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Final Report -

Community Website

Mr David Thompson

30047616

BSc Computing

University of South Wales

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Project Title: Community Website

Website link: https://www.testvalleymensshed.com/

Project Supervisor: Mark Ware

STATEMENT OF ORIGINALITY

This project was completed as part of the BSc (Hons) Computing, at the University of South Wales. The work is my own. Where the work of others is used, it is referenced and attributed to the relevant source.

ACKNOWLEDGMENTS

The author would like to thank the project supervisor, Dr Mark Ware for the support and guidance of this project by arranging appropriate meetings and contributing invaluable feedback throughout.

Appreciation is given to the Test Valley Men's Shed community for agreeing to be the target community of the project.

Lastly, thanks to all the community members that provided visual and textual content for use in the development of the website, as well as the much-appreciated feedback provided in the online survey.

ABSTRACT

The project delves into the comprehensive design, implementation, and evaluation of a community website tailored for the Test Valley Men's Shed community in Hampshire. With the increasing significance of online connectivity, the project aimed to the create a platform enabling the community to showcase its information and community projects online. The website features user registration and authentication integrated with streamlined project submission functionality. Emphasizing accessibility and responsiveness, the website ensures optimal user engagement across diverse devices and browsers. In addition to detailing the development process, the report examines the deployment process and the testing protocols employed, including functionality testing, security assessments, and usability evaluations. Utilizing technologies such as PHP, Bootstrap, and MySQL with PhpMyAdmin, the website safeguards against potential vulnerabilities through practices such as password hashing, an integrated invite system, and data validation. Evaluation results affirm a successful outcome, with the website effectively fulfilling the community's goals and requirements while providing an intuitive and engaging user experience.

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1 Introduction

This Project focuses on the design, evaluation, and Implementation of a community website for the Men's shed community situated in the Tranquil Test Valley, Hampshire. The need for the project stems from the digital age where online connectivity and presence play a significant role in preserving and expanding the essence of a community. Avenues for research will span across crucial project management techniques such as requirements gathering and development methodologies, a thorough exploration of the target community's background, and a comprehensive evaluation of various technologies. These efforts aim to determine the most appropriate path that align with the project objectives and requirements to deliver an efficient and responsive community website.

1.1 Background

Community websites have become increasingly popular ever since the introduction of the World Wide Web in the early 1990s. The internet has provided us with the ability to communicate and share information in a much faster and diverse way when compared to the traditional letter and face-to face conversations. E-mails, video-calls, instant messaging, and social media platforms such as Facebook or WhatsApp are now seen as some of our primary forms of communication, allowing us to communicate with people all over the world (Ahuja, 2023). Consequently, this has led to the growing popularity of community websites. These websites provide a common virtual space for like-minded people to gather and discuss topics of interest, ideas and share their passions wherever they are. This allows communities to grow at a much faster pace. Findings of a study show that 66% of people that are looking to make connections with other people with similar interests is one of the primary reasons why they engage in online communities (Beer, 2020). Furthermore, in recent research, conversations on online communities are seen as more meaningful and respectful where people can feel more like themselves (Beer, 2020). The demand for community websites continues to grow with 76% of internet users now participating in online communities (TROIANO, 2022). According to an article published by Nick Torday, many charities see online communities as a key strategic priority over and above other service delivery and charitable events (Torday, 2011). Similarly, this is also true for sports clubs and gamming societies that take advantage of online communities to expand their knowledge and skills with a diverse range of people that promotes diversity and inclusion. Online communities have also proven to have a positive impact on raising awareness, donations for charitable organisations, and on mental health as a form of relaxation (Minta Vibe, 2023)

1.2 Rationale and Justification

The Rationale behind this project reflects the previously mentioned advantages that Community websites have to offer. A certain community benefits greatly from being accessible online. A community website will be a safe and secure environment for all its users to see the most up-to-date information about their passionate community. Having this will eliminate many hours of conducting a google search to find out the latest news, information, as well as current and past projects of the Community. All the community information and projects will be presented on the website in an elegant and easy-to-find way, and users will also have the option to post their own projects and ask other members questions within the community. As a result, this will make the community more engaging and increase their members in a much more diverse way from users all over the UK. In today's age, Community websites have become a vital and easy form of communication for users to connect and collaborate with one another on a diverse level. As technology grows these online community websites will become even more popular, with already 76% of internet users participating in online communities (TROIANO, 2022), making the creation of such websites an important skill to have to keep up with the continuously growing digital era.

2 Project Objectives

The aim of this project is to design, develop and evaluate a website. The intended audience of the website will be a community for users to share information, communicate and gather people together in a common virtual space. This will involve requirements gathering, project management, research on community background, and evaluation of various platforms and technologies to determine the most appropriate approach for achieving project goals.

Key objectives:

Objective One: Understand Community needs.

1. **Community Understanding**
    - Define the Target Community for the Project
    - Conduct research to understand the community's preferences, goals, and expectations for the website.
2. **Gather Project Requirements**

- Conduct Interviews to collect detailed project requirements from the community.
- Document the project requirements to aid the design and development process.

3. **Explore and Compare Technologies**
   - Evaluate different technologies for building the website, considering factors such as browser compatibility, ease of use, responsiveness, cost, and flexibility.
   - Compare and select the most suitable technologies for the project.

Objective Two: Design the website.

1. **Initiate front-end design Phase:**
   - Begin the design process, translating project requirements into a visually appealing interface.
   - Develop wireframes and design mock-ups to later be used in the website Implementation.
2. **Back-end Design:**
   - Identify the data structure and relationships required for the website.
   - Choose an appropriate back-end language and database for the website.
   - Utilize an Entity-Relationship Diagram(ERD) to Illustrate the relationships between entities in the system and a clear design on how the data will be processed.

Objective Three: Implement the Website

1. **Front-end Implementation**
   - Implement the Front-end of the website that will be visible to the user, incorporating the finalized design and chosen technologies.
   - Ensure responsiveness for optimal user experience on various devices.
2. **Back-end Implementation**
   - Develop the back-end Infrastructure, implementing functionalities aligned with the community goals and finalized database design.
   - Introduce features such as User authentication and Login. This will allow members to login and add new projects.

Objective Four: Evaluate the Website

1. **Usability and Design Assessment:**
   - Conduct testing to evaluate the usability, responsiveness, and functionality of the completed website.
   - Gather user feedback for future improvement.

Objective Five: Document Project Findings

1. **Report on Evaluation**
   - Document findings from the evaluation phase, highlighting successes and areas for improvement.
2. **Document Skills Acquired**
   - Showcase skills and lessons learned throughout the project.

3 Project Management:

The project management approach adopted for this project adheres to the structured phases of the System Development Life Cycle (SDLC) to guide comprehensive project planning and key milestone achievements.

3.1 System Development Life Cycle

The System Development Life Cycle (SDLC) is a project management methodology that consists of structured stages involved in a development project from initiation through evaluation and maintenance of the completed product. This can be applied to technical and non-technical systems (Gillis, 2019).

The advantages of applying SDLC for project management include (Clark, 2022):

- Enhanced sight of the development process.
- More efficient time management, planning, and scheduling.
- Increased control over risk management and cost estimation.
- A structured approach to meet customer expectations and improved satisfaction.

The stages of the SDLC process includes:

1. **Initiation**

   The purpose of this stage is to determine whether there is sufficient justification for the project to be launched. This stage is dependent on a request for the project to be undertaken.

   Regarding the current project, the initiation phase refers to the project proposal and ethics form that was presented to the University on the 6th of October 2023. The project proposal consisted of objectives, timeframe, plan, and description of the proposed project.

2. **Project set up.**
   In this stage the project objectives are discussed to determine a way for them to be met.

   In the case of this project the objectives are detailed, and an updated timeline is reviewed.
3. **Requirement elicitation and analysis**
   The requirements for the project are defined and gathered in this stage, including features and functionality.

   Interviews with the community were undertaken to gather the project requirements for the website, as well as a visit to the Test Valley workshop. This started with a pre-written checklist which was filled out throughout the interview, and additional features were added to the list as more was discussed with the community. Topics that were discussed in the interviews include features, functionality, as well as a priority level on each of the features and functionalities that were desired by the community. The completed project requirements list with the responses from the community can be seen in Figure 1 under primary research.

