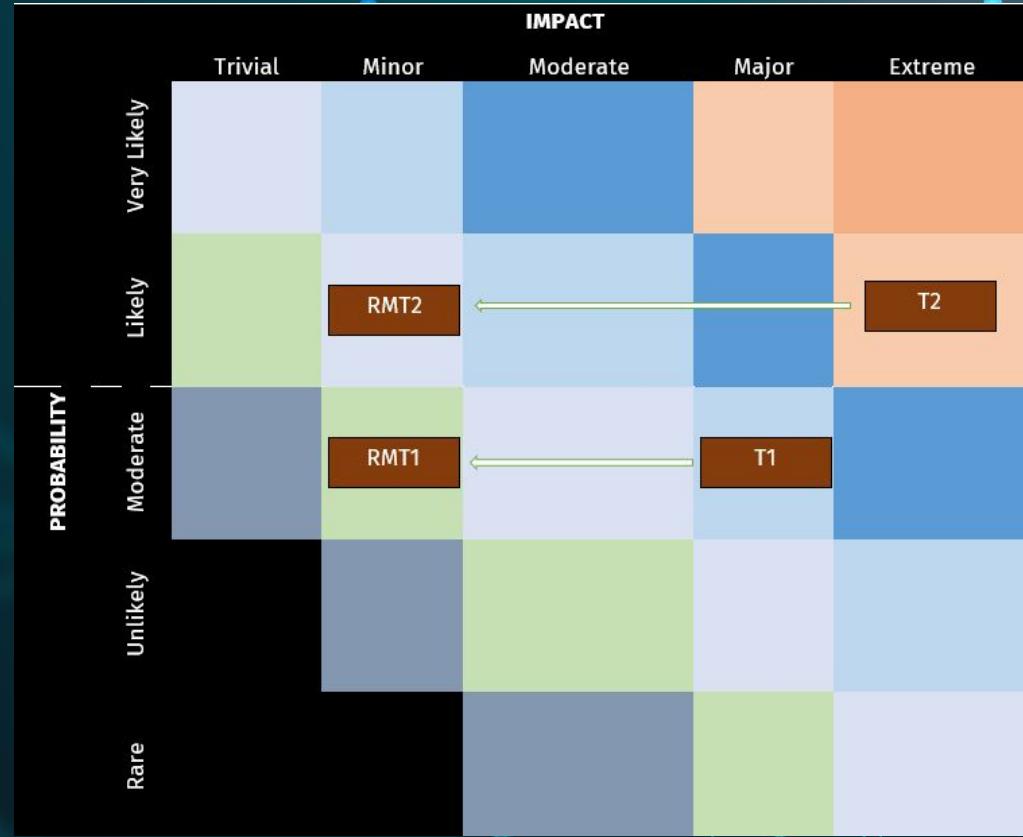
Potential Design

T1: Designs that are fundamentally flawed, infeasible, unstable or below Brendan's standards.

T2: A poor design will expose itself as functional defects or hurdles to development that hinder project progress.

RMT1: Careful design planning prior to implementation can highlight any potential flaws in the design

RMT2: Through copious testing of functional aspects of the project, prior to completion of the total project



Implementation

T3: Adopting off the Shelf Software

T4: Inadequate Resources for Implementation and Testing

RMT3: Research all options, testing the software, and confirming vendor support before committing to any third-party software.

RMT4: By pinpointing resources that can be dedicated to working with the vendor as well as rigorous testing prior to deployment of any code



