

UNIVERSIDADE FEDERAL DO RIO GRANDE DO SUL
INSTITUTO DE INFORMÁTICA
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GIOVANI MARCANTE TIRELLO

**Visualization of the Votes on Resolutions
from the United Nations General Assembly**

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Advisor: Profa. Carla Maria Dal Sasso Freitas

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UNIVERSIDADE FEDERAL DO RIO GRANDE DO SUL

Reitor: Prof. Carlos André Bulhões Mendes

Vice-Reitora: Prof^ª. Patricia Helena Lucas Pranke

Pró-Reitora de Ensino: Prof^ª. Cintia Inês Boll

Diretora do Instituto de Informática: Prof^ª. Carla Maria Dal Sasso Freitas

Coordenador do Curso de Ciência de Computação: Prof. Rodrigo Machado

Bibliotecária-chefe do Instituto de Informática: Beatriz Regina Bastos Haro

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ABSTRACT

Despite the fact that observing the countries' positionings at the United Nations General Assembly is extremely useful for analyzing their political stances, there are few and unrefined interactive applications that offer detailed data visualizations of the resolutions discussed in these meetings. When looking through the textual outputs of an overwhelming amount of votes for resolutions discussed by the Assembly throughout over seven decades, discovering patterns, similarities and differences between the countries' opinions become even harder for specialists and also keeps the general public away from its rich data. This work, therefore, presents an application that includes many visualizations of the United Nations Member States' votes at the Assembly's annual meetings. This project aims to allow the user to analyze the resolutions from both broad and detailed perspectives and observe the countries' behavior in relation to many relevant topics in world politics, providing deeper and more satisfactory research results through filtering options for year ranges, countries, geographic regions and country groups. Popular visualization tools, such as the D3.js library, and user-centered design principles were used to continuously improve the application throughout its entire development process. Formal evaluations were performed with both specialists and the general public, which proved the application to be an useful tool for UNGA resolutions' data collection and analysis. The full data gathering, development and evaluation processes and its results have been reported in this work, as well as the functioning of the application's visualizations.

Keywords: United Nations General Assembly. UNGA Resolutions. Information Visualization.

Visualização dos Votos das Resoluções da Assembleia Geral das Nações Unidas

RESUMO

Apesar do fato de que observar os posicionamentos dos países na Assembleia Geral das Nações Unidas seja extremamente útil para analisar suas posições políticas, existem poucos e não refinados aplicativos interativos que oferecem visualizações de dados detalhados das resoluções discutidas nessas reuniões. Ao analisar os resultados textuais de uma enorme quantidade de votos em resoluções discutidas pela Assembleia ao longo de mais de sete décadas, descobrir padrões, semelhanças e diferenças entre as opiniões dos países torna-se ainda mais difícil para os especialistas e também mantém o público em geral longe de seus ricos dados. Esta monografia, portanto, apresenta uma aplicação que inclui varias visualizações dos votos dos Estados-Membros das Nações Unidas nas reuniões anuais da Assembleia. Este projeto visa permitir ao usuário analisar as resoluções tanto de uma perspectiva ampla quanto detalhada e observar o comportamento dos países em relação a muitos tópicos relevantes da política mundial, fornecendo resultados de pesquisa mais profundos e satisfatórios por meio de opções de filtragem por faixa de anos, países, regiões geográficas e grupos de países. Ferramentas de visualização populares, como a biblioteca D3.js, e princípios de design centrados no usuário foram usados para melhorar continuamente a aplicação em todo o seu processo de desenvolvimento. Avaliações formais foram realizadas tanto com especialistas quanto com o público em geral, o que provou que o aplicativo é uma ferramenta útil para a coleta e análise de dados das resoluções da AGNU. Os processos completos de coleta, desenvolvimento e avaliação de dados e seus resultados foram relatados nesta monografia, bem como o funcionamento das visualizações da aplicação.

Palavras-chave: Assembleia Geral das Nações Unidas, Resoluções da AGNU, Visualização de Informações.

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LIST OF ABBREVIATIONS AND ACRONYMS

AGNU	Assembléia Geral das Nações Unidas
CSV	Comma-separated values
DGACM	Department for General Assembly and Conference Management
IR	International Relations
ONU	Organização das Nações Unidas
PCA	Principal Component Analysis
SDG	Sustainable Development Goals
SEQ	Single Ease Question
SUS	System Usability Scale
UEQ	User Experience Questionnaire
UFRGS	Universidade Federal do Rio Grande do Sul
UI	User Interface
UN	United Nations
UNGA	United Nations General Assembly
UNSC	United Nations Security Council
UX	User Experience

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1 INTRODUCTION

The widespread access to the internet and social media has materialized communications and media specialist Marshall McLuhan's visionary idea of a "global village" in which the world would eventually become interconnected through the propagation of media technologies all over the planet (MCLUHAN, 1962). McLuhan (1962) believed that this interconnectedness would end up having profound implications in the countries' cultures, societies, economies, and politics. And just as he predicted, nowadays, political decisions are not only in the interest of specialists but of the general public as well.

Along with the general public's interest in political decisions, the transformations that came with the widespread access to the internet brought the demand for higher levels of political transparency to hold public officials and organizations accountable and fight corruption (MATTOZZI; MERLO, 2007). In order to maintain their credibility, governments, organizations, and entities have adopted transparency policies within their systems. The United Nations (UN) is one of them.

The United Nations General Assembly (UNGA) is one of the main organs of the UN. Its 193 Member States have been meeting annually since 1946 to make "decisions on important questions, such as those on peace and security, admission of new members and budgetary matters" (UNITED NATIONS, 2021) along with any questions or any matters within the scope of the UN Charter (UNITED NATIONS, 1945). The Assembly's decisions and recommendations are determined through a voting process in which each Member State is allowed one vote. This voting system aims to bring equality among the Member States to the organization's decision-making process by not considering the countries' demographic, geographic, economic, and political differences. The Assembly then materializes the voting results in Resolutions that are issued individually and formally express the opinion or will of the Member States (UNITED NATIONS, 1945).

In order to strengthen the organ's accountability, transparency, and institutional memory, the Assembly is committed to openness and transparency with respect to its political and financial decisions (UNITED NATIONS GENERAL ASSEMBLY, 2021a). According to the UNGA's Rules of Procedure, "the meetings of the General Assembly and its Main Committees shall be held in public unless the organ concerned decides that exceptional circumstances require that the meeting be held in private" (UNITED NATIONS GENERAL ASSEMBLY, 2021b) and "all decisions of the General Assembly taken at a private meeting shall be announced at an early public meeting of the Assembly" (UNITED

NATIONS GENERAL ASSEMBLY, 2021b).

The Member States' votes can be interesting sources for analyzing the countries' political positionings in a wide variety of matters over the seven decades of UNGA meetings and, consequently, for predicting their future diplomatic movements. Currently, the UN's official website offers a simple interface¹ for consulting its Resolutions individually in textual form. Interactive visualizations can facilitate data analysis by making it much simpler and easier to understand (MUNZNER, 2014). Therefore, this project aimed to develop a data visualization tool for gathering information, improving the user's experience when analyzing the UNGA's Resolutions and the countries' positions on issues relevant to political, social, and economic relations not only to experts but also to the general public. The application was developed using a dataset² of the resolutions made available at Harvard Dataverse. It provides several filtering options and visualizations for a more personalized result according to the user's wishes.

1.1 Structure

This work is divided as follows:

- Chapter 2 briefly surveys previous visualizations of data related to the UN General Assembly voting sessions;
- Chapter 3 addresses the methodology used throughout the process of developing the application;
- Chapter 4 described the application, with all features it provides;
- Chapter 5 presents the evaluation of the application by potential users and general public;
- Chapter 6 provides a summary of the work, its limitations, and learned lessons, in addition to the improvements left for future work.

¹<https://research.un.org/en/docs/ga/quick/regular/>

²<https://dataverse.harvard.edu/dataset.xhtml?persistentId=doi:10.7910/DVN/LEJUQZ>

2 RELATED WORKS

In this chapter, previous projects related to the proposed application are reviewed. The three following sources provide visualizations of the UNGA's votes: Al Jazeera's "*How has my country voted at the UN?*"¹, the Department for General Assembly and Conference Management's (DGACM) proof-of-concept², and the #UNGAviz Contest³ winner Abdulqadir Rashik's Global Policy⁴.

2.1 Al Jazeera "How has my country voted at the UN?" Visualization

The "*How has my country voted at the UN?*" visualization was created by the AJ Labs (Al Jazeera's data, visual storytelling, and experiments team) in 2019. The English news channel's group of specialists also used the Harvard Dataverse dataset, although it only contemplates UNGA meetings up to 2018 (AJ LABS, 2019).

AJ Labs' visualization focuses on observing countries' voting patterns throughout the decades, allowing the user to analyze these patterns divided by topic (Figure 2.1), along with important historical facts and quotations that are relevant for the understanding of each country's votes through the years. The website also provides a glimpse of what the specialists expected of the next UNGA annual session, in 2019.

