

System Analysis

Website: MDOT MVA: <https://mva.maryland.gov/Pages/default.aspx>

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Part 1: User Research

Project Description

The mva.maryland.gov website is an information system offering various driver and vehicle related services and information. Since it caters to a large population and is the sole website of the MVA, it is important for it to be easy to use and accessible. In our experience, the current website has navigation and usability issues that need improvement to satisfy the information needs of an individual who wishes to obtain a Maryland driver's license.

Information Need(s): Obtaining a new or transferring an existing driver's license by an UMD student/staff:

- (a) by a U.S. national
- (b) by an international affiliate

Stakeholders: MD government, Department of Transportation, UMD students

Systems involved: maryland.gov, mva.maryland.gov

Organizational challenges: The website does not present an intuitive menu that points to the user promptly to the several services offered by MVA. For instance, their [online services page](#) works differently from the rest of the information provided on the website. The list of documents needed to apply for a license service by an international student v/s a U.S. national is different, and the website fails to identify that explicitly (considering all MD residents have the same website to access).

Goals: Improving the information architecture and making the website easier to navigate would in turn help users perform important tasks like applying for a license and utilize various other services efficiently.

Expectations: Recommend updates to improve the accessibility and usability of the MVA web application to better assist the information needs of a new or a returning user thus fulfilling the purpose of eliminating the need for them to call the MVA office or visit them in-person.

Research Methodologies Overview

1. Tree Testing:

Tree Testing is proved to be an effective user research methodology to gauge the performance of the site map/menu of a web-based information system. The accessibility of an information system is key in order for an information system to be usable and effective. Our project aims to aid the new driver's needs which are primarily dependent on the effectiveness of the navigation of the target systems. Therefore, by implementing a tried and tested approach a.k.a tree testing with the help of our participants would lead us to current and potential findability issues of both the Maryland website and Motor Vehicle Administration. Upon successful implementation, deduce recommendations to the site menus that would improve the success of the system in satisfying information needs of its users via easy and effective site navigation.

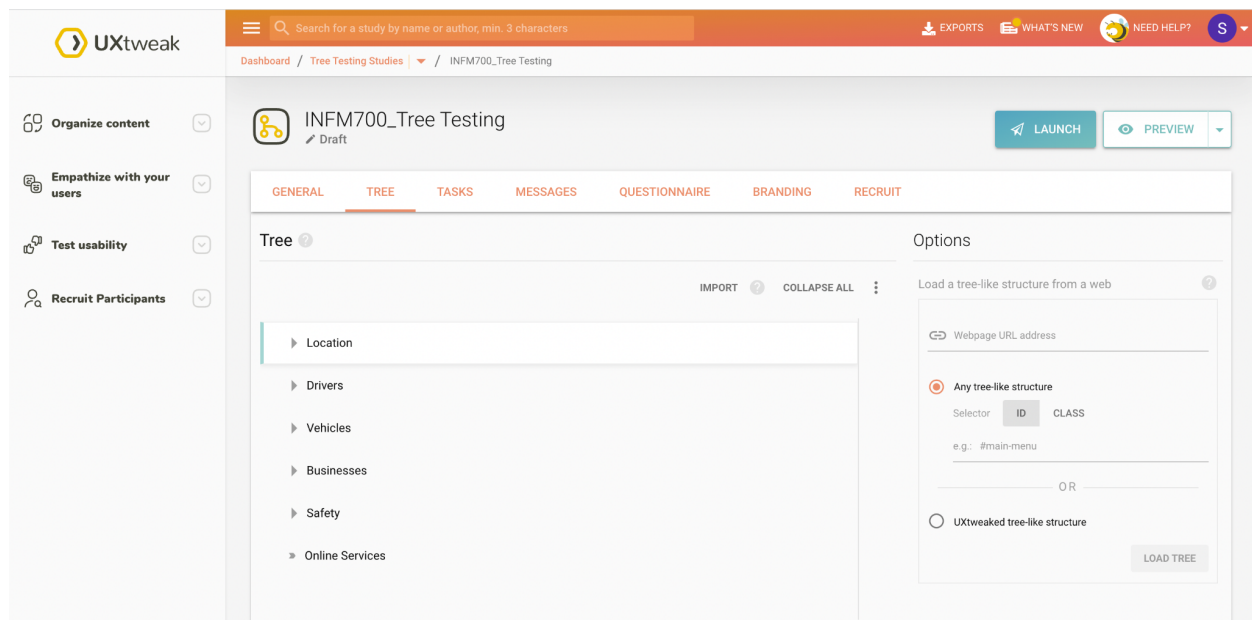
2. Contextual Inquiry:

Contextual inquiries allow a collaborative environment for both the parties involved- researchers and participants. For our information system, we would lead two different groups of two to three participants each to inquire about and observe the way they navigate the website and the tasks assigned to them (using different services offered on the website). One group will have international students and the other will have U.S. national students. We would then evaluate the effectiveness of the current system based on the knowledge of the exact information needs and user behavior of our subjects gained through the activity. Finally, we would present our findings in a consolidated and informative manner that may be used to improve the user experience of a user looking to obtain a license from MVA.

User Research Implementation

1. Tree Testing:

We conducted Tree Testing with 4 users: 2 U.S. nationals (User A and B) and 2 international students (User C and D) studying at the University of Maryland, College Park. We created the tree structure using Google Sheets ([Pr Tree Testing](#)), and further used UXtweak as our tree testing tool to test with our participants.



Screenshot of Tree Testing tool UXtweak

The following five tasks were performed by the users-

1. You are a new international student at UMD and are planning to apply for a new driver's license. See if there are any resources on this site that can help you begin the process.
2. You are a young American citizen planning to apply for a driving license but are unsure about the eligibility criteria to apply. See if you can find relevant information on the website to help you out.
3. Your non-commercial driving license has recently expired. See if there are resources on the website that can help you begin the renewal process.
4. You are planning to buy a new vehicle but are unsure of the process. Can you find any tips for the buyer on the website before visiting the dealership?

- You are interested in the Rookie Driver Program of Maryland but are unsure whether you are eligible for it. Can you find relevant information that can help you with the same?

Results:

The tasks performed by the four users yielded the following results:

Legend:

Correct	Incorrect
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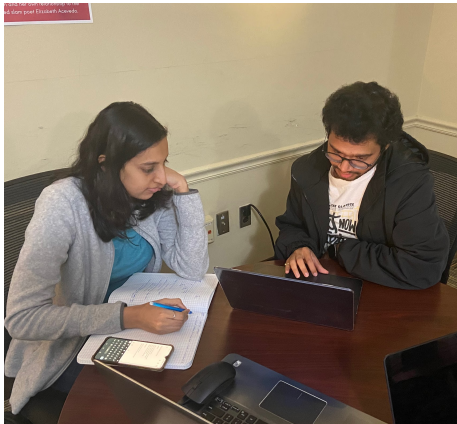
Tasks	User A (U.S. national)	User B (U.S. national)	User C (international)	User D (international)
T1	Correct	Correct	Correct	Correct
T2	Correct	Correct	Incorrect	Incorrect
T3	Correct	Correct	Correct	Correct
T4	Incorrect	Correct	Correct	Incorrect
T5	Correct	Incorrect	Incorrect	Incorrect

Insights:

- We noticed that users struggled with tasks T4 and T5 as compared to T1, T2 and T3. Information on the website for tasks T4 and T5 has been categorized into sub-levels, with various options within each sub-level. This is why the users found it difficult to navigate and the various options presented also caused cognitive load.
- In some places, the same terminology was used for two or more different uses/links. For example, T5 has the term 'Rookie Driver Program', which is used at two different places on the website. This created confusion amongst the users and hence three of them failed the task.

3. Users C & D struggled with task T2. The reason for this was that some categories were not named well on the website, hence causing confusion amongst new users who had very little context of the US driving license terminologies.