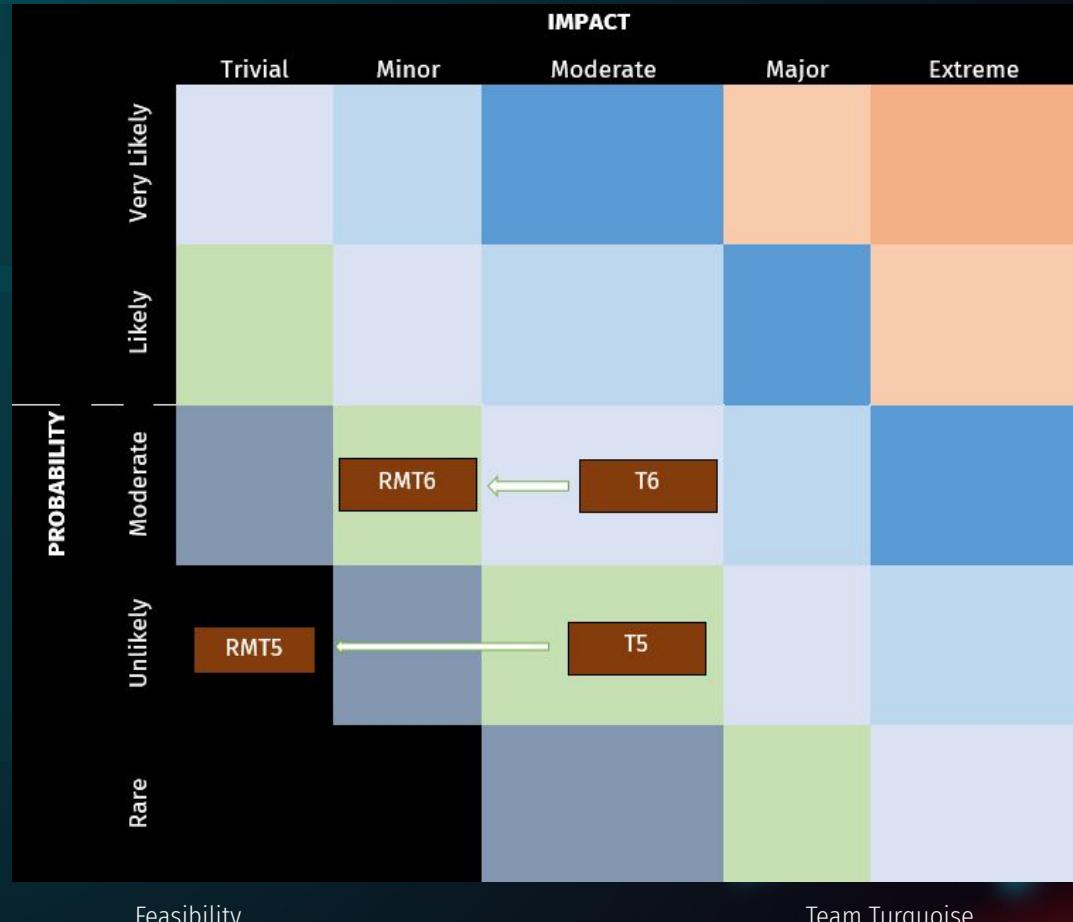
Implementation

T5: Poor Change Management

T6: Poor data Migration and Tech Integration

RMT5: Our team will be using Git by adopting GitFlow for branching, enforcing code reviews, and maintain continuous integration.

RMT6: We will establish a rollback plan, encourage collaboration, implement backup and disaster recovery measures, and monitor changes for improvement.



