

The Rise of Terrorism in the European Union

Bárbara Ramalho
82057

barbara.ramalho@tecnico.ulisboa.pt

Miguel Antunes
82121

miguel.a.antunes@tecnico.ulisboa.pt

Rodrigo Agostinho
94040

rodrigo.agostinho@tecnico.ulisboa.pt

ABSTRACT

Terrorism in the European Union is a topic that has been widely covered in news platforms over the last years, concerning EU citizens. However, deciding which sources to trust may be a challenge. Consequently, this project aims to build an intuitive and interactive visualization that provides comprehensive information on the EU terrorist attacks over the last three decades.

1. INTRODUCTION

In the last decades, the nature of terrorist threats has changed considerably. Consequently, the world has also changed in response to the rise of terrorist activities. Yet, terrorism has always been existent.

Despite the increase in both the amount of terrorism-related literature and public interest towards the matter, gaining access to appropriate and reliable data is often difficult as we have witnessed the rise of social media sites as news coverage platforms. Therefore, analyzing and understanding such activities has become more critical than ever.

Terrorism is understood as an intentional form of violence that involves targeted attacks that intend to scare, intimidate, and threaten some population group, typically for a political or religious purpose. Attacks are usually directed at immediate targets such as civilians, events, or institutions, but also a wider audience whom perpetrators aim to fright, intimidate, and shock. These attacks may also have different purposes, such as political, social, economic, religious, or ideological purposes.

As citizens, we are apprehensive about the rising trends of terrorism in the European Union (EU). In fact, according to a survey of the European Parliament on “Perceptions and Expectations of EU Citizens”, the population demonstrated overwhelming and consensual support for increased intervention in the fight against terrorism. Besides, we are also uncertain which sources to trust regarding this issue. Consequently, we intended to collect reliable data to create a visualization that illustrates patterns on the evolution of terrorist attacks in the EU, without extraneous opinions or bias from questionable sources.

The interactive and exploratory visualization aims to answer a set of pre-defined questions, providing useful insights while making the large volume of data approachable and informative. The identified questions are:

1. **How have terrorist attacks evolved over the years?** - Identify trends in terrorist activities and examine the evolution in the number of attacks over the years.

2. **What are the most targeted areas?** - Identify which countries are the most affected by terrorist activities and which countries are predisposed to suffer future attacks.
3. **Has the success of terrorist attacks decreased?** - Evaluate if the percentage of successful terrorist attacks increased or decreased throughout the last years.
4. **Terrorism is mostly domestic or international?** - Compare the nationalities of terrorist groups and the nationality of the targets to understand the proportion of domestic and international terrorism.
5. **What do terrorist groups target?** - Identify what is the motive behind attacks, per example, if they are mainly motivated by religious sentiment or by political revolt.
6. **Who are the most prominent terrorist groups?** - Identify who are the most notorious terrorist groups and examine how their activity evolved throughout the years.
7. **Are there any inclinations in forms of attack?** - Distinguish the numerous attack types and investigate which ones had higher success or which ones resulted in a higher number of fatalities.
8. **Has terrorism changed us?** - Analyze how military and security expenditures varied with the rise of terrorism. Specifically, examine if the EU invested more in military and security programs upon suffering losses from terrorist attacks.

2. RELATED WORK

Terrorism has become a commonly covered topic in different media platforms, which often portray a scenario of ever-growing threat. The inspiration behind the development of the before-mentioned visualization arises from the need to understand if terrorism is actually increasing and what characterizes such evolution.

Ritchie et al. [1] examined the evolution of global terrorism over the last decades by developing various idioms to answer questions related to the topic of discussion. Specifically, the author adopts a line chart to display the evolution of deaths from terrorism and a time slider, enabling the user to select the preferred time period. Additionally, the authors also included a choropleth, enabling the visualization of the number of deaths per country worldwide. The user may also utilize the choropleth to select the desired country, and consequently, filter the data displayed in the line chart.

Ritchie et al. developments motivated the proposed visualization, which also features both a choropleth to display the number of terrorist attacks per country and a line chart to illustrate the evolution in the number of terrorist attacks and similar measures (e.g., number of successful

attacks). The choropleth also features a similar selection mechanism, where the user can select a country and filter the line chart (and other idioms) data for the chosen country.

The authors also study how unconventional variables are correlated to terrorism, such as the frequency of airline hijackings, which can be classified as a form of terrorism. Accordingly, we brainstormed which variables could impact the evolution of terrorism and decided to study the correlation between military expenditure and terrorism attacks.