2.2 DGACM Assembly Proof-of-Concept Visualization

DGACM's application consists of proofs-of-concept visualizations of its XML conversion of UNGA resolutions application (DGACM, 2021). These visualizations are divided by UNGA sessions, not allowing the user to analyze voting patterns across the sessions. In each of them, it is possible to search for resolutions' general information, voting patterns, related UN Sustainable Development Goals (SDG), and other details (Figure 2.2).

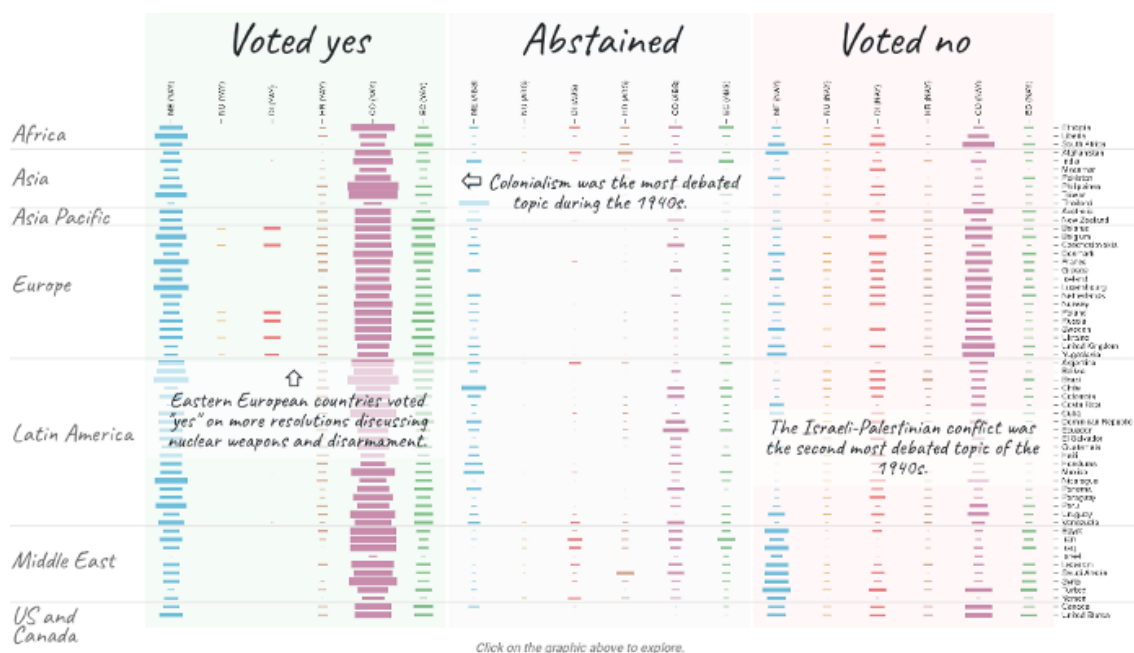
¹<https://interactive.aljazeera.com/aje/2019/how-has-my-country-voted-at-unga/index.html>

²<https://www.un.org/dgacm/en/content/visualizations-and-machine-readability>

³<https://ideas.unite.un.org/home/Page/PCUNGAviz>

⁴<https://ungavizui.aqrashik.com/>

Figure 2.1 – Example of Al Jazeera’s members votes display in the 1940s.



Source:

(<https://medium.com/@ajlabs/how-ajlabs-uses-data-to-tell-stories-fd946188c389>)

2.3 UNGAviz textual analytics and data visualization

The UNGAviz textual analytics and data visualization became the winner of a 2017 UN contest that encouraged contestants to create a tool for providing greater visibility and transparency to the Member States’ voting choices at the UNGA (UNITED NATIONS, 2017). Through this application, the user can search for a specific word or sentence and receive a visualization of all the resolutions that contain that particular word or sentence. Then, the user can search for a specific country and observe its voting patterns and voting similarities compared to other members’ votes (Figure 2.3). The application also provides a direct link to the resolution’s official page at the UN website, so that the user can check out more details about that specific document. However, the application does not provide a detailed visualization of voting similarities between countries.

2.4 Final Comments

It is interesting to observe that similar previous projects focused on UNGA resolution votes usually vary between big-picture and more specific visualizations. However,

Figure 2.2 – Example of DGACM visualization for the resolution A/RES/75/1 of the 75th session.

UNITED NATIONS
GENERAL ASSEMBLY RESOLUTIONS, 75TH SESSION

SEARCH BY SYMBOL
A/RES/75/1

75/1. Declaration on the commemoration of the seventy-fifth anniversary of the United Nations

3rd plenary meeting
Adoption meeting

Seventy-fifth session
Session

Agenda item 128 (a)
Agenda item

A/75/L.1
Originating document

21 September 2020
Adoption date

#noMainCommittee
Committee

Strengthening of the United Nations system: ...
Agenda item name

N.A.
Report paragraph

UNBIS Thesaurus subjects
Anniversaries
Declarations
International Cooperation

Goals and targets

9	5	17	13	12
8	4	16	Tak...	Ens...
7	3	15	11	10
6	2	14	Ma...	Red...

Voting by Member State

Vote distribution
Adopted without a vote

Sponsorship
1 Sponsors
0 Additional sponsors

President of the ...

UNITED NATIONS
DEPARTMENT FOR GENERAL ASSEMBLY
AND CONFERENCE MANAGEMENT

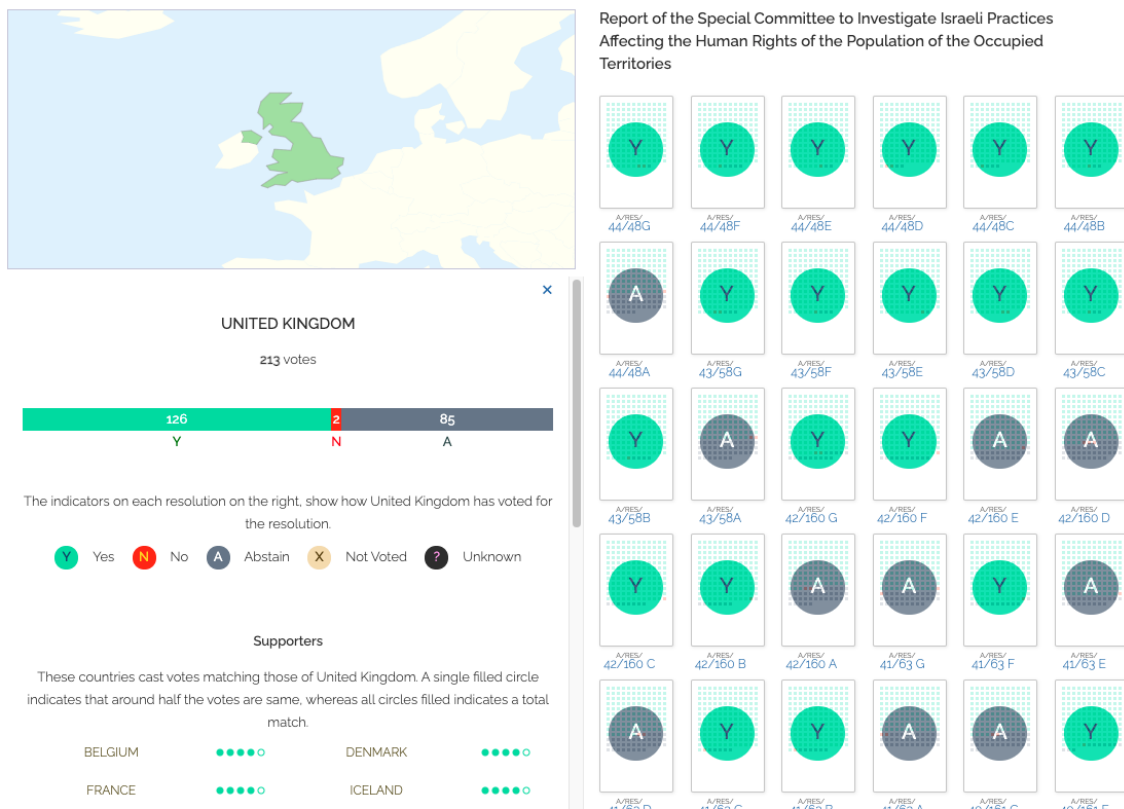
gText

Visit the [machine-readability page](#) to learn more about the project and download the General Assembly resolutions in XML format. Note: The boundaries and names shown and the designations used on the map do not imply official endorsement or acceptance by the United Nations. The relevant Sustainable Development Goals were automatically identified using the [LinkedSDGs](#) demo app developed by the Department of Economic and Social Affairs. Please note that automated results might not be fully accurate. Contact us at untranslation@un.org.

Source: (<https://www.un.org/dgacm/en/content/visualizations-and-machine-readability>)

the project presented herein aims to provide the user with different levels of visualization, which support analyzing the data in question through different lenses, leading to more refined conclusions.

Figure 2.3 – Example of the UNGAViz visualization searching for the term "Israeli" and choosing the member United Kingdom.



Source: (<https://ungavizui.aqrashik.com/>)

3 METHODOLOGY

This chapter aims to explain the methodology chosen to create the proposed application, such as the processes of data and requirements gathering, mockup creation, and evaluation with potential users. The prototyping details and tools used for the development of the application are also presented in this chapter.