4. **Design**
   The proposed system is designed, and plans are made for the development process, adhering to the project requirements gathered. Wireframes and design mock-ups are designed to later be used in the website Implementation. The data structure and relationships required for the website are also detailed.

   These designs were delivered to a member of the community through email correspondence for feedback, along with the request of additional images and textual content to be displayed on the website.
5. **Implementation/Construction**
   The system is developed, incorporating the finalized design, project requirements, and chosen technologies.
6. **Testing**
   Testing is performed to evaluate the completed system prior to deployment.

A progress update was issued to the community prior to the deployment phase, and the finalised website was delivered to the community members after deployment, alongside an online feedback survey created at https://www.supersurvey.com/ (Survey Maker, 2024).

7. **Project Closure**

   Upon project completion with the finalised website having passed through testing and deployment, the documentation is completed. This marking the closure of the project.

8. **Review and maintenance.**

   Following project closure, the project methodologies, implementation techniques used, and results are reviewed for future improvement. A discussion of necessary ongoing maintenance is also taken place.

3.2 Timeline:

Personal Project Plan	**Start**	**Finish**
Project Discussion	28/09/2023	28/09/2023
Project Timeline Creation / Project Management	30/09/2023	03/10/2023
Project Proposal	28/09/2023	06/10/2023
Research (Literature Review)		
Gather project requirements	01/11/2023	08/11/2023
Community Background	08/11/2023	15/11/2023
Research of CMS and Bootstrap	15/11/2023	25/11/2023
Research of back-end technologies	25/11/2023	01/12/2023
Hosting	01/12/2023	04/12/2023
Project Interim Report	13/10/2023	**04/12/2023**
Design		
Prototype design (Front-end)	15/11/2023	02/12/2023
Back-end Design	08/12/2023	22/12/2023
Development		
Front-end	15/01/2024	05/02/2024
Database and Back-end Implementation	05/01/2024	26/02/2024
Debugging	01/03/2024	08/03/2024
Evaluation		
Functionality Testing	08/03/2024	14/03/2024
Accessibility testing	14/03/2024	20/03/2024
Responsiveness testing and deployment	20/03/2024	22/03/2024
Documentation of Implementation	22/03/2024	15/04/2024
Project Dissertation Submission	15/04/2024	**15/04/2024**
Presentation Viva	**16/04/2024**	**26/04/2024**

4 Research

4.1 Target Community

The target community is a growing community called “Men’s Shed” Based in Laverstoke, Hampshire. This community encourages older gentlemen to get out and work with new people on practical projects of their choice, usually involving woodwork. One of the Men’s Shed found its home in the serene Test Valley, Hampshire surrounded by the peaceful countryside. This site ceased its opportunity inside a disused building that the Parish Council thought was too expensive to demolish. Neighbouring Men’s Sheds include the Bombay Sapphire Distillery, The Overton Black Arrows Archery Club and The Whitchurch Tennis Club. (Mens Sheds - Another in the growing number of Mens Sheds., 2023)

Woodwork may be one of the main projects undertaken by these gentlemen, but it’s not limited to only this, other activities are metalworking, car maintenance, home computer use, cooking electronics, and much more. No particular set of skills is necessary to take part in this community, just a keen interest in practical things, so the community always welcomes new members along with a good supply of tea and coffee. To name a few projects already undertaken these can be as follows: a solid oak seat for a local project, wooden bird & owl boxes, Christmas ornaments in the village of Overton, and replacement of rotten floorboards with new electrics and sockets.

The Community has received lottery funding and has made appearances in the Basingstoke Gazette, the Andover Advertiser, and even on the BBC South News which conducted a report on the Test Valley Men’s Shed. (News about Men in Sheds - Test Valley Men’s Shed, 2023)

4.2 Project Requirements

4.2.1 User Personas

User personas help understand the needs of people that will be using the website (Veal, 2023). For the Test Valley community website, three personas are created for an improved design and implementation process:

1. Ben, the Retired carpenter
    - Background: Ben is 61 years old. He has been passionate about woodworking his entire life. After retiring, he found himself feeling isolated and missed working alongside others.

- Goals and interests: Ben is looking to find a group of people to work alongside him on some projects he has lined up. This will help get him out the house and help meet new people with similar interests.
- Points to consider: Ben can get overwhelmed by technology. He may need clear navigation and organization to find relevant content on the website.

2. Anthony, electrician
    - Background: Anthony is a 50-year-old technology enthusiast who is thinking of retiring. He enjoys working with electrics and on computers.
    - Goals and interests: Anthony is looking to find a new hobby to keep him occupied and his mind active for when he retires. He wants more time away from work but doesn't want to be left doing nothing, and only has a week left before retirement. A community that shares his interests is what Anthony is looking for, where he can spend a day or two a week just working on things he enjoys.
    - Points to consider: Anthony would benefit from a website that has all the information he needs in a quick glance, with helpful links to navigate him through the website faster.
3. Rob, a local handyperson
    - Background: Rob is a 67-year-old retired handyperson. He enjoys learning new skills and staying active during retirement.
    - Goals and interests: Rob is looking to explore new projects. The projects he is looking for includes more than just woodworking. He looks to find inspiration from projects other people are working on, to carry on picking up new skills.
    - Points to consider: Rob desires access to various project ideas. He also would like a platform where he can post his own projects, to share knowledge and collaborate with other like-minded people.

4.2.2 User requirements

The user requirements, extracted from interviews with the selected community during the requirements phase of the Software Development Life Cycle (SDLC), are categorized into the following sections:

- Website business goals and purpose:
  The purpose of the website is to provide an accessible online location to showcase the communities' information, current and past projects, and act as a gateway for new members to easily join and get in contact with the community.
- Secondary goals:
  The website aims to be simplistic and user-friendly, catering to the needs of older gentlemen.
- Features and Functionality

Feature/Functionality	Description	Priority	Notes
Logo	A place to display the Communities' name.	Top Priority	A logo may be added along with the navigation bar.
Menu	A horizontal Menu displaying the menu items, links, and pages of the site.	Top Priority	The menu bar with drop-down functionality for sub-menu items to be considered.
User Registration	Registration and login functionality that allows users to sign-in.	Priority	This can be added on a separate page or as a sidebar.
User Profiles	User profiles displays the members details.	Interest given	
Forms	Place that allows users to enter data	Top Priority	To be used primarily for Community

	and personal information.		contact page and user Login.
Posts	Ability for members to post new projects.	Priority	
Content Feeds	Internal or external feeds, such as Facebook, containing media content.	Not a Priority but some interest given	No Preference given between Internal or external feeds if one was to be added. A link will suffice.
Visual content	Visual content such as a slideshow across the site. Other content will include images or videos contained in a post, gallery, and other areas.	Priority	These can be included within a gallery as well as on website pages.
Sidebar	Column placed on the side of a web page to provide secondary links, user information, or login.	Little Interest	
Responsiveness	Adaptable across all screen sizes.	Priority	
Map	Visual map revealing the location of the community.	Interest given	An Interactive JavaScript Bing map will be developed and displayed in the footer and contact

			page. This will showcase the location of the Test Valley Men's Shed with pop up events for link directions and will include a layer switcher.
Documents/Files	Documents and files to be visible on the website.	Priority	Area in footer containing community's important documents as downloadable links.

Figure 1: The table shows the features and functionality requirements gathered for the chosen community's website, with its correspondent priority level and additional notes.

- Deliverables

  The deliverables to the community include website design mock-ups, the website link, and video walkthrough upon completion.

- Website layout

  Pages:

  - Homepage:

    This page displays a slideshow with Call-to-Action buttons, a summary of the community, and showcase of some of their current projects and news.
  - Men's Sheds:

    This about page is dedicated to information about The Men's Shed community with several sections and images.
  - Projects:

The Projects page is a dynamic web page that showcases the communities' past and current projects, with PHP pagination concept that increases the page count as more projects are added by members of the site.