The dashboard developed by Ashwini Swain [2], which includes dot distribution maps, bar charts, and line charts, also inspired the proposed solution. The dot distribution map displays multiple attacks for each country while the bar chart presents the most affected cities. Additionally, the line chart displays the evolution in the number of terrorist attacks over the selected time period. The dashboard also comprises a drop-down list to select the desired countries, which we also incorporated in the proposed solution. Notwithstanding, the authors included every world country in the drop-down list, which leads to an exhaustive and time-consuming selection. However, we will not face the same problem as we can only select a single European Union country simultaneously.

Wang et al. [3] introduced a similar visualization, using a steam graph instead of a line chart. Additionally, the authors also introduced the possibility of filtering the information by terrorist group name or attack type.

Several studies explored the visualization of global terrorism. However, most current literature explores only the evolution of terrorist attacks per country, failing to explore distinctive variables such as the attack type, target type, the terrorist group responsible for the attack, among others. Additionally, such literature offers limited interactivity between idioms.

3. THE DATA

From the early start of the research process, we discovered the **Global Terrorism Database (GTD)** [4], which was the main source of data for the visualization development. The GTD is a comprehensive open-source dataset with approximately 190.000 records of global terrorist incidents from 1970 to 2018. Each incident contains up to 135 features under seven main categories, such as the incident date and location, attack information, weapon information, target information, perpetrator information, and casualties.

The main challenge was the feature selection and the cleaning process due to the high-dimensionality and heterogeneity of the data. With 120 features, we had to carefully select a small set of informative features that accurately answered the pre-defined questions, namely the country, year, successfulAttack, internationalAttack, attackType, targetType, targetSubtype, terroristGroup, numberKilled, and numberWounded.

Several categorical features (e.g., targetType) contained missing values, which we replaced by a sentinel value since these entries still included relevant information and allowed the calculation of important measures, such as the total number of attacks. Additionally, we had to limit the data granularity and merged similar values in categorical features to reduce the data dimensionality and heterogeneity. For example, targetType included both "Government (General)" and "Government (Diplomatic)", which were merged to "Government". However, determining which values could be group together was a lengthy, exhaustive, and (occasionally) ambiguous process.

The internationalAttack variable was derived by comparing the nationality of the target with the nationality of the terrorist group. Consequently, we can infer if the attack is either domestic or international.

After both the selection and cleaning process, we filtered the entries associated with European Union countries between 1990 and 2018. The original 190.000 records and 135 attributes were reduced to approximately 8.000 entries and 10 features.

We utilized an additional database, namely the **SIPRI Military Expenditure Database** [5], which provides the countries annual military spending from 1949 to 2018, allowing comparison of countries' military spending. We aimed to study the correlation between the rise of terrorism and investment in military activities (Question 7).

We also considered incorporating further data, such as the European Union Budget [6], which provides information about EU global expenditure, from 2007 to 2018. However, this timeframe is not compatible with the GTD timeframe.

Initially, we computed several derived measures, such as the sum of the number of attacks or fatalities per country and date. However, when developing the visualization, we realized we needed to filter the information according to the user selections (e.g., target type and terrorist group) and calculate the measures according to such selection. Consequently, we abandoned the pre-computed measures stored in the CSV files and directly compute them upon selection events.

4. VISUALIZATION

4.1. Overall Description

The visualization layout is composed of a configuration panel and a 2x3 matrix, which accommodates six different idioms, namely a choropleth map, a line chart, a bubble chart, a sunburst, a radar chart, and finally a word cloud. The configuration panel enables the user to select the preferred country, target type, attack type, and terrorist group. Additionally, the configuration panel also features a time slider, enabling the user to select the desired timeframe, and a "Default View" button, allowing the user to re-configure the idioms with the initial settings (Figure 1).

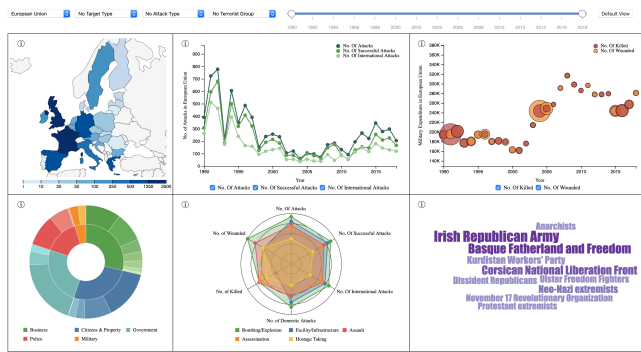


Figure 1 - Visualization Layout

All idioms contain a hoverable info icon (Figure 2), which presents information about the corresponding idiom and assists the interpretation process.

