

# From Flowchart to Questionnaire: Increasing Access to Justice via Visualization

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## ABSTRACT

One of the main barriers of access to justice is the lack of awareness of legal rights, procedures, and available resources. In this project, we develop F2Q (Flowchart to Questionnaire), an open-source toolbox for legal experts or staff members at legal clinics or help centers (oftentimes with no programming expertise) to easily design and automatically generate web-based interactive questionnaires. Such questionnaires help guide the clients of these help centers, frequently minorities and underserved populations without legal representation, through a series of questions that help them correctly categorize their legal problems and identify appropriate remedies or solutions. Using F2Q, the questionnaires can be easily modified in case of changes to the law and regulations. These questionnaires serve as a virtual assistant to provide initial guidance to find answers to legal questions and, if needed, to direct the clients to a legal expert at the help center for further assistance. Most importantly, this efficient process could prevent potential clients from giving up their quest for justice due to a lack of awareness or inability to find the appropriate legal aid: when people do not know what questions to ask and where to seek answers, they give up and live with the injustice. F2Q aims to break down, or at least weaken, such barriers.

## 1 INTRODUCTION

Access to justice describes how people obtain equal access to legal systems. Ensuring access to justice is a challenge faced by a number of developing and developed countries. Surprisingly, it remains a crisis in developed countries such as the United States, even though there should be no dearth of resources. The U.S. Department of Justice established the Office for Access to Justice (ATJ) in 2010 to “address the access-to-justice crisis in the criminal and civil justice system” [4]. ATJ is guided by three principles: promoting accessibility, ensuring fairness, and increasing efficiency [4]. Specifically, promoting accessibility aims to “eliminate barriers that prevent people from understanding and exercising their rights” [4]. However, one of the main barriers has been that people are not aware of when their rights are being violated and where to get legal help. For instance, consider debt collection in the State of Utah; a total of 380,000 debt collection cases were filed between 2014 and 2019 [1]. About 70% of these cases received default judgments because the defendant (many times from minority and low-income populations) failed to file their responses and the plaintiff (e.g., debt collectors) received judgment in their favor. Default judgments can be highly punitive to defendants, resulting in high fees, garnishment of wages, and loss of property.

In the United States, a number of legal self-help centers or legal clinics (referred to as *help centers* in short) have been set up by state governments to provide legal aid to defendants who do not have legal representations. These centers help answer questions and direct people to the correct resources so that they can understand and exercise their rights. However, people seeking help (referred to as *clients*) are oftentimes unaware of the available resources, and

people working in help centers (referred to as *legal experts*) may need to spend a great deal of time understanding the problem, thus helping clients find an appropriate solution.

In this project, we aim to promote accessibility, i.e. being able to access justice, from the perspective of help centers. Based on feedback collected from a legal expert working at a help center, one of the main barriers to accessing justice is identifying the problem and collecting information about its potential solutions. If a virtual assistant could be built that guides clients initially to understand (a) the criminal/civil case they are involved with and (b) the type of legal action they are seeking (and whether it is available for the case), then access to justice could be made more efficient. Our paper presents an initial work that demonstrates the capacity of basic visualization tools in aiding not only the general public but also legal professionals efficiently, and highlights the potential for future visualization collaboration.

**Contributions.** Our long-term goal is to address how data visualization can be used to empower under-served communities. Using techniques from data visualization, we present *F2Q* (Flowchart to Questionnaire), an open-source toolbox to help people with no programming expertise (e.g., legal experts or staff members at nonprofit organizations) design and generate a web-based interactive questionnaire. The client-facing front end of *F2Q* contains an interactive questionnaire that helps a client navigate a number of legal cases. The expert-facing back end of *F2Q* helps legal experts at help centers design and generate a questionnaire via flowcharts using simple glyphs and interactive visualization. *F2Q* is easily extendable to cover any legal case in a help center. In this paper, we showcase two scenarios, debt collection and protection. Two additional scenarios, eviction and small claims, are presented in the supplement.

In designing the front end, we gathered feedback from a legal expert at a local help center regarding what online questions would help guide clients initially before they are directed to a legal expert. The front end is designed to help clients understand the legal case for which they should be filing suit or defending against. It guides clients through simple questions and answers to find out what problem they are facing and the legal resources that are available to them. For instance:

- Is it a crime against themselves, and hence, could they seek legal action directly?
- Is it a crime against a minor and do they then have power of attorney to seek legal action?
- How do they respond to an eviction notice versus how can they evict someone who may be dangerous from their property?
- Why is the debt collection agency garnishing their paycheck?
- What is the process of suing against a financial fraud?