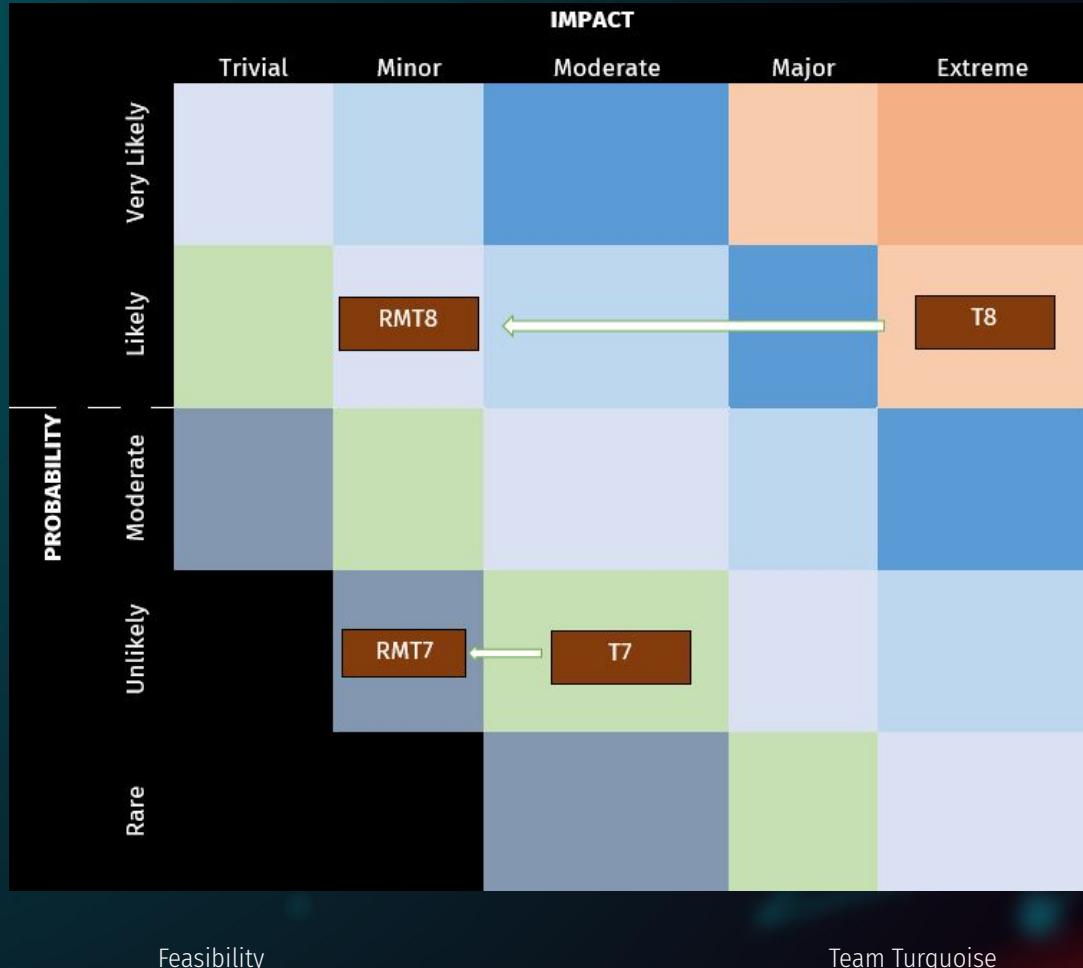
Interface

T7: Spending too much time refining the look and feel of a user interface at the expense of Brendan's requirements.

T8: Ignoring or deferring system-to-system interface requirements until the design phase or later.

RMT7: Proper project planning and prioritization via identification of functional requirements and prototyping.

RMT8: Iterative development that touches each system of the project even if it's not complete