3.1 Data Gathering

First of all, general research on the available data related to UNGA resolutions and sessions was performed. Resolution records provided by the UN's official website¹, with a simple research tool and textual output, were analyzed, along with the Harvard Dataverse dataset². Harvard's dataset is a CSV file with each country's resolution votes from sessions 1 to 75. The information available for each vote include:

- rcid: roll-call vote ID until 1985;
- resid: new roll-call vote ID;
- ccode: COW country code;
- member: whether the country is a member or not of the UN;
- vote: vote choice by number:
 - 1 meaning "Yes" vote;
 - 2 meaning "Abstain" vote;
 - 3 meaning "No" vote;
 - 8 meaning "Absent" vote;
 - 9 meaning "Not a member" vote;
- country: ISO-ALPHA 3 country code;
- countryname: country's full official name;
- year: year of vote;
- session: UNGA Session of the vote;
- date: date of vote;
- unres: resolution number;

¹<https://research.un.org/en/docs/ga/quick/regular/>

²<https://dataverse.harvard.edu/dataset.xhtml?persistentId=doi:10.7910/DVN/LEJUQZ>

- amend: whether the vote was on an amendment;
- para: whether the vote was on a paragraph rather than an entire resolution;
- short: a short description of the resolution;
- descr: a long description of the resolution;
- important: votes considered important, thus needing two-thirds of majority for approval;
- issue codes: classification of resolutions based on searches in descriptions:
 - ME column being true for votes relating to the Palestinian conflict;
 - NU column being true for votes relating to nuclear weapons and nuclear material;
 - DI column being true for votes relating to arms control and disarmament;
 - CO column being true for votes relating to colonialism;
 - HR column being true for votes relating to human rights;
 - EC column being true for votes relating to economic development.

This grouping and characterization system makes it easier to handle data modelling in comparison to the data provided directly by the UN. Because of that and the source reputation, Harvard Dataverse's dataset was selected for developing the application in question.

3.2 Initial Mockup

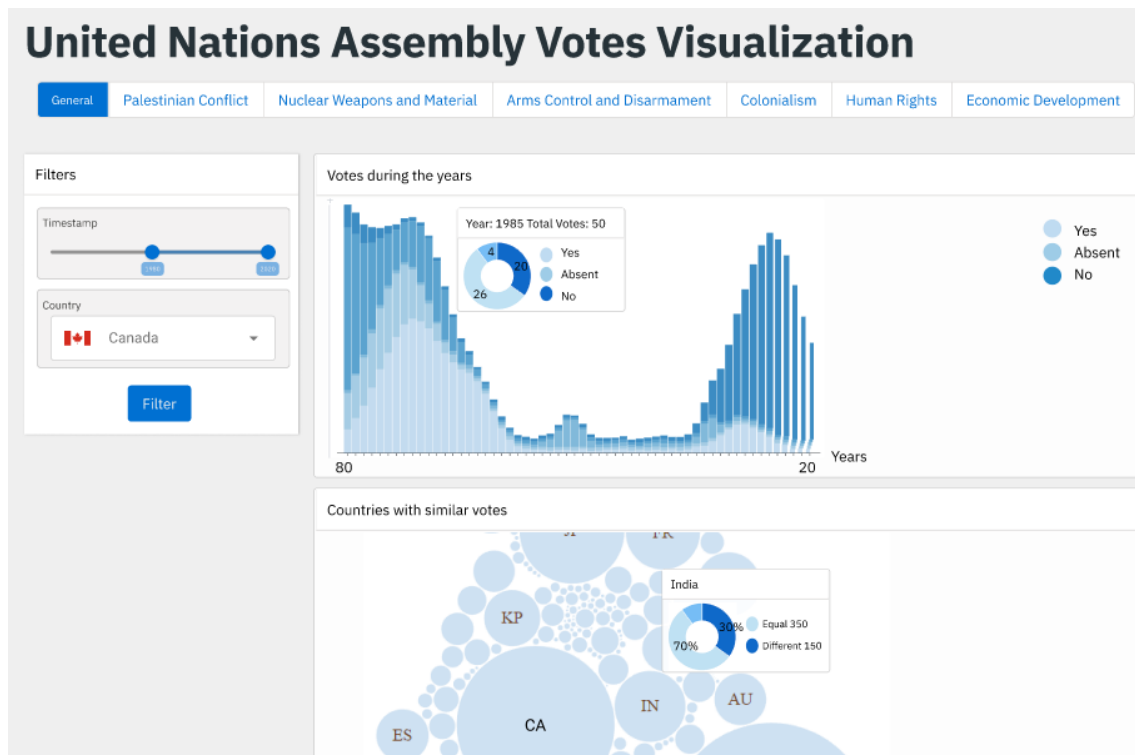
A mockup was made, and we invited professors and students from the International Relations undergraduate course at UFRGS to participate in informal meetings as stakeholders. The mockup allowed them to understand what the project consisted of and provide more in-depth ideas for its development. In order to do that, the web-based prototyping tool Figma³ was chosen. The mockup displayed two charts that could filter the topics already divided on the database, the year range, and UN Member States (Figure 3.1).

The first chart was a stacked bars chart in which the votes of the selected country, topic, and year range were displayed. The vote type bars stacked were presented for each year of the year range selected. When scrolling through each stacked bar, it was possible

³<https://www.figma.com>

to see a pie chart with the sum of every type of vote by the selected UN member in that specific year. The second chart was a bubble chart which allowed the user to see a pie chart with the percentages of equal votes between the previously selected country and other UN members when hovering over each bubble.

Figure 3.1 – Initial mockup presented to specialists



3.3 Requirements Gathering With Experts

The requirements for this project were gathered through direct contact with International Relations (IR) professionals and students who are interested in UNGA's voting process as a source for analyzing world politics.

The insights we obtained from the specialists included:

- There is a need for an application that facilitates a more detailed comparison between countries;
- We should create an application that details the resolutions and votes filtered;
- There could be a more in-depth division of topics in the dataset;
- It could be beneficial to include United Nations Security Council's (UNSC) resolu-

tions;

- We should develop an application that allows the user to visualize each country in a position (based on its votes) that is related to its proximity to the principles outlined in the UN Charter;
- Considering the fact that the specialists consulted were based in Brazil, some of them suggested that the application should be focused on the country's participation at the UNGA.

3.4 Prototyping

After creating the mockup and meeting with the IR specialists, the visualization prototype was developed. The application was divided into two parts: the back-end, providing the connection with the database, and the queries and data manipulation processing; and the front-end, corresponding to the user interface (UI) and the visualizations.

3.5 Informal Evaluation With Experts

Throughout the entire prototyping phase, periodic informal meetings with the IR professors and students from UFRGS occurred in order to evaluate the the application's progress. The goal was to validate the development, point out potential problems and missing aspects that were more perceptible by the user, and make adjustments that would lead the application to become more useful for the target audience.

Informal meetings with visualization researchers from the Visualization, Interaction and Simulation Lab (VISLab) at UFRGS were also held, in which more insights on the UI and visualizations were collected.

During the meetings with both the IR specialists and visualization researchers, it was suggested that it could be interesting to:

- Include visualizations related to relevant country groups and geographic regions, such as a comparison clusterization;
- Allow the user to select more than one country/region/group per visualization;
- Add options for changing specific visualizations rather than the entire application only, providing the user with a more personalized experience;

- Focus on the data made available in the Harvard Dataverse dataset, because UNSC votes are not as easily accessible;
- Not add more topic divisions, because it would require developing an application that could filter the resolutions' titles, descriptions, and clauses;
- Not focus on Brazil only, as the filtering options allow the user to analyze specific countries individually;
- Make the application dashboard-like, as it could help on overall comparisons and viewing each visualization;
- Add hover buttons out of which explanations about the application's resources would pop up;
- Include an initial result on the first page loaded, so that the user can get an initial understanding of the available visualization options.

3.6 Database Model

When analyzing the Harvard Dataverse dataset, it was decided that MongoDB⁴, a document-based database, was to be used. The main reasons that led to this decision include:

- MongoDB is a simple and extremely popular database, which makes it easier to find resources on how to use and implement it;
- Considering that the dataset is a CSV, the conversion to a binary JSON single-instance document instead of creating many tables meant that little effort was required to store the great amount of votes;
- JSON-like document simplify the process of escalating the dataset, making adding or deleting fields in the document schema more flexible;
- The vast query possibilities and the JSON results simplify the manipulation of data in the application's code;
- The availability of Atlas⁵, MongoDB's cloud database service, makes the cloud storage of the data easier, more secure, and reliable.

Taking these favorable aspects into consideration, the dataset was converted to JSON and stored in an Atlas cluster.

⁴<https://www.mongodb.com>

⁵<https://www.mongodb.com/cloud/atlas>

The schema utilized for the JSON corresponds to the columns available on the CSV file, described in Section 3.1.

3.7 Development Tools

To host and run the application Heroku⁶, a cloud platform that simplifies the online hosting process, was used. It integrates with the chosen version control software, GitHub⁷, rebuilding the application automatically every new code commit. The JavaScript IDE WebStorm⁸ was used to develop and debug the code locally.