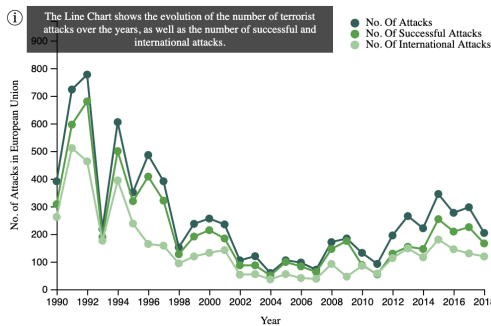


Figure 2 - Example of Info Icon

In addition, the sunburst, the radar chart, and the word cloud display a "No Information Available" notice upon the inexistence of data for the current selection (Figure 3). This phenomenon may happen since we decided to maintain entries with "Unknown" value in such features, as discussed in Section 3.

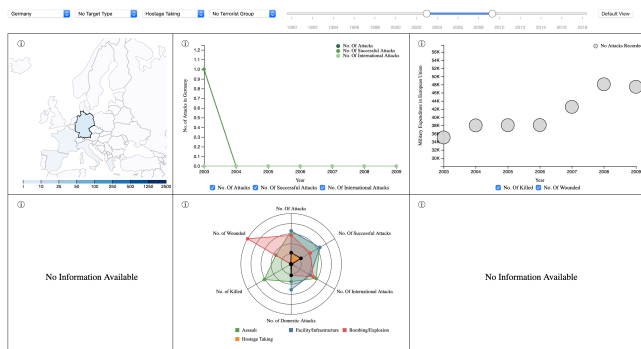


Figure 3 - Example of "No Information Available" notice

Despite the selection dropdowns in the configuration panel, the user may also perform a selection through the choropleth, the sunburst, the radar chart, or even the word cloud. Such selection is always reflected in all remaining idioms. We should note that the visualization displays information for the European Union when no country is selected. Moreover, the user can define the preferred time horizon through the time

slider. Upon the selection of a time horizon, both the line chart and the bubble chart xx axis display the years from the selected period, while the remaining idioms aggregate the information for the selected period.

The **choropleth** (Figure 4) illustrates the number of terrorist attacks in each European Union country over the selected timeframe. Whenever the user moves the mouse over a country, a tooltip shows the exact number of attacks for the corresponding country. Additionally, moving the mouse over a country triggers a highlighting mechanism by reducing the opacity of the remaining countries.

The user may also select a country through the choropleth. To execute so, the user must click on the desired country, which triggers a highlighting mechanism by emphasizing the country shape border. The selection will be reflected both on the remaining idioms and on the "<select>" element located in the configuration panel.

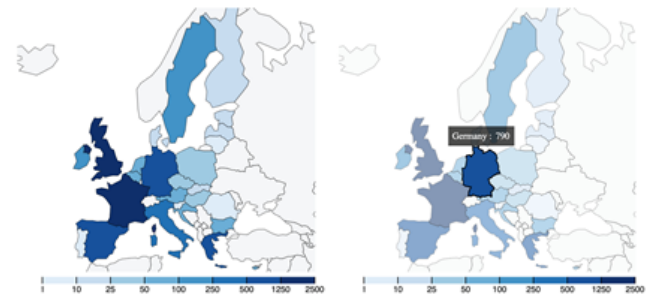


Figure 4 - Example of the selection mechanism on the choropleth

The **line chart** (Figure 5) illustrates the evolution of the number of terrorist attacks in the selected country (or European Union) over the chosen time frame. Besides the number of terrorist attacks, the idiom also contains the number of successful attacks and the number of international attacks. However, the user may not want to examine all variables simultaneously. Therefore, we implemented three checkboxes that allow the user to select which variables should figure in the visualization.

Whenever the user moves the mouse over a time point, a tooltip shows the exact number of attacks for the corresponding year. Additionally, moving the mouse over a point triggers a highlighting mechanism by increasing its radius and reducing the opacity of the remaining variables.