Users performing the tasks:



Screen recording of tree structure used for testing on UXtweak: [UXtweak_Screen_Recording](#)

2. Contextual Inquiry:

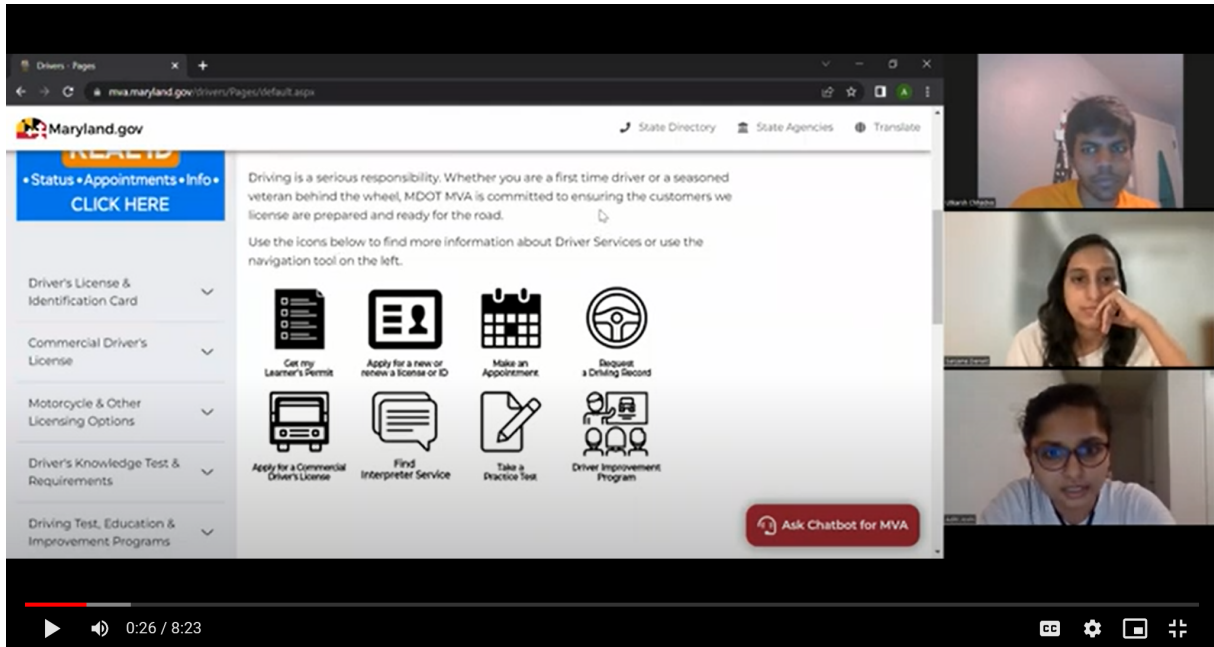
We conducted 1 remote moderated and 3 in-person moderated Contextual Inquiries with 4 users: 2 U.S. nationals (User A and B) and 2 international students (User C and D) studying at the University of Maryland, College Park. We created 2 sets of task lists containing 2 tasks each, and further used Zoom as our testing tool to conduct the inquiry with our participants.

The following two tasks were performed by the 2 U.S. nationals (Users A & B)-

1. You are new to the state of Maryland and you want to exchange your old state's license to obtain a new Maryland state license. Please use mva.maryland.gov to find out the requirements in order to do that.
2. Once you identify the requirements, can you schedule an appointment to proceed with the process.

The following two tasks were performed by the 2 international students (Users C & D)-

1. You are new to the U.S. and you want to exchange your old country’s license to obtain a new Maryland state license. Please use mva.maryland.gov to find out the requirements in order to do that.
2. Once you identify the requirements, can you schedule an appointment to proceed with the process.



Moderated Zoom interview with User C

[Moderated Zoom interview link](#)

Results:

The tasks performed by the four users yielded the following results:

Legend:

Correct	Incorrect
---------	-----------

Tasks	User A (U.S. national)	User B (U.S. national)	User C (international)	User D (international)
T1	Could determine	Could not find the	Took a while but	Could correctly

	what requirements were needed for an in-state license.	requirements needed to obtain an in-state license.	could correctly determine what requirements were needed.	determine what requirements were needed easily.
T2	Opened an incorrect 'online document guide' link instead of the 'schedule appointment' link.	Found the correct link for 'schedule appointment', but chose an incorrect category in the process.	Opened an incorrect application link instead of the 'schedule appointment' link.	Opened the correct 'schedule appointment link' and could book an appointment easily.

Insights:

1. We found out that Users A and B had some difficulty with the website, even though they were U.S. nationals. User B, in particular, could not navigate through the website easily. User A could perform one of the tasks correctly.
2. User C and D had an easier time with the website comparatively. User C took a while for Task 2, and eventually opened an incorrect link. User D found both the tasks manageable.
3. We agreed that the website should have an option of 'Schedule an appointment' close to the requirements section. This button should directly lead users to the specific appointment category. This will avoid extra cognitive load and confusion during the process of scheduling an appointment.

Part 2: Data Architecture

Data Governance

The data governance at the Maryland Department of Transportation (MDOT) MVA is managed internally and externally. Internally by Transportation Business Units (TBU), and externally by vendors and contractors. These external vendors/contractors are in contractual agreement with MDOT.

Data quality maintenance is the responsibility of many different departments working together- for example, even internally, data quality practices vary across MDOT, and even across offices with a single TBU. Because MDOT is a large enterprise, a uniform data governance has been identified across various data sources, information flows and business processes.

Strategic Roles in Management and Administration of MDOT MVA's Data Governance Implementation:

1. **MDOT Data Governance Council** - This is an enterprise-level data governance group that includes administrators or senior level managers from TSO and each TBU. Their **responsibilities** include that of setting up MDOT-wide principles and policies for Data Governance and they handle conflict resolution related to data assets and information systems.
2. **TSO and TBU Data Governance Councils or Boards** - This role includes members that represent core TBU business processes. Their **responsibilities** are to provide supervision and coordination of Data Governance implementation at MDOT TSO and each TBU
3. **Data Working Groups** - This includes business process and IT staff from MDOT TSO and TBU offices. Their **responsibilities** include overseeing implementation of policies, procedures, and business practices associated with their respective data programs. They also provide regular updates on key initiatives to the TSO or TBU Data Governance Council.

Operational Roles in MDOT MVA's Data Governance Implementation:

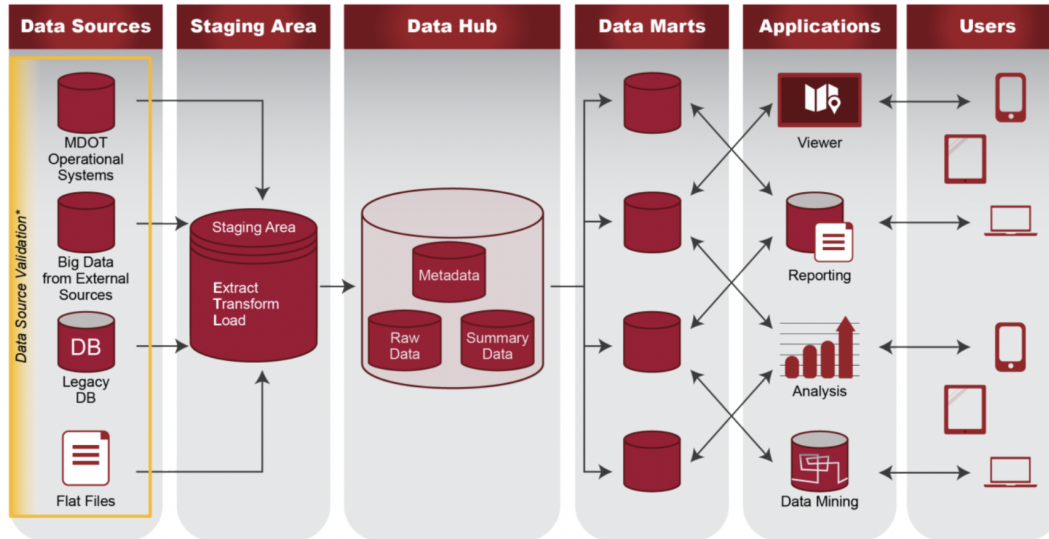
1. **Data Steward** - This is usually a person familiar with data's use in support of business processes. Their **responsibilities** include being accountable for a specific type of data or data domains, ensuring that data is collected, maintained, and used in accordance with agency-adopted standards or policies, and security, confidentiality, authority, and liability policies are established and enforced. They also coordinate closely with Data Owners and Information System Custodians.
2. **Data Owner** - Within the MVA, this is typically a business analyst whose main **responsibilities** include creating and maintaining discrete data assets.
3. **Information System Custodians** - This is typically a member from the IT staff whose core **responsibilities** include providing technical development and support for information systems and supplying data to support MDOT's business processes.
4. **Data User or Stakeholder** - This is any individual or agency internal or external to MDOT. Their **responsibilities** include using, accessing, benefitting from, or being otherwise affected by MDOT's data.