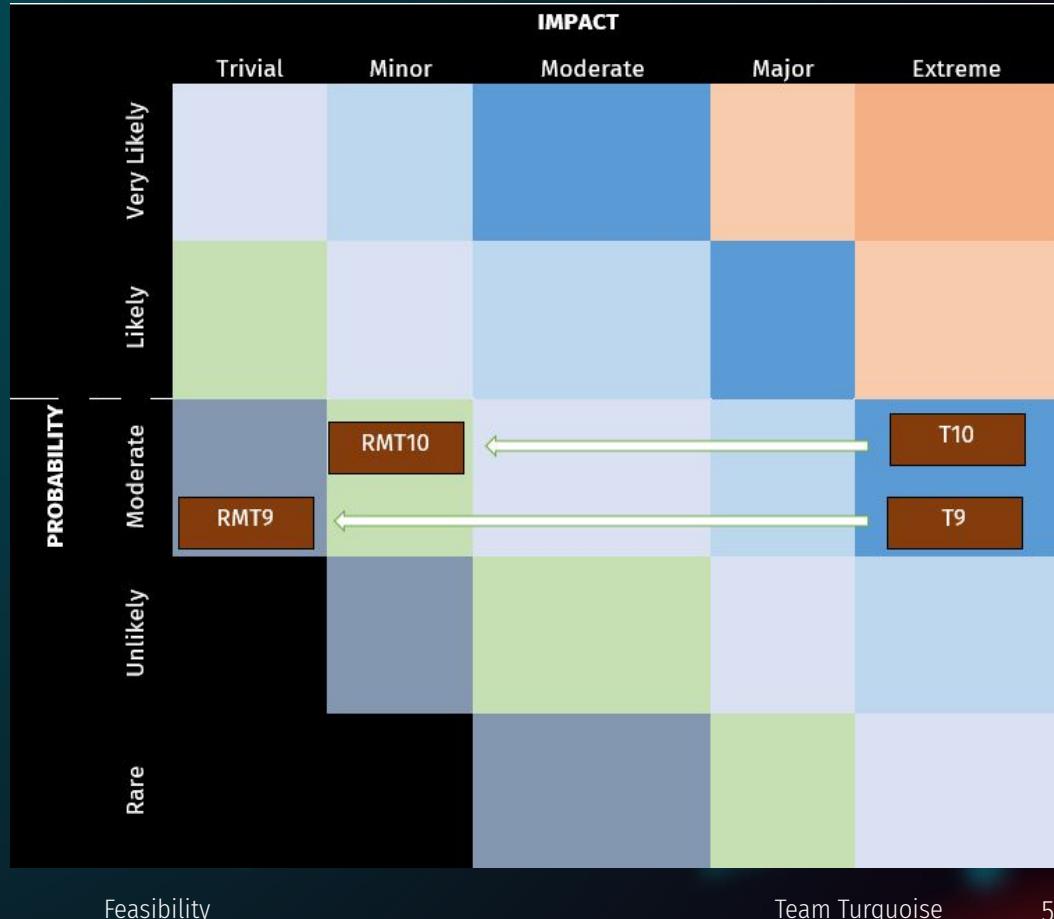
Interface

T9: Confusing which system "owns" the interfaces, creating delays in critical, cross-project planning.

T10: Segregating interface requirements from analysis models.

RMT9: By starting interface analysis early in the design process we can assign system ownership before potential cross-project issues arise

RMT10: By drafting analysis models at the beginning of the project we can reduce interface requirement segregation



Verification

T11: Every identity verification is unique.

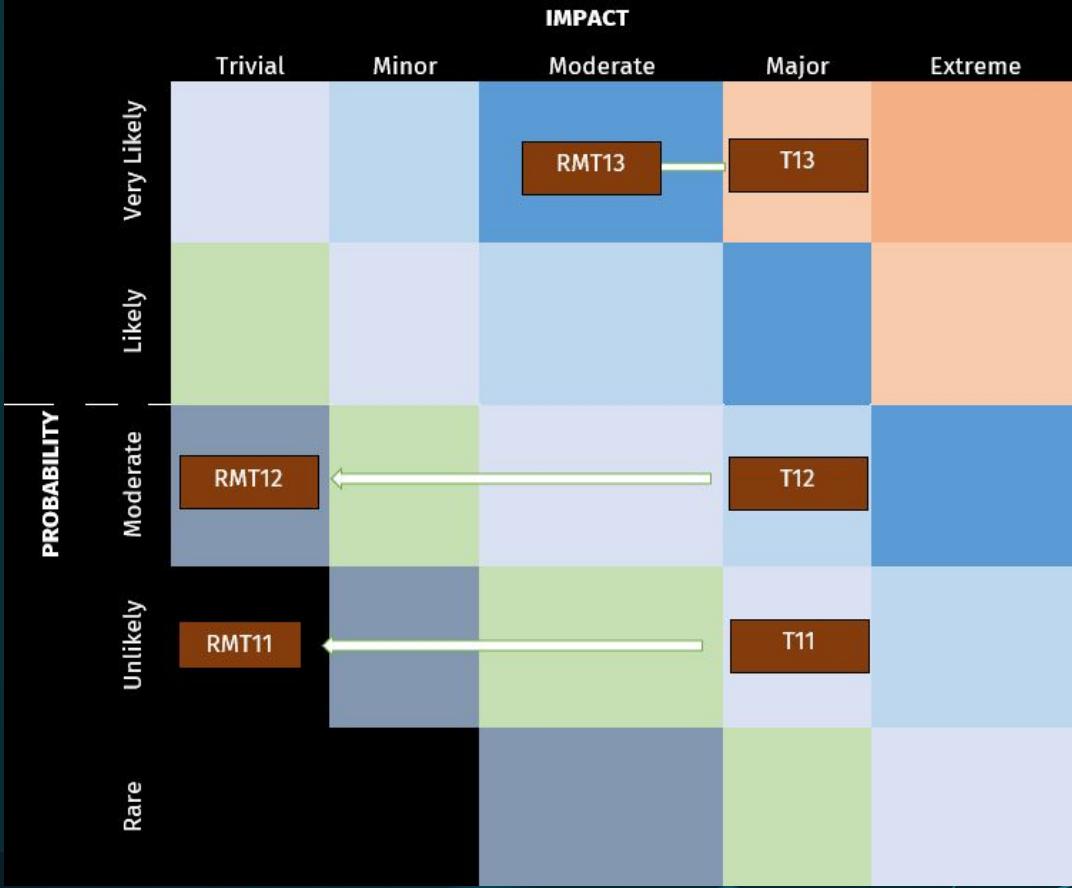
T12: The accounts are all different, so the level of risk for a verification varies.

T13: Risk levels can change as technology, regulations, consumer behavior and criminal activities evolve.

