# Interim Presentation

- By Team 3 (2023)

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# Introduction


- Objective: Bridge the gap between standard documents and needs of those with learning disabilities (Focus: Dyslexia).
- Social Impact: Aligns with the theme of "social good"; enhances user experience and inclusivity.
- Primary Function: Transforms various document types (PPT, Word, Excel) into highly accessible formats.

# User Scenario: The Characters

## User Personas

### The Student Living With Dyslexia

Name: Emily
Age: 21

**Scenario**

Emily is a university student pursuing a degree in Psychology. Her studies require her to read dense academic papers and textbooks. She often finds herself spending more time on reading assignments than her classmates due to dyslexia, which affects her ability to participate in group discussions and other academic activities.

**Goals**

- Improve her academic performance.
- Reduce the time she spends on reading and re-reading materials so she can focus on other aspects of her studies.

**Pain points**

- Struggles with reading comprehension.
- Often has to re-read paragraphs multiple times.
- Prolonged study hours leading to reduced leisure time.
- Increased stress levels due to academic pressures.

### The Professional Living With Dyslexia

Name: Mark
Age: 42

**Scenario**

Mark is a marketing manager in a tech company. His job involves reading and creating lengthy reports, as well as going through a large number of emails daily. Due to dyslexia, he finds it challenging to quickly process written information, which sometimes affects his ability to make timely decisions and contribute effectively in meetings.

**Goals**

- Become more efficient at his job.
- Read and comprehend work-related documents quickly to make more timely managerial decisions.

**Pain points**

- Difficulty in quickly processing written information.
- Has to re-read documents multiple times.
- Delays in decision-making due to reading challenges.
- Stress exacerbates reading difficulties, creating a vicious cycle

### The Supportive Parent

Name: Jamie
Age: 55

**Scenario**

Jamie is a sculptor and the parent of a 12-year-old, Tim, who is living with dyslexia. They are actively involved in Tim's education and often help him read through his school assignments. They also attend school meetings and consult with special education therapists to find ways to better support Tim's learning. They are constantly on the lookout for resources that can help Tim become more independent in studying.

**Goals**

Find a reliable tool that can make reading easier for Tim.

**Pain points**

- Difficulty in finding suitable reading materials for Tim.
- Extended time spent on helping Tim with studies.
- Reduced family leisure time due to educational commitments.
- Stress and pressure felt by the entire family.

# Technical Problem: The Setting

# Core technical problems

**Reason for Building the application**

- Addressing accessibility for individuals with dyslexia and other disabilities in various document formats.

**Unique Features**

- Allows users to export reformatted, optimized documents for convenient re-reading.

**Document Formats Supported**

- .doc, .docx, .ppt, .pptx, .xls, .xlsx

**UI/UX**

- Prioritizes accessibility for all users.
- Desktop-first approach with responsiveness for other devices.

**Architecture**

- Cloud-based for scalability, flexibility, and security.

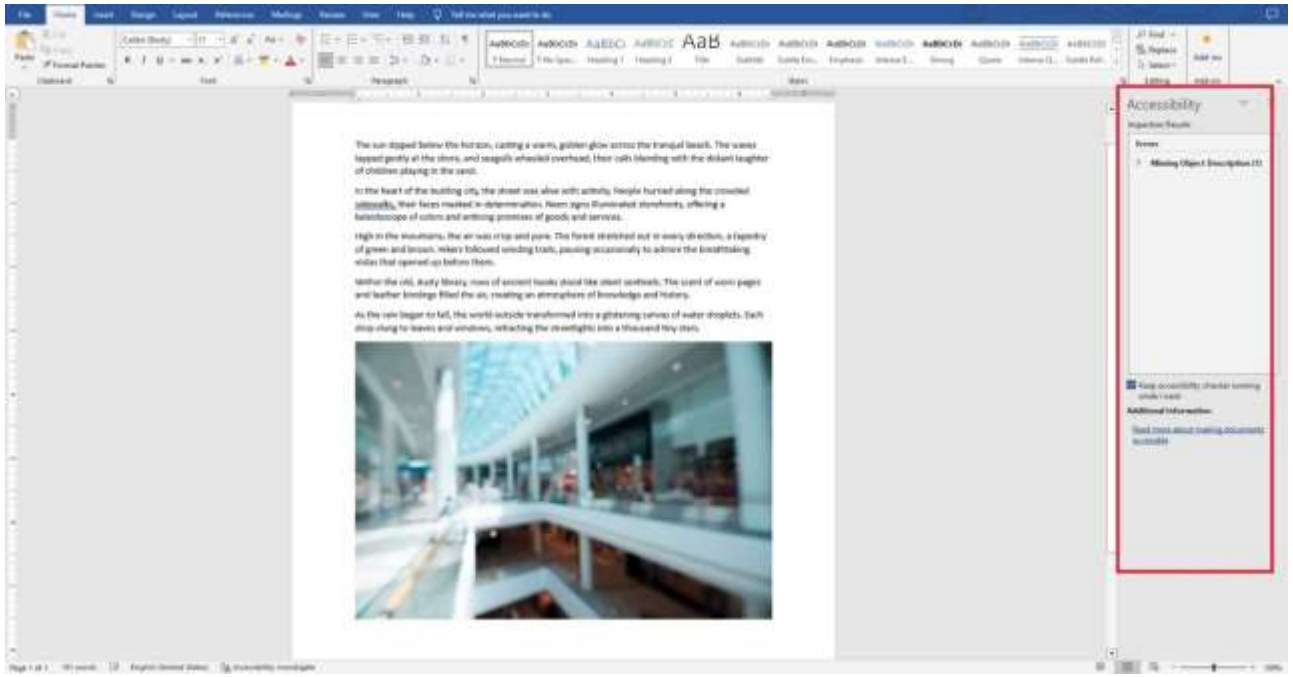
**Document Optimization Features**

- Informed by research, user feedback, and technical feasibility studies.