Data Sources

A large organization like MDOT has a primary database from where they get most of their data. Further, it also relies on multiple sources to extract data from for displaying external links and other sources of information on the website. As its primary source of data, MDOT has developed a 'Data Hub' that connects data to the people within the organization who need it.

Primary Data Source - The Data Hub:

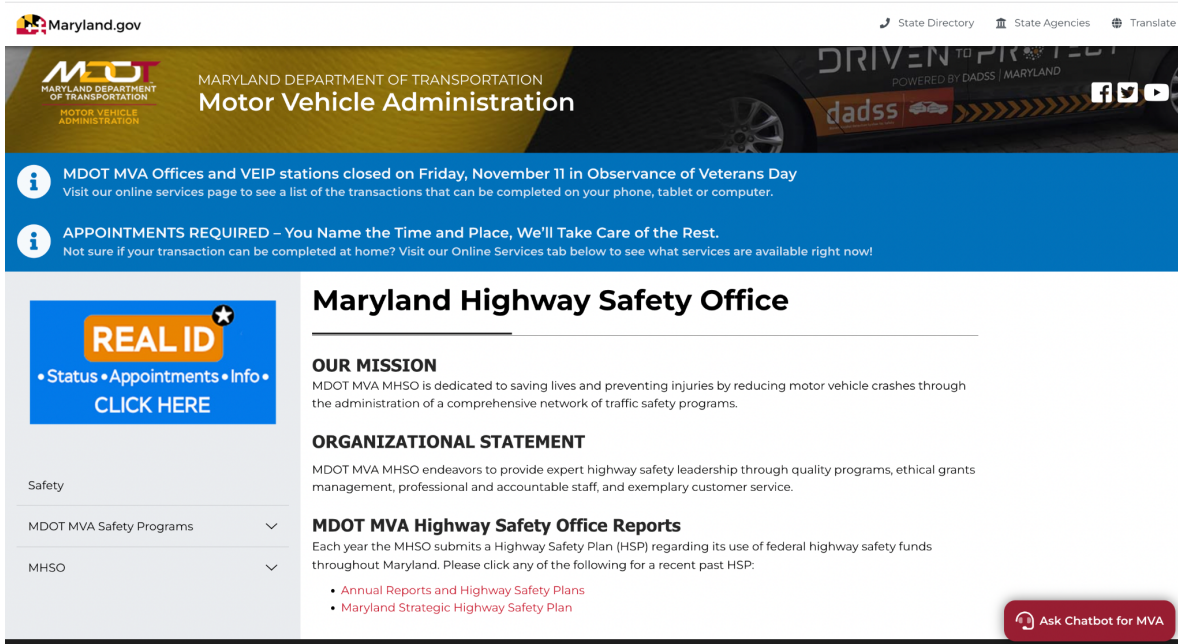
- Makes timely, relevant, and trusted data and information available from the system of record in accessible formats. This is done to support decision making and customer service needs.
- Reduces duplication of data entry, and saves time associated with data requests.
- Maintains data security and confidentiality while improving transparency.



Data Sources for MDOT (Source: MDOT Data Governance and Data Hub Report, May 2019)

Data owned by different departments:

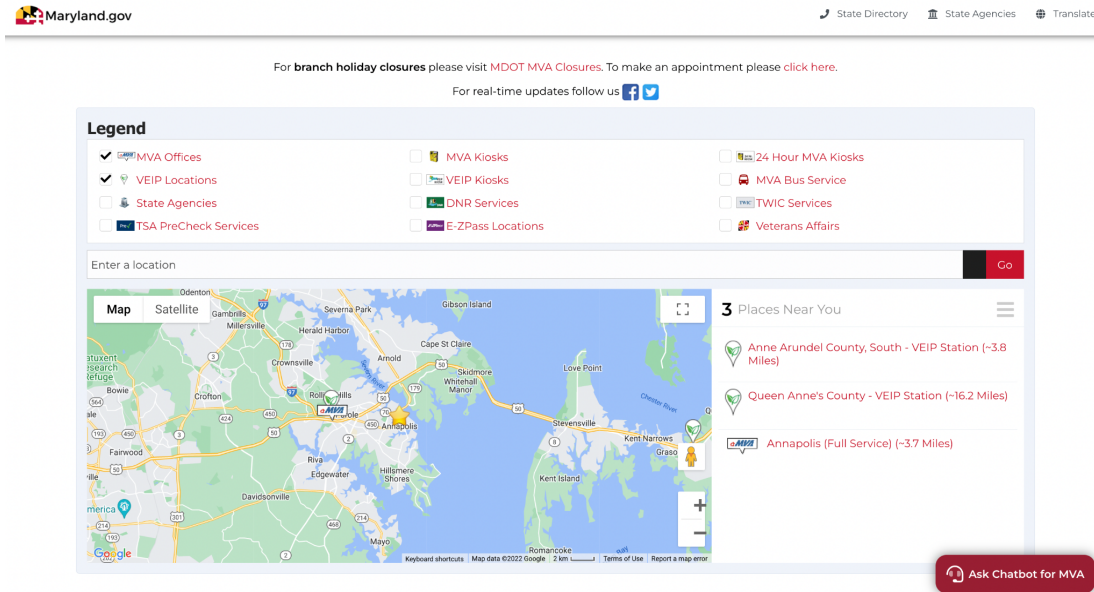
The MVA website has a page on Maryland Highway Safety Office that includes information and helpful links for users. Assuming that the MHSO is a separate department within MDOT, the data might be sourced from their department internally.



Screenshot of the MHSO page on the website

External Sources:

The Location and General Operations page on the website uses Google maps as an external source of data to show the locations of their offices.



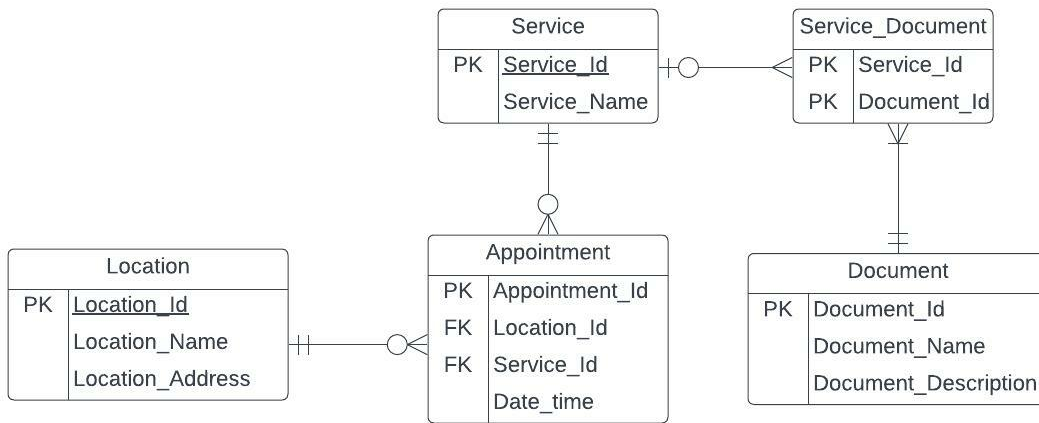
Screenshot of the Location and Operations Page

Data Dictionary & Logical Data Model

	A	B	C	D	E
1	COLUMN_NAME	Alias	DATA_TYPE	DOMAIN	COMMENTS
2	Service_Id	ServiceId	NUMBER	service	This is an unique service identifier used by MDOT's MVA application for listing services offered.
3	Service_Name	Service	TEXT	service	Represents various services offered by MDOT
4	Location_Id	LocationId	NUMBER	location	Represents MD MVA offices codes. See domain Location for names of offices.
5	Location_Name	Location	TEXT	location	
6	Location_Address	Where		location	
7	Appointment_Id	Confirmation Code	TEXT	appointment	Unique, character field generated by mva application.
8	Date_Time	When	DATETIME	appointment	The day and time of an appointment
9	Document_Id	DocumentId	NUMBER	document	Official document identifier used for user validation
10	Document_Name	Document Name	TEXT	document	Name of the official document

