Virginia Tech Center for Autism Research Website Renovation

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*Client*: Dr. Julee Farley

Final Report

*CS 4624: Multimedia, Hypertext and Information Access*

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1 Executive Summary
The following sections contain information about the project and provide an introduction to this report. They include a description of the project, an explanation of who the client was, and the concepts and reasoning behind the actual project itself.

1.1 Project Overview
The main goal of this project was to improve the web presence of the Virginia Tech Center for Autism Research (VTCAR). With that intention, a team of 3 Computer Science undergraduate students from Virginia Tech, Kyle Simmons, Sebastian Welsh, and Steven Whitehead, was assembled. To begin, the team was put in contact with Dr. Julee Farley, who was the client for this project. Dr. Farley is a member of the administration at the VTCAR and worked as the research coordinator. At the time, she maintained the center's old website by periodically updating events and research opportunities. After seeing the websites of other organizations and comparing them to the center's old website, Dr. Farley wanted the center's website to be redesigned. She wanted a website that was better organized, easier to maintain, and more aesthetically appealing than their current layout. For example, the new site was to provide information to parents who are looking to have an assessment conducted, donors who wish to give aid or volunteer, and trainees who seek educational materials. Furthermore, the overall layout and design of the website was to be attractive and modern, but also functional and usable. The site was to demonstrate how active the VTCAR is in the community through attractive pages and pictures while also showcasing the personnel that work at the center with descriptive, biographical pages.

Ultimately, in pursuit of these enhancements, the team gathered requirements, designed a completely new website, prototyped the designs, and performed usability and performance testing on such prototypes. All of this was done before a final version was implemented, which was then accepted by the client. The finished product has been delivered and is accessible at: www.vtcar.science.vt.edu.

1.2 Rationale for Building System
The old website had a number of problems that ultimately drove the desire for a completely new site. In terms of visual appearance, the style of each page was inconsistent and the color schemes and layouts were outdated when compared to newer website themes. Additionally, the old website used stock photographs relating to Virginia Tech as a whole rather than images unique to the VTCAR. Furthermore, the website did not convey the fact that the VTCAR is very active in its community because it lacked pictures from the events and outreach that the center conducted. On top of all of this, the website needed to be migrated to the new Ensemble Content Management System (CMS). This was a crucial step in order to make the new website more easily updatable and match the styling and themes of the new, modern Virginia Tech web design (seen at www.vt.edu).
2 User Manual

The following sections contain information and resources pertinent to users of the final project deliverable, the new VTCAR website. They provide a description of the finished product, the roles and responsibilities of individual user types, and screen captures to help explain to a user of the website how to navigate to the information and media that they desire.

2.1 Website Description

The Virginia Tech Center for Autism Research was established in the Virginia Tech College of Science to promote collaborative research on Autism Spectrum Disorders and related conditions from multiple disciplinary perspectives [1]. There are great resources and various components within the VTCAR such as current research opportunities, outreach events, and the assessment that they conduct, yet such resources and information was lacking from the web at the time this project began. Therefore, it was important that all of this information was made publicly available and accessible to anyone who is seeking information regarding the VTCAR. The new website was to solve these problems and more, while still containing general information about the center and providing specific utilities that allow users to perform integral actions associated to the VTCAR.

2.2 User Roles and Responsibilities

The following list contains the various roles and responsibilities of the common users that access the VTCAR’s website.

- **User Seeking Information**
  - Parent of Autistic Child: Parent who is looking for additional information or guidance to help care for their child with autism.
  - General User: Any user who wishes to learn more about the VTCAR or the information provided on the site.

- **User Seeking Evaluation**
  - VTCAR Evaluation: Parent or child who is in need of an evaluation or information regarding such an evaluation.

- **Donors**
  - Previous Donor: Donor looking to stay involved with VTCAR through donations and/or volunteering.
  - Prospective Donor: Potential new donor who is looking for information about how to donate and ultimately help the VTCAR.

- **Service Provider**
  - Service Provider: People looking to learn about the training material and consultation services provided by the VTCAR.
● Community Member
  ○ Community Member: People looking to learn about the VTCAR’s outreach events or how to enter into VTCAR PALS.

● VTCAR Employees
  ○ Website Maintenance Employee: VTCAR staff member who will be in charge of maintaining the website after the primary work is done.
  ○ CMS Trainer: The VTCAR staff member who will be in charge of training other staff members on how to use the Ensemble CMS to update the website.

2.3 Website Navigation Overview

The following screen captures and descriptions are included with the intent to show the various navigational options within the final website. It is important to note that the following screen captures are of the final website as of 4/27/2016. Screen captures elsewhere in the report, namely in the Developer Manual, are of earlier website versions and therefore may appear out of order. The screen captures in this section are simply to aid a user's understanding of the website's navigational structure and not to depict the final product.

Figure 1. Navigation Model
As seen in Figure 1, there are two primary methods of navigation from the home page (labeled ‘A’ in Figure 1). The first is represented by the green arrows that originate from the navbar at the top of pages ‘A’ and ‘C’. Clicking a link in the upper navbar directs a user to a new page. Hovering over a link in the upper navbar, waiting for the dropdown to appear, and clicking a link within the dropdown, directs a user to a more specific page relating to the link of interest. In this example, clicking “Research” will direct a user to the page containing the primary and high-level overview of the research that the VTCAR conducts. Hovering over the link and selecting “Current Research Participation Opportunities” from the dropdown would direct a user to page ‘B’.

The other primary method of navigation is depicted by the orange arrow in Figure 1, which originates from the blue navbar underneath the photo carousel that is only on the home page (page ‘A’). These five links direct a user to pages specific to one of the several user types that the VTCAR website aims to inform. In this example, clicking “For Families” directs a user to the specific page within the website that contains family-oriented information, media, and links that are pertinent to the VTCAR (page ‘C’).

On top of these two primary methods of navigation, the website also utilizes inline links and block-oriented buttons to assist with navigation and accessibility. Both the links and buttons are interactive. Clicking one will result in a user’s browser navigating to a new page within the VTCAR website or to an external site. The buttons are large and blue with white text while the links are maroon and become underlined when a user’s mouse hovers over them.
3 Developer Manual

The following sections contain information pertinent to developers of the new version of the VTCAR website as well as developers who may wish to continue working on the VTCAR website after the current team is finished. This section acts to document the overall development process that the team underwent. It includes a section listing and explaining the requirements as dictated by the client and the industry as well as a section covering design considerations, constraints, and mock-ups. Furthermore, there is a section that discusses the implementation plan that was used and the prototyping that was done. Finally there are sections that cover the refinement of the aforementioned prototype, the testing of the final, refined version, and the maintenance that is required to keep the final version updated, available, and accessible to all.

3.1 Requirements

3.1.1 Existing Website Screen Captures

In order to better understand the requirements for the new website and what was problematic with the old website, the old website had to be analyzed. Such analysis is contained in this section.

The old website’s homepage featured generic photographs of Virginia Tech in a short and wide orientation which lacked uniqueness and appeal. The page also contains several sidebars, one on the left and one on the right, leaving a very narrow container in the middle for the page-specific information. Additionally, and common to all of the screen captures in this section, the font size, colors, and styles made the content difficult to read. A screen capture of the old VTCAR homepage is included below.

![Figure 2. Screenshot of existing homepage - 02/27/16](image-url)
The pages featuring people were dull and most profiles were missing a picture. Furthermore, the multiple sidebars once again created awkward spacing and left an inefficiently sized region for the content specific to this page. This ultimately made the content difficult to read. A screen capture of Ms. Marci Donelson’s old VTCAR biographical page is included below.