# Comprehensive analysis of similar systems

Microsoft Office Accessibility Checker

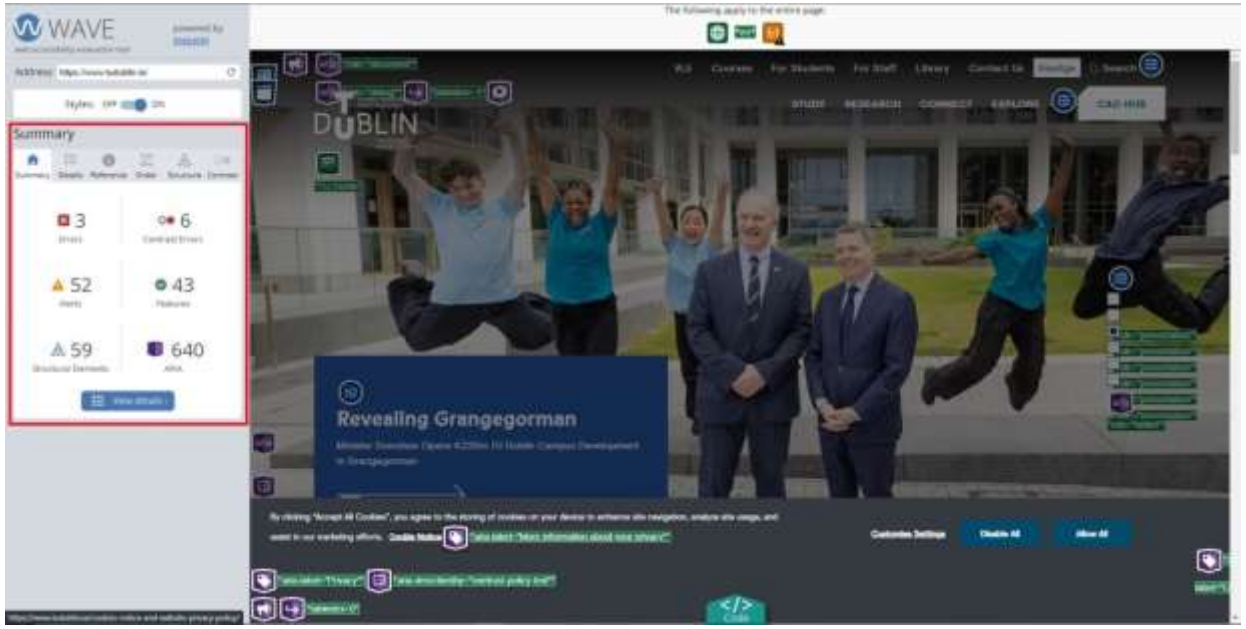
- Features
  - Auto-scans MS Office docs
  - Task Pane UI
- Pros
  - Integrated in Office
  - User-friendly
- Cons
  - MS Office files only
  - Not fully comprehensive



# Comprehensive analysis of similar systems

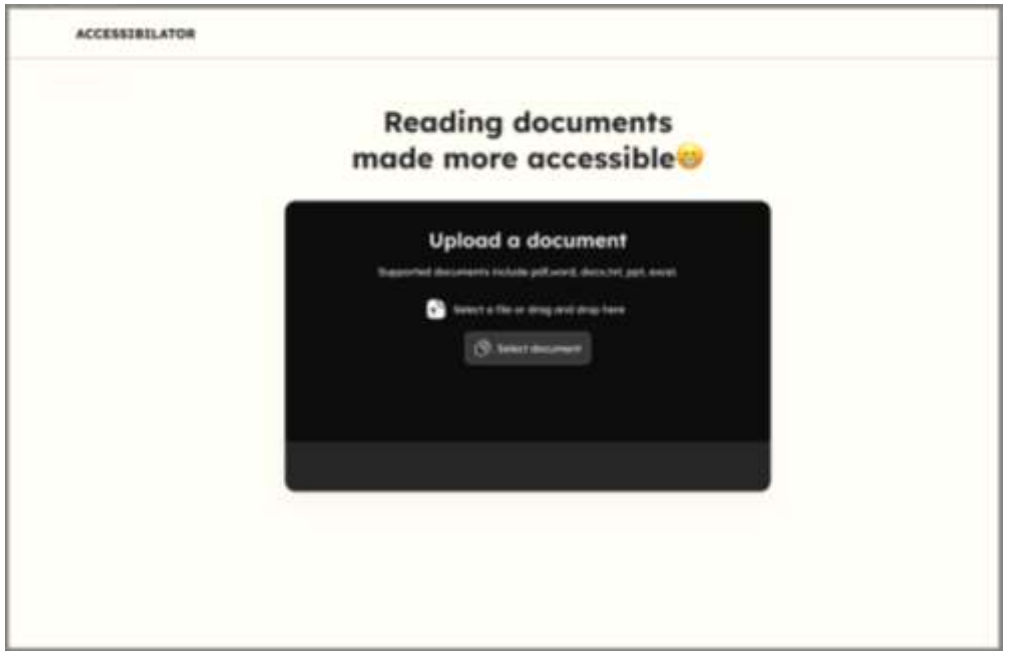
WebAIM's WAVE Tool

- Features
  - Web-based
  - Checks various issues
  - Visual overlay
- Pros
  - Free
  - Easy to use
  - Comprehensive
- Cons
  - Web content only
  - False positives