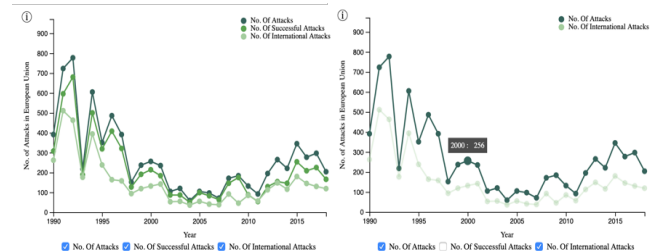


Figure 5 - Example of the checkbox selection and the hover mechanism in the line chart

The **bubble chart** (Figure 6) aims to represent the impact of the number of fatalities and the number of wounded in military expenditure for a given country (or European Union) over the selected timeframe. Similarly, we also implemented checkboxes that allow the user to select which variables should figure in the visualization simultaneously.

Whenever the user moves the mouse over a bubble, a tooltip exhibits the exact number of military expenditure and the number killed (or wounded) for the corresponding year. The hover also triggers a highlighting mechanism by increasing the bubble opacity.

In addition, when no fatalities or injuries were recorded in the corresponding time point, the bubble is colored with a grey tone to better communicate such information.

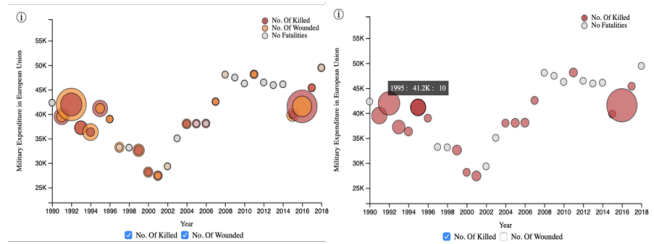


Figure 6 - Example of the checkbox selection and the hover mechanism in the bubble chart

The **sunburst** (Figure 7) illustrates what terrorist groups target the most by displaying the number of attacks for the different target types and corresponding sub-types. To reduce noise in the visualization, the idiom only displays the top six target types.

Whenever the user moves the mouse over a time point, a tooltip shows the exact number of attacks for the corresponding target type. Additionally, moving the mouse over a “slice” triggers a highlighting mechanism that allows the user to focus on the corresponding chart “slice”. The user may also select a target type or a target subtype by clicking on the corresponding “slice”, reflecting the selection both on the remaining idioms and on the configuration panel.

We should also note that the legend is also automatically adjusted according to the target types displayed.

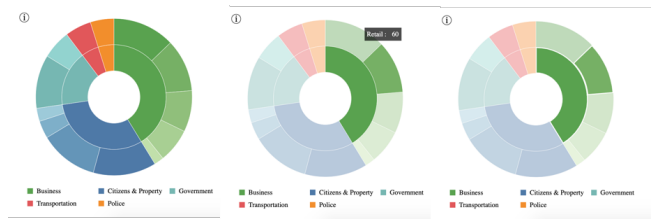


Figure 7 - Example of both the hover and selection mechanism in the sunburst

The **radar chart** (Figure 8) displays the number of attacks, number of successful attacks, number of international attacks, number of domestic attacks, number of killed and number of wounded for the distinct attack types in the

selected country (or European Union) over the chosen timeframe.

Whenever the user moves the mouse over a radar area, a highlighting mechanism is triggered by increasing the area opacity. Additionally, moving the mouse over a radar point displays a tooltip showing the attack type and value of the corresponding variable. The user may also select an attack-type by clicking on the corresponding area, reflecting the selection both on the remaining idioms and on the configuration panel.

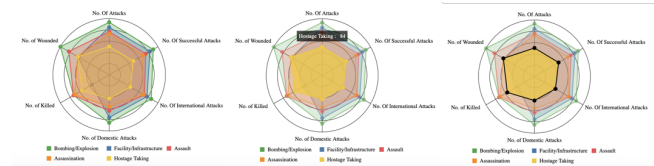


Figure 8 - Example of both the hover and selection mechanism in the radar chart

Finally, the **word cloud** (Figure 9) displays the most predominant terrorist groups for the current selection. Similarly to the other idioms, whenever the user moves the mouse over a word, a highlighting mechanism is triggered by reducing the opacity of the remaining words. Additionally, moving the mouse over a word displays a tooltip showing the number of attacks for the corresponding terrorist group. The user may also select a terrorist group by clicking on the corresponding word, reflecting the selection both on the remaining idioms and on the configuration panel.