For the back-end development, an open-source JavaScript runtime environment that helps to build scalable network applications, Node.js⁹, was used. The Express.js¹⁰ framework was used along with Node.js in order to ease the HTTP communication with the application's front-end. In order to facilitate the integration and the querying with the MongoDB database, an object modelling tool called Mongoose¹¹ was used.

For the front-end development, Angular¹² and React.js¹³ were compared as bases for the UI construction. Due to its simplicity to learn and to use, React.js was chosen. React-Bootstrap¹⁴, a Bootstrap¹⁵ equivalent open-source framework for React.js, was chosen as the foundation for the UI design. React.js multiselect-react-dropdown¹⁶ component allows the multi-selection of countries, country groups, and geographic regions. The promise-based HTTP client, Axios¹⁷, was used to enable communication with the back-end.

The D3.js¹⁸ library, one of the most well-known JavaScript libraries for producing dynamic and interactive data visualization, was chosen for the front-end data visualization. Semiotic¹⁹, a framework that provides integration between D3.js and React.js was used to implement all the visualizations included in the application.

⁶<https://www.heroku.com/>

⁷<https://github.com/>

⁸<https://www.jetbrains.com/pt-br/webstorm/>

⁹<https://nodejs.org/en/>

¹⁰<https://expressjs.com/>

¹¹<https://mongoosejs.com/>

¹²<https://angular.io/>

¹³<https://reactjs.org/>

¹⁴<https://react-bootstrap.github.io/>

¹⁵<https://getbootstrap.com/>

¹⁶<https://www.npmjs.com/package/multiselect-react-dropdown>

¹⁷<https://github.com/axios/axios>

¹⁸<https://d3js.org/>

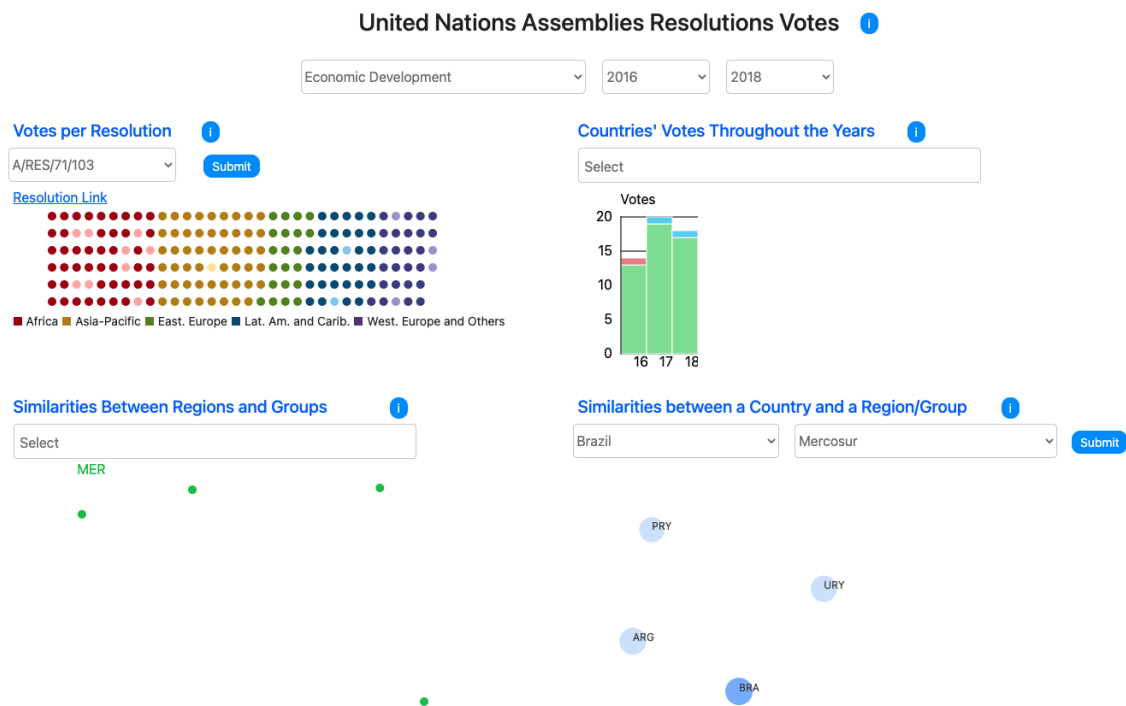
¹⁹<https://semiotic.neract.io/>

4 UNGA RESOLUTIONS VOTES VISUALIZATION APPLICATION

This chapter described the application developed during this project, along with details about each visualization. The application is hosted at <https://un-resolutions-votes.herokuapp.com/>.

After accessing the application's site, the user can visualize the application's title and its four divisions: Votes per Resolution, Countries' Votes throughout the Years, Similarities between Regions and Groups, and Similarities between a Country and a Region/Group (Figure 4.1).

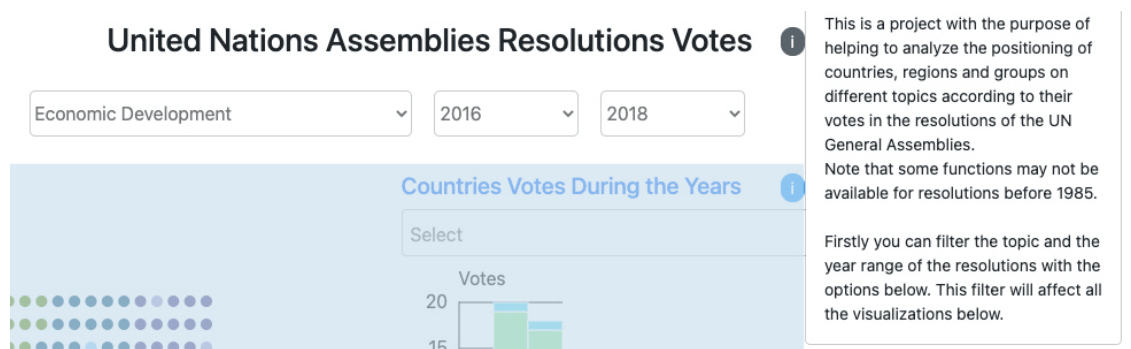
Figure 4.1 – UNGA Resolutions Votes Visualization Application



An *additional information* icon next to the title provides basic information about the project and filtering options relevant for all of the visualizations included in the application (Figure 4.2). Below the title, the user finds the general filters, which allow choosing a topic and a year range. The topics are those provided by the dataset.

When selecting a topic and year range, all of the application's four divisions reload with the filtered data. Next to each visualization's title, information icons provide access to descriptions and instructions explaining their use.

Figure 4.2 – Application header with title, additional information, and filters.



4.1 Votes per Resolution

The first visualization (Figure 4.3) is focused on a single resolution at a time, which the user can choose from a list. When the chosen resolution is submitted, a link that leads to the UN’s official documents website¹ is displayed. On the website, the user can check out more detailed information on that specific resolution, each of which includes a header, preamble clauses, and operative clauses:

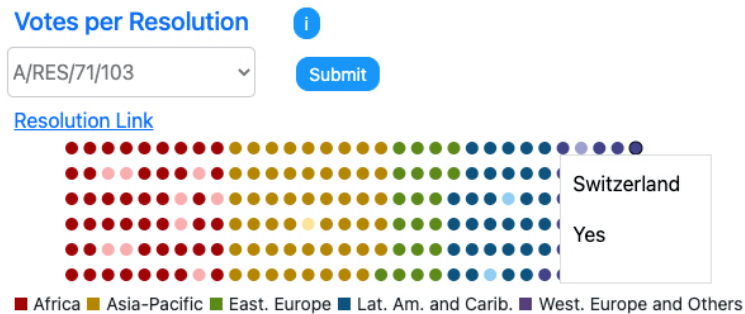
- The heading contains information about the organ issuing the resolution, in this case the UNGA or its subsidiaries;
- The preamble clauses are introductions to the operative clauses, explaining its purposes and nuances;
- The operative clauses are sequentially numbered clauses, one for each specific action, explaining the recommendations that should be taken into consideration if the resolution is approved.

Right below the link, it is possible to see the display of every Member State divided firstly by the UN’s regional country groups², and then alphabetically. Different colors differentiate each UN regional group and, on a big-picture, it is also possible to differentiate the votes between members depending on how faded the color is on each of them. Countries with darkened colors have voted “Yes” for the resolution in question, while any other type of vote is characterized by faded colors. It is also possible to hover over each member’s dot, where said member’s name and vote appear (Figure 4.3).

¹<https://undocs.org>

²<https://www.un.org/dgacm/content/regional-groups>

Figure 4.3 – Votes per Resolution visualization example.