In other words, the front end help clients ask specific questions at the help center that can help them receive better and faster access to justice. On the other hand, the back end helps a legal expert design a questionnaire using interactive visualization that combines a flowchart with simple drag-and-drop glyphs. It requires no programming expertise and supports the import, export, and modification of a questionnaire stored in CSV and/or JSON formats. The *F2Q* toolbox is open source and available via Github: <https://github.com/tdavis1ab/F2Q>.

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Finally, Core ideas from *F2Q* are currently being developed by contractors at a local help center, leading to tangible societal impact.

## 2 RELATED WORK

In order to understand how visualization can aid in access to justice, we discuss research from various fields including law, computer science, and psychology. Synthesizing insights from these domains together can inform optimal design tools that assist in improving access to justice, while staying within the established guidelines such as privacy regulations. We summarize the related work on improving access to justice via technologies, web-based interactive questionnaires, and software tools that generate flowcharts and interactive questionnaires.

Herman [14] summarized how the courts increase access to justice for self-represented litigants via web technologies, including virtual self-help centers, live-help/live-chat programs, and interactive form-filing and form-deliveries. Gorham-Oscilowski [12] studied the role of statewide legal information websites to increase access to justice in the United States via pilot case studies, online surveys, and interviews. The author developed a set of recommendations to guide the future improvement of statewide legal information websites. Lawler et al. [15] discussed the utility of legal self-help resources in Australia. French [11] studied a legal self-help software that provides guidance to the unauthorized practice of law. Compared with the existing legal self-help tools, our toolbox provides a user-friendly interactive prototype that enables legal experts to easily generate a questionnaire from a flowchart for communicating legal concepts, and improves the clients' comprehension of the legal landscape via the generated questionnaire.

For interactive questionnaire tools, Chiew and Salim [8] proposed *WEBUSE*, a web-based questionnaire for evaluating the usability of websites. The tool can analyze user responses and generate a usability report based on the analysis. Ahmadaliev et al. [5] proposed a web-based interactive questionnaire instrument to help detect and address clients' learning preferences. Conversational chatbots are also widely used as virtual assistants. For example, Zhi and Metoyer [19] proposed a visualization-augmented chatbot, *GameBot*, for exploring game statistical data.

Several tools enable users to design flowcharts interactively, such as *Graphviz* [10], *Lucidchart* [3], and *Gliffy* [2]. However, none of them enable users to convert the designed flowchart to a web-based interactive questionnaire directly and automatically. Assila et al. [7] proposed a tool for generating a web questionnaire to help collect human-computer interaction (HCI) evaluations. In comparison, *F2Q* is designed to be an open-source, lightweight, and easy-to-deploy toolbox for users with little technical training to create and generate questionnaires that improve access to justice.

## 3 VISUALIZATION

During the development stage of *F2Q*, we addressed a number of design requirements (e.g., **R1**, **R2**, and **R3**) based on the feedback from a local legal expert via multiple sessions. We highlight a few key requirements below:

- **R1:** The tool should contain an internal-facing component that enables the easy design of a questionnaire, and a client-facing interface with the questionnaire. A help center staff member should be able to easily modify and update a designed questionnaire.
- **R2:** The tool should protect the privacy of clients while providing valuable information.
- **R3:** The tool should contain a panic button in the user interface to allow clients to exit the current page quickly.

Based on these design requirements, the toolbox *F2Q* consists of two components, a client-facing *interactive questionnaire* (front end) and an expert-facing *designer tool* (back end). A help center

staff member can download the designed questionnaire from the designer tool and update the user interface by simply updating a configuration file. The designer tool enables a legal expert or a help center staff member to easily create a flowchart of a questionnaire associated with a specific type of legal case and update the user interface accordingly using drag-and-drop, even if they have little knowledge about web design and programming, addressing **R1**. To address **R2**, we do not save any client/browser data after clients close the window. Instead, clients can download their responses and corresponding information at the end of the questionnaire if they choose to. To address **R3**, we have added a button that leads to a commonly used website (e.g., [www.google.com](http://www.google.com)).

We choose to utilize a flowchart due to its ability to visually depict the logical flow of a questionnaire, which ensures that the sequences of questions follow coherent and organized paths. The flowchart is also popular in legal contexts [16]. Furthermore, it provides a visual overview of the questionnaire to help a designer verify that all aspects are covered while avoiding repetitions in the questionnaire.