To reduce noise in the visualization, the idiom only displays the top ten terrorist groups.



Figure 9 - Example of both the hover and selection mechanism in the word cloud

4.2. Rationale

A visualization design rationale details the reasons behind decisions made when designing a visualization or interface. Therefore, in this section, we provide an overview of the visual encodings used in the idioms and why they work.

The **choropleth** allows the visualization of patterns in geographical regions, where countries are associated with a categorical data type. Their visual encoding is linked with shape, area, position, and color. The color (i.e., single hue progression) is utilized to represent the proportion of the statistical variable being displayed, namely the total number of attacks. Consequently, the idiom illustrates which countries suffered the most terrorist attacks (Question 2).

We adopted the use of the choropleth over the use of a bar chart since representing 28 countries in the bar chart may

introduce challenges in the reading process. Additionally, the choropleth also serves as an easy and intuitive interaction tool to select the desired country.

Line graphs illustrate the evolution of quantitative data over time. Their visual encoding is linked with position and color. The xx position represents the year while the yy position represents the total number of attacks. Additionally, the color distinguishes the different variables.

Line charts are the ideal solution to visualize the evolution of terrorist attacks over the years (Question 1). Additionally, the line chart also displays the evolution of both the total number of successful attacks and the number of international attacks, allowing an evaluation of the percentage of successful attacks and international attacks (Questions 3 and 4).

A **bubble chart** is a type of chart that displays three dimensions of data. Therefore, we chose this idiom to represent the impact of the number of fatalities in military expenditure throughout the years (Question 8). The bubble chart visual encoding is linked with the position, area size, and color. The xx position represents the year while the yy position represents the amount of capital invested in military activities. Additionally, the area size depicts the number of fatalities, and the color distinguishes the different variables.

Sunbursts are often used to represent hierarchical data. Their visual encoding is linked with the (hierarchical) position, area, and color. The different hierarchy levels represent the target type and sub-type, the area represents the number of attacks, and the color distinguishes the different categories (i.e., the attack types). Consequently, we chose this idiom to identify what is the motive behind terrorist attacks, in other words, what do terrorist groups target the most (Question 5).

Radar charts allow the display of quantitative multivariate data. Their visual encoding is linked with position and color. The position represents the value of numerical variables (e.g., the total number of killed) while the color identifies the different attack types. Therefore, radar charts are an appropriate solution to display the different features for the different attack types, offering an overview of which attack types are more frequent, had higher success, or resulted in a higher number of fatalities (Question 7).

A **word cloud** is a visual representation of textual data, typically used to visualize the importance of each word through font size and color. Therefore, their visual encoding is linked with size and color, representing the total number of attacks. We chose this idiom to efficiently identify the most prominent terrorist groups (Question 6).

We also considered the use of a stream graph. Although such visualization can represent the evolution of the most prominent terrorist groups throughout time, it required a lengthy legend to identify the different groups. Additionally, it also introduced difficulties in the selection process due to the reduced areas of some groups.

The main challenge regarding the complexity of the real data was the high heterogeneity in the categorical variables, specifically:

- The target type and sub-type contained more than 120 distinct categories. Therefore, we had to analyze these values and define a higher-level granularity by grouping similar values. Additionally, some of the values were only associated with a single attack, and hence, were categorized with a sentinel value to reduce noise in the visualization.
- The terrorist group names were quite long, and some groups included abbreviations, introducing complexity in the word cloud. Therefore, we merged groups with identical names and removed abbreviations. Similarly, groups associated with a single attack were categorized with a sentinel value.

The categorical variables also contained missing values, which were labeled with a sentinel value, namely "Unknown". However, these were not included in the idioms (e.g., the sunburst, the radar chart, and the word cloud) since they do not provide valuable informative.

We also had to implement different scales (linear, logarithmic, and thresholds) to have an interpretable distribution of the data. For example, the choropleth uses a threshold scale while the radar chart uses a logarithmic scale.

Regarding scalability issues, the main challenge corresponds to the simultaneous selection of multiple variables. For example, when the user selects "Bombing/Explosion" attacks occurred in Italy, between 2010 and 2018, by the terrorist group "Anarchists", the visualization does not present meaningful information due to the data scarceness for such complex selection, as seen in Figure 10.