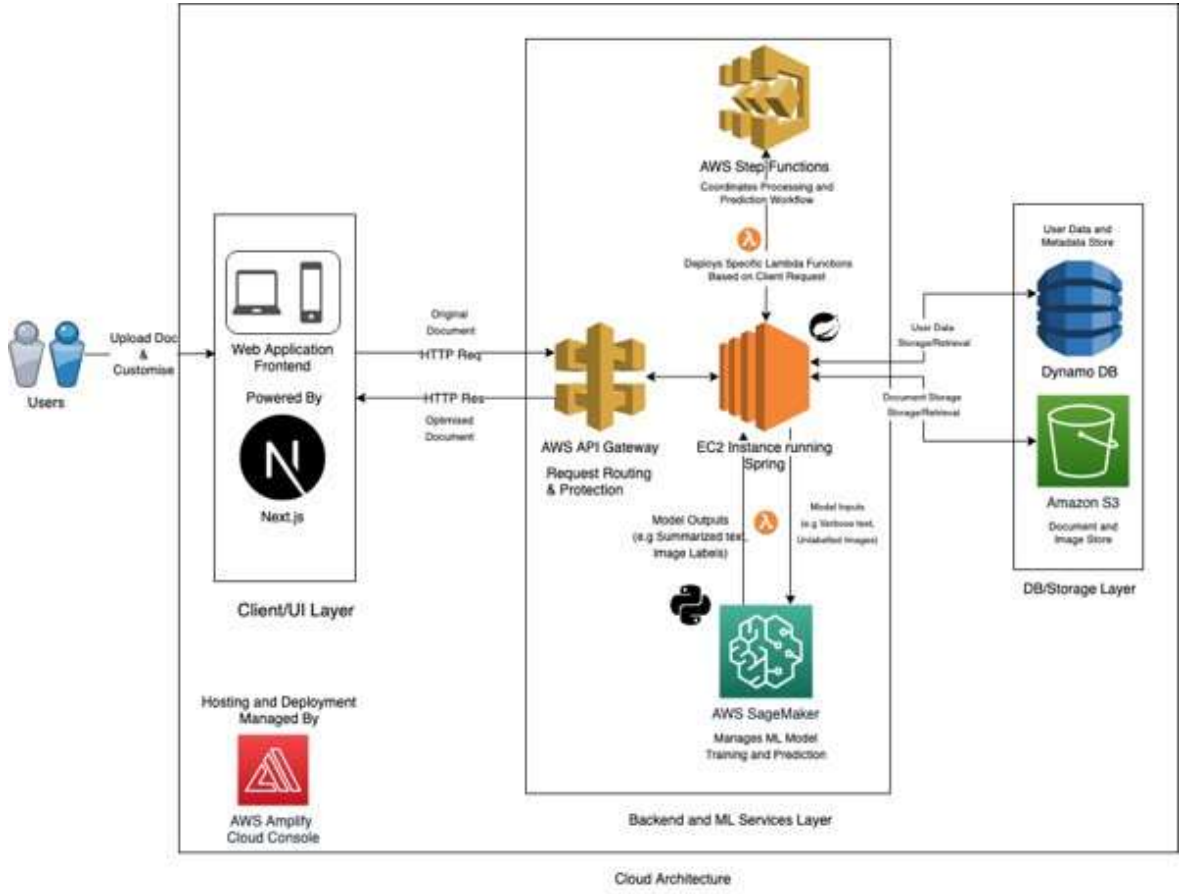
# Comparison with the Accessibilator

- **Comprehensiveness**
  - Accessibilator: Fixes colour, font for full accessibility
  - Others: Limited features
- **Ease of Use**
  - Accessibilator: User-friendly
  - MS Office: Integrated but limited to MS
  - WAVE: Web-only
- **Price**
  - Accessibilator: Free with extensive features
  - Others: Varies
- **Specialization**
  - Accessibilator: Identifies and fixes issues
  - Others: Only identifies issues