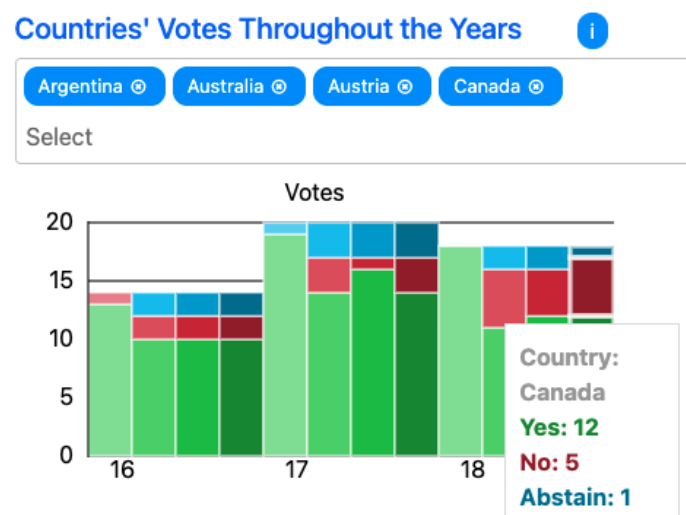


4.2 Countries' Votes Throughout the Years

The purpose of the second visualization (Figure 4.4) is to allow the user to analyze each selected country's votes on a specific topic per year. It is possible to select up to four countries at the same time, where each country's bar is differentiated by its color shade.

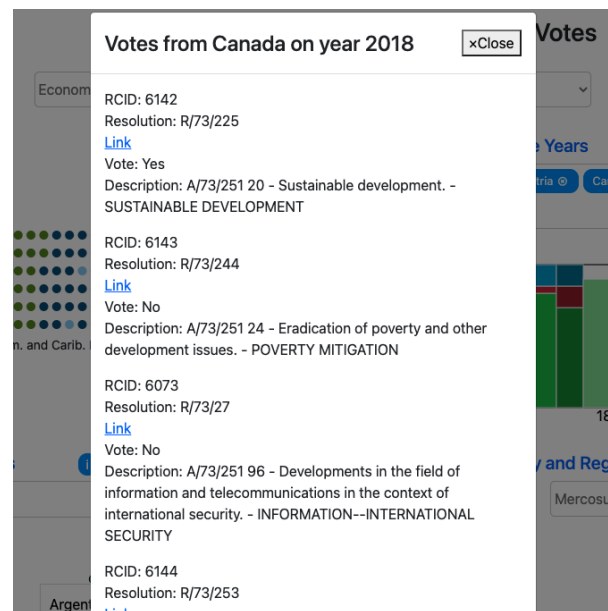
On each bar, it is also possible to visualize the distribution of vote types by color, in which "Yes" votes are green, "No" votes are red, and "Abstain" votes are blue. Hovering over each bar allows the user to see the member's name along with the sum of its voting types.

Figure 4.4 – Countries' votes during the years visualization example.



For a more detailed analysis of a country's votes each year, the user can click on the bar, and a new window displaying information about all related resolutions and said country's votes on each of them pops up (Figure 4.5).

Figure 4.5 – Country's votes details by resolution example.



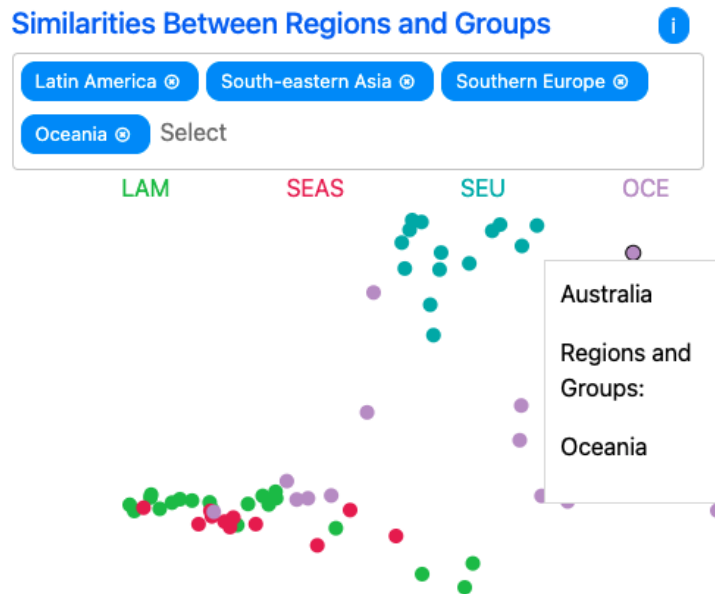
4.3 Similarities between Regions and Groups

The third visualization focuses on the analysis of voting similarities between country groups or regions (Figure 4.6). It is possible to choose up to four regions and/or country groups that are represented in a scatterplot. Each region and/or country group is differentiated by color. Their proximity is based on their voting similarities on the filtered resolutions. When hovering over each dot, the user sees its name and which groups and regions it is a part of.

In order to define the proximity of the votes, an adaptation of the Principal Component Analysis (PCA) method by Singular Value Decomposition³ with a basic Jitter Plot randomization function to stop the country dots from overlapping is used. The PCA is one of the most popular methods for dimensionality reduction, making it easier to interpret visualizations. The method consists of finding the two main components of the dimensions with the highest score variation and considering them the new two-dimensional axis (KANTARDZIC, 2011).

³method adapted from CivisAnalysis, courtesy of Rodrigo Nunes Moni Silva

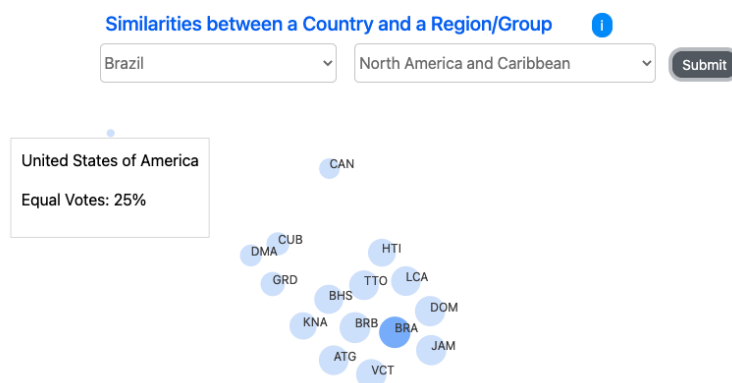
Figure 4.6 – Similarities between regions and groups example.



4.4 Similarities Between a Country and a Region/Group

The last division of the application shows the similarities between the votes by a specific country and by the countries of a selected region or group (Figure 4.7). The largest and the closest the members' dots are from the selected country, the higher is the percentage of similar votes between them. This percentage can be checked out when hovering over the members' dots, where the user can also see the country's name.

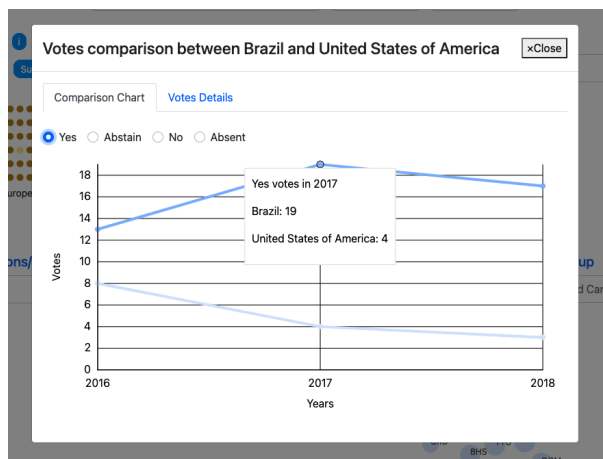
Figure 4.7 – Similarities between a country and a region/group example.



For a more detailed comparison, it is possible to click on another member, and a new window with two tabs is displayed: the Comparison Chart and the Votes Details. The Comparison Chart tab shows a line chart comparing the votes of the previously selected

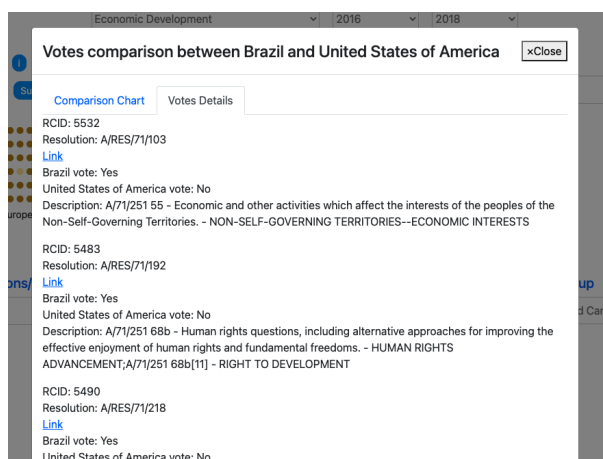
and the latter. When hovering over the lines, the sum of the selected vote type for that year and for each country is displayed (Figure 4.8).

Figure 4.8 – Comparison chart tab example.



The Votes Details tab, on the other hand, shows details and the link to each of the filtered resolutions, along with the vote of the previously selected country and the latter (Figure 4.9).

Figure 4.9 – Votes details tab example.



5 EVALUATION WITH USERS

This chapter presents the results of the evaluation of the application with its potential users. Relying on the developers' assumptions or conjectures can be a threat for the project's outcome, thus analyzing the target audience's response after using the application is an effective strategy to assess its usability and value (MUNZNER, 2010).

5.1 Method

Since the visualizations were developed as part of a web-based application, we decided to invite potential users, i.e., the IR students and professors and also general public, to try it and answer a questionnaire about the visualizations. The questionnaire is available in Appendix A.