RMT11: OAuth provides a secure way to authenticate users.

RMT12: OAuth's inherent flexibility allows it to cater to different levels of risk associated with various account types.

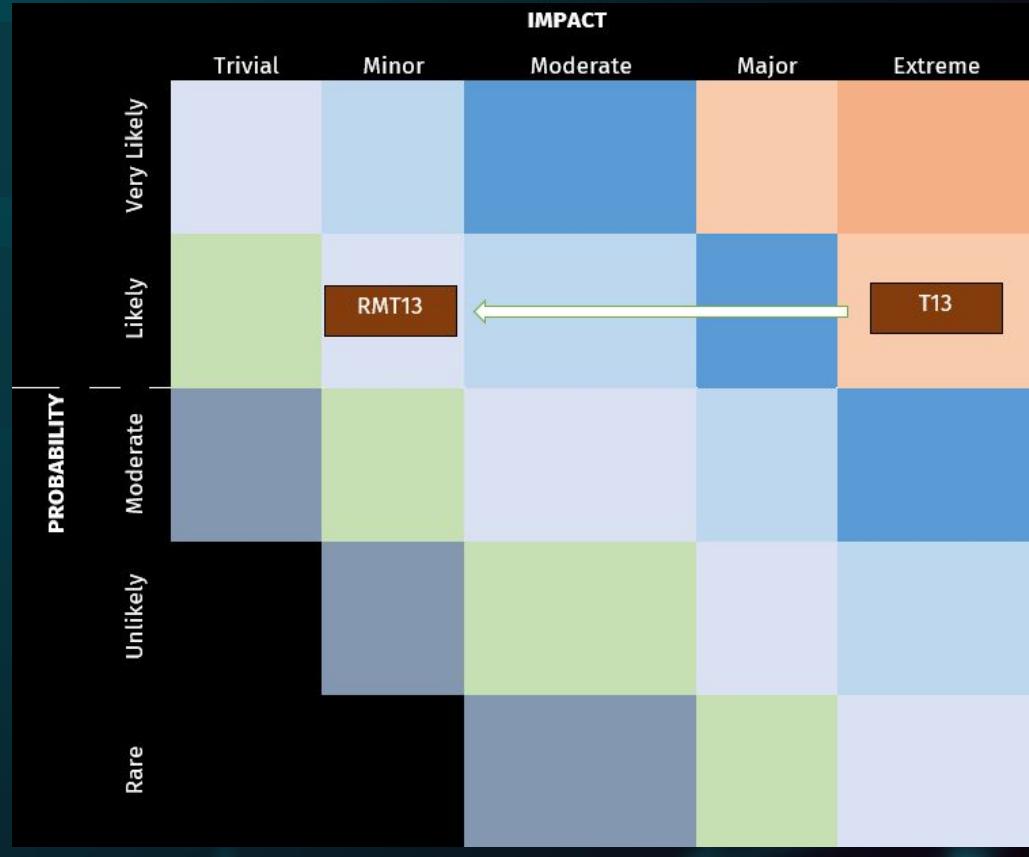
RMT13: OAuth adapts to changing risk levels by allowing for the revocation and renewal of tokens.



Maintenance Problems

T14: Data Loss and service interruption

RMT14: Regular updates and maintenance.