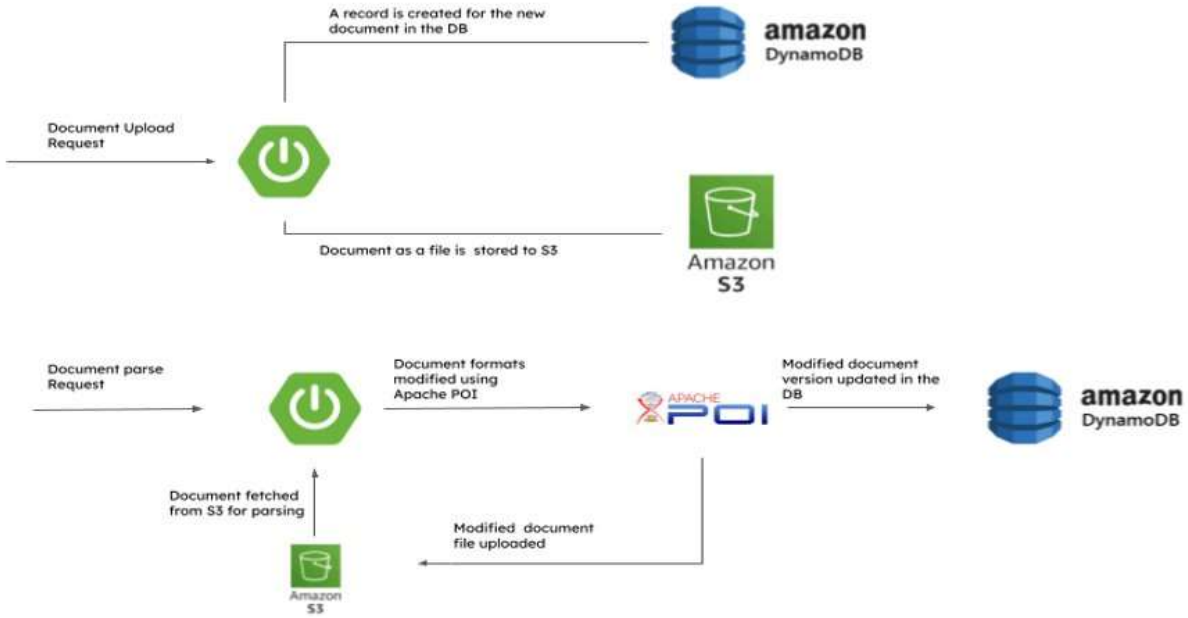
# Technical Solution: The Plot

# System Architecture




Cloud Architecture

# Backend Workflow



# Upload Document

Doc , Docx 

Txt , Rtf 

XLS, XLSX 

CSV, XML, XLSB 

PPT, PPTX 

CSV, XML, XLSB 

Technological Solution

- Uploading the file via a REST API Endpoint and loading it to an AWS S3 Bucket to store it.

# Font style and Size


→ Arial

→ Comic Sans MS

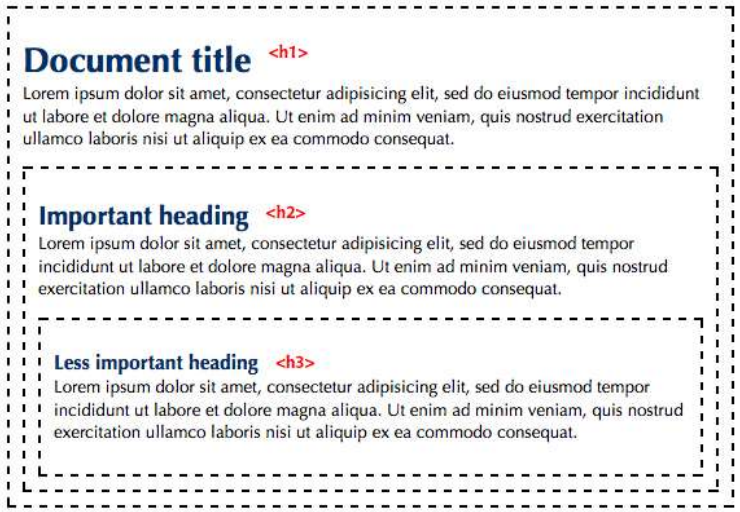
→ Verdana

→ **Lexend**

Technical Solution

- Font styles such as Lexend, Open Sans, Comic Sans OpenDyslexic, Dyslexie can be applied as per user preference using Apache POI's built-in methods. The default font style will be Open Sans.
- The document's font size can be fetched and modified using Apache POI. The default setting for the new font size is 14 points, although this can be customized by the user

# Headings



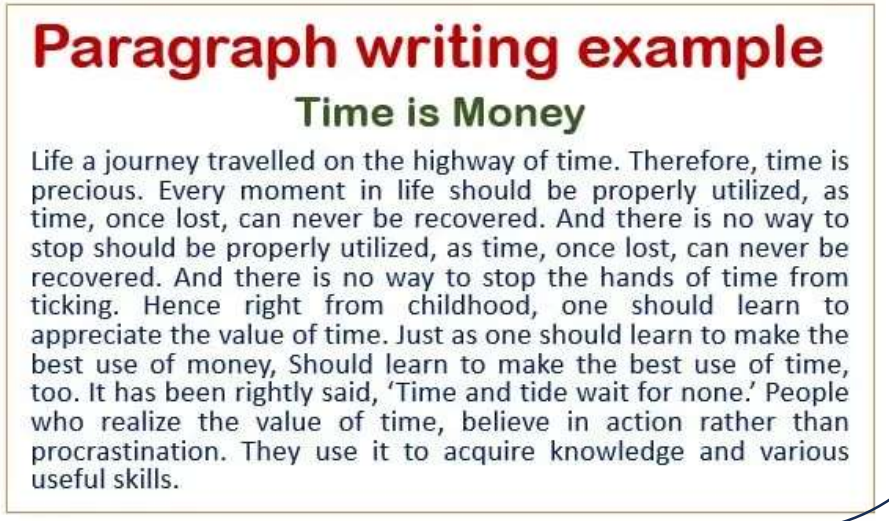

Technical Solution

- Automatic generation of contextually relevant, easy-to-understand headings
- Utilizing Long Short-Term Memory (LSTM) model.
- Hosted on Amazon SageMaker for scalability and integration.

# Paragraph splitting

Technical Solution

- .Efficiently create manageable chunks and simpler sentence structures.
- Utilizing OpenAI's text completion and fine-tuning APIs.