![Figure 3. Screenshot of existing personnel pages - 02/27/2016](image)

The outreach page, one of particular applicability to the center, also implemented dull styles and multiple sidebars. On top of this, a generic picture of a cloud was present but provided no context that was pertinent to the topic of the page. A screen capture of the old VTCAR outreach page is included below.

![Figure 4. Screenshot of existing outreach page - 02/27/2016](image)
While these screen captures only help depict three of the many pages within the old VTCAR website, they get the point across regarding what needed to change and what the new website had to improve upon. Such requirements included improving the visual appeal, minimizing navigational complexities, increasing and optimizing font size and color, and restructuring the organization of the collective group of pages such that information could be found more efficiently.

### 3.1.2 Non-Functional Requirements

The following non-functional requirements are listed to show the expectations of the primary stakeholders of the system. There is a description of exactly what the stakeholder wanted to see in the system. Then, for each requirement, the potential constraints on the system are listed such that there is a direct correlation between non-functional requirements and system constraints. This gave the developers the ability to trace a consideration backwards through the requirements elicitation and determine who the primary stakeholder was for each aspect of the new website. These requirements were designed to encompass the expectations for the new website in terms of usability or maintainability as well as others.

- **Easily update the website after the team is finished with their work.**
  *Constraints:*
  - Instead of building the website from scratch, continue to use the CMS as well as upgrade to the improved version.

- **Ability to understand how the website works.**
  *Constraints:*
  - Provide training for staff members who will be working with the website CMS such that they are better prepared to maintain it after the team is finished.

- **All visitors should be able to easily find information about the upcoming events.**
  *Constraints:*
  - Provide a calendar of events on the front page of the website.
  - Provide a social media stream on the front page of the website so that visitors can learn more about the VTCAR.

- **Website should be a place community members want to visit.**
  *Constraints:*
  - Design a meaningful website that provides helpful information related to the VTCAR.
  - Organize the information in a way that is easily navigated and accessible.

- **Website should have a unique and clean design.**
  *Constraints:*
  - Keep the style of the website consistent across all internal web pages.
  - Research and define a design that will be useful for the entire website.
● Website should highlight the staff with personalized pages that contain additional information about each member.
   *Constraints:*
   - Redesign the current staff member pages to contain additional information and have a more aesthetically pleasing style that exists across each staff member’s page.

● Show all of the different multimedia that the center has gathered from past events.
   *Constraints:*
   - Implement a photo carousel on the front page and also display pictures throughout the website where appropriate.

● Website should load quickly for any visitor.
   *Constraints:*
   - Any page within the website should be loaded within 2 seconds of the initial action that initiated a page to load.

● Website should be easily navigable.
   *Constraints:*
   - Build an intuitive design that allows the user to find what they need without guidance and prior knowledge.
   - Group related information together for easier navigation.

● Parents should be able to easily find the information that pertains to them.
   *Constraints:*
   - Create a parents section that brings together all of the information that parents are interested in and provide it in a central location.

● Donors should be able to easily learn how they can contribute to the VTCAR.
   *Constraints:*
   - Create a donor section on the website that gives specific information about how one can donate or contribute to the VTCAR.

● Service Providers should be able to easily learn about the training materials provided by the VTCAR as well as other important offers of the center.
   *Constraints:*
   - Create a service providers section that contains all of the different material that a provider would need, such as training resources.

### 3.1.3 Functional Requirements

The following list contains functional requirements that map to exact functionalities and features that the new website offers its users. This list, while not comprehensive, had undergone several iterations over the development cycle before a version that the client and team were fully satisfied with was created.
• Homepage
  o Parents section for related parent information
  o Donors section for related volunteering information
  o Trainee section for training material
  o Professional section for all related information
  o Calendar of events
  o Photo carousel to showcase VTCAR pictures

• Social Media Integration
  o Twitter links
  o Embedded Facebook feed

• General Links
  o Subscribe to the VTCAR newsletter
  o Research participation
  o Volunteering with the VTCAR
  o Becoming a VTCAR affiliate

• General Features
  o Unique design specific to the VTCAR
  o Old code migrated to new Ensemble CMS
  o New website developed in new Ensemble CMS

3.1.4 Performance
In order to match the expectations and standards of modern websites, each page within the new VTCAR website was designed to load within 2 seconds [2]. The worst case scenario for the loading of a single page was set to 2 seconds because that is the time after which most users become irritated if the page is not yet loaded [3]. In order to match this strict performance requirement, all digital media was compressed in a manner that retained as much quality yet saved as much space as possible. In addition to compressing the media, all pages were designed to execute their JavaScript code after all of the HTML code had rendered, so a web page appears to load faster to the user.

3.1.5 Hardware
Due to the fact that the new website was to be under the vt.edu domain, at www.vtcar.science.vt.edu, the new website was built to be hosted by TeamDynamix, a service provided by Virginia Tech. TeamDynamix offers an enterprise level system for web hosting which ensured that all hardware requirements were met to a satisfactory level, regardless of system loads and site traffic.

3.2 Design

3.2.1 Scope of Design
The following design details are included with the intent of representing the creative and requirement fulfilling work that the team conducted within the timeframe of the project.
Overall, the VTCAR believed that a more engaging website would allow visitors to better understand the VTCAR’s mission, activities, opportunities, and research. There was a focus on improving navigation within the design and providing a seamless experience for any visitor of the website. This was achieved by partitioning related information into sub-sections of the website and directing the appropriate users to that information effectively. Due to the center’s reliance on the Ensemble CMS, the designs had to consider the constraints of the CMS, which at times limited creativity. The following designs were directly derived from the requirements gathered throughout that phase of the project.

### 3.2.2 Design Constraints

The following design constraints are intended to show some of the limiting factors that reflected in the website designs. They represent external and internal considerations that impacted primary stakeholders of the project.

- **New website must reside within the CMS.**
  *Rationale:* The website must have a strong sense of maintainability because once the team is finished, the VTCAR staff will inherit the upkeep of the site.

- **The project needs to be finished in the Spring 2016 semester.**
  *Rationale:* The team graduates and losses all access to the system at this time. There is a strict deadline from the professor to adhere to this timeframe.

- **The website must adhere to all Virginia Tech rules and laws.**
  *Rationale:* The VTCAR website resides at the science.vt.edu sub-domain and therefore must represent Virginia Tech in an appropriate and professional manner.

- **The website should strive to be as disability-friendly as possible.**
  *Rationale:* There will be a wide variety of users visiting the website and it’s the responsibility of the VTCAR website to be as disability-friendly as possible. For example, effectively making smart color choices can help avoid potential issues with colorblind users.

- **The website’s content should load as fast as possible.**
  *Rationale:* Provide a user with an easy and stress-free experience.
As was previously mentioned, several requirements were gathered during the team’s initial client meeting. The VTCAR staff also provided example designs and other autism research sites to help guide the designs and make it apparent what they were looking for. Then, after the initial meeting, a sitemap was constructed (the final version of which is seen in Figure 5). The goal of this sitemap was to organize the overall layout of the site and show how various pages are connected. The home page is the root of the map and from there a user can navigate to any of the seven informational pages, represented by the green nodes in Figure 5. In the white boxes under each green node, there is a list of the content that was included on that page. Furthermore, the red nodes are accessible from the home page and some of these nodes link to pre-existing pages or contain information on their own page. Since resources, information, and pertinent links change between families, donors, community members, researchers, and service providers, the site content was partitioned by type of user. Lastly, the white boxes under each red node represent the contents of that page.

After showing Dr. Farley the sitemap, she was very pleased with the layout and flow. Her ideas and feedback were incorporated back into the map, and then the team moved on to use case analysis and user interface mockup creation.

**3.2.4 Use Case Diagrams**

The following use case diagrams represent some of the basic actions that various users will perform while visiting the website. This diagram does not contain all of the different...
use cases but helped aid in the creation of the basic designs. Specifically, the following use cases are the backbone actions that the new website was to support.