- Gallery:
  A visually appealing gallery showcasing images of the Test Valley Men's Shed community.
- Contact:
  A community contact page featuring a contact form, bootstrap hero banner, and an Interactive JavaScript Bing map showcasing the community's location.
- Members:
  Drop down menu items including a "my profile" page and a chat for site members.
- User Login / Logout:
  A simplistic login form that accepts the user's email and password that will allow members to access additional areas of the website.

4.3 Technologies

Technologies and programming languages were carefully chosen to meet project requirements:

4.3.1 Consideration of Content Management System (CMS)

A content management system is a software that allows users to create, view, modify and manage content on a website (Tomme and erdfisch, 2016)

There are many different types of Content Management systems such as Software as a Service(SaaS), Proprietary, and Open source (Pearlstein, 2022).

SaaS is a cloud-based CMS integrated with other services that works well for small businesses to obtain a rapid online presence. This CMS provides user support and requires little technical skills though they can be somewhat restrictive. Examples of these are Wix and Squarespace (Pearlstein, 2022).

Proprietary CMS on the other hand is a closed system with built-in features, such as Adobe Experience Manager(AEM). No control is given with this CMS and is a paid platform (Pearlstein, 2022).

Finally, we have Open-source CMS, popular among developers. This CMS offers a lot more flexibility with continuous support and a large developer community, with source code that is free to use and widely available to view and modify (Tuduo, 2023).

The three most popular open-source content management systems are:

- **WordPress:** This a free, simple, and friendly CMS, popular for creating blog-based websites as well as other web-based applications. This CMS requires no coding knowledge and powers over 40% of all websites online though has been known to have additional costs for hosting & plugins as well as having compatibility issues. Some businesses that use WordPress are: The Walt Disney Company, The New Yorker, and BBC America (Rajput, 2013).
- **Joomla:** Joomla, built using PHP and MySQL, provides a range of modules and plugins to create a personalised website designed for people who code and for those who lack web development skills. Similar to WordPress, this CMS is accessible to anyone and has been known to be reliable & flexible, though requires a difficult learning curb and technical expertise. Companies that use Joomla are IKEA, Harvard University, Linux.com, etc (Rajput, 2013).
- **Drupal:** Drupal is a highly popular CMS and is the most preferred for complex eCommerce, social networks & government sites, built using PHP, MySQL, or PostgreSQL. This CMS is flexible, provides tools to code custom pages, and various plugins. Though Drupal can also be used for those without coding knowledge, it also requires a difficult learning curb and more technical expertise. Companies that use this CMS are NASA, Tesla, The Australian Government, The British Council, and even The White House (Rajput, 2013).

The advantages and disadvantages of using a content management system can be seen as (Advantages & Disadvantages of Using a Content Management System, 2021):

Advantages:

- Ease of use and easy to access.
- CMS can be customised to meet business requirements.

- Improved search engine optimization.
- Built-in security.
- Ability to collaborate with others.
- CMS system supports creation of vast number of user accounts and registration with login functionality.
- No coding experience necessarily required for the backend.
- Some CMS systems offer free hosting and domain.
- User support and community of developers.

Disadvantages:

- Maintenance: CMS systems may require maintenance on a weekly basis.
- CMS systems load speed can be slow.
- Limited control, with some functionality's dependant on available plugins
- Cost: Some plugins and functionality on CMS systems require payment.

Based on the project requirements, if a CMS was to be chosen for the project, Drupal is the optimal choice of CMS, providing flexibility through PHP, plugins, and custom pages, proving useful for the community's visual content requirements and to showcase the Men Shed projects. It also supports user accounts via MySQL for easy registration. However, it has limitations on both front and back ends, and requires ongoing maintenance.

4.3.2 Consideration of building a custom website

Upon thorough investigation of Content management systems, it becomes clear that opting for custom websites, despite requiring more time to develop, may provide greater flexibility and control to meet project requirements. This approach outlined by crooks (2019), offers the following advantages:

- Cost avoidance: While CMS do offer free platforms, they often come with limited access to features and functions, along with advertisements. This can be avoided by building a custom website.
- Control over hosting services: a custom website offers freedom in sourcing independent hosting services that is most appropriate for the site requirements.

- More freedom to features and functions: Writing a website with your own code allows for the endless possibilities to customise the features and functionality of the website, to better meet project requirements.
- Code is less likely to be attacked by hackers.
- Helps grow as a programmer and web developer: In the development of a custom website, through programming challenges, valuable coding skills and design techniques will be earned.

In conclusion, after a comprehensive investigation, the decision to opt for custom websites emerges as the preferred method to meet the project requirements for the community website. This strategy aligns with the project goals, ensuring flexibility and control over the websites design and functionality, and providing enhanced user experience and an opportunity for personal growth as a developer.

4.3.2.1 Front-end languages and frameworks

The front end of the community website will be developed mostly using html, CSS, and JavaScript, with some features making use of jQuery. The chosen framework for the website is Bootstrap 5.

Bootstrap is a popular HTML, CSS, and JavaScript front-end framework that allows the development of fully responsive websites and website applications. This framework was built in 2011 and since then has become the most used CSS framework and the second most used JavaScript framework (Abdaladze, 2023). It has been reported that Bootstrap was used to build more than half a million websites in the US (Samuel, 2022). Some websites that use Bootstrap are Fox News, Spotify, LinkedIn, Udemy, MasterCard, and Twitter (Samuel, 2022).

Some of the benefits of using the Bootstrap framework are (Jordana, 2021):

- Grid system: The Bootstrap framework includes a grid system consisting of rows and columns, reducing the number of media queries needed to develop a fully responsive website.

- Browser compatibility: The framework is consistently compatible with all the most popular web browsers, making websites very accessible.
- Bootstrap Image system: The framework handles image display and responsiveness using predefined CSS classes such “container”.
- Documentation: This framework offers some of the best documentation for developers for best practices, tools, and features.

4.3.2.2 Back-end languages and database

The backend of the site will be developed using languages such as PHP that will draw data from the MySQL database.

PHP is a widely used back-end programming language commonly used to communicate between databases such as MySQL and dynamic web pages (ISLAM, 2022). This programming language , being one of the oldest programming languages, comes with a wide community of developers (ISLAM, 2022). Some websites made with PHP include Facebook, Wikipedia, WordPress, and Etsy (Fleury, 2020).

Some advantages that PHP provides, as outlined by ISLAM(2022), are:

- Open-source software: Making the server-side language accessible to everyone.
- Platform Independent: Works efficiently on all platforms which, again, will add to making the website more accessible.
- Performance and Stability: This programming language is quick and reliable when connecting to chosen databases, with faster loading speeds than any other programming language even thorough slow connection issues.
- Community: As mentioned, PHP comes with a vast community of developers, providing aid to any solution.

PHP and SQL will be used primarily in the development of user registration and login on the community website. Secondary uses will include dynamic web pages and concealing restricted sections of the site reserved for members and admin users.

4.4 Hosting

Once the website has been implemented, a hosting service will be required to make the community website accessible on the worldwide web.

The things to consider when choosing a hosting service can be broken down to the following (Domantas and Astari, 2022):

1. **Considering the website type and purpose.** This includes consideration of the website's purpose , scope, platform, features, and budget.
2. **Determining the required type of hosting**. This is to determine whether the hosting service is suitable for the type of website to be hosted, such as one with or without a CMS.
3. **Hosting Technology and features**. This includes Domain names, security, and performance, database features, ease of use.
4. **Support services**. Finding a hosting provider that will provide around the clock support if issues were to arise.
5. **Cost**. Determine the price, if any, that will be required to host the website.

The website at hand is a community website, powered by PHP, Bootstrap CSS, and JavaScript. Features include responsive web design, dynamic web pages, login and registration, email communication, and form submissions. This interacts with a MySQL database via PhpMyAdmin. The website will have a mid-ranged audience and low to mid-level traffic.

The hosting provider suitable for the site is one that will support these technologies such as PHP and MySQL, and will provide ease of use, low cost, reliability, security, and good speed performance.