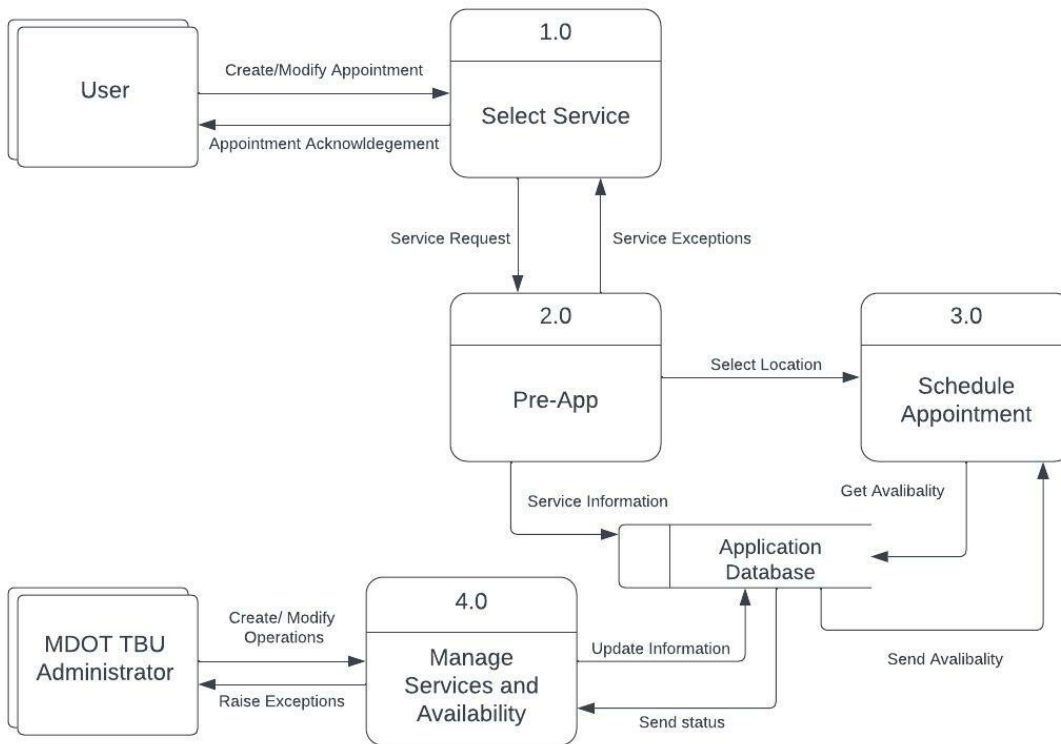
Data Dictionary

[View Data Dictionary](#)



Logical Data Model

Data Flow Diagram



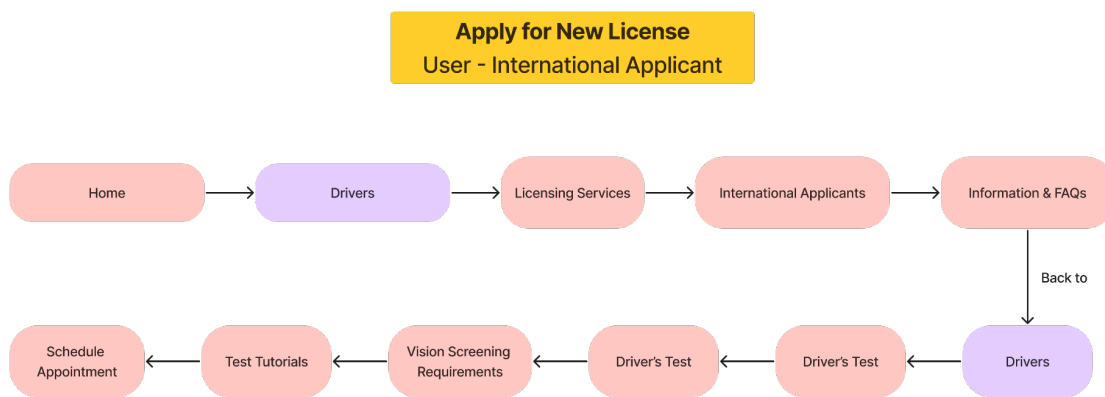
Data Flow Diagram

Part 3: Information Architecture

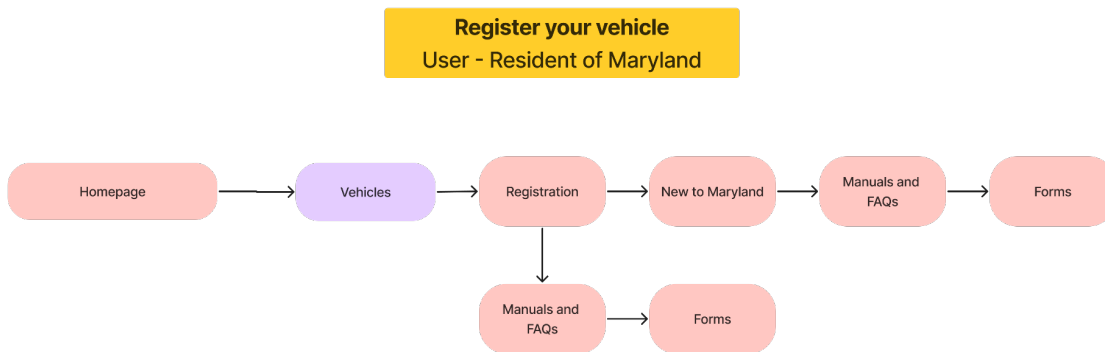
We used the following three IA artifacts that incorporated the findings from our user research and accommodated the data architecture that we created.

User Journey Mapping

Through the user research, we as a team got insights on the existing website flaws- what was not working and could be improved for better user satisfaction. Based on the insights (outlined in assignment P1), we proposed the following two flow diagrams for the users for two key tasks- apply for a new license and register your vehicle.



Proposed flow diagram for 'Apply for a new license' task



Proposed flow diagram for 'Register your vehicle' task

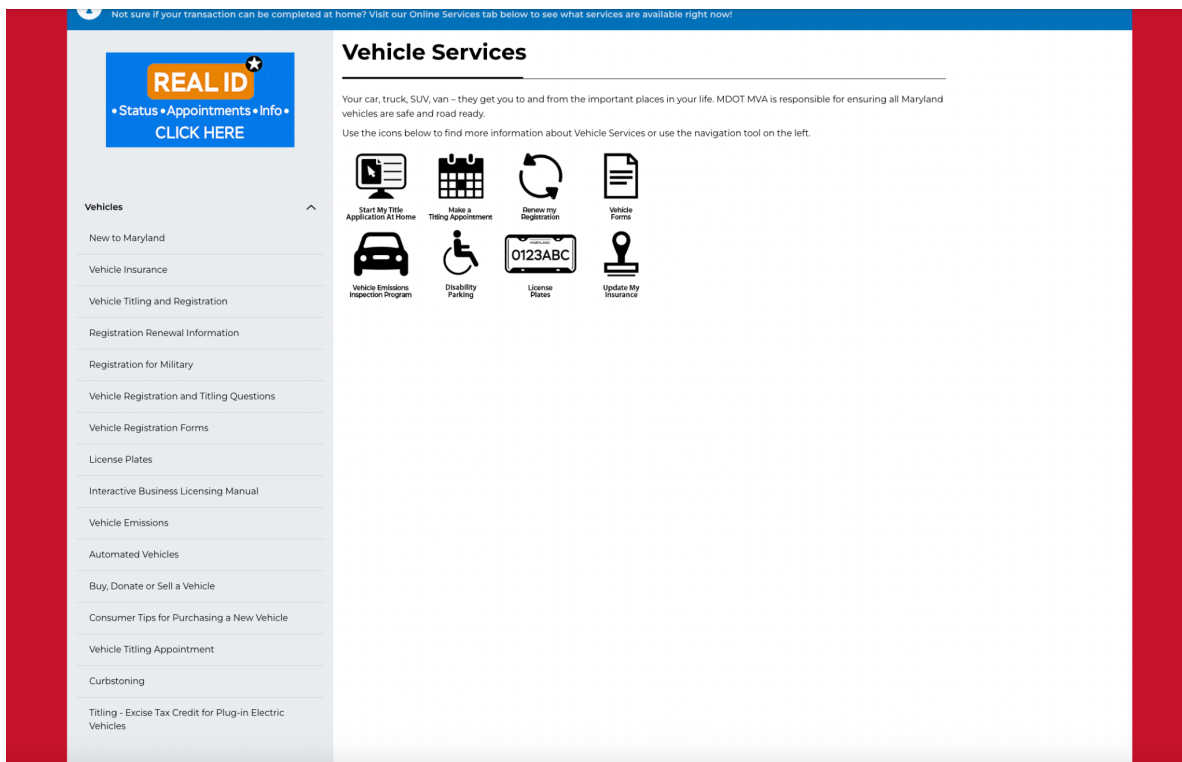
Link to the proposed flow diagrams for the MDOT MVA website on FigJam:

<https://www.figma.com/file/IZv9epsAbVLab8X2r98cFC/INFM700-P3-Artifacts?node-id=0%3A1&t=ONcxzjZTcQdZAJDy-1>

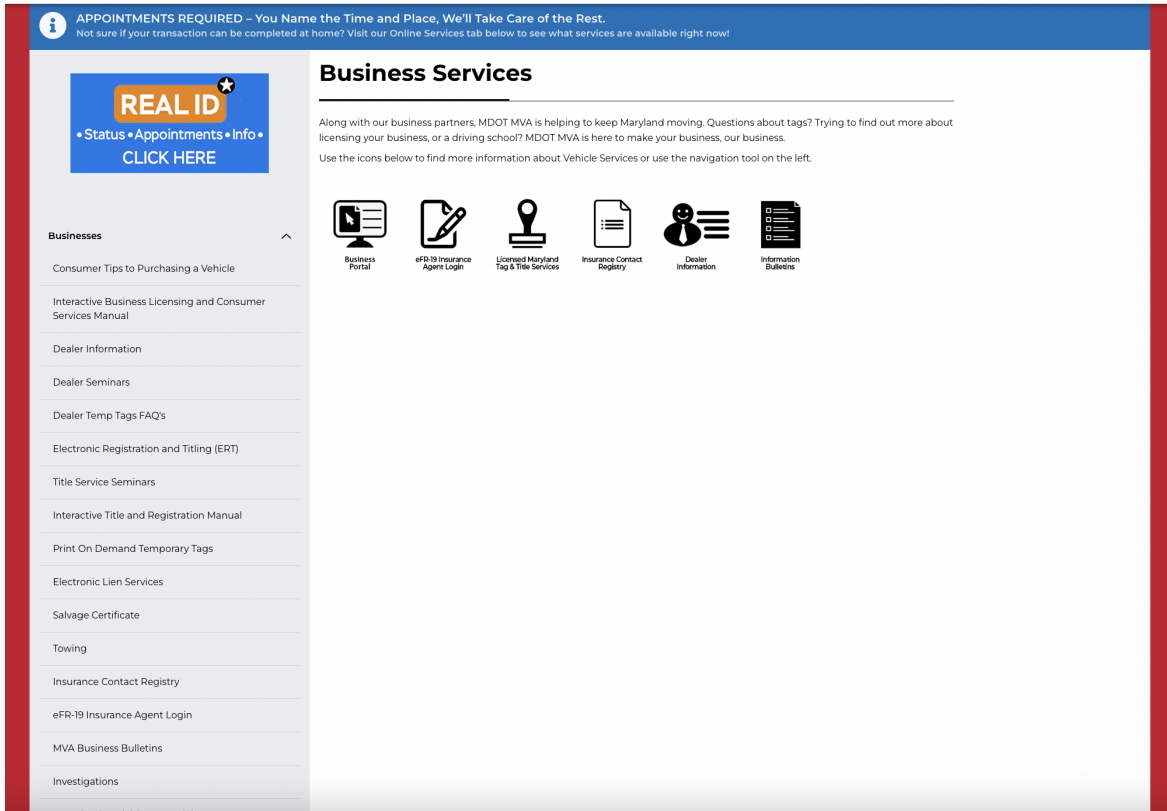
Navigation Structure (Information Architecture Diagram)

Based on the insights from P1 and on the proposed User Journey Mapping, we proposed the following navigation structure for the MDOT MVA website. This navigation structure is designed in a way to eliminate disorganized duplicate information and extensive user flows.

For example, the existing website has certain vehicle registration and titling information/ FAQs under the 'Businesses' category. We reorganized this important information and grouped it under the 'Vehicles' category. This ensures that users find relevant information under the correct category.



'Vehicles' category on the current website - Left navigation shows no categorisation



'Businesses' category on the current website - Left navigation shows no categorisation

Second, under the 'Locations' category, information was displayed without any organization and displayed as many separate links. What we did was to ensure users do not get lost when they are under this category. We changed the name of the category from 'Locations' to 'Operations' because it included information on hours of operation and holidays. Under this new 'Operations' category, we clearly defined five subcategories to make information search more efficient.

Location & General Operations

Holidays & Closings | MVA & VEIP Locations | Bus Schedule | VEIP Self-Service Locations | 24-hour Tag Return

Hours of Operation:

MDOT MVA is open by appointment only. To see a list of transactions that can be completed using your phone, tablet or computer visit [myMVA eServices](#).

[Make an appointment here.](#)

Our new appointment scheduler has many different appointment options to choose from! With so many choices, it's important to select the correct appointment type to ensure your service is not delayed.

CURRENT OPERATIONS UPDATES: [HERE](#)

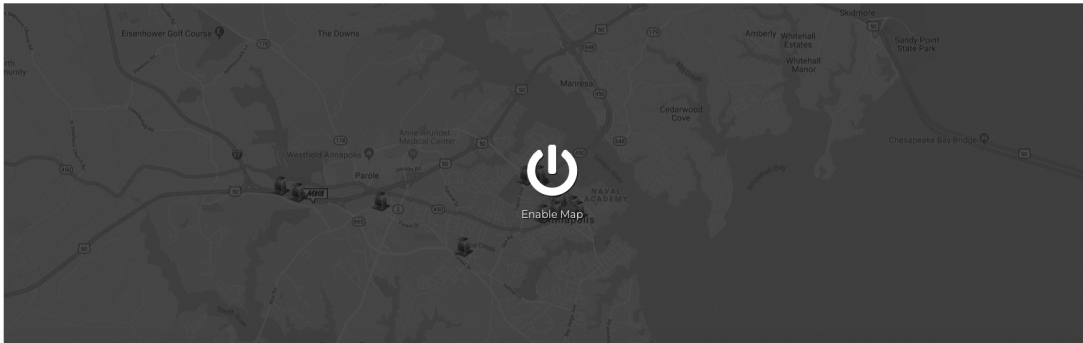
Vehicle Emissions Inspection Program (VEIP) Testing sites are **OPEN and operating normally**. MDOT MVA does not offer appointments for VEIP tests, just stop by at your convenience.