![Use case diagrams for the website](image)

**Figure 6. Use case diagrams for the website**

### 3.2.5 UI Mockups

In order to better present ideas, page layouts, and designs to the team’s contacts at the VTCAR, wireframes and UI mockups were constructed. Two of the most primary pages, the homepage and staff-spotlight page, were drawn out on paper. These sketches were wireframes and only focused on the organization of content on these two pages. The requirements were also considered throughout this process to better meet the VTCAR’s desired result. After the wireframes were created, Dr. Farley provided further feedback on the organization of these two pages. She was pleased and after adjusting them with her feedback in mind, UI mockups were made using Microsoft Publisher, Gimp, and Microsoft Paint. The two UI mockups and a brief description of each can be found below.
As seen above, Figure 7 was the initial mockup of the home page design. Below the generic Virginia Tech navbar is a photo carousel that slowly rotates through several high resolution images that represent the various activities of the VTCAR. Below that
carousel is another navbar that directs site visitors based on their characteristics. Dr. Farley found this idea from another autism research site and wanted to implement it into the new VTCAR site. Next is a short description of the VTCAR, their goals, and the work that they complete. Below that are two wells, one for social media updates and the other for upcoming calendar events. Lastly, there is a section to once again direct visitors deeper into the site as well as a footer containing the center’s contact information. The goal of this page was to minimize bounce rate and make it easy for users to navigate deeper to their desired location.

**Background**
- B.A. - Economics, Washington and Lee University
- M.S. - Developmental and Biological Psychology, Virginia Tech
- Ph.D. - Developmental and Biological Psychology, Virginia Tech

**Publications**


*Figure 8. VTCAR personnel page mockup*
The second of the two mockups can be seen above in Figure 8. This particular mockup shows the initial design for the staff spotlight page. Given the requirement to spruce up and aesthetically improve the pages that spotlight VTCAR’s personnel, the above mockup was created. Beginning at the top, after the generic navbar, is a section that introduces the person. It contains their picture, a description of their work and roles, and their contact information. All of this information is placed on top of a colorful and artsy background. Furthermore, below this section, there is space for further details and information about the particular person.

3.2.6 Components and Tools Used

One of the tools required for this project was the Ensemble Content Management System provided by Virginia Tech. This CMS provided a platform for building and maintaining the website without significant coding knowledge. Nonetheless, custom code was still written in order to add more advanced features to the website. HTML5, CSS3, and JavaScript were used as the main tools for building the aforementioned advanced features. These markup, scripting, and styling languages gave total control over how the website looked and operated. The team used Twitter’s Bootstrap, a CSS UI framework, to handle some of the styling as well.

3.3 Implementation

3.3.1 Implementation Overview

As previously mentioned, the website was built within the Ensemble CMS which provided a way to instantaneously collaborate and share all changes to the website as they were developed. In order to fulfill the requirement of having an easily updatable website, the team decided to use as many pre-built components as possible, in contrast to implementing all custom HTML and CSS. However, for each page that required custom code, the team utilized pre-included libraries such as Twitter’s Bootstrap. The following sections describe the exact implementation steps that were executed as well as a description of the team’s testing and evaluation plans.

3.3.2 Implementation Steps

The team followed the Gantt chart as shown in Figure 18 as closely as possible to ensure that the delivery of the final product was on time. Both the requirements elicitation and analysis phases were completed and all necessary requirements were documented such that they were visible for the lifetime of the project. The team followed an Agile software engineering [4] approach such that as soon as new requirements were discovered and added, the implementation plan was updated accordingly. This involved constant contact with Dr. Farley but resulted in a better final product that was tailored to the needs of the client.

Following the discovery of the requirements, the team designed some potential layouts for the new website and prototyped a few pages which can be seen above in Figure 7 and Figure 8. In order to implement the new website, the team developed an
implementation plan that helped them follow the timeline. There were four main implementation phases, each of which is described below.

**Phase 1: Migration**

The old VTCAR system was built and hosted within the outdated Ensemble CMS. In light of the release of the new Ensemble system, in March of 2016, the website and its assets needed to be migrated over to the new platform. The first phase of work was to oversee the migration of the old website into the new CMS system so that all future work could be done in the new system. After all the content was transferred, the team verified that the old website was still functional within the new CMS such that the production website remained public while the new site was being developed.

**Phase 2: Implement New Layouts**

Following the migration of the old website into the new CMS, the team moved into the implementation phase which is where the majority of their work was conducted. In order to avoid the new changes clashing with the weekly updates to the old website that were performed by the VTCAR, the team worked solely in the new CMS. This ensured that nothing changed on the live site until it was ready to be published. A high level overview of the steps within the implementation phase is included below.

1. Build the new website structure and page orientations as per the sitemap
2. Update the content of old pages to be more modern and fluid
3. Update the layouts and styles of the old pages to reflect the new designs
4. Update the staff spotlight pages so that they reflected the new designs
5. Update the custom homepage with social media integration, a showcase of upcoming events, a calendar, and custom navigation to pages for families, donors, community members, researchers, and service providers
6. Include all navigational links so that they direct to the correct pages

**Phase 3: Update Website Multimedia**

After all the pages were updated to match the newly designed sitemap, the team worked on integrating updated multimedia into the new website. Dr. Farley provided a folder with various photos from prior VTCAR events that were then placed on the appropriate pages. Furthermore, stock photos were taken from open-source internet libraries to further fill the site with lively and applicable content. This phase also included the creation of a photo carousel on the homepage that highlighted the VTCAR. Final styling of the website was also conducted during this phase to ensure that all pages matched the proposed styling.

**Phase 4: Test**

The final phase of the implementation was testing all of the new features that had been implemented in the website as well as verifying that all previous functionality was
maintained. The team performed regression, acceptance, usability, and performance testing which are detailed extensively in the following section.

3.3.3 Testing and Evaluation Plan

After the VTCAR website was renovated, as described above, testing was required. In order to prepare for this phase, the team created a testing plan. The purpose of this plan was to ensure that there were no bugs or points of failure in the new website as well as that the site met the requirements of the client. Due to the nature of the renovation, there were four main types of testing that the plan included: regression, acceptance, usability, and performance. Each subset of testing was to be performed systematically and in the manner described below.

*Regression Testing Plan:*

In order to fully and properly ensure the functionality of the site, a regression testing plan was developed. To ensure complete coverage, each page was to be tested individually by a team member. The team member who was responsible for a particular page was required to follow these steps:

1. Access the new VTCAR website
2. Navigate to the page to be regression tested
3. Perform the following tests for that particular page while noting the page that was tested by replacing “<Insert Page Title Here>” with the page name:

<table>
<thead>
<tr>
<th>&lt;Insert Page Title Here&gt; Testing</th>
<th>Passed?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visually inspect the page, ensuring that the layout and styling matches the designs</td>
<td></td>
</tr>
<tr>
<td>Starting at the top, click all navigation links and ensure the desired destination is reached</td>
<td></td>
</tr>
<tr>
<td>Ensure all dynamic features such as photo carousels, scrollable containers, and dropdowns are fully functional</td>
<td></td>
</tr>
<tr>
<td>Ensure that all forms (i.e., newsletter signup) work as intended</td>
<td></td>
</tr>
<tr>
<td>Ensure all of the above tests pass in Google Chrome, Mozilla Firefox, Internet Explorer, and Safari</td>
<td></td>
</tr>
<tr>
<td>Ensure that the page styling and layout is compatible with mobile devices</td>
<td></td>
</tr>
</tbody>
</table>
Acceptance Testing Plan:

In order to verify that the website met the specified requirements of the client and that it was of the quality that the client expected, an acceptance testing plan was constructed. The personnel at the VTCAR were to conduct this test, which is laid out below:

1. Notify project client that they are to begin acceptance testing of the new website
2. If possible, monitor the client’s testing, taking note of how they navigate through the site and if there are any issues that they experience
3. Also note all feedback that is provided by the client during the testing period
4. Once the client has completed the testing and has fully examined the website, have them complete the following form (where 5 is highly satisfied and 1 is dissatisfied):

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Satisfaction Level (1-5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Website should be easily updatable after the Capstone team is finished with their work</td>
<td></td>
</tr>
<tr>
<td>Client has an understanding of how the website works and was built</td>
<td></td>
</tr>
<tr>
<td>All visitors should be able to easily find information about the upcoming events</td>
<td></td>
</tr>
<tr>
<td>Website should be a place community members want to visit</td>
<td></td>
</tr>
<tr>
<td>Website should have a unique and clean design</td>
<td></td>
</tr>
<tr>
<td>Website should highlight the staff with personalized pages and additional information about each member</td>
<td></td>
</tr>
<tr>
<td>Show all of the different multimedia that the center gathered from past events</td>
<td></td>
</tr>
<tr>
<td>Website should load quickly for any visitor</td>
<td></td>
</tr>
<tr>
<td>Website should be easily navigable</td>
<td></td>
</tr>
<tr>
<td>Parents should be able to easily find the information that pertains to them</td>
<td></td>
</tr>
<tr>
<td>Donors should be able to easily learn how they can contribute to the VTCAR</td>
<td></td>
</tr>
<tr>
<td>Professionals should be able to easily learn about the training materials provided by the VTCAR as well as other important materials</td>
<td></td>
</tr>
</tbody>
</table>

Table 2. Acceptance testing plan
Usability Testing Plan:

In order to verify that the website was user-friendly and the flow of the application was intuitive, a usability testing plan was constructed. For this portion of the testing, a small group of diverse people were to be chosen. Their actions, issues, and feedback were recorded during this time.

Preferably, the following personas were to be selected to conduct this testing and they should have all shared the commonality that they desire something from the center.

- A VTCAR staff member
- An affiliate
- Autism expert or professional
- A potential donor

Performance Testing Plan:

In order to verify that the website was efficient and functioning properly, a performance testing plan was also constructed. This portion of the testing plan was to be conducted by the project team members and all data was to be benchmarked using Google Chrome’s developer tools [5]. The following steps were to be performed for each page:

1. Navigate to the particular page that is to undergo performance testing in Google Chrome
2. Right click on the page and click “Inspect”
3. Click on the “Timeline” tab at the top of the now open console
4. Refresh the page and let the application record until the page is loaded (this will produce a report similar to the one in Figure 9)
5. Observe the various performance characteristics of that particular page and record them
6. Research the desirable performance characteristics for a website of this nature and assert that the new VTCAR site’s characteristics are similar and within a small margin
7. Rerun tests with different browsers as well as on mobile devices

3.4 Prototyping

3.4.1 Prototyping Overview

Upon successful migration to the new Ensemble CMS system, the team began prototyping the website inside of the application. When the website was initially migrated over to the new system, the current website’s files and assets were present in the directory listing within the application, but were blank. After analyzing the sitemap and taking the implementation plan into consideration, the team deemed it necessary to start from scratch. This decision was made for several reasons, one being bugs in the migrated pages and another being that the new sitemap changed site navigation significantly. Therefore, the current website content and resources were archived and new files and resources were created using the new CMS system. This approach also
allowed for pages such as the homepage and user pages to be created using the built in templates which the team’s new designs dictated.

It is worth mentioning that in light of the new CMS system, there were some familiarization and learning that had to occur before prototyping of any sort began. In order to maximize learning, the team sat down together and began inspecting all the capabilities of the new CMS. They also experimented with the functionalities that would better help them implement a few of the custom designs and utilities that they planned on developing. During this investigation, the team found a few bugs and issues with the newly released CMS and reported them back to the Ensemble team through their VT Dynamix bug reporting service. The Ensemble team was quick to fix the minor issues and explain workarounds for the more serious problems.

After their aforementioned investigation session, the team felt comfortable with the new system and were confident in their ability to fulfill all of the center’s requirements and their own personal designs to the fullest.

**3.4.2 Prototyping Approach**

To begin prototyping and ultimately implementing the new version of the website, the team first looked to their sitemap and created pages and directories to mimic the structure that they had designed. These pages were mostly blank but were named and ordered accordingly such that there were no bugs in the site’s navigation. This also allowed the team to create and organize the main navigational header which is displayed at the top of each page.

Once each page was created and the entire structure of the site was outlined as per the sitemap, the team began filling each page with content. Such content included photos and text. Photo assets were taken from the current VTCAR website, the center’s photo library, and open-source internet libraries. Furthermore, text was taken from the current website and adapted to fit the new website structure. Custom text was also written by the team and the center to fill the remaining text areas. Throughout this process, Ensemble components were used to organize and style text and photo assets. This was done to ensure that non-technical website administrators can maintain each page’s content with minimal website development knowledge. This was important to ensure that the website can be continuously updated with ease.

While two of the team members were populating each page with text and photo assets, the remaining team member was working to populate the more complicated pages. The homepage was the first page with significant complication. While the homepage template that Ensemble provided contained components such as photo carousels and text boxes, which were both necessary in order to make the homepage abide by the UI mockups and requirements, there were several components that were missing and had to be built from scratch. The first custom component that needed to be built was the navigational bar at the bottom of the photo carousel (seen in Figure 7). Additionally, the center wanted their social media page to be embedded into their homepage. This required custom HTML and JavaScript as well as Facebook API integration in order to
fully implement this feature. Lastly, custom navigational buttons and links were implemented near the bottom of the page to create an aesthetically pleasing interface to direct users to other parts of the website as well as to the center’s social media pages.

After the home page was prototyped, the focus shifted to creating a template that could be used to better aesthetically present the center’s staff and administration. This was one of the original requirements of the center and was what drove the design of the staff and administration spotlight page. After spending a significant amount of time trying different CMS layouts and adding appropriate components, implementing the design in Figure 8 was proving to be very difficult. While it was possible to recreate the aesthetic appearance of the UI mockups and designs that the team did, the amount of custom HTML, CSS, and JavaScript required was very large. After checking with their client, the group decided that a template that was easily updatable by the center’s non-technical employees should take precedence over a completely custom page that looked great but required significant website development knowledge to update. Therefore, the team discarded their previous design and decided to use the Ensemble “People Page” template to represent the center’s staff and administration.

After coming to this conclusion and pivoting away from the original personal spotlight design, the team went to their client for feedback. Upon receiving feedback, the team created a plan to refine their prototype and better align it with the requirements of the VTCAR. Such a plan can been found in the following section.

3.4.3 Updated Website Screen Captures

The following section contains screen captures and descriptions of a few of the website pages that were initially prototyped. It is also worth noting that the following captures were of the entire page and that a normal browser window would only be capable of viewing a portion of each at a time. This should be taken into consideration while reviewing them.

Home Page

The home page pictured in the screen capture below represented an initial prototype of the home page, which was a result of several design and development iterations. The home page contains Ensemble’s Photo Carousel component at the top, which cycles through several photos that encompass the VTCAR. The next element is a custom navigation bar that allows users to immediately navigate to the information they desire. Next is a section that contains a short introduction to the center and then a section with the center’s upcoming events and their social media feed. Below that is a section with links to the center’s social media pages as well as navigational blocks to direct users elsewhere in the site, minimizing bounce rates.
Welcome to the Virginia Tech Center for Autism Research


**Events**

**VTCAR Spring 2016 Speaker Series**

VTCAR hosts a Speaker Series to encourage collaboration across current and interested affiliates, and to reach out to the community. We are pleased to invite all affiliates and the community to attend these talks. They are held on selected Fridays, from 12:30-2:00 pm at the North End Center (NEC) 2200 on the Blacksburg VT campus, with a light refreshment break at 1:00 pm. Below is our series of speakers with exact dates. We hope to see you there!