Technologies and features to consider from the hosting provider are many (Domantas and Astari, 2022):

1. **Security.** A good provider will offer a secure environment to manage the website, with multiple layers of firewalls to monitor traffic, detect malware, and protect data against unwanted attacks. This service should also offer network monitoring and automated backups.
2. **SSL certificates**. Secure Sockets Layer(SSL) is a standard security protocol for an encrypted link between a server and a client. Commonly known as TLS, Transport Layer Security. This secures users data on the internet, displayed with an icon lock on

secured websites. This can drive users away from using a website if it is not provided. Many hosting providers offer this service for free (What Is an SSL Certificate? , 2023).

3. **Setup and Use.** It is essential to find a hosting provider that offers an easy-to-use control panel interface.
4. **Speed.** Hosting providers offer various advanced features to maintain an efficient speed for the hosted site, such as Lite Speed Web servers with advanced cache engines.

Other considerations more specifically aimed at websites powered by PHP and MySQL include (Gánem, 2021):

1. **Updated versions of PHP.** Not all hosting services provide this.
2. **Support of MySQL databases.**
3. **FTP Access.** This provides more control of your file uploads in a secure environment directly into the server, via an FTP client application.
4. **phpMyAdmin.** Another great tool that some hosting providers have built-in, allowing easy transfer and management of databases for the hosted website.

After careful consideration, the chosen hosting provider for the community website is Hostinger.

This hosting provider provides all the discussed considerations that are suitable for the website. These include (Gánem, 2021) :

- **Hostinger's hPanel**: a user-friendly control panel to configure domain names and manage files.
- **FTP**: for easy and direct file uploads.
- **phpMyAdmin**. This feature will make the database transfer from local server to the hosting provider very straightforward, by simply exporting and importing files from one phpMyAdmin to another.
- **Free domain names**
- **Free SSL certificates**, for enhanced security of user's data on the community website.
- **Up to unlimited SQL databases**
- **Uptime guarantee of 99.9%.**

- **Low cost** with many free services, making it an affordable option that completes every requirement for the website.
- **Firewalls and automated backups**

5 Website Design

5.1 Front-end design

The front-end designs feature a wireframe of the landing page, a mood board, and designs of various pages of the site using Figma, a powerful user interface design tool. This platform is the most used by UX/UI designers (Blandino, 2023).

1. Website wireframe

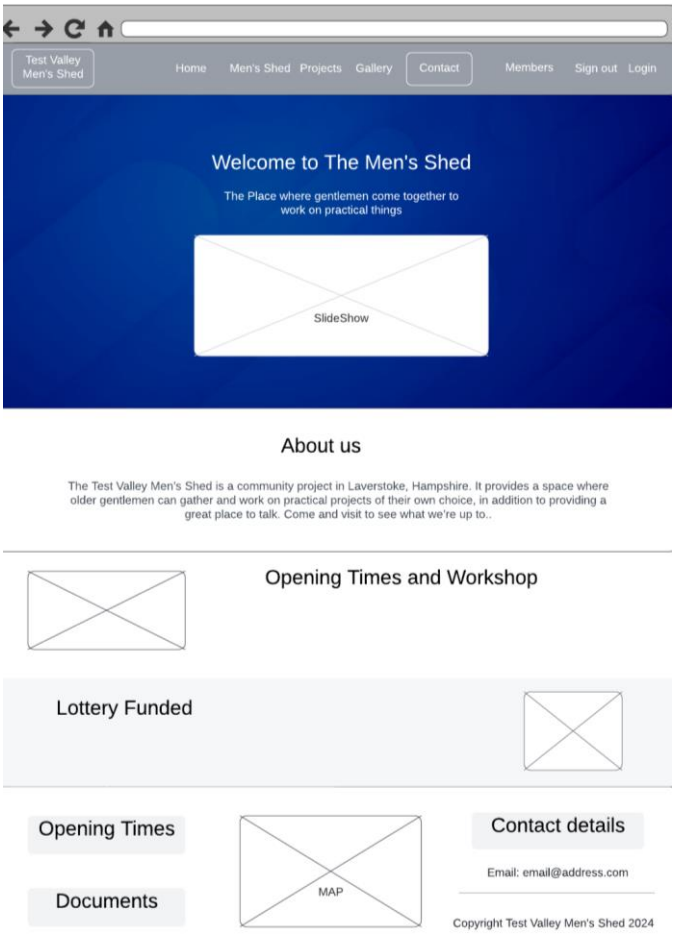

Figure 2 Wireframe design created using Lucidchart at https://www.lucidchart.com/ (LucidChart, 2023).

2. Mood board

   The mood board is used organize ideas and design concepts for the design phase.

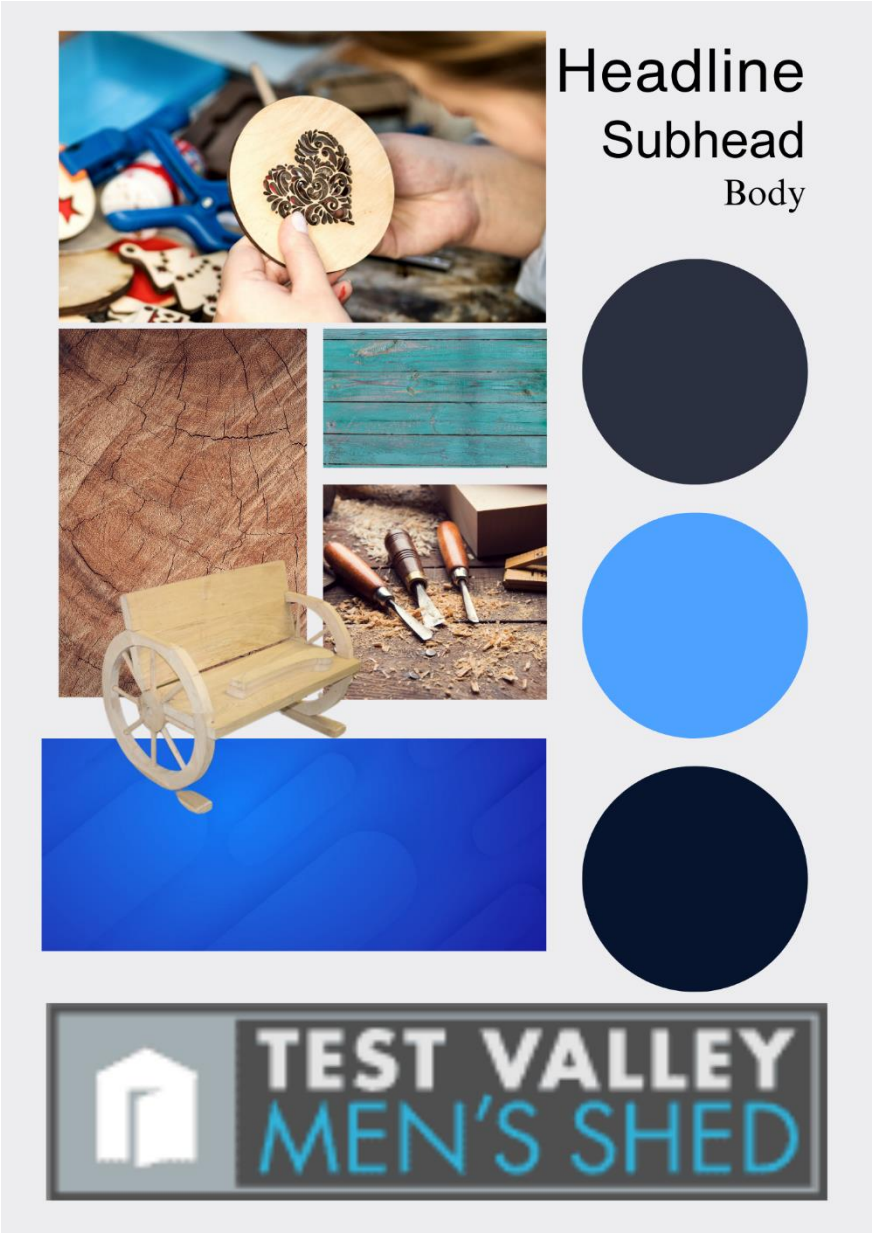

Figure 3 Mood board showcasing visual concepts for the community website, created with Canva at https://www.canva.com/ (Canva, 2024)

3. Homepage design

This page features a responsive user-friendly navigation bar with the community's logo, and links to relevant pages of the site. This includes a dropdown members menu and user-login. Furthermore, visitors are welcomed to the community on arrival with an elegant slideshow, displaying highlights of the community, designed to leave a good first impression. Below users can find a summary of the community, the opening times and other relevant information.