[View VEIP Wait Times.](#)

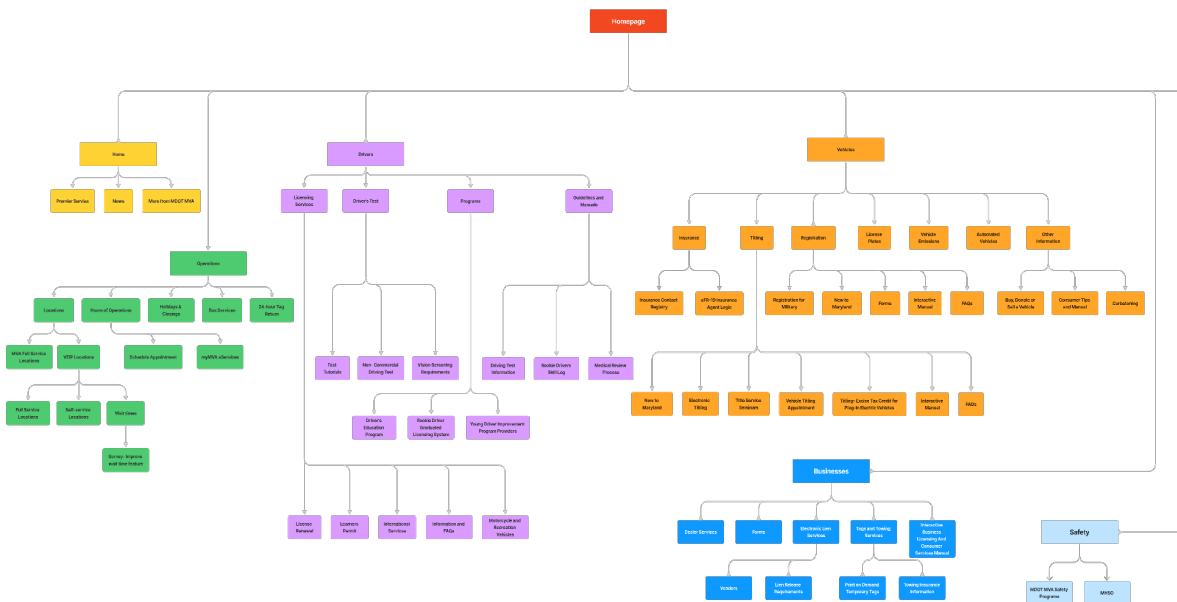
VEIP testing can also be completed **24/7** at our **Self-Serve Kiosk** ([view locations here](#)).

For **branch holiday closures** please visit [MDOT MVA Closures](#). To make an appointment please [click here](#).

For real-time updates follow us [f](#) [t](#) [w](#)



'Locations' category on the current website - Information displayed has no categorisation



Proposed navigation structure for <https://mva.maryland.gov/Pages/default.aspx>

Link to the proposed navigation structure for the MDOT MVA website on FigJam:

<https://www.figma.com/file/IZv9epsAbVLab8X2r98cFC/INFM700-P3-Artifacts?node-id=0%3A1&t=ONcxzjZTcQdZAJDy-1>

This proposed navigation structure is done keeping in mind the data architecture. Because the website is owned by MDOT, the proposed changes do not harm or cause any major disturbances in MDOT data governance plans or require any separate data sources.

Wireframes

a. Driver's License Page: Although the language used on the website is clear, appropriate, and familiar to the user, we felt that the structure of the website is not well suited for such a task. They use an anchor menu on the top of the web page, each linked to different sections. Users must scroll back to the top page to select or navigate to a different option making it an inconvenient choice. Also, the menu is on the side, and not on the top, which makes it an unfamiliar territory for users.

The screenshot shows the Maryland Driver's License website. The navigation menu on the left includes:

- Driver's License & Identification Card
- Commercial Driver's License
- Motorcycle & Other Licensing Options
- Driver's Knowledge Test & Requirements
- Driving Test, Education & Improvement Programs
- Guidelines & Manuals
- Others

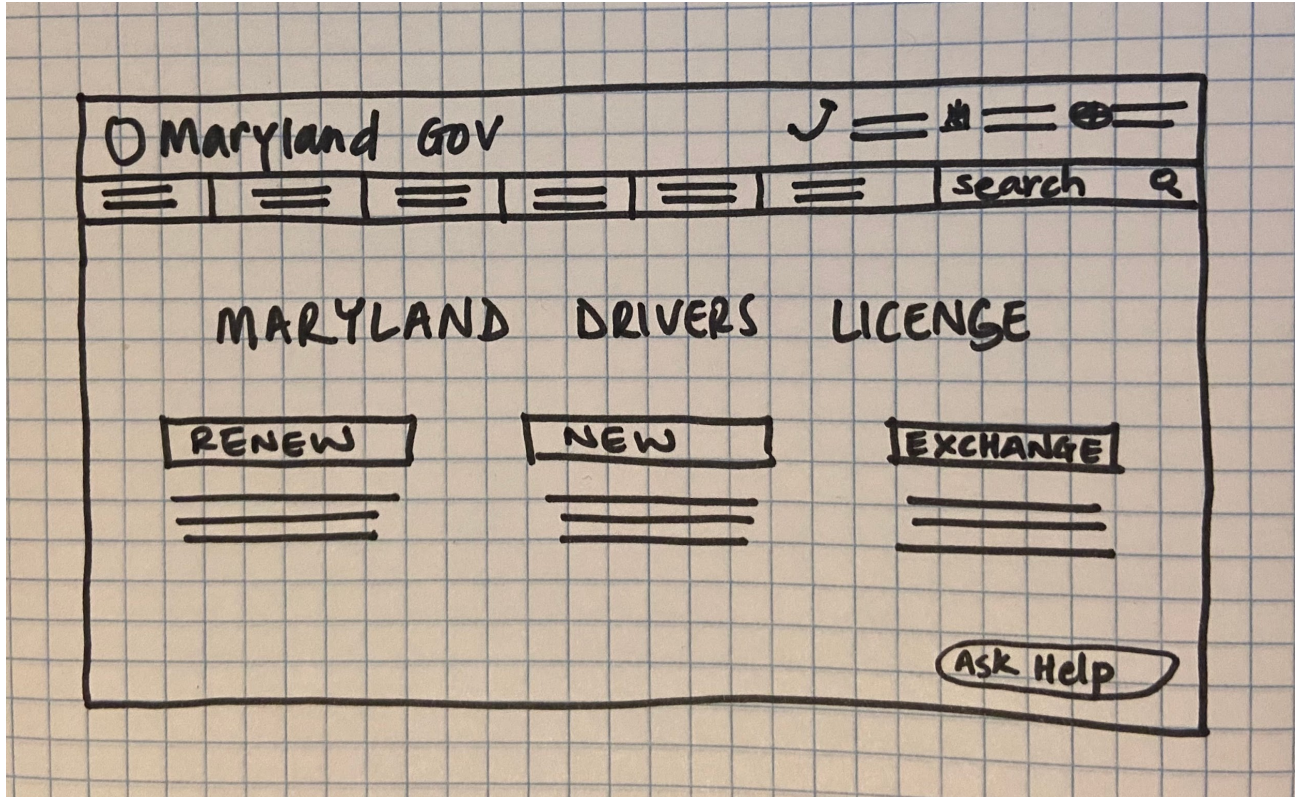
The main content area is titled "Maryland Driver's License" and contains the following sections:

- Maryland Driver's License**: The information below pertains to a regular non-commercial driver's license, [click here](#) if you have or wish to obtain a commercial driver's license (CDL).
 - Renewing a Maryland License
 - If You Have Never Held a Driver's License, [click here](#)
 - Correcting a Maryland License
 - Duplicate Maryland License
 - Lost Maryland License or Permit
 - New to Maryland
 - Stolen Maryland License or Permit
 - Provisional to Regular License
 - Exchanging an Out of State License
 - Exchanging an Armed Forces License
 - Exchanging an Out of Country License
- Renewing Your Maryland License**: [Click here](#) for complete information on renewing your Maryland license.
- Correcting/Changing Your Maryland License or Permit**: IMPORTANT: For all name changes - marriage, divorce, etc., **please update your name with the Social Security Administration first, and if possible bring proof of that change with you to your MDOT MVA appointment.**

A chatbot button labeled "Ask Chatbot for MVA" is located in the bottom right corner.