- **Backlog**

New VT guests can park on the 2nd floor or higher in the NEC parking lot and obtain validation for free parking.

**Speaker Series Overview**

Michael Fox, PhD, Nov 1999  
Karen Breakey, MSc, PhD, April 1, 2016  
VTGW Community Members

**2nd Annual VTCAR Autism Symposium**

The 2nd annual Autism Research Symposium will be hosted in Falls Church, VA on Friday, March 4, 2016. The keynote speakers will be Dave Hamilton and Lindsey Nebeker of the Autism Live documentary. See more information at this link.

- **Social Media**

**Virginia Tech Center for Autism Research**

Visit our social media pages for more information and updates about Autism.

- **Follow us on Facebook**

- **Follow us on Twitter**

Interested in learning more about VTCAR and the people involved?  
Looking to make a monetary donation or volunteer at various events?  
Want to learn more about our research opportunities and areas of interest?

Join our mailing list in order to have the VTCAR Newsletter delivered directly to your email.

---

*Figure 10. Screenshot of initial Home page prototype - 03/30/2016*
About Page

The screen capture shown below represents the first prototyped version of the new About page for the VTCAR. The primary content displayed on the page includes a brief paragraph that describes the VTCAR, their mission, as well as a section on the core research areas of the center. Originally the core research areas section resided on a separate page but for simplicity reasons, it was moved into the general About page.

![Screenshot of initial About page prototype - 03/30/2016](image-url)
The Grants page depicted below includes multiple descriptions of projects within the VTCAR that have been awarded grants. In order to display the large amount of information and links, with minimal scrolling, a navigational side column was implemented to store links to the ongoing research.

Figure 12. Screenshot of initial prototype of the Grants page - 03/30/2016
3.4.4 Deviations from Implementation Plan

Below is a description of the differences between the team’s implementation plan and what was actually prototyped. The adaptive nature of the project and the limitations of the Ensemble CMS led to many of the deviations seen below. Yet with that said, all prior requirements were still taken into consideration and incorporated into any design changes that were made.

One of the major differences to the implementation plan seen above that was experienced by the team during the prototyping phase was that the old website pages were not migrated over properly. When the CMS migration occurred, the old website files were transferred over and remained organized correctly, yet each page had no content. Therefore, the team had to deviate from their original plan and create each page from scratch, which is described in section 3.4.2. Nonetheless, it is worth mentioning that in retrospect, this approach was much more efficient and led to a cleaner final prototype.

Another deviation that the team experienced was the lack of actual HTML, CSS, and JavaScript files they created. The new CMS does not allow for raw files to be created that represent pages or parts of a page. Instead, the CMS requires a user to drag and drop an HTML component onto a predefined template and enter custom code into this component. This didn’t cause the team too many issues but did require more significant planning and layout considerations which they did not account for when planning their implementation.

Lastly, and as it was previously discussed in section 3.4.2, the team was forced to deviate from their initial personnel spotlight design (Figure 8) due to the limitations of the Ensemble CMS. As it was touched on above, implementing a design such as the one seen in Figure 8 required too much custom code that ultimately would not allow the center’s employees to easily modify or update a person’s individual page. Therefore, the decision was made, with the input from the VTCAR, to forgo the new design and use the CMS’s “Person Page” template instead.

3.5 Refinement

3.5.1 Refinement from Prototype

After a client meeting that took place on 3/30/16, the team constructed a list of all the comments made by Dr. Farley with regard to the current development progress at the time. All of the following changes were extremely important and were implemented as soon as possible in order to follow the client’s requests.

- Replace homepage carousel photo
  
  Reasoning: The photo that was being used as the main photo on the home page carousel needed to be changed. The team received a message from their client that a third party requested to have the photo removed.
• Add a navigation link for SAFE
  *Reasoning:* Previously, the only way to access the SAFE page was by clicking a link that was visible on the Outreach page. Dr. Farley wanted to have the SAFE page accessible from the main navigation bar because the VTCAR wanted to put a focus on that project.

• Remove ongoing research links
  *Reasoning:* The old website had a section of links on the Grants page that pointed to ongoing research; however they were all dead links. Dr. Farley requested to have those links removed from the new site to ensure no dead links existed.

• Add images to Funding Resources page
  *Reasoning:* The prototype for the Funding Resources page contained all of the old information that was migrated from the old page. Dr. Farley requested that the Funding Resources page as well as similar pages have some multimedia in order to improve their visual appeal.

• All external links open in a new tab
  *Reasoning:* Dr. Farley wanted to have all of the links that pointed to external pages open in a new tab so that the VTCAR site was still present in a user’s browser after the link was clicked.

• One general footer for all pages
  *Reasoning:* The new CMS system does not easily provide a way to update one piece of information that is consistent and reused throughout the entire website. Dr. Farley requested that the team finds a way to have a general footer that can be updated once for the entire website. That way, if a piece of information must be changed, it doesn’t need to be updated on every page.

• Easier editable HTML and CSS
  *Reasoning:* After the work was done to develop the new website, all future work will be performed by VTCAR staff. For that reason, Dr. Farley would like to keep the website as simple as possible while still attaining some level of creativity. Therefore, all the new content and styling must be developed using components provided by the CMS to allow for easier editing after the primary development is complete.
3.5.2 Refinement Enhancements

One of the initial requirements that was extracted during the requirements elicitation phase was for the website to feature a calendar of events as well as exclusive pages for upcoming and past events. While the home page featured a preview of upcoming events, it needed a dedicated page for including and displaying a large number of events. Google Calendar provided the ability to embed a calendar in HTML code. An existing calendar could easily be imported, or a new calendar could be created and maintained by VTCAR staff. The team, as well as the VTCAR, decided it would be best to create a new VTCAR calendar so that the staff would have total control over the content contained within the calendar.

The team also had to perform work to ensure that the website was mobile friendly. Ensemble took care of some mobile device compatibility but on the pages with custom styling, some of the changes caused odd behavior initially. For instance, creating the extra navigation bar below the carousel on the homepage looked great on desktop browsers, but takes up an enormous amount of screen space on lower resolution mobile devices. Another notable problem is that the text overlay that is visible on top of the carousel on larger displays is shifted underneath the carousel on mobile devices. This caused a problem because the overlaid text was in white and was on top of a white background. One possible fix was to dig into the custom styling within Ensemble, however this may have caused issues in terms of keeping the website simple for when the project was finished. Therefore, it made sense to remove the overlay text on the carousel so that the website looked great on all platforms.

One of the sections of the website that was lacking new pages was the lower navigation bar. The web pages dedicated to information for families, donors, community members, researchers and service providers had not been fully completed yet. Instead of linking to new pages, the client decided that it was sufficient to link to other areas of the website. That way, certain types of users can instantly find what they are looking for and the VTCAR staff have fewer web pages to update. Nonetheless, the links that resolved to individual pages, such as “For Families”, were developed and their pages were filled with the appropriate content.

3.6 Testing Results

The following sections describe the various testing methods that were executed as a way to ensure both the usability and functionality of the new VTCAR website. There is also a section that covers the results of the performance tests and a section that discusses the acceptance testing that was performed by the client after the completion of the site.

3.6.1 Regression Testing Results

The primary function of this testing method was to verify that the enhancements made to the website did not break any of the old functionality. Therefore, for each page, one of the three developers performed various tests. Table 3 and 4, shown below, each
represent a complete test for a respective page on the site. A couple of the regression testing reports have been included in this document to provide an overview of the entire set of regression tests that were performed.