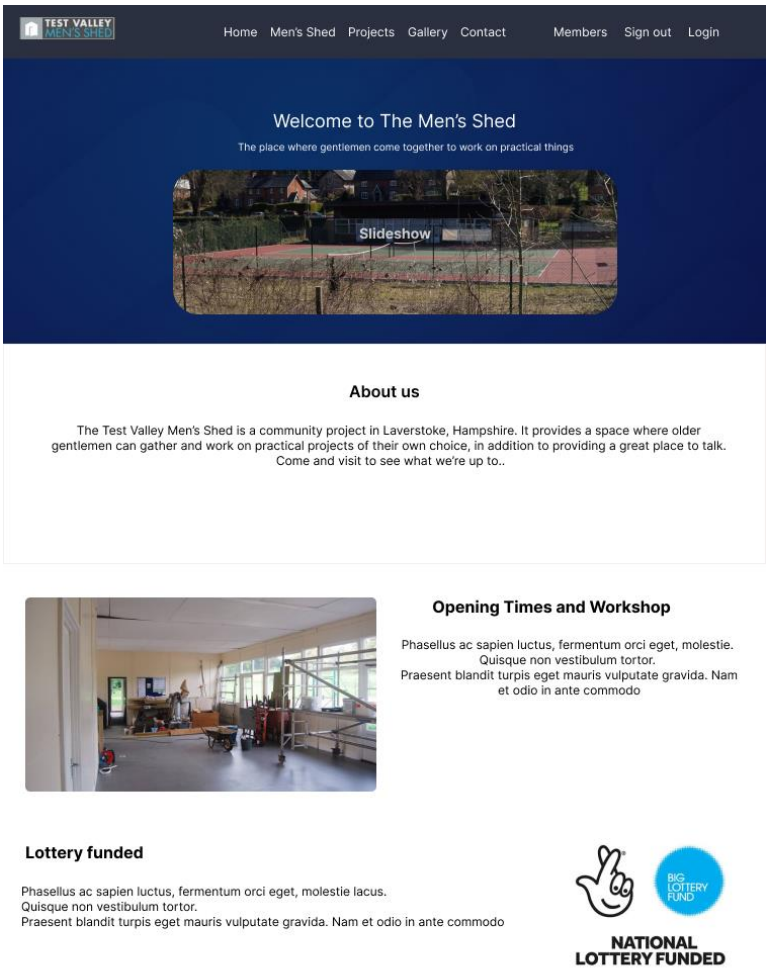

Figure 4 Homepage design using Figma at https://www.figma.com (Figma, 2023)

4. Footer

   The footer remains consistent on every page of the website, where users can easily and quickly find all the most important information.

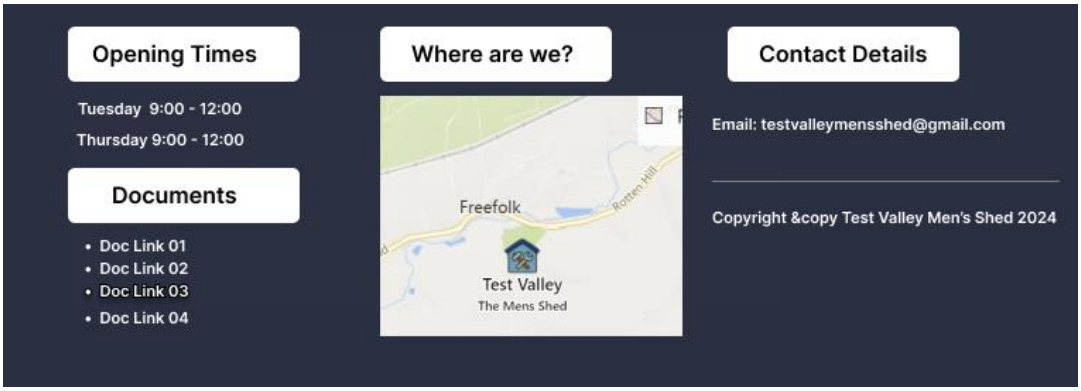

Figure – Footer design using Figma at https://www.figma.com (*Figma*, 2023)

5. Contact page.

The website features a simplistic contact page with a helpful widespread form where users get in touch with the community, and clear instructions on how to find the location of the Test Valley workshop. The wide interactive map below the form will help users even further, displaying the Test Valley location with a pop-up link for directions.

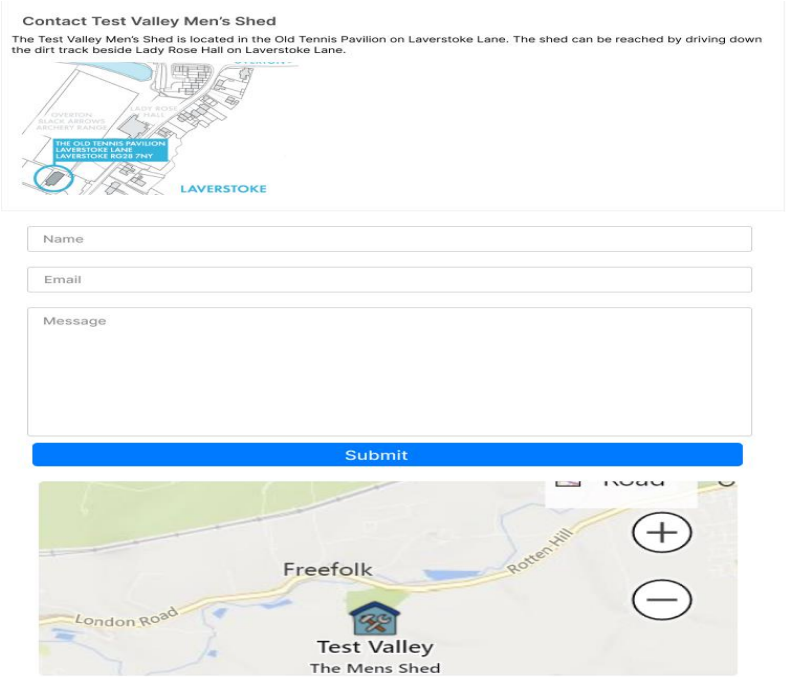

Figure 5 Contact page design using Figma at https://www.figma.com (Figma, 2023)

6. User Login

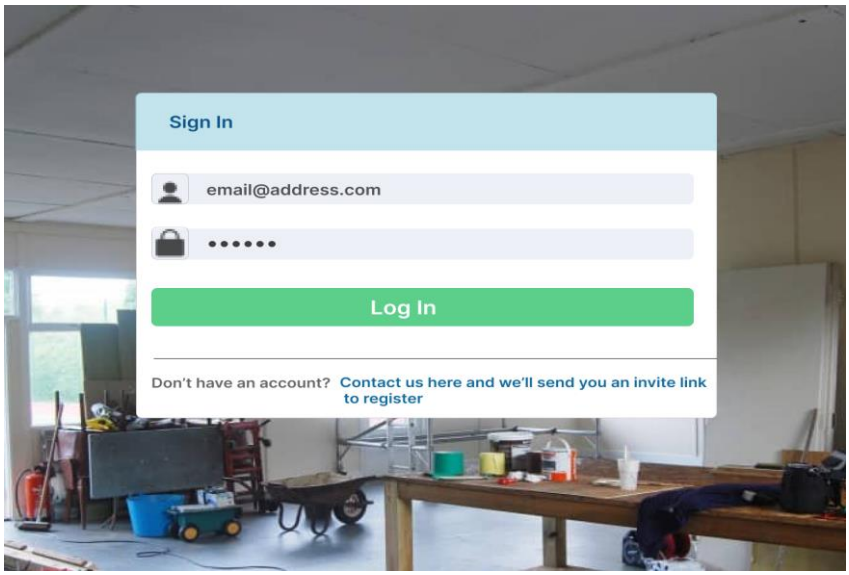

Figure 6 Login page design using Figma at https://www.figma.com (Figma, 2023)

7. Mobile responsive mock-up design featuring navigation toggle.

Figure 7 Mobile design.