We now describe in detail the visualization components that are at the core of *F2Q*. They are developed by following the guiding principle of creating intuitive, informative, and interactive visualization for users without any programming expertise.

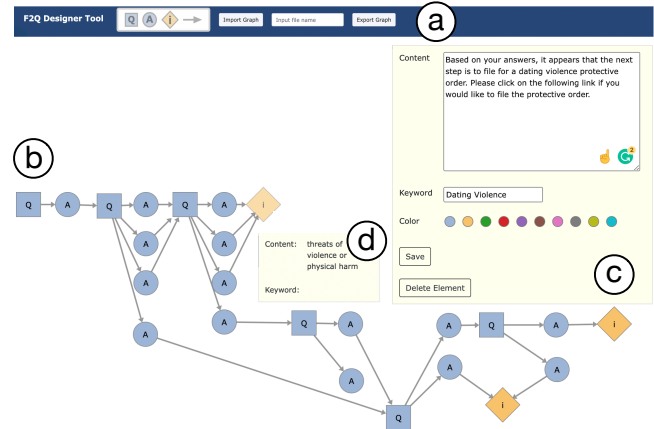


Figure 1: The visual interface of the designer tool.

### 3.1 Back End Designer Tool

The back end designer tool consists of two panels, the selection panel and the design panel. In the selection panel (Fig. 1a), three glyphs represent three types of nodes in a flowchart: the question node (Q), the answer node (A), and the information node (I). The panel also includes an edge glyph (an arrow) that enables user-driven connectivity among the nodes. The design panel shown in Fig. 1(b) visualizes the graphical skeleton of a flowchart.

During the design process of a flowchart, a user may select a node glyph, and use drag-and-drop to create a node at a specific location in the design panel. Drag-and-drop is a direct manipulation that is easy to use and ideal for grouping, reordering, and moving objects in the design panel. By double clicking a node, the user can update the content, keywords, and color associated with the node, see Fig. 1(c). The user can also delete the node from the flowchart. While hovering over a node, the associated content is displayed next to the node for quick reference, see Fig. 1(d). To add an edge between two nodes in the flowchart, the user needs to select the edge glyph first, and then select its corresponding source and target nodes in the design panel to draw an directed edge. In general, a question node can be connected to multiple answer nodes; an answer node can be connected to either a question node or an information node; and a flowchart typically terminates at one or more information nodes.

Once a user finishes designing a flowchart, the flowchart can be exported as a graph in JSON and CSV file formats. Before exporting

**Legal Help - Protection**
Close

Whom are you seeking protection from?  
You can pick more than one of the answers that might apply.

Someone I am/was married to.

Someone I live/used to live with (including roommates).

Someone I am in a consensual sexual relationship with.

Someone I am related to as a parent, step-parent, child, step-child, grandchild, grandparent, sibling, aunt, uncle, niece or nephew.

Someone I have had children with or am expecting a child with.

Someone I was in a dating relationship with. ("Dating relationship" means a relationship of romantic or intimate nature, or a relationship which has romance or intimacy as a goal by one or both parties, regardless of whether the relationship involves sexual intimacy. It does NOT mean casual fraternization in a business, educational or social context).

Someone who sexually assaulted me.

None of the above.

Go Back

Figure 2: The user interface of the interactive questionnaire for seeking protection.

the graph, an error checker is applied to avoid possible errors in the flowchart such as an incorrect connectivity (e.g., an answer node is connected to another answer node). The output file is then used as an input to the front end to generate/update an interactive questionnaire accordingly. A previously created flowchart in JSON or CSV format may be imported to the designer tool for modification/conversion.

### 3.2 Front End Interactive Questionnaire

The front end interactive questionnaire starts with a welcome page with brief instructions to a help center client on how to fill out the questionnaire. The next page clarifies that all the information provided by the client will be kept confidential, and the client's responses and information associated with the case may be downloaded by the client if they want to do so, in case the client wants a copy of the questions and answers. Such information will not be stored after the end of the session. If a client agrees to continue, they will be taken to the first question of the questionnaire; see Fig. 2 for an example of the case of seeking protection. The client selects one of the text boxes that best matches their specific situation by clicking on it to navigate to follow-up questions or information relevant to their selected scenario. A client can navigate the questionnaire back and forth via the "Go Back" button on each page. The interface also comes with a "Close" button designed to function as a panic button so that a client can quickly close the entire session in an emergency to protect their privacy. At the end of the questionnaire, the interface provides instructions on what to do next based on client responses and a link to the documents that they might need to file.