# Colour Enhancement

**Good Background Colors for Readers:**
**A Study of People with and without Dyslexia**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**ABSTRACT**

The use of colors to enhance the reading of people with dyslexia have been broadly discussed and is often recommended, but evidence of the effectiveness of this approach is lacking. This paper presents a user study with 341 participants (89 with dyslexia) that measures the effect of using background colors on screen readability. Readability was measured via reading time and distance travelled by the mouse. Comprehension was used as a control variable. The results show that using certain background colors have a significant impact on people with and without dyslexia. Warm background colors, *Peach*, *Orange* and *Yellow*, significantly improved reading performance over cool background colors, *Blue*, *Blue Grey* and *Green*. These results provide evidence to the practice of using colored backgrounds to improve readability; people with and without dyslexia benefit, but people with dyslexia may especially benefit from the practice given


The use of different background colors to enhance reading performance of those with dyslexia has been broadly discussed in previous literature and has been recommended by institutions such as the *British Dyslexia Association* [4]. To the extent of our knowledge the existing recommendations are not based on objectives measures collected with large user studies. In this paper, we present the first study that measures the impact of ten background colors on the reading performance. The user study was carried out with a large number of participants (341) with and without dyslexia, allowing for a statistical comparison between groups.
The main contributions of this study are:

- Background colors have an impact on the readability of text for people with and without dyslexia, and the impact is comparable for both groups.
- Warm background colors such as *Peach*, *Orange*, or


Rello, L., & Bigham, J. P. (2017). Good Background Colors for Readers. Proceedings of the 19th International ACM SIGACCESS Conference on Computers and Accessibility - ASSETS '17. https://doi.org/10.1145/3132525.3132546


## Technical Solution

- The Apache POI library allows you to fetch the current text colour for contrast analysis. Utilizing algorithms like the WCAG contrast ratio, you can assess and adjust the text and background colours for better readability

# Layout - Alignment

aligned left:

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Donec accumsan sollicitudin tellus et malesuada. Nullam facilisis, mi vitae sodales aliquet, massa metus posuere tortor, ac feugiat tellus arcu sed magna. Vestibulum id mi ipsum, ut vehicula lacus. Nunc ullamcorper consequat eros et tincidunt. Cras vel enim elit. Vivamus nunc quam, vestibulum eget posuere eu, auctor at nibh. Sed eget nulla in eros rhoncus suscipit. Etiam purus lorem, fermentum ut aliquet aliquet, feugiat in velit. Mauris euismod, massa sit amet ultricies suscipit, diam lacus faucibus tortor, sed euismod libero nibh vitae erat. Etiam sollicitudin mollis nulla et cursus.

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Technical Solution

- The document layout can be set to left-aligned using Apache POI's built in methods.

# Table of Contents

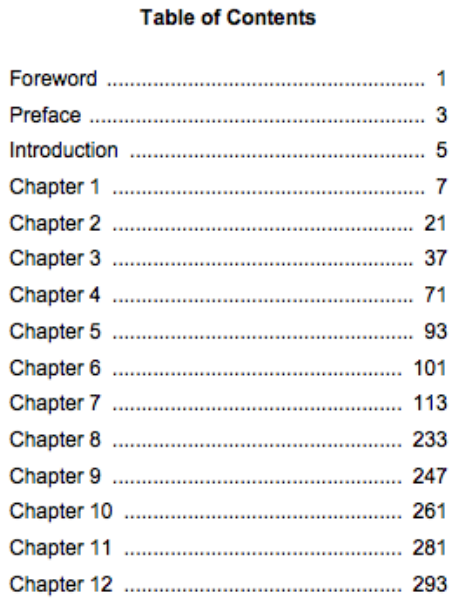


Table of Contents



Technical Solution

- Headings in the document can be identified by iterating through its paragraphs using the Apache POI.
- A new paragraph is then created to list these headings in a numbered format, serving as the table of contents.

# Bad Words


Technical Solution

- Text sanitization techniques to remove or replace inappropriate language.
- Python libraries: profanity-check, profanity filter, better_profanity.

# Expand Abbreviations and simplify Jargons

**Internet Slang and Abbreviations**

| | | | |
|---|---|---|---|
| AFAIK | As Far as I Know | MMB | Message Me Back |
| AFK | Away from Keyboard | msg | Message |
| ASL | Age/Sex/Location? | MYOB | Mind Your Own Business |
| ATM | At The Moment | N/A | Not Available |
| b/c | Because | NC | No Comment |
| b/w | Between | ne1 | Anyone |
| b4 | Before | NM | Not much |
| BBIAB | Be Back in a bit | noob | Newbie |
| BBL | Be back later | NP | No Problem |
| BFF | Best Friends Forever | NTN | No Thanks Needed |
| BRB | Be Right Back | OMG | Oh My Gosh |
| BTW | By The Way | OMW | On My Way |
| CTN | Can't Talk Now | OT | Off Topic |
| CYE | Check Your E-mail | PC | Personal Computer |
| dl | Download | pls | Please |
| ETA | Estimated Time of Arrival | POS | Parent Over Shoulder |
| FWIW | For What it's Worth | ppl | People |
| FYI | For Your Information | qt | Cutie |
| GG | Good Game | re | Regarding |
| GJ | Good Job | SMH | Shaking my head |
| GL | Good Luck | Srry | Sorry |
| gr8 | Great | TBA | To Be Announced |
| GTG | Got To Go | TBC | To Be Continued |
| GMV | Got My Vote | TC | Take Care |
| HTH | Hope this helps | thx | Thanks |
| hw | Homework | TIA | Thanks in Advance |
| IAC | In Any Case | TLC | Tender Loving Care |
| IC | I See | TMI | Too Much Information |
| IDK | I Dont Know | TTFN | Ta-ta For Now |
| IIRC | If I Remember Correctly | TTYL | Talk To You Later |
| IKR | I Know, Right? | txt | Text |
| IM | Instant Message | TY | Thank You |
| IMO | In My Opinion | w/e | Whatever |
| IMHO | In My Humble Opinion | w/o | Without |
| IRL | In Real Life | WB | Wait |
| J/K | Just kidding | XOXO | Hugs and kisses |
| K | OK | Y | Why |
| LB | Late | YNt | Why Not |
| lBr | Later | YOLO | You Only Live Once |
| LMK | Let Me Know | YW | Youre Welcome |
| LOL | Laughing Out Loud<br>Lots of love | ZZZ | Sleeping |