For all tests that failed, there is a description as to why the test failed and a respective solution in a gray box beneath the test case. After the testing report, there is also a section that includes images related to the regression testing performed on that page.

**Test 1 - Outreach page**

Table 3. Regression testing for Outreach page

<table>
<thead>
<tr>
<th>Outreach Page Testing</th>
<th>Passed?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visually inspect the page, ensuring that the layout and styling matches the designs</td>
<td>Yes</td>
</tr>
<tr>
<td>Starting at the top, click all navigation links and ensure the desired destination is reached</td>
<td>Yes</td>
</tr>
<tr>
<td>Ensure all dynamic features such as photo carousels, scrollable containers, and dropdowns are fully functional</td>
<td>Yes</td>
</tr>
<tr>
<td>Ensure that all forms (i.e., newsletter signup) work as intended</td>
<td>No (see below)</td>
</tr>
<tr>
<td><strong>Problem:</strong> When clicking on the Volunteer Survey link, it did not open in a new tab, which was a feature requested by the client. <strong>Solution:</strong> Changed the hypertext link so that it opens in a new tab when clicked.</td>
<td></td>
</tr>
<tr>
<td>Ensure all of the above tests pass in Google Chrome, Mozilla Firefox, Internet Explorer, and Safari</td>
<td>Yes</td>
</tr>
<tr>
<td>Ensure that the page styling and layout is compatible with mobile devices</td>
<td>Yes</td>
</tr>
</tbody>
</table>

*Related Images*

The image below is a screen capture taken on a Nexus 5 to verify that the Outreach page loads and is compatible with mobile devices.
SAFE - Supporting Autism Friendly Environments

Be a VTCAR PALS!

Partners in Autism Learning and Service (PALS) consists of community organizations that are interesting in furthering autism research. If you'd like to become a VTCAR PALS, contact Angela Scarpa at ascarpa@vt.edu.

Test 2 - Current Research Participation Opportunities page

Table 4. Regression testing for Current Research Participation Opportunities page

<table>
<thead>
<tr>
<th>Current Research Participation Opportunities Page Testing</th>
<th>Passed?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visually inspect the page, ensuring that the layout and styling matches the designs</td>
<td>Yes</td>
</tr>
<tr>
<td>Starting at the top, click all navigation links and ensure the desired destination is reached</td>
<td>Yes</td>
</tr>
<tr>
<td>Ensure all dynamic features such as photo carousels, scrollable containers, and dropdowns are fully functional</td>
<td>Yes</td>
</tr>
<tr>
<td>Ensure that all forms (i.e., newsletter signup) work as intended</td>
<td>No (see below)</td>
</tr>
</tbody>
</table>

Problem: When clicking on external links, they did not open in a new tab.
Solution: Changed thehypertext links so that they open in a new tab when clicked.
Ensure all of the above tests pass in Google Chrome, Mozilla Firefox, Internet Explorer, and Safari | Yes

Ensure that the page styling and layout is compatible with mobile devices | Yes

**Related Images**

The image below is a screen capture taken on a Nexus 5 to verify that the Current Research Participation Opportunities page loads and is compatible with mobile devices.

![Current Research Participation Opportunities](image)

*Figure 14. Current Research Participation Opportunities mobile device compatibility test*

### 3.6.2 Usability Testing Results

The method of usability testing was utilized to get user feedback on the actual usability of the site. To ensure that the results of such testing were pertinent, testers encompassing various personas were selected. Such personas included:
• A VTCAR staff member
• An affiliate
• Autism expert or professional
• A potential donor

These personas were selected because they represent the main types of users that the VTCAR website is likely to have visit it on a daily basis. Therefore, the feedback and input from people who are of these particular personas was the most applicable to the website and for that reason, the testing results from this round of testing were of great significance.

In order to begin having users perform the planned usability testing, the new instance of the website had to be staged at a publicly accessible URL. Publishing the website to the current www.vtcar.science.vt.edu URL was premature at the time as the website was not yet finished. Therefore, the Ensemble system's staging functionality was used to place the current version of the new website at http://vtcar.science.stage.cms.vt.edu/ such that all of the usability testers could access it from their own computers.

After the website was staged, the team created a survey using Google Forms. At the top of the form was the following explanation which outlined the purpose of the testing and how it was to be conducted.

“In light of the recent renovations that were done to the VTCAR website, you have been asked to perform a short usability test to ensure the new site is functional and user-friendly. Please follow these steps to perform the requested testing and feel free to leave any feedback that you feel is pertinent to the usability of the website or the overall site in general. If you have any questions, please contact Sebastian Welsh at welshs16@vt.edu. Your time is greatly appreciated!

2. Perform the following actions and provide feedback as you see fit.
3. After performing the respective actions, please take a minute to review the actual page content as you navigate through the site. Your opinions and suggestions regarding the content can be left in the feedback field at the end of this survey.”

Testers were selected and the survey was distributed solely by the VTCAR personnel with the understanding that each tester should match one or more of the personas listed above. Participants were VTCAR members, associates, and affiliates and their responses were collected anonymously. Testers were given several tasks and asked to rank the usability and/or aesthetics of a particular page. The prompts are listed below:

1. Navigate to the "For Parents, Donors, Community, Researchers, or Providers" pages. Choose the page that is most applicable to you. For example, a
researcher interested in learning about the core research areas of the VTCAR should choose "For Researchers".

2. Navigate to the center's newsletter subscription page (there is no need to actually subscribe to this newsletter, simply arriving at the page will suffice)

3. Overall opinion of the Home page

4. Navigate to the center's Publications page

5. Navigate to the general People page. What is your overall opinion of this layout and design?

6. Navigate to Dr. Angela Scarpa's Bio and rate the overall experience.

7. Navigate to Dr. John Richey's Bio, who is a part of the VTCAR Steering Committee.

8. Find directions to the center as well as a map of their office location.

9. Navigate to the information regarding the center's Technology Core which is part of their Core Research Areas.

10. Find information about the center's upcoming events.

11. Navigate to the VTCAR Facebook and Twitter pages using the new website.

12. Navigate to the SAFE (Supporting Autism Friendly Environments) Facebook page through the new website.

The results of such testing are below. In the following graph, a 1 signifies a rating of “Highly User Friendly” and a 5 signifies a rating of “Poor Usability”. Each blue bar is the average of the usability rating for each respective prompt (found above) and the orange line signifies the average of all the usability ratings, which was 2.10.
At the end of this survey, users were asked to enter any and all feedback that they had regarding the updates made to the website. This included opinions, feedback, criticisms, and concerns. As of 4/17/2016 there have been 14 responses to the survey, all of which contain highly valuable feedback.

Overall, the usability testing conducted over the period of 4/11/2016 - 4/17/2016 was highly successful and proved that the overall usability of the website was of an acceptable level. Furthermore, the feedback received from each tester was taken into consideration during a client meeting on 4/15/2016 with Dr. Julee Farley, Dr. Angela Scarpa, and Ms. Marcia Donnelson, all of the VTCAR. Each point of feedback was either accepted, rejected, or adapted and all pertinent changes were made.

3.6.3 Performance Testing Results

Following usability testing, the team had to conduct performance testing to ensure each web page loaded within the desired threshold of 2 seconds. In order to measure the load time of each page, the team used the Network Developer Tool provided by Google as mentioned before. For example, using the Network Tool on the homepage yielded the following results.

**Figure 15. Average Usability Ratings**
After running the Network Tool for every page on the VTCAR website several times, the team constructed the following bar graph to visualize the average load time for each page within the website.
As seen above, in the VTCAR Page Loading Times graph, all of the individual pages load within the 2 second threshold that was adopted as an acceptable page load time.