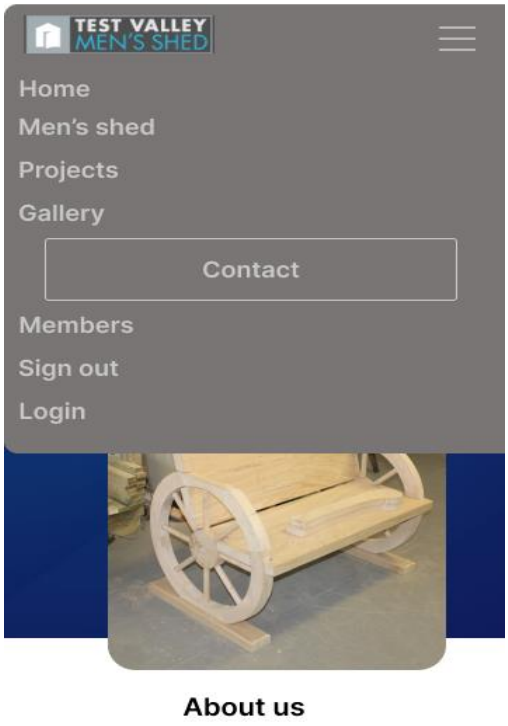

Figure 8 Mobile design with toggle.

Figure 7 and 8 –Mobile designs using Figma at https://www.figma.com (*Figma*, 2023)

8. Member chat design

This member chat is designed to allow members to interact with one another when using the website. It features a chat box with a dynamic welcome message to the user in the top left corner, a chat area displaying each members messages alongside a timestamp, and a text area with a button to submit the typed message.

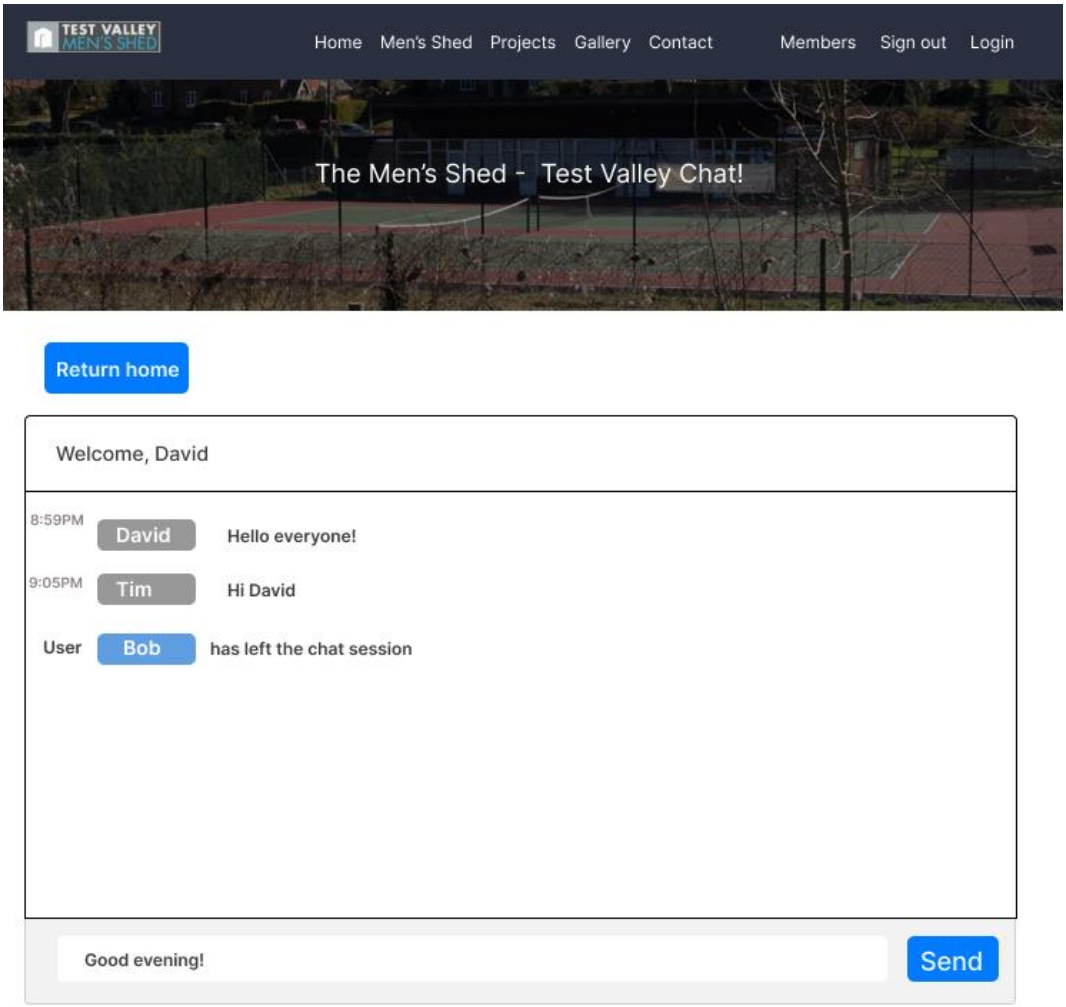

Figure 9 Member chat design using Figma at https://www.figma.com (Figma, 2023)

5.2 Back-end design

The community website requires a simple database to meet its requirements, providing functionality to dynamic web pages that display the community's projects, login and registration, and invite system.

The backend database of the community website operates around four key tables: Author, Post, Category, and Invitations. The Author table stores user's details, including unique identifiers, names, email addresses, encrypted passwords, user bios, and user roles. The Post table is responsible for storing individual project information, such as titles, authors, content, categories, publication dates, and keywords. The category table categorizes projects with unique primary keys and names. Lastly, the Invitations table will support the invite system to register onto the website, by storing unique identifiers, email addresses, and randomly generated 10-digit invite codes for secure registration via invitation links.

The relationships and assumptions in these tables are as follows:

1. Author - Post:
    - Each author can create multiple posts, as members can post multiple projects.
    - Each post belongs to one and only one author, as each post will only be associated with a single author.
2. Post – Category:
    - Each post can belong to only one category.
    - A Category can have multiple posts associated with it.
3. Author – Invitations:
    - One author can send multiple invitations.
    - Each invitation is sent by a single author.

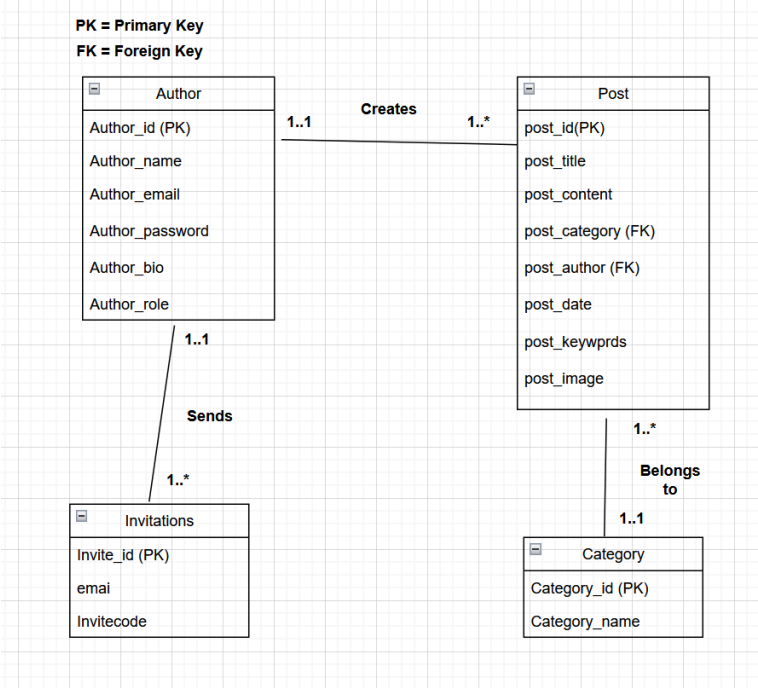

Figure 10 ERD database tables, created using Lucidchart at https://www.lucidchart.com/ (LucidChart, 2023).