We sent the invitation by email to the undergraduate students of the Institute of Informatics and International Relations courses from UFRGS. The invitation contained an a brief explanation about the project and the link to the questionnaire.

The questionnaire contains: (1) a term of consent agreed by the participant; (2) questions about the respondent's profile; (3) the link to the application; (4) a step-by-step tutorial on how to complete the proposed tasks, each of them followed by a correctness result check; (5) a Single Ease Question (SEQ), which is a seven-point rating scale to measure task difficulty (WETZLINGER; AUINGER; DÖRFLINGER, 2014); and, (6) a seven-point rating scale to measure the usefulness of the task.

In relation to the "Votes per Resolution" visualization, the subjects were asked to choose a certain resolution, as follows:

- 1.1 Click on the link for the resolution and check if a new tab with more information on said resolution pops up;
- 1.2 Check how many "Latin America and the Caribbean" countries have voted differently than "Yes" for the resolution;
- 1.3 Check Argentina's vote for the resolution.

In relation to the "Countries' Votes Throughout the Years" visualization, the subjects were asked to choose Australia and Canada as the selected countries:

- 2.1 Check how many times Canada voted "No" in a certain year;

- 2.2 Click on an Australia's bar and check how it voted for a certain resolution.

In relation to the “Similarities Between Regions and Groups” visualization, the subjects were asked to choose Southern Europe and Western Asia as the selected regions:

- 3.1 Check which Western Asian country's votes are closer to the Southern European countries' votes;

In relation to the “Similarities Between a Country and a Region/Group” visualization, the subjects were asked to choose Brazil as the selected country and G8 as the selected group:

- 4.1 Check the countries with the highest and the lowest percentages of voting similarity in comparison with Brazil;
- 4.2 Click on Japan's dot, then click on the “Yes” option in the “Comparison Chart” tab, and check how many resolutions Brazil and Japan voted “Yes” for in a certain year;
- 4.3 In the “Votes Details” tab, check Brazil's and Japan's votes for a certain resolution;

Finally, the subjects were asked to navigate freely through the application and share their thoughts on it, and were also asked to answer two widely known standardized questionnaires:

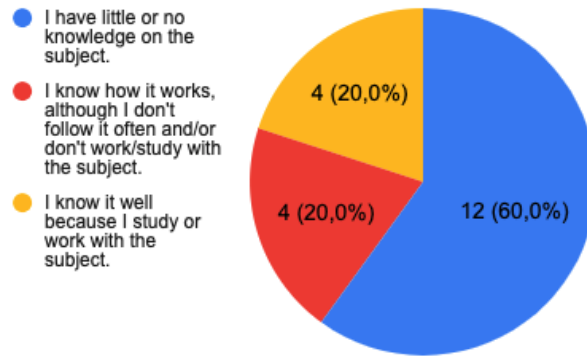
- the User Experience Questionnaire (UEQ), used to measure the application attractiveness, perspicuity, efficiency, dependability, stimulation and novelty (LAUGWITZ; HELD; SCHREPP, 2008), and
- the System Usability Scale (SUS), which allows the measurement and the quantification of the interviewees' general perception of usability (BROOKE, 1996).

5.2 Results

5.2.1 Demographics

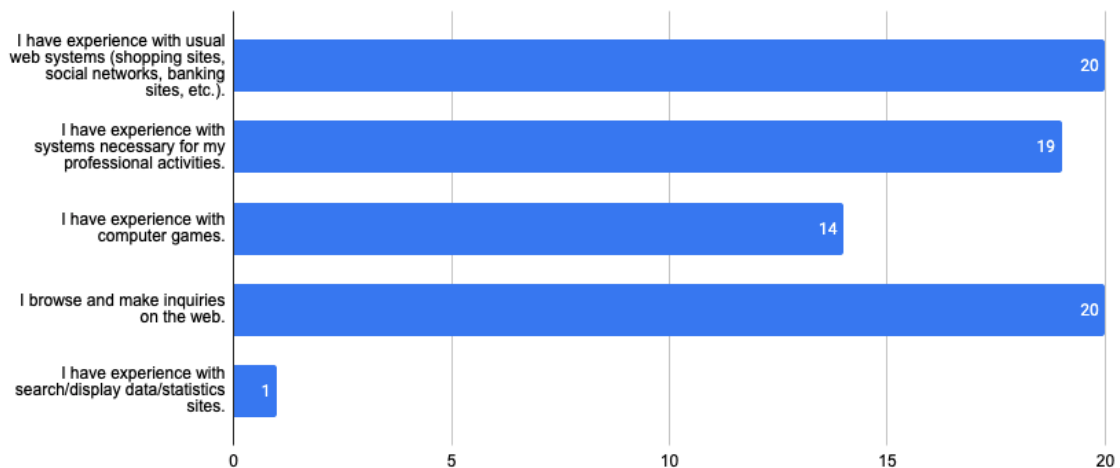
The questionnaire was answered by a total of twenty people, out of which 60% were from the general public with little to no previous knowledge on the UNGA's functioning, 20% were familiar with the UNGA but did not keep up with its work, and the last 20% claimed to study or work with the subject (Figure 5.1).

Figure 5.1 – Participants' knowledge about UNGA results.



Most of the subjects were familiar with usual web systems, one of them have had previous experience with data/statistics search/exhibition websites (Figure 5.2).

Figure 5.2 – Participants' experience with interactive systems results.



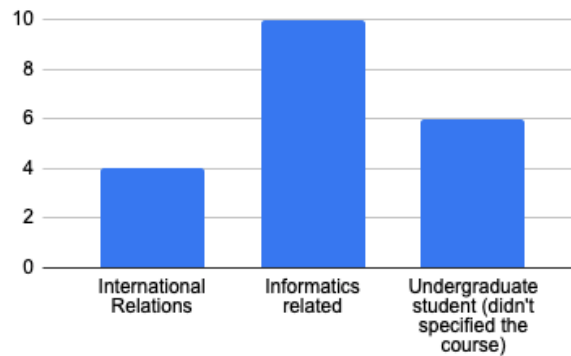
All of the participants are undergraduate students or graduated/worked on International Relations or Informatics related areas (Figure 5.3).

5.2.2 Analysis of the participants' answers to the task-related questions

The results for the step-by-step questions are presented on Table 5.1.

It is possible to infer that, according to the participants, the application's available functions are useful and not difficult to perform. In only two tasks, 50% of the participants responded correctly: 4.1 and 4.3. As for the others, the percentage of correct answers was high.

Figure 5.3 – Participants’ area of expertise and/or level of study..



Task or Question	Correct answers (%)	SEQ average (1 easy to 7 difficult)	Usefulness average (1 not useful to 7 useful)
1.1	90	2.15	5.55
1.2	85	2.95	5.6
1.3	100	2.65	5.25
2.1	90	3.65	5
2.2	95	3.3	5.55
3.1	90	3	5.7
4.1	50	2.55	5.55
4.2	85	2.2	5.45
4.3	50	2.6	5.45
General Average	- 81	- 2.78	6 5.45

Table 5.1 – Table of step-by-step questions’ results

When asked about the usefulness of the general application (Figure 5.4), there was a great feedback, with 6 being the average answer in a scale of 1 to 7.

5.2.3 Assessment based on the User Experience Questionnaire

The UEQ’s answers are shown on Figure 5.5, in which it is possible to observe positive results on most of the topics, the slow/fast topic receiving the least positive answers. In Figure 5.6, it is possible to infer that the positive answers from the UEQ resulted in great means and variances of the six measurements.

Good results can also be observed when compared with a benchmark of more than 450 studies (Figure 5.7) obtained from the UEQ data analysis tool¹, from where Figures 5.5 and 5.6 were also taken.