3.6.4 Acceptance Testing Results

The method of acceptance testing was utilized to get client feedback on the overall website. To ensure that the initial requirements (found in section 3.1) were met to a satisfactory level, the acceptance testing form found in section 3.3.3 was turned into a PDF document. Then, instructions and a signature line were added to it and the testing report was sent off to the client, Dr. Julee Farley. The returned document is included below:
**Client Acceptance Testing Form**

Please complete the following form by placing a satisfaction level in the box to the right of each requirement and then signing at the bottom. A satisfaction level of 5 signifies that the requirement was met to a highly satisfactory level while a satisfaction level of 1 signifies that the requirement was met to a highly dissatisfactory level.

*These requirements stem from those created when the project was conceptualized*

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Satisfaction Level (1-5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Website should be easily updatable after the Capstone team is finished with their work</td>
<td>5</td>
</tr>
<tr>
<td>Client has and understanding of how the website works and was built</td>
<td>5</td>
</tr>
<tr>
<td>All visitors should be able to easily find information about the upcoming events</td>
<td>5</td>
</tr>
<tr>
<td>Website should be a place community members want to visit</td>
<td>5</td>
</tr>
<tr>
<td>Website should have a unique and clean design</td>
<td>5</td>
</tr>
<tr>
<td>Website should highlight the staff with personalized pages and additional information about each member</td>
<td>5</td>
</tr>
<tr>
<td>Show all of the different multimedia that the center gathered from past events</td>
<td>5</td>
</tr>
<tr>
<td>Website should load quickly for any visitor</td>
<td>5</td>
</tr>
<tr>
<td>Website should be easily navigable</td>
<td>5</td>
</tr>
<tr>
<td>Parents should be able to easily find the information that pertains to them</td>
<td>5</td>
</tr>
<tr>
<td>Donors should be able to easily learn how they can contribute to the VTCAR</td>
<td>5</td>
</tr>
<tr>
<td>Professionals should be able to easily learn about the training materials provided by the VTCAR as well as other important information</td>
<td>5</td>
</tr>
</tbody>
</table>

Overall, the team has met the requirements of this project and I am satisfied with the finished product.

Signed: [Signature]

Client Name

Client Signature

Date: 4/26/16
As seen in the acceptance testing results above, Dr. Julee Farley felt that the new VTCAR website met all of the initial requirements to the highest level of satisfaction. In returning the above completed document to the team, Dr. Farley also included the following feedback:

“I wanted to let you all know that I and others at VTCAR are quite pleased with your work. It’s been great working with you this semester, and we truly appreciate all the work you’ve done.”

Therefore, in light of the completed form and feedback, the acceptance testing of the new VTCAR website was concluded and the new website was accepted.

3.7 Maintenance

3.7.1 Updating Website Content

While the primary work has been completed with regard to developing the new VTCAR website, there is still a steady amount of work to be done in order to keep the content of the website up to date. Therefore, it is important to understand the steps that must be taken when updating content on individual pages. As previously mentioned, all content that will be updated was created using the pre-defined components provided by the Ensemble CMS. This allows all the information to be updated by someone with little to no programming experience. Below are two examples which highlight potential cases where updating the website is required and how to properly execute the desired change.

*Changing content*

1. Navigate to [https://author.ensemble.vt.edu/mysites.html/content](https://author.ensemble.vt.edu/mysites.html/content) and select the desired page for editing.

2. Ensure that the Ensemble CMS is in **Edit** mode

3. Highlight the component that requires updating by clicking on it
2nd Annual VTCAR Autism Symposium

The second annual Autism Research Symposium was hosted in Falls Church, VA on Friday, March 4, 2016. The keynote speakers were Dave Hamrick and Lindsey Nebeker of the Autism in Love documentary. See more information in our flyer here.

Patrick County Autism Conference

The Patrick County Office of the Virginia Cooperative Extension will be hosting an Autism Conference on July 29, 2016 that will feature Dr. Temple Grandin, Dr. Angela Scarpa and one other autism expert.

More details can be found at the link to the flyer below.
See flyer.

4. Select the “pencil” icon to update the content

5. Update the relevant information

2nd Annual VTCAR Autism Symposium

The second annual Autism Research Symposium was hosted in Falls Church, VA on Friday, March 4, 2016. The keynote speakers were Dave Hamrick and Lindsey Nebeker of the Autism in Love documentary. See more information in our flyer here.

Patrick County Autism Conference

The Patrick County Office of the Virginia Cooperative Extension will be hosting an Autism Conference on July 31, 2016 that will feature Dr. Temple Grandin, Dr. Angela Scarpa and one other autism expert.

More details can be found at the link to the flyer below.
See flyer.
6. Confirm the changes

7. Select the updated page in the file directory view

8. Publish the changes

9. The published changes will now appear on the live site
**Adding new components**

1. Navigate to [https://author.ensemble.vt.edu/mysites.html/content](https://author.ensemble.vt.edu/mysites.html/content) and select the desired page for editing.

2. Ensure that the Ensemble CMS is in **Edit** mode.

3. Open the Components/Assets tab.

4. Find the desired component in the Components tab, such as an HTML component.

5. Drag the component to the desired location on the webpage.
6. Select the component to be updated

7. Select the “wrench” icon to make changes to the component

8. Add the custom HTML

```
<div class="text-center">
  <p>Want to learn more?</p>
  <button class="btn btn-primary">Click Me</button>
</div>
```

9. Confirm the changes

10. Ensure the HTML component is correct
11. Select the updated page in the file directory view

12. Publish the changes

13. The published changes will now appear on the live site

3.7.2 Testing Future Changes

After updating content or adding a new component to the website as described above, the next step is to test those changes to ensure a high quality website is still maintained. In order to test the changes, the following tests should be performed in order:

1. Perform Regression Testing as explained in section 3.3.3. This form of testing will verify that all previous functionality as well as new functionality work as intended.

2. Perform Usability Testing as explained in section 3.3.3. This form of testing will verify that users of the site can easily navigate to the new content as well as measure how well users like the layout of the new content.

3. Perform Performance Testing as explained in section 3.3.3. This form of testing will verify that the new content will load within the 2 second threshold.
Once the above testing has been completed, all feedback should be evaluated and changes implemented. Optionally, the tests can be performed again to ensure that the changes were implemented properly. Finally, after testing has completed, the new changed pages should be published so that they are transferred onto the live site.
4 Lessons Learned

The following sections contain information regarding the lessons learned throughout the development cycle of the project. The first section discusses the timeline of the project, from conceptualization to completion. Following the timeline, there is a section that discusses the team member contributions. Next, there is a section that discusses the various problems that were experienced over the development cycle and the respective solutions that were implemented by the team. Lastly, there is a section that presents the final product and the future work that could be done to further improve this project and ensure the longevity of the system.

4.1 Timeline of Work

The following Gantt chart shows the different activities that took place over the lifetime of the project as well as the weeks in which each activity was performed. The team adhered to the timeline as close as possible as to ensure a quality product was delivered by the appropriate due date.

![Gantt chart for the timeline of the project](image)

Figure 18. Gantt chart for the timeline of the project

4.2 Team Member Contributions

**Kyle Simmons - Architect and Secondary Developer**
- Migrated old website into new Ensemble CMS
- Designed new framework for VTCAR website
- Developed sitemap and structure of new site
- Handled social media plugin integration

**Sebastian Welsh - Primary Designer and Secondary Developer**
- Researched unique themes for new website
- Designed a consistent and requirement fulfilling style for the entire website
- Created/Integrated appropriate backgrounds and artwork
- Built a new UI for the website that was appealing to all users
- Handled all CSS styling for new website

**Steven Whitehead - Primary Developer and Tester**
- Wrote new HTML code for the updated website
- Developed JavaScript code to handle advanced functionality
- Tested all the code and content appropriately
4.3 Problems and Solutions

One of the main problems encountered during the early stages of the project was getting access to the new Ensemble CMS. Since pages created on the previous CMS would not migrate to the new CMS, the team was required to wait for the new system to be released before creating new web pages. The migration was scheduled to take place by the beginning of February 2016. However, the transition to the new system did not take place until the middle of March, which severely shortened the timeframe for the development of the new website. Therefore, the team spent a lot of time planning and designing such that the web page creation could be performed quickly, once access was granted.