The questionnaire designer (e.g., a legal expert) is able to update the content of the questionnaire by updating the input file name in the configuration file associated with the front end. The metadata associated with the questionnaire such as its title, welcome message, and initial instructions can also be updated via the configuration file. Little technical background is required to update the configuration file because it is self-explanatory.

### 3.3 Implementation Details

Both the front end and the back end are implemented using HTML/CSS/JavaScript stack. The interactive visualizations are enabled with the *D3.js* library. Importing a previously saved flowchart is also handled by methods from the *D3.js* library. For exportation, a flowchart is encoded as a JSON/CSV file with the data URI scheme (i.e., the data is embedded directly into HTML). The questionnaire interface configuration is stored as a JSON file.

## 4 USE CASES

*F2Q* comes with four use cases to demonstrate its utility: debt collection, protection, eviction, and small claims, two of which can be found in the supplement due to space constraints. A help center staff member will be able to use the toolbox to quickly generate and convert a flowchart into a web-based interactive questionnaire. The questionnaire serves as a simple virtual assistant to provide initial guidance to clients regarding their case step by step. We provide a small snapshot for the designed flowchart of each case; see the supplement for the complete flowchart.

### 4.1 Debt Collection

Our first use case is related to debt collection. A client coming to the help center can seek information regarding their cases, including:

- Figuring out why their paychecks are being garnished;
- Stopping the garnishment;
- Getting help with how to fight their debt cases;
- Making sure the debt is theirs.

Fig. 3 (left) shows the flowchart designed using *F2Q*. Instead of using the default glyph-based coloring scheme, we color the nodes according to the answers to the first question, so that it is easier for the designer to observe the paths in the flowchart. Fig. 3 (right) demonstrates a snapshot of the flowchart with contexts, for example, when a client is willing to pay the debt, but does not have enough money currently. If a client (e.g., defendant) agrees that they owe the full amount, they can contact the plaintiff to see if they will settle the case. If a client disagrees with parts of the complaint, they can file an Answer (i.e., a formal reply to the court) online.

The client-facing questionnaire according to the flowchart on the top level (Fig. 3 left) includes 11 scenarios, including for instance:

- Why is my paycheck being garnished?
- How do I fight this case? I got a summons and complaint. What should I do?
- Should I contact the creditor? Should I try to settle this with the creditor?
- I want to pay this, but I don't have the money right now. What should I do?
- My ex was supposed to pay this. What do I do?
- I never got the papers and did not find out about this until my paycheck was garnished.

### 4.2 Protection

In our second use case, we present a more complicated flowchart based on input of a legal expert that provides help to clients seeking protection. At the beginning of the questionnaire, the client is asked to clarify who is seeking protection (i.e., the clients or someone else) and from whom they are seeking protection (see Fig. 2). Based on their answers, the system provides detailed information for physical harm, threats of violence, domestic violence, stalking, etc. Fig. 4 (left) shows the flowchart designed using *F2Q*. Fig. 4 (right) shows an example of a client seeking protection from someone they are/were married to. Based on the type of abuse they are facing, the system provides guidance to which kind of document they could file. Fig. 2 shows the client-facing top-level questionnaire based on a subset of the flowchart.