Technical Solution

- Utilize Machine Learning to automatically expand or abbreviate text in documents.
- Transform complex jargon into simple language for easier comprehension.

# Glossary Auto-generation

Scribbr Glossary - Example

Scribbr

Glossary

| Term | Definition |
|---|---|
| Analysis of Variance (ANOVA) | A statistical tool used to analyze the differences among means. |
| Confidence interval (CI) | The mean of an estimate +/- the variation in the estimate. |
| Comma Separated Value (CSV) | A text file that uses a comma (,) to separate each value inputted. |
| Mean Squared Error (MSE) | A measurement of how close a fitted line is to plotted data points. |
| Odds Ratio (OR) | A quantification of the strength of association between two events. |
| Process Behavior Analysis (PBA) | Written analysis of a Process Behavior Chart (PBC) |
| Quality Assurance (QA) | Systematic monitoring and evaluation to ensure standards are met. |
| Root Mean Square (RMC) | The square root of the mean square, or the quadratic mean. |

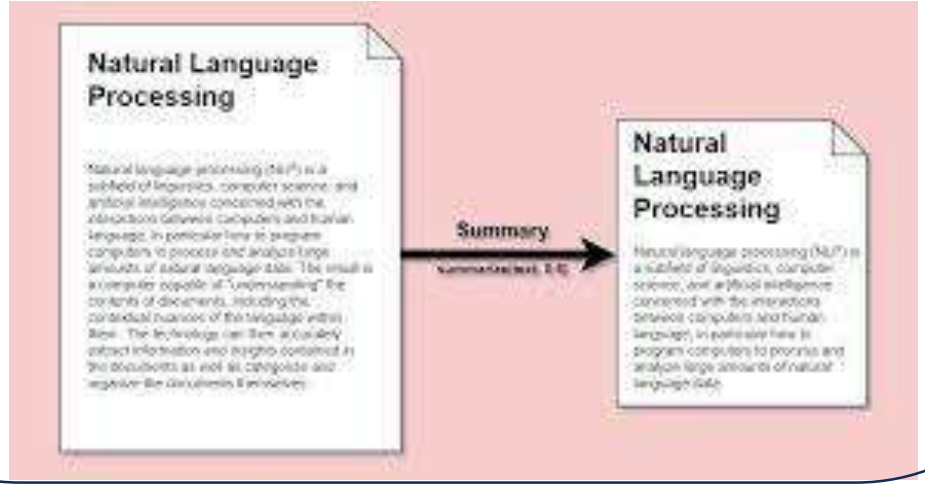
Technical Solution

- Enhanced readability and quick reference guide for readers
- Utilizing TF-IDF to identify key terms and phrases in documents.
- WordNet API for fetching contextually relevant definitions.