Figure 10 - Scenario with insufficient data

The other scalability issue corresponds to the impossibility of representing worldwide data in the choropleth since we explicitly designed this idiom to represent only the European Union countries. However, the other idioms would scale to supplementary data since the sunburst, radar chart, and word cloud only represent the most common categorical values to guarantee the legibility of the visualization.

Regarding the prototype evolution, in an initial phase, we sketched a low-fidelity prototype (Figure 11) to study the

adequacy of the overall visualization and examine how the different idioms could interact with each other.

In the second phase, we realized we could not include all the variables originally proposed in the line chart and bubble chart in order to make these idioms legible. Additionally, we also had to adjust the layout space allocated to each idiom. Lastly, we had to replace the steam graph with a word cloud, as previously discussed.

In the third phase, we developed each idiom separately, to learn the functionalities of the D3 library, and to examine the adequacy of the different idioms to both the information available and the proposed set of functionalities.

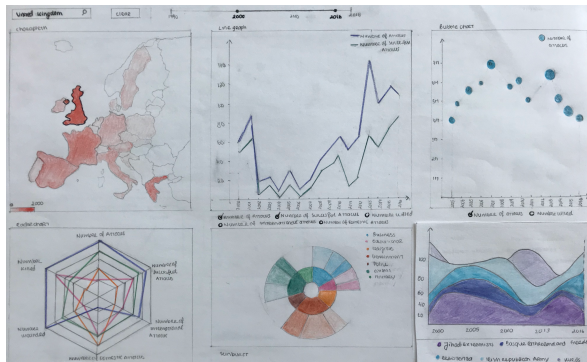


Figure 11 – Sketch of the low-fidelity prototype

Finally, we developed the configuration panel to accommodate the different selections and integrated the various idioms by implementing interactivity mechanisms. The final prototype can be found in Figure 1.

4.3. Demonstrate the Potential

The following example aims to demonstrate the potential of the visualization: Let's assume the user wants to know which country suffered a higher number of terrorist attacks between 2010 and 2018. To achieve this the user must select the desired timeframe through the time slider.

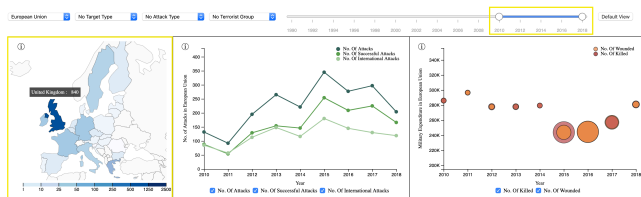


Figure 12 - Timeframe selection

As we can see, the country which was most affected by terrorist activities was the United Kingdom, suffering 840 attacks over eight years.

Now, the user wants to know more about the terrorism situation in the before-mentioned country, specifically, if the number of attacks has increased over the years, and if such attacks have been successful. To achieve this, the user must click on the country shape or select the country through the configuration panel.

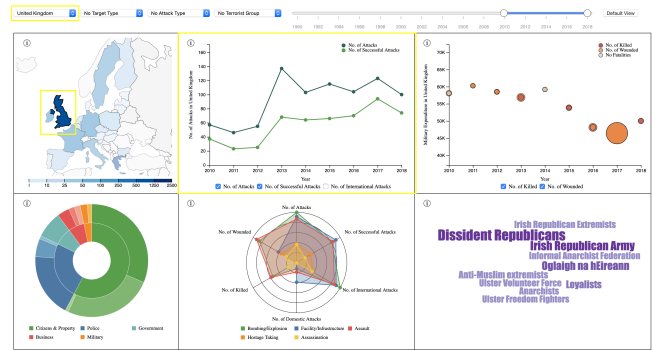


Figure 13 - Selection of United Kingdom

Analyzing the line chart (Figure 13), we can conclude that terrorist attacks have been increasing over the last years, peaking in 2013, with the majority of terrorist attacks being successful. Additionally, the line that represents the successful attacks follows the same trend as the total number of attacks line.

Next, the user scans the word cloud and identifies "Dissident Republicans" as the most prominent terrorist group. The user wants to know what the before-mentioned terrorist group targets the most and their inclinations in forms of attack. To achieve this, the user must click on the corresponding word, reflecting the selection both on the configuration panel and on the remaining idioms.



Figure 14 - Selection of the "Dissident Republicans" group

As we can see, "Dissident Republicans" were responsible for 99 attacks, targeting mostly police personnel as indicated in the sunburst. Additionally, by examining the radar chart, we can conclude that this terrorist group mainly executes "Bombing/Explosion" and "Assault" attacks, with a success rate of approximately 50%.