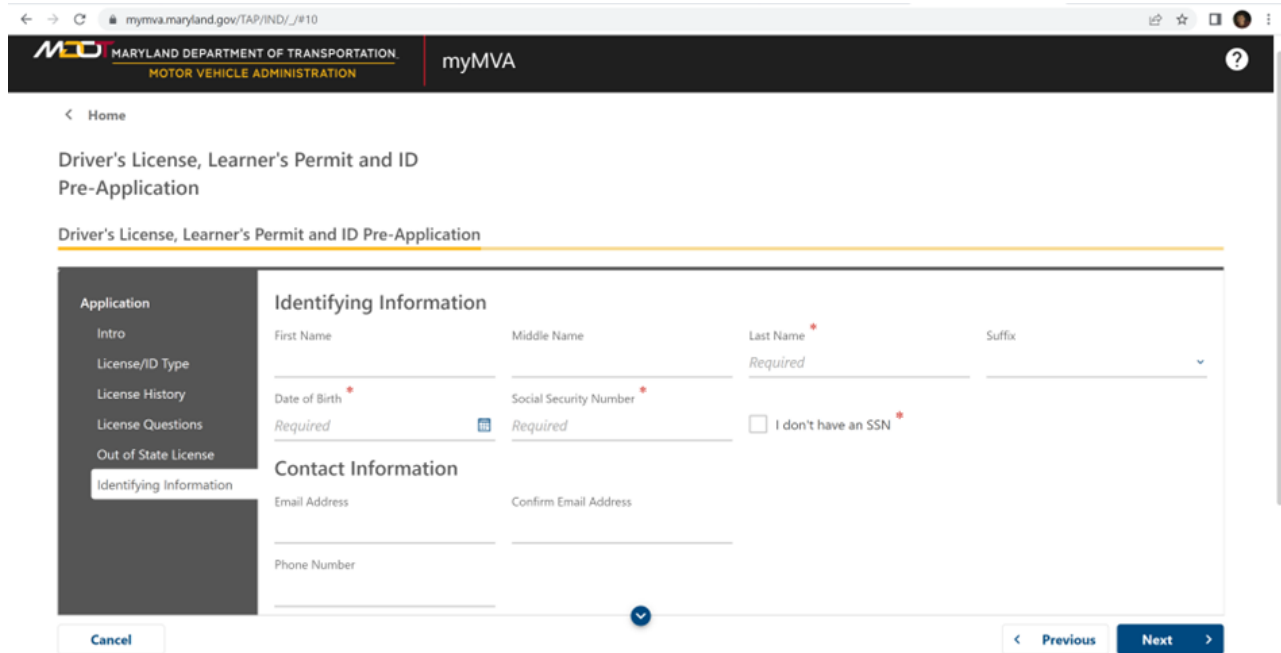
Existing Driver's License Page on the website

The proposed wireframe design shows that the side navigation bar could go on the top, and that the main three services of the license page- new, renew, exchange, could be highlighted to make it easier for the users.



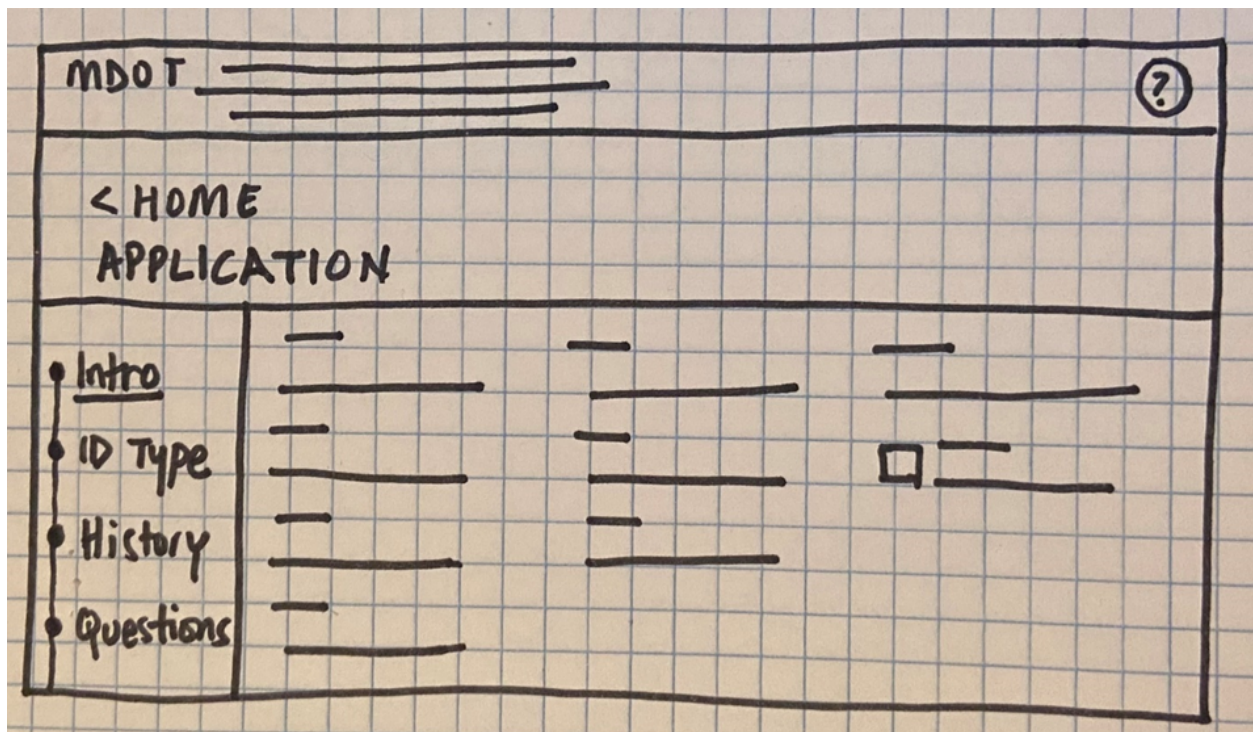
Proposed wireframe design for the Driver's License Page

b. Schedule Appointment: Nowhere on the website can a user see the system status. For obtaining a license, the website should provide an expected timeline to the user. Even when one books an appointment through the main MVA website (the sole website to book all MVA related services appointments), they do not show any status. When we tried to schedule an appointment, we could not see the next parts of the form, or how long the form would be. There should be an open and continuous communication of the system's state to build trust amongst the users.



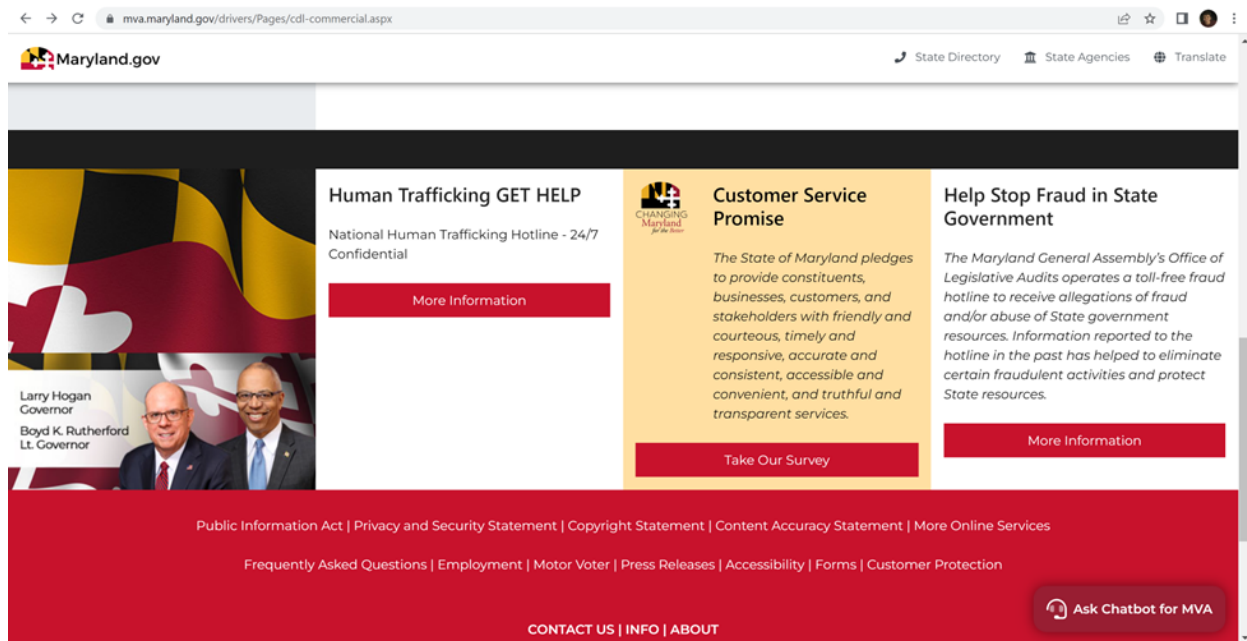
Existing Schedule Appointment Page on the website

The proposed wireframe design shows that adding a simple navigation scroll menu on the left will help users understand what all information is needed and long the form would be.