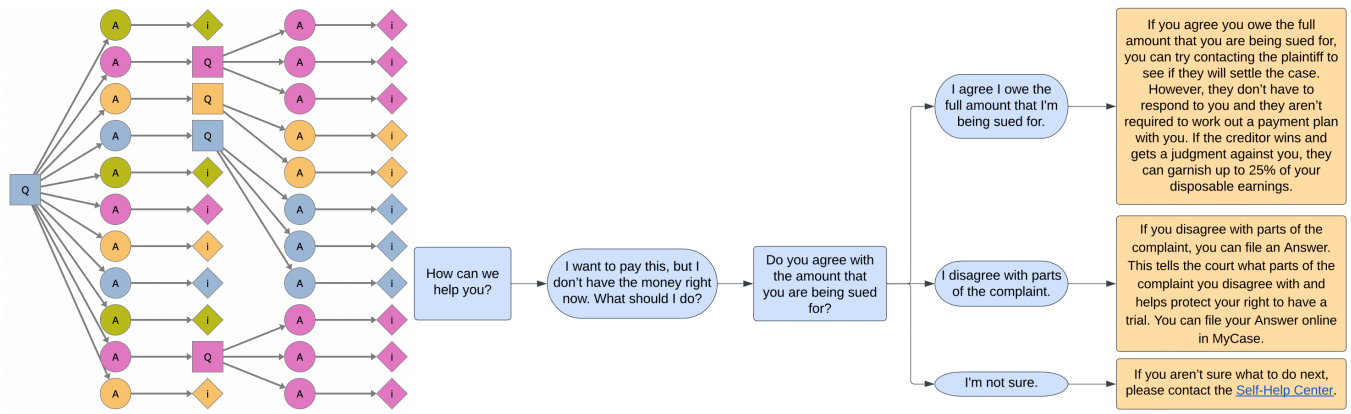


Figure 3: Debt collection case: the flowchart design (left) and a snapshot of the questionnaire (right).

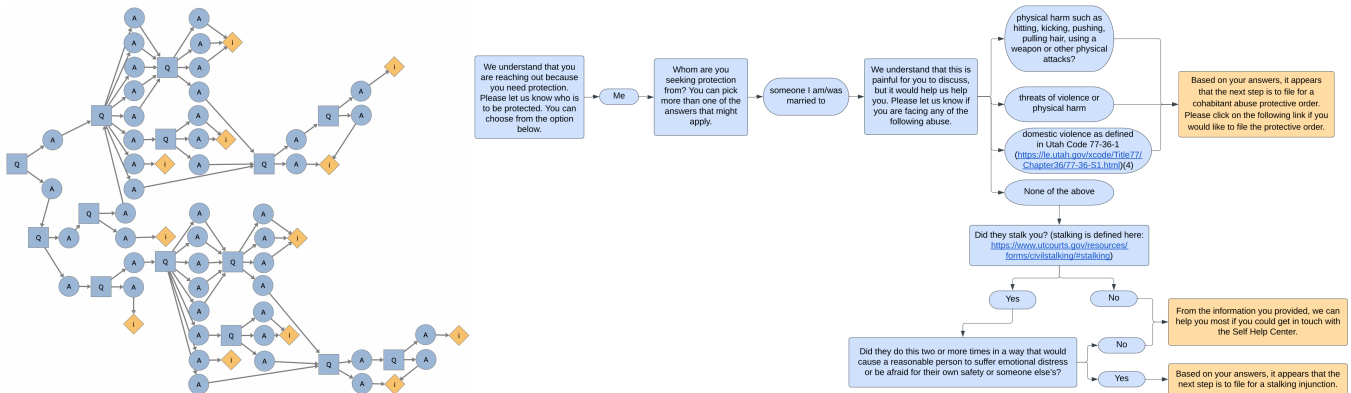


Figure 4: Protection case: the flowchart design (left) and a snapshot of the questionnaire (right).

## 5 CONCLUSION AND DISCUSSION

We present *F2Q*, an open-source toolbox that aims to increase access to justice via visualization. We demonstrate how a web-based interactive questionnaire could easily be designed and automatically generated using *F2Q* to guide the clients of self-help centers or legal clinics, in particular, for minorities and under-served populations who do not have a lawyer, to get faster and better access to justice. We describe two use cases involving debt collection and seeking protection (and two additional ones in the supplement involving eviction and filing small claims). We give details of the questionnaires associated with these use cases based on the input of a collaborating legal expert. These questionnaires guide a client initially through a series of questions that help them identify the problem, the appropriate solution, and available legal resources. They serve as a virtual assistant to provide initial guidance to possible solutions and to direct the client to a legal expert at the help center for further assistance. An interactive questionnaire thus saves time for both clients and legal experts, making access to justice more efficient. Most importantly, this efficient process prevents potential clients from giving up their quest for justice, which has been shown to be one of the biggest barriers to accessing justice.

Along with providing a user-facing front end, *F2Q* is equipped with a back end that enables a legal expert or a help center staff member to create and modify questionnaires using flowcharts. Such a process is designed for users with no technical training, by being intuitive, informative, and interactive. A back-end user could easily modify existing questionnaires in case of changes to the law and regulations.

Whereas a conversational AI Chatbot (such as ChatGPT) might serve a similar purpose for the front end, the current technology

based on large language models (LLMs) has known limitations, for example, hallucinations or producing convincing text that is subtly false [17]. An advantage of *F2Q* is that it is open source, lightweight, and easy to deploy; and the back-end user has full control over the type of legal guidance described by expert-crafted flowcharts.