One requirement that was extracted later in the development cycle was to combine the main People page with the Other VTCAR Associates page in order to save space as well as limit the amount of pages that would require updating in the future. However, the usability testing showed that most users did not realize that the Other VTCAR Associates multi-tab component existed at the bottom of the main People page. Therefore, the team had to use the Redirect page provided by the Ensemble CMS in order to redirect to an anchor tag within the main People page. This would allow users to see the Other VTCAR Associates tab in the main navigation dropdown such that navigation to that section would be easier. However, after much struggle, the team learned that the Ensemble CMS did not have the ability to recognize anchor tags. In order to meet the client’s requirements, the team decided to create a general Other VTCAR Associates page that had embedded JavaScript which would redirect to the anchor tag on the main People page. As well as meeting Dr. Farley’s requirements, the team also had a conference call with some of the developers of the new Ensemble CMS in order to communicate the various issues they had found over the course of development.

Another problem that the team encountered was the fact that incorporating pictures into the new website proved to be harder than initially thought. Initially a shared folder was set up with Dr. Farley in order collect various images that could be used throughout the website. Despite the large collection of images that were shared, many of them did not suit the needs of the website and the team had to develop a solution. Eventually, the team, with the help of Dr. Farley, solved the issue through the use of stock photographs from various online libraries. Another related issue was that some of the images uploaded to the CMS could not be used within the carousel on the home page. The team eventually discovered an undocumented issue with the new CMS in that images that have been digitally edited do not have the metadata that the CMS requires. The team had been resizing images, before uploading them to the CMS, which was causing the CMS to reject the images. Once the issue was discovered, images were instead uploaded the CMS and edited within the system.

4.4 Final Product and Future Work

Given the conclusion of all intended testing, the incorporation of all feedback, the resolution of all bugs and problems, and the acceptance of the final iteration of the
website by the client, the website is now finished. As of 4/22/2016, the new website has been published to www.vtcar.science.vt.edu and contains all of the updated code, resources, and content that the team developed. Through the culmination of several requirements gathering, design, development, testing, and feedback collection iterations, a website of high usability, impact, and function has been developed and put in place of the center’s old website. Such iterations involved a great deal of work, care, and attention to detail.

The team spent a significant amount of time meeting with the client initially, and then on a weekly basis, to collect requirement and preliminary feedback in order to enable their design process. Their client was helpful in this effort and knew of the changes she wanted made and the issues she wanted resolved from day one. The team then took these requirements and began researching the capabilities of the Ensemble CMS and websites of similar purpose in order to further visualize and document the goals of the project and the design of the final product.

Such requirements, research, and ideas then came together into design mock-ups which were ultimately developed into prototypes. Custom code was written and implemented alongside CMS components to build web pages that were user-friendly, accessible, aesthetically pleasing, and value-providing to the VTCAR, all of which was verified through the team’s usability and acceptance testing as described in section 3.6. Great care was also taken to ensure that non-technical VTCAR staff members could easily and intuitively update the new website. This was an initial requirement and it remained one for the duration of the project. The team took this into consideration during the entire design and development process.

Next, the aforementioned prototype was then released to a small portion of users for usability testing while the team performed internal regression and performance testing. Feedback from these tests was then analyzed with the client, changes to requirements and designs were made, and the process iterated. This process occurred over the course of the semester and the final website, hosted at www.vtcar.science.vt.edu is the result of such work. The client and the Virginia Tech Center for Autism Research as a whole are pleased with the work of the team as well as with the final website and the increased attention it brings the center. And with that the project was concluded.

Nonetheless, if more time and resources were to be put into further developing the website, there are a few things that could still be done. The VTCAR would still like to improve the aesthetics of some of the pages through custom graphics and photography. While these improvements were hindered by the fact that the team had minimal graphic design and photography experience, the aesthetics of the website could still be improved further through custom, specific, more diverse, and high-fidelity photos and graphics that better encompass the purpose of particular pages. Furthermore, at the time this report was published, the VTCAR was interested in creating media-based training resources, such as photos and video, relating to autism and the work that the center conducts. It is the option of the team and the center that staging such multimedia on the website would be valuable to both the center and the community. Therefore, this
is another enhancement that could be done to further improve the VTCAR’s web presence.

These two enhancements would both act to further enable the VTCAR and its mission, but significant hindrances prevented the team from implementing them within this version of the final product. There are areas of improvement, of lower impact, that could also be explored to further improve website usability and adaptability, but such improvements are limited by the capabilities of the Ensemble CMS. It is the hope of the team that future versions of the CMS will provide more features and enable some of the more detailed and intricate designs to be implemented in a way that is easily updated by the center’s non-technical personnel. The team was unfortunately limited in this regard due to the fact that Ensemble was released within the project timeframe and therefore had limited support and functionality. Yet, the team and the VTCAR were able to build an enhanced, accessible, and visually appealing website that, if properly maintained, will provide benefit to the Virginia Tech Center for Autism Research for the remainder of its existence.
5 Acknowledgements

This section contains personal acknowledgements for the individuals who provided beneficial, critical, and intelligent input regarding this project throughout its development cycle. The success of this project is indebted to the following contributors:

Ms. Marcia Donnelson  
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Ms. Donnelson is the Grant Specialist at VTCAR and provided input as well as content to help in the development of the new VTCAR site. The team would like to thank Ms. Donnelson for all the input and creativity that she contributed.

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Dr. Farley is the Research Coordinator at VTCAR and was the main point of contact during the project. The team would like to express great appreciation for the work and dedication that was exhibited by Dr. Farley. Without Dr. Farley’s guidance, the project would not have been executed as smoothly.

Dr. Edward Fox  
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Dr. Fox is the professor for CS4624: Multimedia/Hypertext, the course in which this capstone project was completed under. Throughout this project, Dr. Fox provided mentorship and assistance to the team regarding client-team interaction, project development and documentation, and report creation. The team is very appreciative to have received input from Dr. Fox as well as from his graduate teaching assistant, Yilong Jin.

Mr. John Jackson  
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Mr. Jackson is the Director of Web Communications at Virginia Tech. He oversees the development and implementation of the new Ensemble Content Management System and was crucial in accelerating the timeframe for the completion of the project. The team is particularly grateful for the quick email responses and attention to detail that was given by Mr. Jackson.

Dr. Angela Scarpa  
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Dr. Scarpa is the Director of VTCAR and provided a great deal of input while developing the new VTCAR site. The team would like to thank Dr. Scarpa for her help and guidance while developing the new site.
6 References

This section contains references that were utilized throughout the creation of this document as well as throughout the development of the project. Each citation provides the source as well as an annotation describing how the source was used.

[1] VT Center for Autism Research. Date Accessed-Web. 29 Mar. 2016. <http://www.vtcar.science.vt.edu/index.html>. This source is the main resource for the document as it is the previous website for VTCAR. The website provided valuable resources such as old content and gave a platform to begin working from.

[2] WebSiteOptomization.com. "The Psychology of Web Performance." Website Optimization. Copyright 2015. Date Accessed-29 Mar. 2016. <http://www.websiteoptimization.com/speed/tweak/psychology-web-performance>. This source mentions a study that was performed which looked into what load times were acceptable and mentioned a tolerable wait time of 2 seconds, which is the threshold before a user will consider leaving the site.