¹<https://www.ueq-online.org/>

Figure 5.4 – General usefulness of the application results

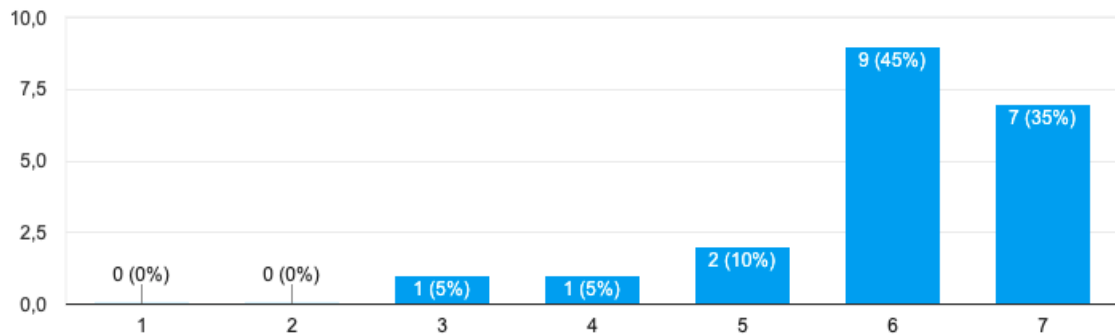
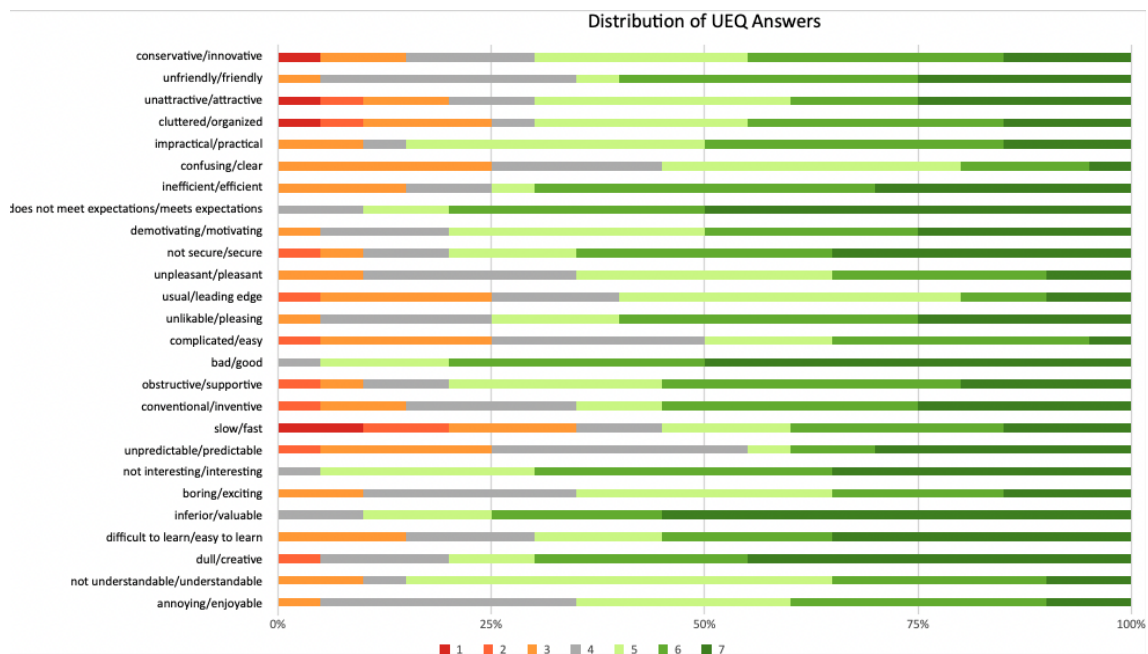


Figure 5.5 – Answers from the UEQ questionnaire



5.2.4 Assessment based on the System Usability Scale questionnaire

In the SUS, the average individual scores were 71 (Figure 5.8), which is considered a good and above average web application (BANGOR; KORTUM; MILLER, 2008). Also, out of the 20 answers, over half of the individual scores were over 80. The most problematic subject pointed out by the participants was related to the confidence when using the application.

Figure 5.6 – UEQ measurements means and variances

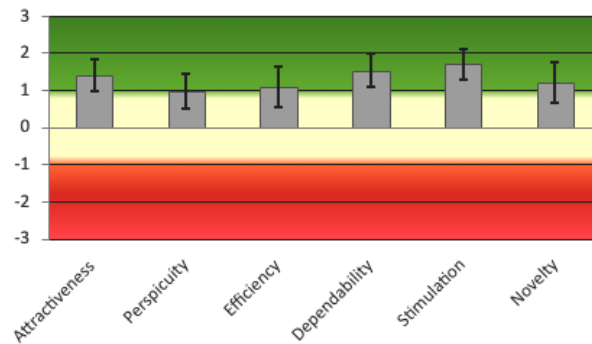
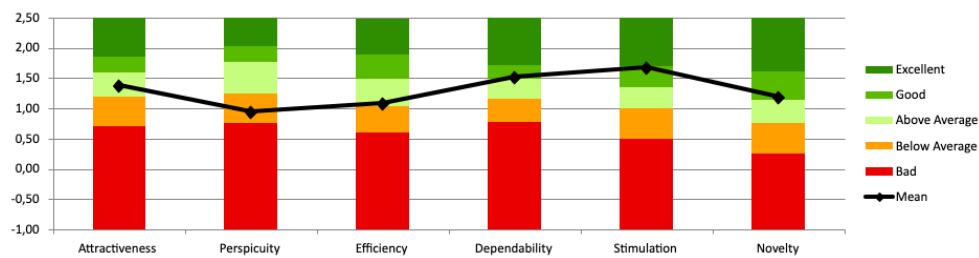


Figure 5.7 – UEQ benchmark comparison



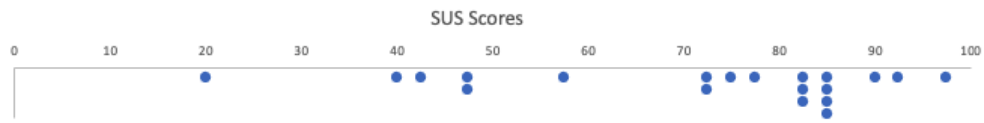
5.2.5 Comments from the participants

Many positive feedback messages were written about the application's functionalities and its usefulness for UNGA simulations, and IR and Geopolitics studying, researching and working environments.

The participants also left observations and comments, which include the following:

- There was a lack of division between the years on "Countries' Votes Throughout the Years" visualization.
- There could be a better differentiation between countries on "Countries' Votes Throughout the Years" visualization.
- There could be filtering and searching options on the resolutions lists.
- There was a delay when obtaining some of the results.

Figure 5.8 – SUS individual score results



5.3 Final Comments

In general, the users have had a good experience with the UI and visualizations, considering the excellent feedback on the application’s usefulness.

When analyzing the results for task 4.1 of questionnaire, it seemed to be difficult to find the country with the lowest percentage of voting similarity. This could be due to the small size of its graphical representation compared to other countries and the faded color with little contrast with the background.

In task 4.3, only 50% of the participants chose the correct answer, “Yes and Abstain”, while 40% chose “Yes and Absent”, which could be due to a confusion between the similar words “Abstain” and “Absent”.

The lowest ratings received in the final question about the general application’s usefulness (one 3 and one 4) came from participants with little to no knowledge of the UNGA’s work. All of the specialists, on the other hand, assigned the application’s highest ratings. The same happened with the SUS answers, where the lowest scores came from participants with little to no knowledge on the subject, while the highest came from IR specialists.

The most problematic aspect pointed out by the participants through the SUS questionnaire referred to the confidence when using the application, which could be related to little to no experience with data/statistics search/visualization websites of some of the participants.

6 CONCLUSIONS AND FUTURE WORK

This project aimed to propose and develop an application that included a set of different visualizations for analyzing the countries' votes at the UNGA. Meetings for gathering requirements with International Relations and data visualization specialists were held in order to design an application that would be useful and easy to navigate not only for specialists to use in their research projects, teaching environments, and UNGA simulations, but also for the general public who wants to understand the UN Member States' political positionings over the years. For measuring the project's effectiveness, an evaluation survey was applied to both specialists and the general public.

6.1 Limitations

In order to create a more secure database that can be simply maintained, the use of a cloud database was preferred. Due to its high cost, a shared instance was selected, which could be one of the causes for the delay on the communication with the database. As the UNGA does not offer a dataset including the resolutions' votes that is easy to manipulate, a third-party dataset was used. Even though this dataset comes from a reliable source, it depends on its creator for updating the data with new resolutions. Lack of information or categorization of the resolutions approved by the UNGA during its first meetings, along with errors in new voting instances, limited the application developed herein.

6.2 Lessons Learned

Gathering the right requirements can be a challenge, considering that the user does not always know how to express its objectives, leading to late adjustments and, consequently, less time left for improving the project. Furthermore, even though these informal evaluations help the project to evolve, formal evaluations are also crucial for uncovering usability issues. However, formal evaluations carried on through an online form can lead to misinterpretations of some of the development choices, resulting in suggestions of adjustments that have been previously tested and proven not to be the best alternatives. This format of evaluation can lead to a lack of clear information about issues pointed out by the users.

6.3 Future Work

For future work, small adjustments to increase the application's usability, as suggested by the participants, can be done. These suggestions include:

- Generating a padding between years in the "Countries' Votes Throughout the Years" visualization,
- adding labels to differentiate countries in the "Countries' Votes Throughout the Years" visualization;
- including filtering and searching options when displaying lists of resolutions.
- changing the color design to increase the contrast between the countries and the background, reducing misinterpretations in the "Similarities between a Country and a Region/Group" visualization, and
- changing the "Absent" vote type to a more complete sentence, such as "Absent of voting" to reduce confusion between similar words.

An important point that came up through analyzing the survey's results is improving the application to make it easier to use and include a deeper explanation on how the application works for the general public. In order to keep the application's relevance, inserting the new resolutions' instances as the dataset updates come up on the database is essential, along with researching and working on the optimization of queries and database communication delays, which is one of the issues found when developing the application. Finally, refining and adding visualizations for improving its usefulness could enhance the application further.

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APPENDIX A — QUESTIONNAIRE

Avaliação de Visualizações de Dados de Votações na Assembléia Geral da ONU

TERMO DE CONSENTIMENTO LIVRE E ESCLARECIDO

Você está sendo convidado(a) a participar de uma pesquisa sobre uma aplicação de visualização de dados das votações na Assembléia Geral das Nações Unidas (ONU) . Leia este documento atentamente e esclareça todas as dúvidas antes de consentir na sua participação.