6 Implementation

6.1 Front-end Development

6.1.1 Overview

The implementation of the front-end of the community website closely followed the previously designed website wireframes and mock-ups utilizing the Bootstrap CSS framework, JavaScript, and jQuery, ensuring a responsive and visually appealing user interface across various web pages and login sections.

6.1.2 Layout and styling with CSS and JavaScript

The website features a responsive and engaging layout across all web pages controlled by bootstrap classes , grid system , and custom CSS. The Bootstrap libraries and the custom CSS file “Shed.css” were imported via link tags in the head section of each web page.

The Test Valley Men’s Shed website features the following pages, accessible via a consistent user-friendly navigation bar: Homepage, Men’s Shed (about page), Projects, Gallery, Contact page, and user login. Other member-only restricted pages include Dashboard, My profile, and member chat. These restricted pages are featured in a dropdown menu in the navigation bar, where registered users can add and edit projects, view their profile, communicate, and invite other members.

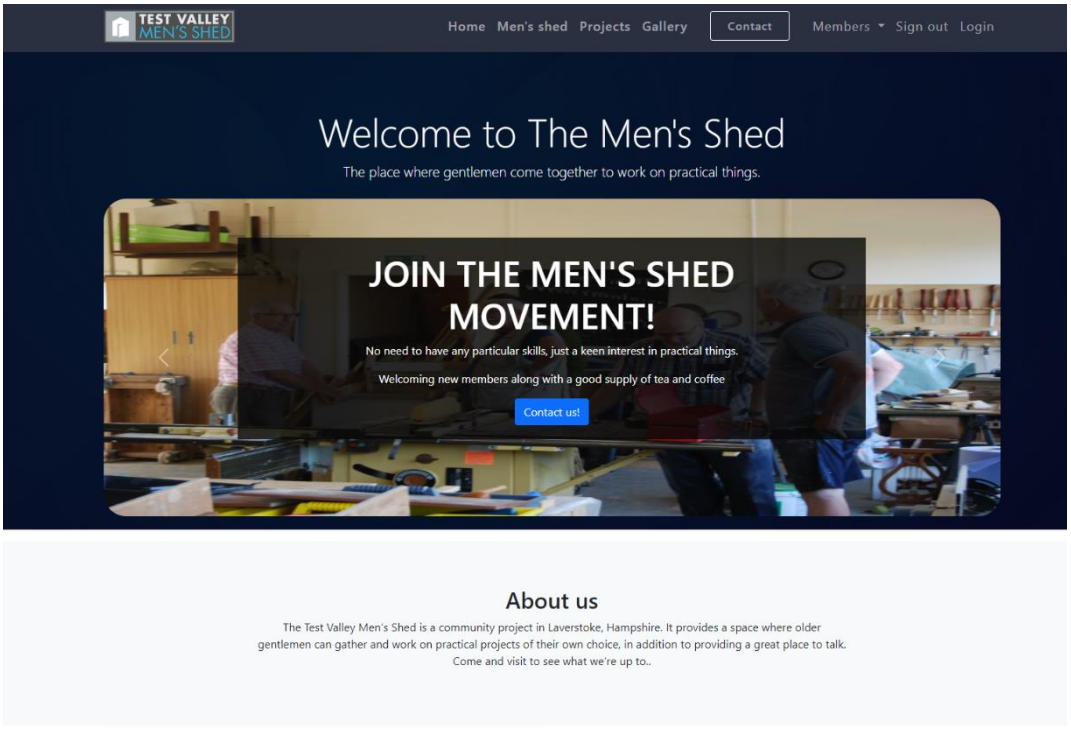

Figure 11 Screenshot of the community website Homepage. Available at https://www.testvalleymensshed.com/ (Men’s Shed, 2024)

The navigation bar and footer remain consistent on all main pages of the site.

The navigation utilizes bootstrap classes such as ‘navbar-expand-lg’, specifying a navbar that will expand to full-width for large screens and collapse into a toggleable menu for smaller screens. This is fixed to the top with the class ‘fixed-top’, allowing the navigation bar to remain visible as the user scrolls down the page. This also fades slightly when the user scrolls down with the help of JavaScript function contained within the ‘main.js’ file, adding to the user experience. The community’s logo is visible on all navigation bars contained inside an ‘<a>’ tag , navigating the user back to the homepage when clicked.

Many bootstrap CSS ‘container’ classes are used throughout the website within ‘div’ elements, allowing the content inside to adjust responsively to different screen sizes.

The bootstrap 12 column grid system provided a flexible and responsive structure to many elements of the website such as the navigation bar, header section, content sections, and footer. This grid system divides the layout of a website into 12 columns which then uses the ‘container’, ‘row’, and ‘col’ classes to the organize the content within these sections. This allowed an enhanced user accessibility and usability.

The footer features the community’s opening times, documents as downloadable links, an interactive JavaScript Bing map, contact details and copyright information. This was structured using a element that wraps the entire footer content, followed by a inside of this container to create a horizontal row that contains the footer’s content. The grid system divides this row into 12 columns. Within the row, three ‘div’ elements with classes such as ‘col-sm-12 col-md-6 col-lg-4’ are used to define the layout of the content across various screen sizes(small, medium, and large). This footer spans over 12 columns on small screens, 6 columns on medium, and 4 columns on large screens.

The homepage, additional to the navigation bar and footer, includes a slider section containing a carousel displaying highlights of the site with images, text, and “Call to Action” buttons, serving as links to the major areas of the site. This is designed to leave a great first impression for the user as they visit the website. The carousel displays a summary of the community, contact link, projects, and news. This utilizes bootstrap component classes such as ‘ ’, defining the carousel, and uses an id “mycarousel” which is used for custom CSS styling and JavaScript code to initialize the carousel. The attribute ‘data-ride=”carousel”’ indicate the carousel to

automatically cycle through the slides. The slider corners were rounded for a better look using ‘rounded-5’ inside of the class “carousel-inner”, with each item inside the slide represented with ‘ ’ containing an image, caption, text, and button.

Other pages, alternatively, include a “Hero” section containing the purpose of the page and a full width faded background image of Test Valley styled with bootstrap classes and custom CSS.

The news section, located on the homepage, also utilizes a slider with bootstrap classes to organise its content using the grid-system. This showcases the community’s largest appearances in news articles and gazettes.

The website’s contact page features a form wrapped in a bootstrap ‘container’ with ‘row’, ‘col’, and other responsive grid-system classes. The class “contact” allows for custom styling. The column contains a form element with an action attribute set to "https://formspree.io/f/mbjnzakb" for form handling. The form consists of input fields for name, email, and a text area. Each input field and text area have appropriate Bootstrap classes for styling. Finally, the submit button styled as a primary button, sends the data to the specified URL for processing, a third-party API for handling form submissions. This is then sent to the Test Valley’s community email account.

6.1.3 JavaScript Bing map API

The community website features a JavaScript Bing map in its footer and contact page to provide users with easy access to the Test Valley Men’s Shed location. To implement this feature, a Bing Maps API Key was obtained from the Bing Maps Dev Center website and integrated into the website's code. The JavaScript code for the map resides in a file named 'map.js' within the 'js' folder. Due to a focus on simplicity for the specific personas of the website, this choice of API was selected for its flexibility, diverse base maps, visually appealing design, and useful infoboxes. The map accurately displays the location of the community's workshop, displayed with a custom pushpin, community name, and an “infobox” with a link to directions, greatly helping community members locate the workshop.