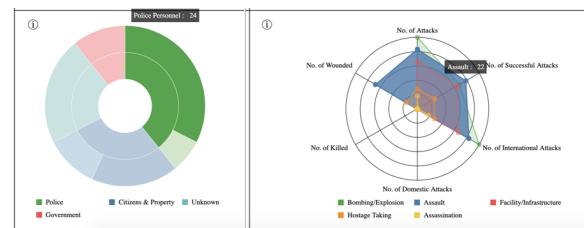


Figure 15 - Interaction mechanisms to support the interpretation of the sunburst and the radar chart

Figure 15 further illustrates the interaction mechanisms that support the interpretation of these idioms

Finally, the user wants to understand if the attacks by "Dissident Republicans" to police personnel are mostly domestic or international. To achieve this, the user must click on the "slice" corresponding to the police personnel. Additionally, the user must also select the "Number of International Attacks" checkbox in the line chart.

Figure 16 represents the visualization after all the selections previously mentioned.

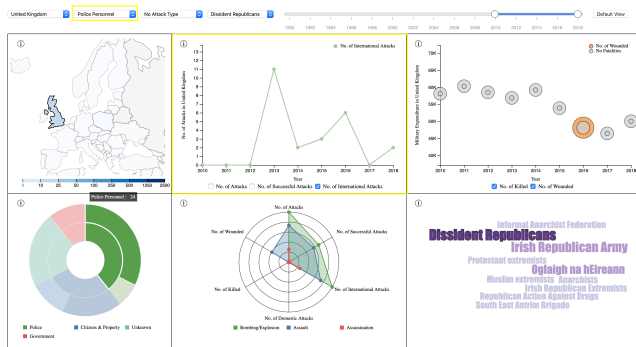


Figure 16 - Selection of the "Police Personnel" target

Analyzing the line chart once again, we can see that the number of international attacks fully overlaps with the total number of attacks, indicating that all attacks were international.

The visualization also provided insights that we were not anticipating. Initially, we expected that the rise of terrorism would be more significant. Although the number of terrorist attacks has increased since 2002, the higher number of terrorist attacks was registered between 1990 and 1996.

We also expected that a higher number of attacks or a higher number of fatalities should result in higher military expenditure. However, we were not able to find an obvious correlation between these features.

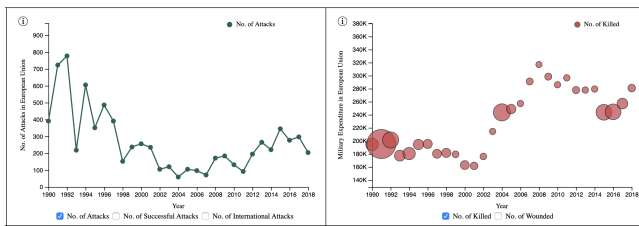


Figure 17 - Evolution of terrorist attacks (line chart) and correlation between the number of fatalities and military expenditure (bubble chart)

We also supposed that terrorism was mostly motivated by political or religious purposes. Consequently, we assumed that both religious and political institutions would be the most target entities. However, this assumption is not verified by the data represented in the sunburst (Figure 18).

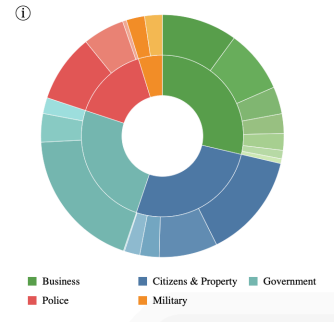


Figure 18 - Top 6 attack targets in the EU

Finally, when we first envisioned the most prominent terrorist groups, we thought that the word cloud would include some big names such as ISIS or Al-Qaeda. However, this is not true for the European Union (Figure 19), confirming the power of media on transmitting misleading information and strengthening the need for a visualization that accurately portrays terrorism evolution over the years.

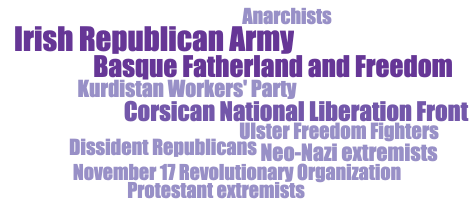


Figure 19 - Most prominent terrorist groups in the EU

5. IMPLEMENTATION DETAILS

The major challenge faced during the implementation of the visualization was the capacity to correctly synchronize the different options selected by the user between the different idioms since the user can perform selections in four different idioms. We overcome this by implementing a configuration panel that centrally stored the different selections.