Objetivo: Essa pesquisa tem como objetivo avaliar a interface, com as diferentes visualizações de dados propostas como parte do Trabalho de Conclusão de Curso de GIOVANI M. TIRELLO.

Procedimento: Para responder, você utilizará a aplicação. Importante mencionar que você poderá abandonar o preenchimento quando desejar. Isso fará com que todas as suas respostas que estiverem sendo registradas para a nossa pesquisa serão perdidas.

Agradecemos antecipadamente,
Giovani Tirello e Carla Freitas (orientadora)

***Obrigatório**

1. Concordo em realizar o teste *

Marcar apenas uma oval.

Sim

Não

As
votações
na
Assembléia
Geral das
ONU

A Assembleia Geral das Nações Unidas tem sessões anuais regulares onde todos os países membros têm representação igualitária. Dentre seus vários poderes, a votação de resoluções, apesar de não ter força jurídica no direito internacional público, nos leva a análise da posição dos países membros aos mais diversos assuntos de cunho internacional abordados.

Objetivo do Trabalho

Esse trabalho tem como objetivo fornecer visualizações interativas das votações das resoluções feitas pelos países membros da Assembléia Geral das Nações Unidas em diversos tópicos abordados desde sua criação até os momentos atuais. Essas visualizações pretendem levar a uma melhor interpretação do posicionamento dos países sobre diferentes assuntos durante os anos, sendo útil tanto para o entendimento do contexto histórico dos mesmos, como de seu contexto atual.

Caracterização da(o) respondente

2. Principal área de atividade (se estudante, indique o nível) *

3. Você conhece o funcionamento das Assembléias Gerais da ONU? *

Marcar apenas uma oval.

- Tenho pouco ou nenhum conhecimento sobre o assunto
- Conheço o funcionamento embora não acompanhe frequentemente e/ou não trabalho/estudo com o assunto
- Conheço bem porque estudo ou trabalho com o assunto

4. Você tem experiência como usuário(a) de sistemas interativos (marque todas as aplicáveis)? *

Marque todas que se aplicam.

- Tenho experiência com sistemas web usuais (sites de compra, redes sociais, sites bancários, etc)
- Tenho experiência com sistemas necessários às minhas atividades profissionais
- Tenho experiência com jogos de computador
- Navego e faço consultas na web

Outro: _____

Inicialização do Sistema

Por favor, responda as próximas sessões do questionário considerando a aplicação completa.

Para responder as perguntas, você deve acessar o sistema pelo link abaixo:
<https://un-resolutions-votes.herokuapp.com/>

A aplicação inicializada se parece com a imagem abaixo (após o usuário fechar a janela de introdução). Caso a aplicação não tenha carregado corretamente, por favor, aguarde alguns segundos e atualize a página. Se mesmo assim a aplicação não inicializar corretamente, por favor envie um email sobre o problema para giovanimt@outlook.com.

United Nations Assemblies Resolutions Votes ⓘ

Economic Development 2016 2018

Votes per Resolution ⓘ

A/RES/71/103 [Submit](#)

[Resolution Link](#)

■ Africa ■ Asia-Pacific ■ East. Europe ■ Lat. Am. and Carib. ■ West. Europe and Others

Countries Votes During the Years ⓘ

Select

Similarity Between Regions/Groups ⓘ

Select

MER

Similarity Between Country and Region/Group ⓘ

Brazil Mercosur [Submit](#)

Tarefas

Por favor, siga os próximos passos e responda as questões relacionadas a eles.

Passa o mouse no ícone de informações ao lado do título principal e leia as instruções iniciais. Em seguida escolha o tópico "Palestinian Conflict", o ano inicial "2010" e o ano final "2015".

1. Passe o mouse no ícone de informação ao lado do título "Votes per Resolution", leia as instruções e em seguida escolha a resolução "R/65/105", clique em Submit e responda as próximas questões.

5. 1.1. Clique no link "Resolution Link". Você foi levado para as informações da resolução correta? (Identifique-a pelo código "R/65/105") *

Marcar apenas uma oval.

- Sim
- Não
- Não consegui ou não entendi como escolher a resolução

10. Você achou essa visualização útil? *

Marcar apenas uma oval.

	1	2	3	4	5	6	7	
Pouco útil	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Muito útil

11. 1.3 Qual foi o voto da Argentina? *

Marcar apenas uma oval.

Yes

No

Abstain

Outro: _____

12. Quão difícil foi realizar a tarefa 1.3? *

Marcar apenas uma oval.

	1	2	3	4	5	6	7	
Muito fácil	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Muito difícil

13. Você achou essa visualização útil? *

Marcar apenas uma oval.

	1	2	3	4	5	6	7	
Pouco útil	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Muito útil

2 Passe o mouse no ícone de informação ao lado do título "Countries Votes During the Years", leia as instruções e, em seguida, escolha os países Australia e Canada, e responda as próximas questões.

14. 2.1 Em quantas resoluções o Canada votou 'No' em 2012? *

Marcar apenas uma oval.

- 12 ou menos
 13
 14
 15
 16 ou mais
 Não consegui fazer a filtragem

15. Quão difícil foi realizar a tarefa 2.1? *

Marcar apenas uma oval.

	1	2	3	4	5	6	7	
Muito fácil	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Muito difícil

16. Você achou essa visualização útil? *

Marcar apenas uma oval.

	1	2	3	4	5	6	7	
Pouco útil	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Muito útil

17. 2.2 Clicando na barra de votos da Austrália em 2014, qual foi o voto do país na resolução "R/69/21"? *

Marcar apenas uma oval.

- Yes
 No
 Abstain
 Outro: _____

4 Passe o mouse no ícone de informação ao lado do título "Similarity Between Country and Region/Group", leia as instruções e, em seguida, escolha o Brasil como país e o G8 como grupo/região e responda as próximas questões.

23. 4.1 Qual é o país com maior porcentagem e aquele com a menor porcentagem de similaridade de votos com o Brasil? *

24. Quão difícil foi realizar a tarefa 4.1? *

Marcar apenas uma oval.

	1	2	3	4	5	6	7	
Muito fácil	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Muito difícil

25. Você achou essa visualização útil? *

Marcar apenas uma oval.

	1	2	3	4	5	6	7	
Pouco útil	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Muito útil

Clique no ponto que representa o Japan e responda as questões 4.2 e 4.3.

26. 4.2 Na aba "Comparison Chart", clique na opção "Yes". Em quantas resoluções de 2013 o Brasil e o Japan votaram "Yes", respectivamente? *

Marcar apenas uma oval.

- 12 e 16
- 16 e 12
- 13 e 15
- 15 e 13
- Outro: _____

A resposta marcada acima significa que o produto foi avaliado como mais "atraente" do que "feio". Marque a sua resposta da forma mais espontânea possível. É importante que não pense demasiado na resposta porque a sua avaliação imediata é que é importante. Por favor, assinale sempre uma resposta, mesmo que não tenha certeza sobre um par de termos ou que os termos não sejam muito relacionados com o produto. Não há respostas "certas" ou respostas "erradas". A sua opinião pessoal é que conta! Por favor, marque apenas um círculo por linha.

34. *

Marcar apenas uma oval.

	1	2	3	4	5	6	7	
Desagradável	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Agradável

35. *

Marcar apenas uma oval.

	1	2	3	4	5	6	7	
Incompreensível	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Compreensível

36. *

Marcar apenas uma oval.

	1	2	3	4	5	6	7	
Criativo	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Sem criatividade

37. *

Marcar apenas uma oval.

	1	2	3	4	5	6	7	
De fácil aprendizagem	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	De difícil aprendizagem

58. *

Marcar apenas uma oval.

	1	2	3	4	5	6	7	
Simpático	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Antipático

59. *

Marcar apenas uma oval.

	1	2	3	4	5	6	7	
Conservador	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Inovador

Avaliação
Geral

Obrigada por suas respostas até aqui!
Agora, por favor, responda o breve questionário abaixo considerando o sistema completo. É o último!

60. Eu acho que gostaria de usar esse sistema com frequência. *

Marcar apenas uma oval.

	1	2	3	4	5	
Discordo Totalmente	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Concordo Totalmente

61. Eu acho o sistema desnecessariamente complexo. *

Marcar apenas uma oval.

	1	2	3	4	5	
Discordo Totalmente	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Concordo Totalmente

67. Eu achei o sistema muito complicado de utilizar. *

Marcar apenas uma oval.

	1	2	3	4	5	
Discordo Totalmente	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Concordo Totalmente

68. Eu me senti confiante ao usar o sistema. *

Marcar apenas uma oval.

	1	2	3	4	5	
Discordo Totalmente	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Concordo Totalmente

69. Eu precisei aprender várias coisas novas antes de conseguir usar o sistema. *

Marcar apenas uma oval.

	1	2	3	4	5	
Discordo Totalmente	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Concordo Totalmente

Muito obrigado por suas respostas
e por seu tempo!

Caso haja alguma dúvida favor enviar um email para
giovanimt@outlook.com

70. Finalmente, se você tem algum comentário adicional sobre o sistema, escreva
abaixo. Agradecemos muito!