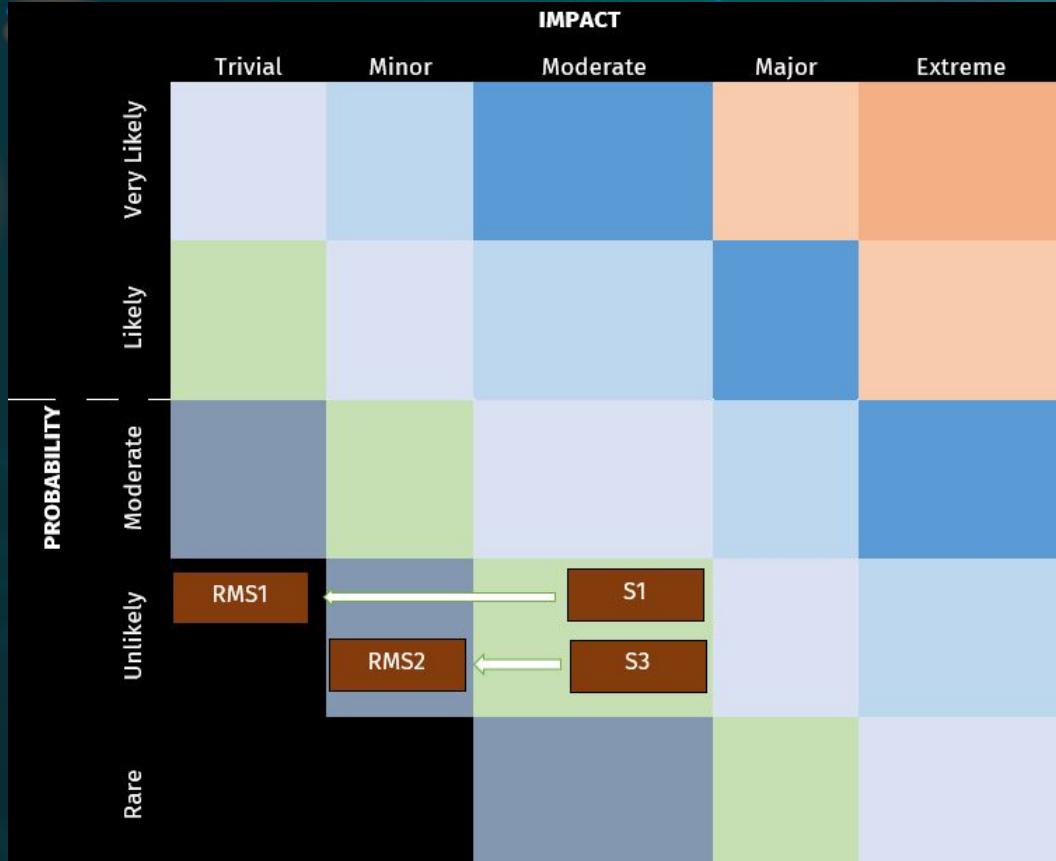
Legal Risks

S1: Defamation- This is not to degrade or slander those within the local area affected or the county it reflects

S2: Privacy Laws- Laws as far as user data will follow the laws of each participating county

RMS1: Establish a clear and accessible reporting mechanism for users to flag inappropriate or infringing content.

RMS2: Privacy policies, anonymization of data published or shared.



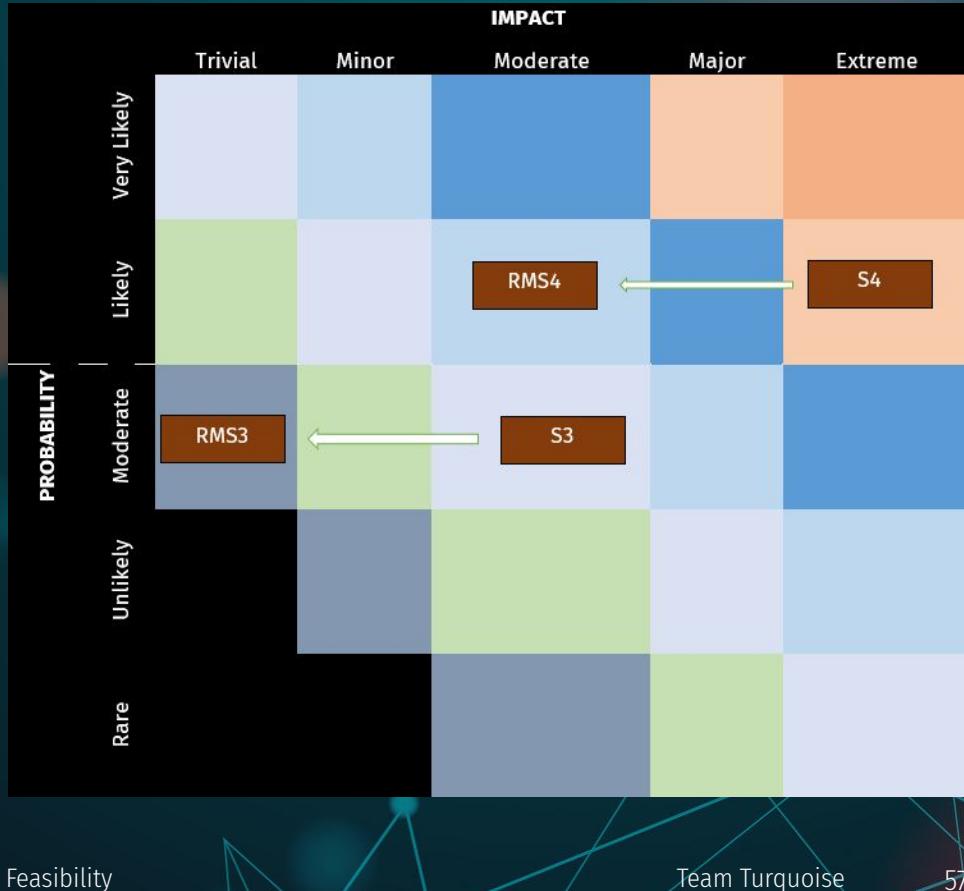
Legal Risks (Cont.)