Even though *F2Q* only scratches the surface of visualization in promoting access to justice, it has already had a tangible societal impact. Currently, based on positive feedback from our collaborating legal expert, core ideas from *F2Q* are being developed by contractors to be deployed at a local help center.

Moving forward, nonprofit organizations would also benefit from web-based interactive questionnaires, for example, to increase access to credit in the financial sector. However, the practical deployment of such a toolbox requires in-depth considerations regarding privacy and scalability. Furthermore, an assessment of usability could be carried out to provide insight into the effectiveness and efficiency of the toolbox; these are left for future work.

McLachlan and Webley recently investigated the use of flowcharts (and other process-oriented diagrams) in legal literature, and put forward questions on how information visualization “may improve access to justice, legal education, and lay comprehension of complex legal frameworks and processes” [16]. Hagan’s Visual Law project [13] advocates the need for representing complicated law concepts in clear and digestible visualization. There is in general a missed opportunity in utilizing visualization in law and legal processes, in particular, for improving the comprehension of law for the lay audiences and improving their ability to raise valid legal arguments [16]. Our work is a step towards such a direction. The overarching goal is to enhance the visualization of law (e.g., [6,9,18]) to empower legal experts to communicate legal concepts, and to improve clients’ legal comprehension in real-world contexts.

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## REFERENCES

- [1] Utah courts caseload. <https://www.utcourts.gov/stats/files/2019FY/?type=dist>, Visited on 2020-07-10.
- [2] Gliffy. <https://www.gliffy.com/>, Visited on 2023-06-06.
- [3] Lucidchart. <https://www.lucidchart.com/>, Visited on 2023-06-06.
- [4] Office for Access to Justice. <https://www.justice.gov/archives/atj>, Visited on 2023-06-06.
- [5] D. Q. Ahmadaliyev, X. Chen, and M. Abdvohidov. A web-based instrument to initialize learning style: An interactive questionnaire instrument. *International Journal of Emerging Technologies in Learning*, 13(12):238, 2018.
- [6] R. J. Ambrogi. Vision quest: Visual law services are worth a thousand words - and big money. *ABA Journal*, 100(5):34, 2014.
- [7] A. Assila and M. S. Bouhlel. A web questionnaire generating tool to aid for interactive systems quality subjective assessment. In *IEEE International Conference on Control, Decision and Information Technologies (CoDIT)*, pages 815–821, 2013.
- [8] T. K. Chiew and S. S. Salim. Webuse: Website usability evaluation tool. *Malaysian Journal of Computer Science*, 16(1):47–57, 2003.
- [9] M. Curtotti and E. McCreath. Enhancing the visualization of law. *Law via the Internet Twentieth Anniversary Conference*, 2012.
- [10] J. Ellson, E. Gansner, L. Koutsofios, S. C. North, and G. Woodhull. Graphviz—open source graph drawing tools. In *International Symposium on Graph Drawing*, pages 483–484. Springer, 2001.
- [11] S. French. When public policies collide: Legal self-help software and the unauthorized practice law. *Rutgers Computer & Technology Law Journal*, 27:93, 2001.
- [12] U. Gorham-Oscilowski. “It’s not just all about the technology”: Understanding the role of statewide legal information websites in expanding access to justice in the United States. PhD thesis, University of Maryland, 2015.
- [13] M. Hagan. Visual Law Project. <http://www.openlawlab.com/project-topics/illustrated-law-visualizations/>, Visited on 2023-08-15.
- [14] M. Herman. Increasing access to justice for the self-represented through web technologies. *National Center for State Courts, Future Trends in State Courts*, pages 29–33, 2007.
- [15] M. Lawler and M. Robertson. Perspectives on the utility of legal self-help resources. *Reaching further: innovation, access and quality in legal services*, page 26, 2009.
- [16] S. McLachlan and L. C. Webley. Visualisation of law and legal process: An opportunity missed. *Information Visualization*, 20(2-3):192–204, 2021.
- [17] OpenAI. GPT-4 system card. <https://cdn.openai.com/papers/gpt-4-system-card.pdf>, Visited on 2023-03-23.
- [18] H. Penfold. When words aren’t enough: Graphics and other innovations in legislative drafting. *Language and the Law Conference*, 2001.
- [19] Q. Zhi and R. Metoyer. GameBot: A visualization-augmented chatbot for sports game (extended abstract). In *CHI Conference on Human Factors in Computing Systems*, pages 1–7, 2020.