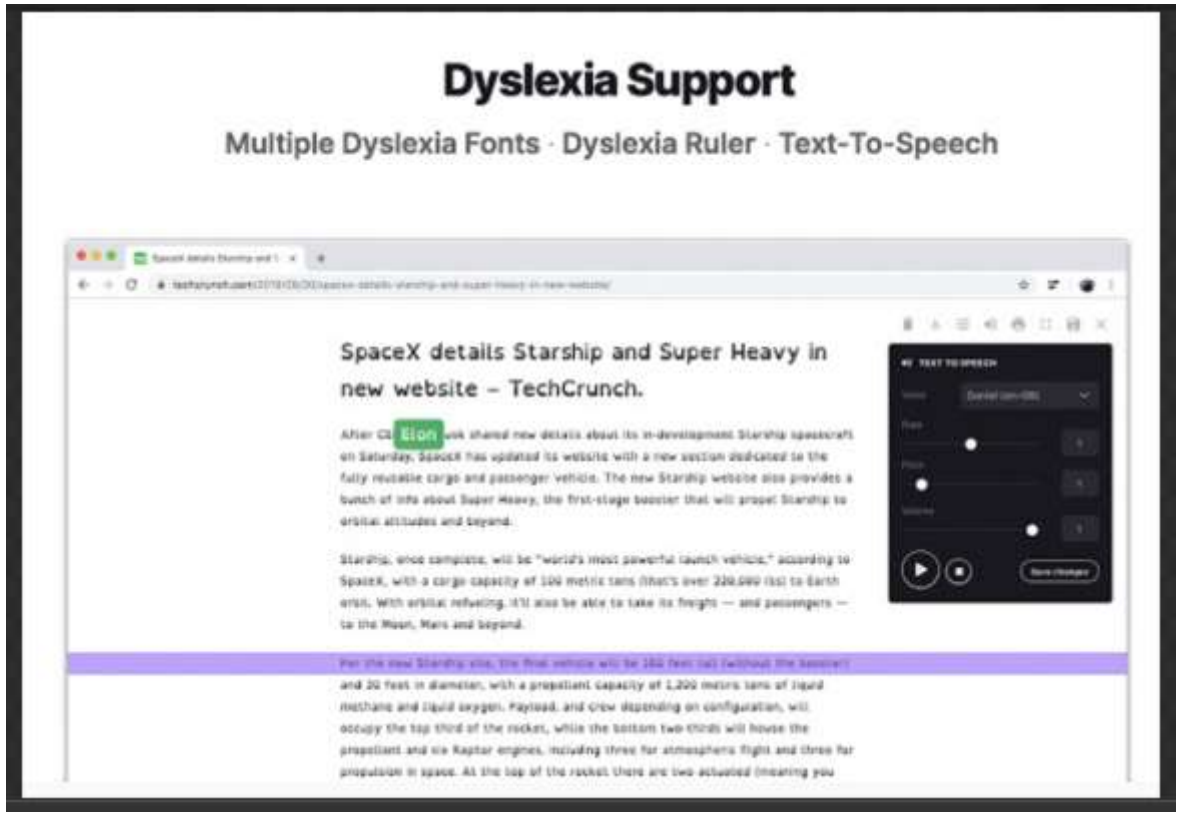
# Text summarization

Technical Solution

- Concise yet informative summaries that retain original meaning.
- Utilizing RNNs, LSTMs, and GRUs for deep learning-based summarization.



# Dyslexia ruler with customisations




## Technical Solution

- Customization panel to alter the properties of the ruler. CSS and JavaScript will be used develop the same