S3: Consent- Those who use their location as a contributor when a file(s) are uploaded, the data collected will be under the contributor's own consent to share the files voluntarily

S4: Non-Compliance with COPPA

RMS3: Implement strict content submission policies, requiring users to confirm they own the rights to the content they upload or it's in the public domain.

RMS4: Age verification methods to ensure no data is collected from children under the age of 13 at all



User/Customer Risks

U1: Unauthorized Access

U2: User Privacy Concerns

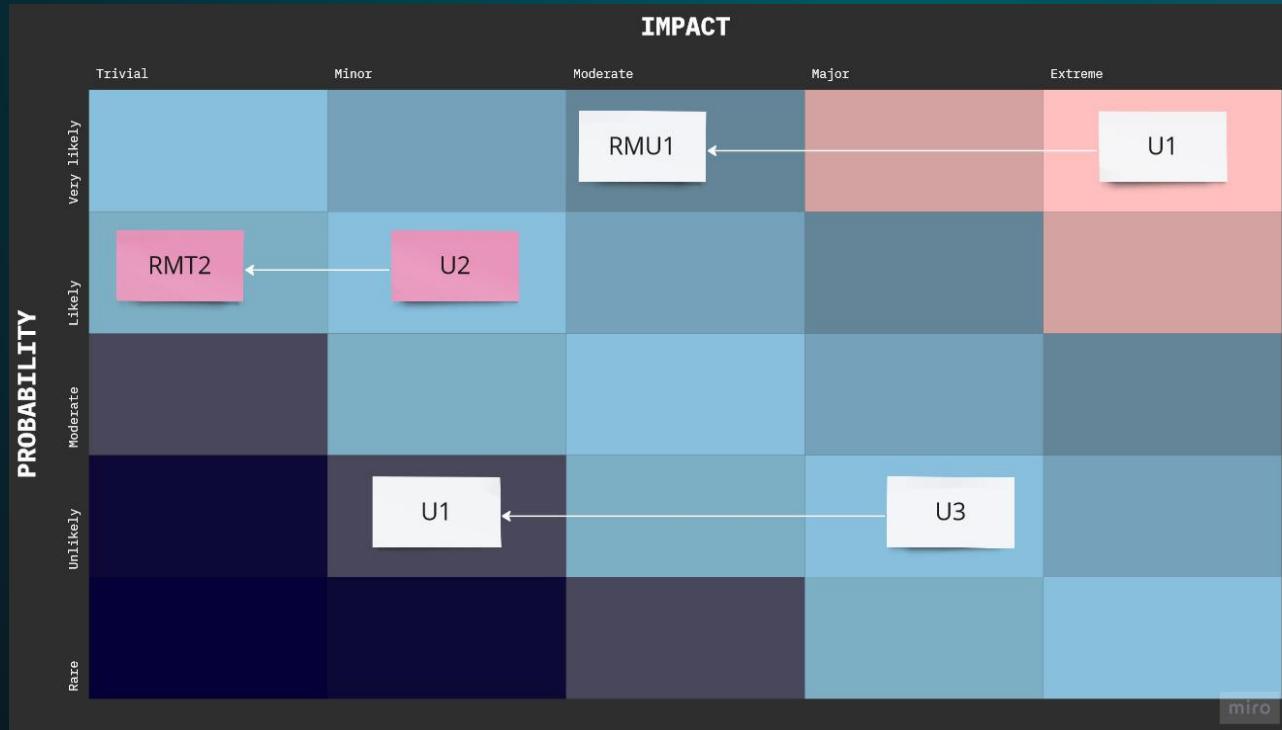
U3: Difficulty in Use

RMU1: OAuth 2.0 protocol

RMU2: Transparent privacy

policies detailing how user data
is used, stored, and protected.