An additional challenge was the implementation of coherent interaction and selection mechanisms across the different idioms, as these contain different "design" elements. For example, when the user hovers over a country or a word, the remaining countries (or words) are faded to highlight the current selection. Additionally, when the user clicks on a country, word, or even radar chart area, the corresponding element is highlighted with black borders to indicate the current selection.

Regarding brushing and linking, we decided not to implement standard brushing, where moving the mouse over an element highlights a subset of data on the remaining idioms since the information displayed in the idioms represents totals instead of unitary elements. Instead, the user may select an element on a given idiom (e.g., the choropleth, the sunburst, the radar chart, or the word cloud), and the several idioms are updated to reflect such selection. This can be accomplished through the use of linking, where different

components are linked by tuples, which are filtered according to the current selection.

Regarding the implementation of algorithms, the only notable development was the algorithm responsible for filtering the data according to the current selection and subsequently calculating the totals (i.e., the derived measures) required for each idiom.

Finally, we had to adapt the choropleth since the examples available on the D3 library only included the world map. However, we were only interested in European Union countries. Additionally, we had to adapt the existent examples of the different idioms, especially the radar chart and the sunburst to support the interaction and selection mechanisms discussed in Section 4.1.

6. CONCLUSION & FUTURE WORK

The development of this project was exciting but challenging as we had to adapt to new challenges at each checkpoint. With this project, we were able to learn the steps required to create a successful visualization, namely the problem definition, data cleaning, sketching of low-fidelity prototypes, and finally, the solution development using the D3 library.

We believe that we were able to answer the majority of the questions proposed. Yet, with different degrees of success. Particularly, in Question 8, where we could not detect an obvious correlation between the number of attacks and military expenditure, as originally expected.

If we were to start over, we would do things differently. Initially, we did not contemplate the possibility of selecting multiple variables simultaneously. Consequently, we wasted a lot of time computing derived measures that were not used since we need to filter the dataset upon each selection. Additionally, we also did not anticipate the intricacy behind the implementation of the different animation and interaction mechanisms, which proved to be a time-consuming process.

We would also consider a better layout for the sunburst legend since the legend may become crammed if the target names are too long.

Overall, we are satisfied with the final result as we believe that it serves the purpose of accurately illustrating the evolution of terrorism in the European Countries while also offering unexpected insights.

Regarding future work, we would invest more time in the development of a better configuration panel that allowed the user to configure which variables were presented in the different idioms. For example, enable the configuration of the choropleth map to display only the successful attacks. Additionally, we would also review the effectiveness of the bubble chart and explore the correlation with distinct features, such as the SIPRI database mentioned in Section 2, or even the Google search statistics on terrorism keywords.

We would also invest more time in the data cleaning processing to reduce heterogeneity in the categorical features. Moreover, contracting a domain specialist could support the accurate definition of a higher-level granularity.

Applying natural language processing techniques could also be useful to identify terrorist groups with similar names that are classified as distinct groups, and consequently, reduce data heterogeneity.

Finally, we would invest the available capital on design and usability services, particularly for improving the different interaction mechanisms and animations of the idioms, making the overall visualization more appealing. Most important, we would focus on the development of improved visual transitions, particularly in the line chart and in the bubble chart, which are the idioms with the poorest transitions.

REFERENCES

1. Hannah Ritchie, et al. 2013. Terrorism. Retrieved December 14, 2019 from <https://ourworldindata.org/terrorism>
2. Ashwini Swain. Terrorist Activities Around the World Retrieved December 14, 2019 from <https://www.kaggle.com/ash316/terrorism-around-the-world>
3. Wang, Xiaoyu, et al. "Investigative visual analysis of global terrorism." Computer Graphics Forum. Vol. 27. No. 3. Oxford, UK: Blackwell Publishing Ltd, 2008
4. The Global Terrorist Database. Retrieved December 14, 2019 from <https://www.start.umd.edu/research-projects/global-terrorism-database-gtd>
5. Stockholm International Peace Research Institute. Retrieved December 14, 2019 from <https://www.sipri.org/databases/milex>
6. European Union Budget. Retrieved December 14, 2019 from https://ec.europa.eu/budget/graphs/revenue_expenditure.html