# Text to speech

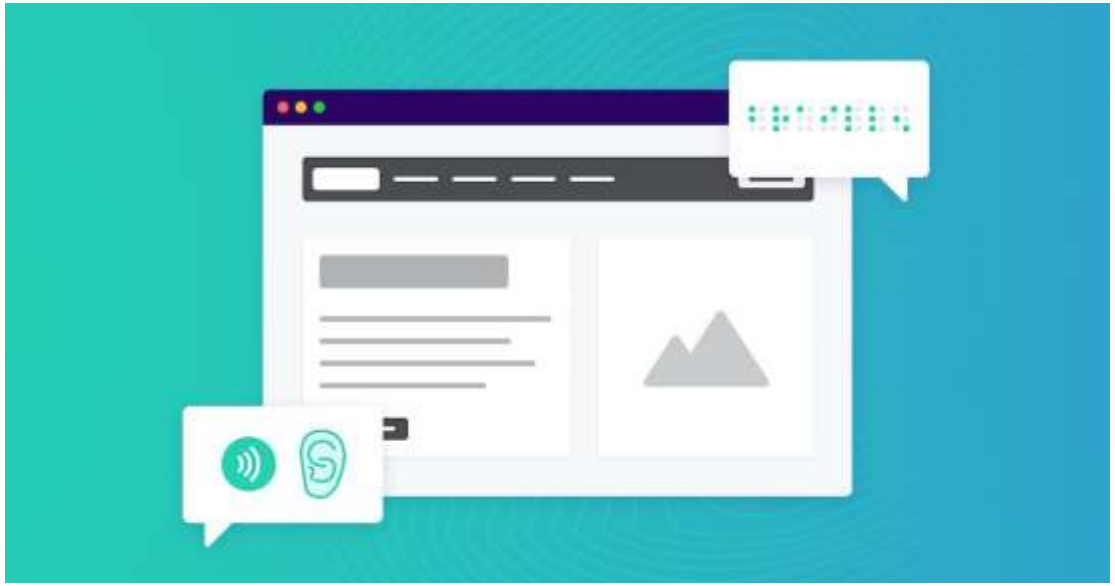

Technical Solution

- Using Web Speech API in JavaScript as a solution

# Screen Reader

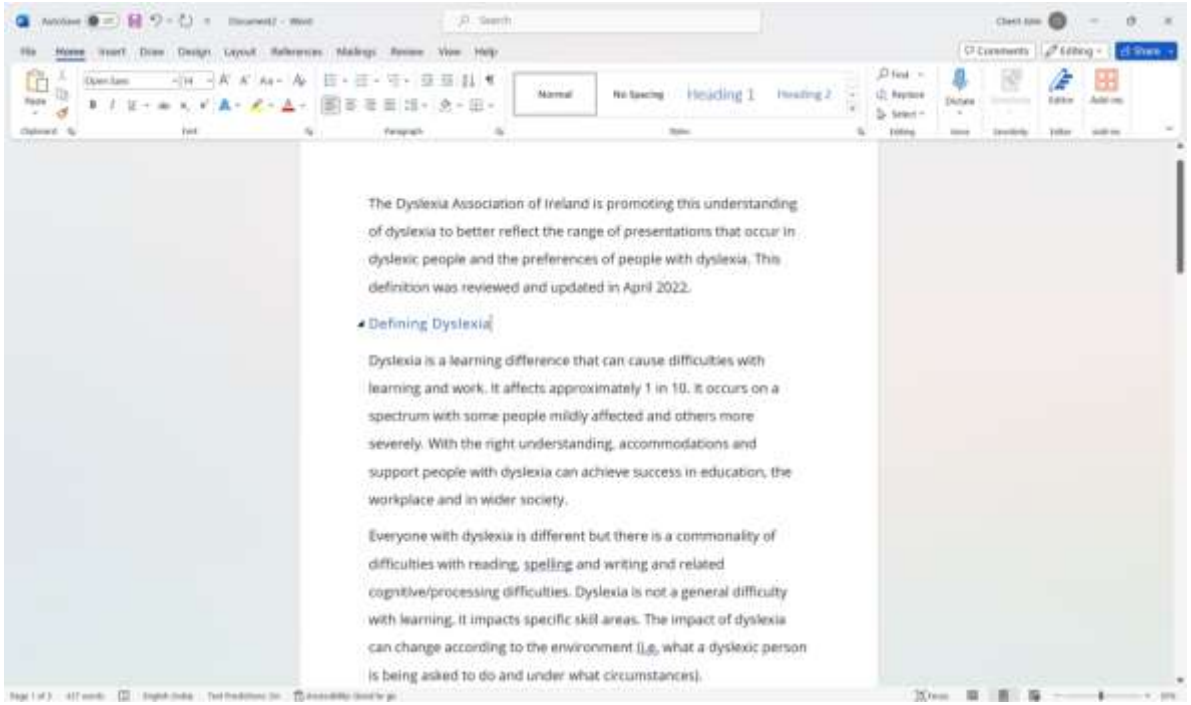
Technical Solution

- Using CSS and JavaScript this issue can be resolved.



# User Evaluation: The Reviews

# What does success look like for your system?




Success is multi-faceted: technical efficiency + meaningful user impact.

User-Centric Goals

- Educate users on dyslexia-friendly formats.
- Automated tools to adapt text, color, layout.
- Inclusive impact across dyslexia spectrum.

Technical Goals

- Efficient document parsing and optimization.
- Seamless front-back-end integration.
- AWS services like EC2, S3, and SageMaker for backend tasks.

Success Metrics

- At least a 20% improvement in document accessibility scores.

# Evaluation


**Front-end Evaluation**

- Tools: Google PageSpeed Insights.
- Metrics: TTFB, FCP, Page Load Time.

**Backend Evaluation**

- Tools: Amazon CloudWatch.
- Metrics: CPU Utilization, Disk I/O, Network Throughput.
- Alerts: CloudWatch Alarms for metrics thresholds.

**Code Quality**

- Unit Testing
- Functional Testing
- Integration Testing

**User Surveys**

- Post-interaction for ease of use, effectiveness, and experience

**Case Studies**

- In-depth interviews with dyslexic users on reading experience

**Usability Testing**

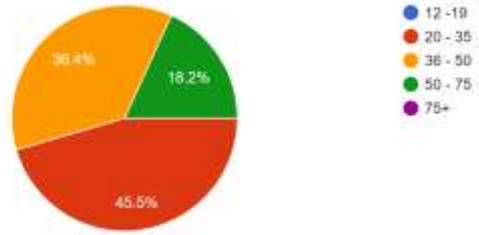
- Multi-method: Think-aloud and Task-Based Testing
- Complemented by user surveys.

**Feedback Loop**

- In-app feedback form for real-time qualitative data

# Survey Findings

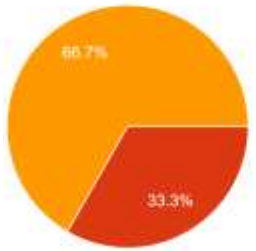
Age Group
11 responses





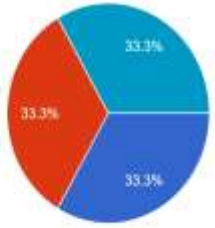


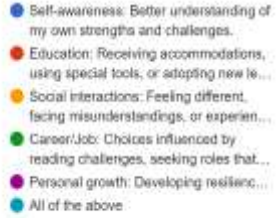
How would you rate your level of expertise with technology?
3 responses



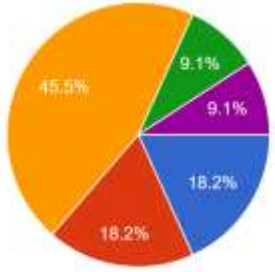


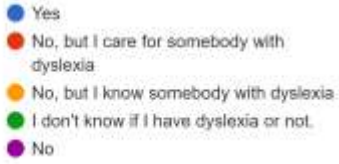
Which of the following areas of your life were influenced by your dyslexia diagnosis?
3 responses



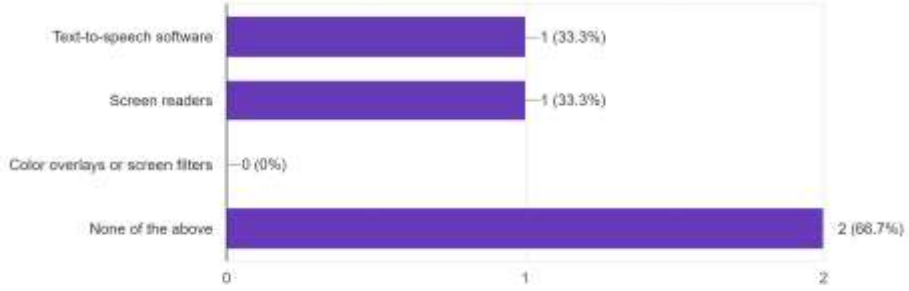




Are you a person with Dyslexia?
11 responses




Do you use any of the following assistive technologies or tools to help you read?
3 responses



# Thank you

Team 3

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