RMU3: Conduct usability testing



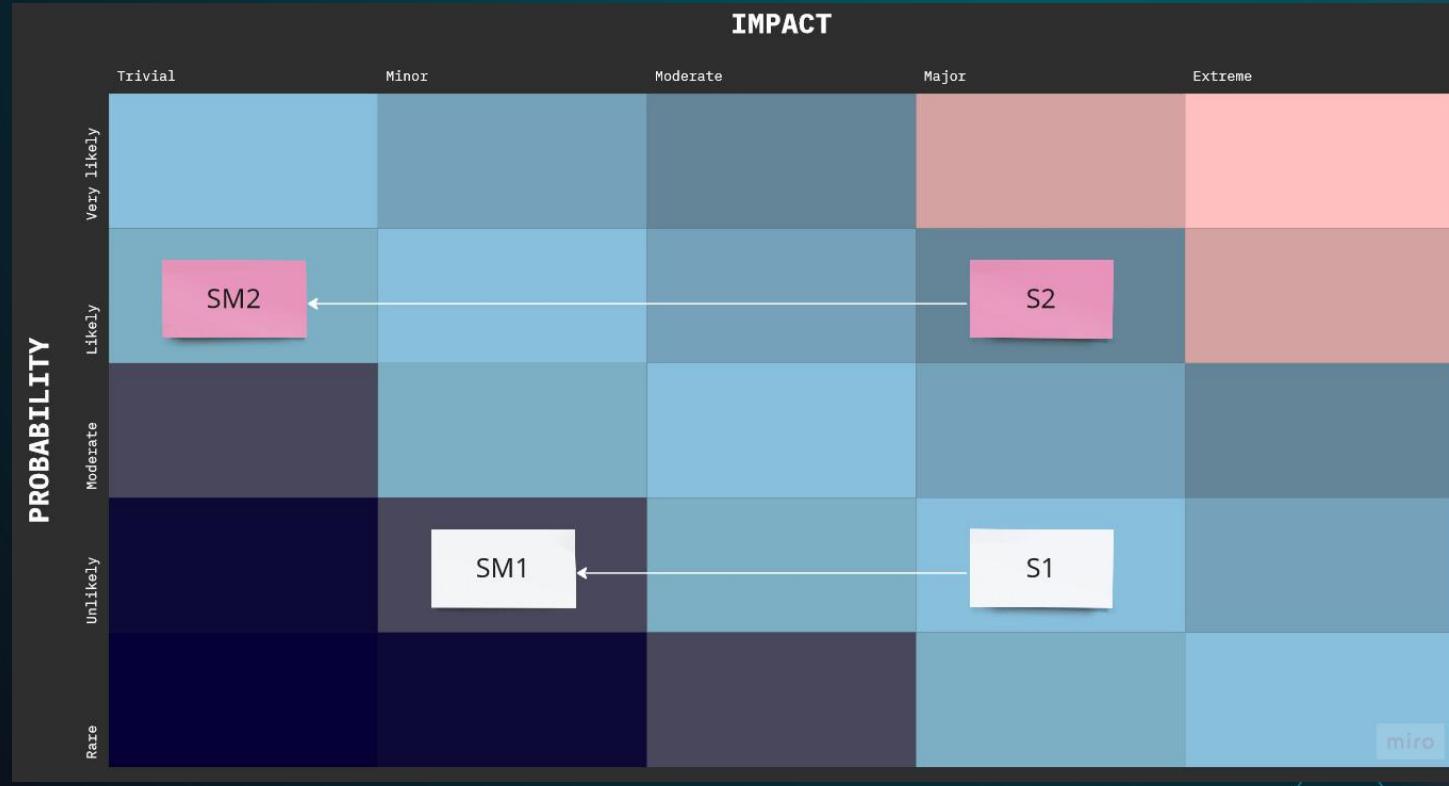
Security Risks

S1: DOS Attacks

S2: Injection Attacks

SM1: IP Tracking/Firewalls

SM2: Data Validation



Conclusion

Sea level rise is on the rise. We are beginning to see the impacts: the canadian wildfires, intense storms, hotter days, and rising sea levels are becoming more common. Climate Change is a global threat we must fight; one sound map at a time.



That's all folks ! (looney tunes theme remake). SoundCloud, (n.d.).
<https://soundcloud.com/yasser-boumechra/thats-all-folks-looney-tunes-theme-remake>



First two sprints for 411

Placeholder



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Glossary

Appendices