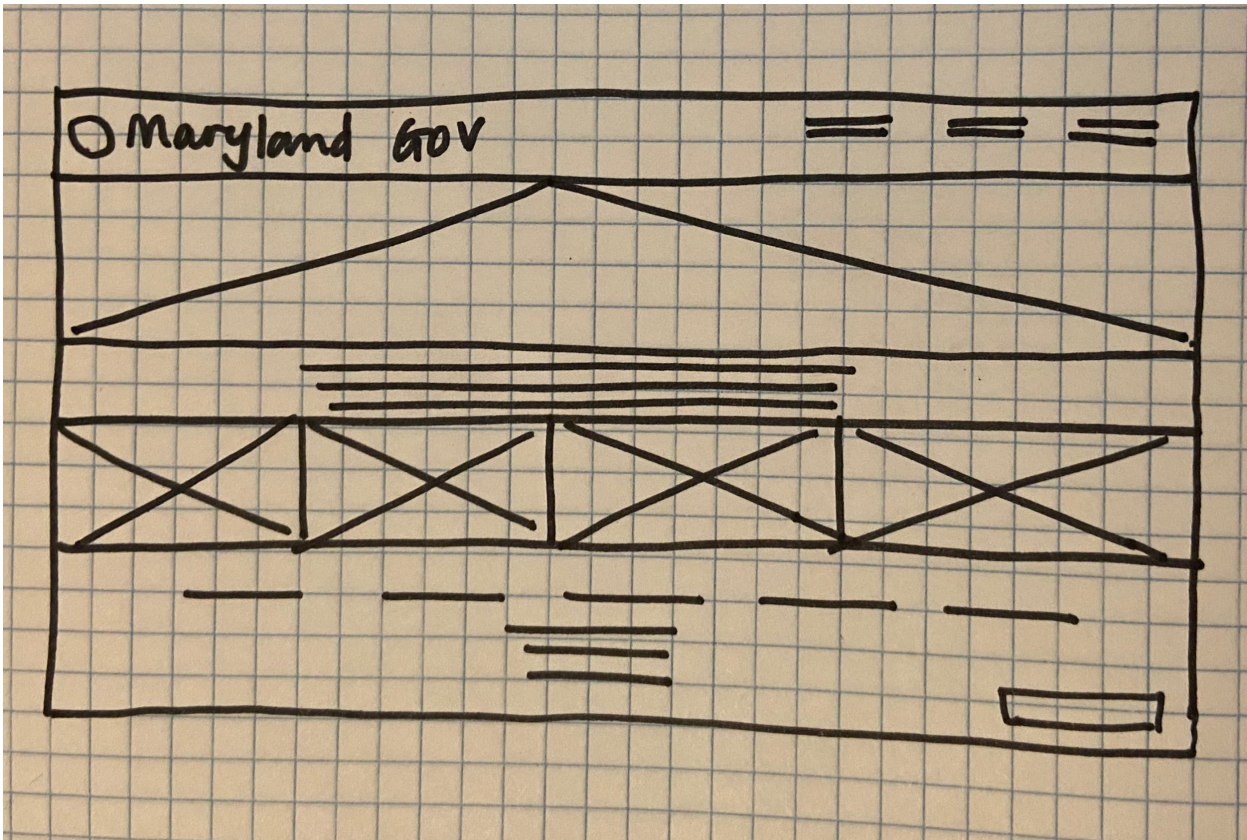
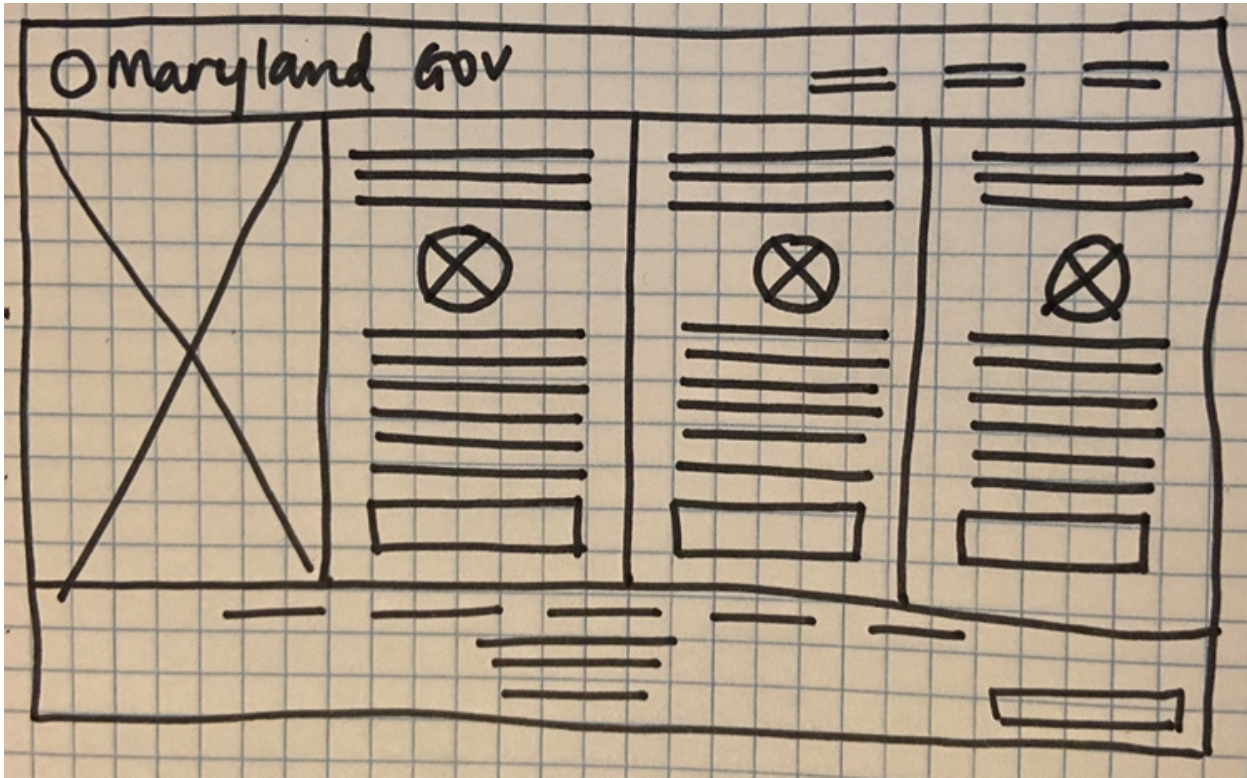
Proposed wireframe design for the Driver's License Page

c. More Information Section on the Homepage: Inconsistent use of button placements and font type on the bottom section of the page. The middle box text does not span across like the other two. Some pieces of information are needed when seen from a social/society point of view, but it is often ignored by users, and is not of use for them at that moment of time. This piece of information is irrelevant and rarely needed by the users. The interface should focus on relevant content and not distract users from actual needed information.



Existing 'More Information' section on the Homepage

The proposed wireframe design shows that making the section much smaller in height, and making them as external links, without text, (so that users can access it if they want to, without getting distracted) would be a much better solution.



'More information' section on the Homepage

References:

1. Ding, W., Lin, X., & Zarro, M. (2017). Chapter 4 - IA Research and Evaluation. In *Information architecture: The design and integration of Information Spaces*. essay, Morgan & Claypool Publishers.
2. *Maryland Department of Transportation Motor Vehicle Administration*. MVA. (n.d.). Retrieved October 2, 2022, from <https://mva.maryland.gov/>
3. *Default*. Maryland.gov - Official Website of the State of Maryland. (n.d.). Retrieved October 2, 2022, from <https://www.maryland.gov/Pages/default.aspx>
4. Maze. (2022, July 28). *Tree testing: The ultimate step-by-step guide*. Maze. Retrieved October 2, 2022, from <https://maze.co/guides/ux-research/tree-testing/>
5. *Maryland Department of Transportation Data Governance and Data Hub*. mva.maryland.gov. (2019, May). Retrieved November 13, 2022, from <https://aws.amazon.com/blogs/compute/uploading-to-amazon-s3-directly-from-a-web-or-mobile-application/>
6. *Tree testing: Fast, iterative evaluation of menu labels and categories*. Nielsen Norman Group. (2017, May 7). Retrieved November 13, 2022, from <https://www.nngroup.com/articles/tree-testing/>