The ‘draw_map’ function is designed to implement multiple Bing maps onto the community website. This starts by retrieving the div elements with class of “map_space” using

'document.getElementsByClassName("map_space")' and storing them inside a variable called "mapSpaces". It then iterates through each element using 'Array.from(mapSpaces).forEach(function (mapSpace)'. Inside the loop, the map options are defined with zoom, center with community's coordinates, map type, with modified controls to remove the "showLocateMeButton" and 'disableMapTypeSelectorMouseOver'. These controls were removed to simplify the user experience by removing unnecessary elements.

```
function draw_map() {
    var mapSpaces = document.getElementsByClassName("map_space");

    Array.from(mapSpaces).forEach(function (mapSpace) {

        var map_ops = {
            center: new Microsoft.Maps.Location(51.230090, -1.300720),
            zoom: 13,
            mapTypeId: Microsoft.Maps.MapTypeId.road,
            showLocateMeButton: false,
            disableMapTypeSelectorMouseOver: true
        };
```

Figure 12 Screenshot of JavaScript code of the draw_map function used to implement the map functionality for the community website.

Following this, the map is created with a pushpin marker at the workshop's location with a custom icon, title, and subtitle. Furthermore, an infobox with additional link to directions when the pushpin is clicked with an event handler. Finally, the pushpin is inserted into the map's layer.

6.2 Back-end Development

6.2.1 Overview

PHP powers the Server-side of the website, interacting with a MySQL database via phpMyAdmin. This setup enables user authentication and registration. Registered users gain access to restricted sections, where they can add new projects to the site, manage their profiles, and engage in communication via a member chat. The community projects are dynamically displayed on an interactive webpage visible to all users, allowing for community engagement. Other Admin-exclusive sections provide additional capabilities. Administrators can edit and delete projects, as well as invite new members through an integrated invite system with PHPMailer and Gmail SMTP for email communication.

6.2.2 Database management and User Authentication

Database management and user authentication are essential parts of back-end web development, ensuring data integrity and user experience. In the community website of Test Valley Men's Shed, database management is used for organizing and retrieving information about community projects, user profiles, and interactions. Additionally, essential user authentication allows for protecting user accounts, controlling access to restricted sections, and enabling secure communication among members. By implementing this functionality, a reliable and user-friendly platform can be created for community engagement and collaboration.

6.2.2.1 Data management

The database consists of four tables: Author, Post, Category, and Invitations. Each table plays a vital role in organising and managing the data for the functionality of the community website.

Author Table

The Author table is the primary table responsible for storing the registered user's information. It includes the following attributes:

- Author_id: A unique identifier assigned to each user, with auto-increment ability, serving as the primary key.
- Author_name: The name of the user, is used in many instances throughout the website, such as projects sections, chat box nametag, profile page, and more.
- Author_email: This email address is associated with the user's account, vital for login and registration functionality.
- Author_password: Encrypted password with password hashing for user authentication purposes.
- Author_bio: User description(optional)
- Author_role: Essential for defining the user role within the community website, differentiating members and Admins that have additional access to restricted areas of the site.

Post Table

The post table is dedicated to storing information about community projects, which are dynamically displayed on the project's webpage. This table features the following attributes:

- Post_id: Unique identifier, primary key.
- Post_title: Headline of the project.
- Post_author: member that published the project.
- Post_content: Detailed description of the project.
- Post_category(FK): References the Category table, functions as a foreign key.
- Post_date: Displayed the date the project was published.
- Post_keywords: Optional keywords associated with the project.

Category Table

The category table serves as a reference for categorizing projects posted on the website. Attributes include:

- Category_id: Unique identifier, primary key
- Category_name: Name of the category.

Invitations Table

The invitations table is essential for the functionality of the website's invite system, where administrators can invite new members to the community website. This table features the following attributes:

- Invite_id: Unique identifier, primary key.
- Email: The email address of the invited member
- Invitecode: A randomly generated 10-digit code associated with their email address, ensuring secure registration via unique invitation links.

6.2.2.2 Login and registration

The signup and login pages are the essential components of user authentication of the website.

The Signup process consists of an invite system, where administrators send members invitation links to their email address to access the registration page. This adds an extra layer

of security by restricting access only to those with valid invitations, ensuring non-members of the community won't be able to register themselves onto the website. Refer to the Invite system section of the report for more information.

Upon gaining access to the signup page, users can then enter their details such as name, email address, and desired password. Data validation then plays a crucial part to ensure the provided email corresponds with the correct format and checks that it matches the associated invite code, as well as checking for empty fields in the form.

To ensure security with sensitive information, password hashing is employed using the 'password_hash()' function. This process converts the text password into an irreversible hash in the database.

Once all validation checks are successful, the user's information is inserted into the database, providing a feedback message to the user indicating successful account creation, granting them access to the website as a 'member', and redirecting them to the login page.

The user can then login entering their email and password in the login form. Data validation ensures the email provided is valid, checks for empty fields, and ensures the user exists in the database before redirecting them to the website. A session is initiated for the user, allowing them access to authorised areas of the website as a member, where they can add projects, view their profile, and communicate with others in the chat. Administrators will additionally be able to edit and delete projects, as well as invite new members.

6.2.2.3 Security measures

The implemented website security features are summarised in:

- **Password hashing:** User passwords are hashed using PHP's 'password_hash()' function, converting plain passwords into irreversible hashes.
- **Data sanitization:** User input is sanitized using 'mysqli_real_escape_string()' to prevent SQL injection.
- **Session management:** Sessions are used to track user authentication of members and administrators, ensuring only authenticated users can access protected areas of the website.
- **Invite code verification**: This ensures only invited members can access the registration of the website.
- **Data validation**: Preventing errors in the database and maintaining data integrity.

- **Error handling**: Error messages are provided to users for incomplete or invalid form submission, guiding correct use of the system.

6.2.3 Invite system with PHPMailer and Gmail SMTP

New members are invited by site administrators through an integrated invite system utilizing PHPMailer and Gmail SMTP for email communication. Upon receiving the invitation, recipients are directed to the registration page with a unique 10-digit code embedded in the URL. Each randomly generated invite code is uniquely associated with the recipient's email address. Prior to completing the registration process, the registration page verifies the invite code, ensuring only invited users are granted access to register.

This solution, aimed at enhancing site security, was inspired by an article by Philip Brown on 'how to create an invite system using PHP' (Brown, 2011). This article provided a basic example, and then was further advanced by implementing PHPMailer and Gmail SMTP to enable the email communication. This includes a personalised message for the recipient with the link to the registration page.

```php
// Generate a unique invitation code
$length = 10;
$inviteCode = "";
$characters = "0123456789abcdefghijklmnopqrstuvwxyz";
for ($i = 0; $i < $length; $i++) {
    $inviteCode .= $characters[rand(0, strlen($characters) - 1)];
}
```

Figure 13 PHP code used to generate the invite code for the community website at https://www.testvalleymensshed.com/

PHPMailer and Gmail SMTP(Simple Mail Transfer Protocol) were chosen for their reliability in handling email communication within the invite system. PHPMailer is a popular open-source library for PHP for sending emails, supporting multiple formats, TLS and SSL protocols, and automatic email address validation. This assures only valid email addresses are used and reduces the risk of undelivered emails and spam complaints (Shcherbakan and Djuric, 2019).

The installation process involved integrating PHPMailer into the project using Composer, a PHP dependency manager. Following the download and setup of Composer from its official website at https://getcomposer.org/download/ (Adermann and Boggiano , 2024), PHPMailer was installed via the command line and integrated into the 'invite.php' file, ready to program the invite system.

The link to 'invite.php' is only visible to administrators on the dashboard of the site, ensuring only authorised users can access the invitation functionality. This page contains a form where administrators can enter a name and email address of the member they want to invite. Upon submitting the form, the randomly generated invite code and associated email address is then stored in the 'invitations' table of the database. Before sending the invitation, the php code checks if the email provided already exists. If it does, the user is redirected back to 'invite.php' with a message indicating that the user already has an account.

Provided that the member doesn't already have an account, they are sent a coded email message with the help of PHPMailer. It includes a personalised message using the name given in the form, along with the registration link.

The registration page checks whether the invitation code is present in the URL and whether it is valid. If these conditions aren't met, the user is redirected to the 'signup.php' page with an error message. The message indicates that the invitecode is either invalid or missing. This ensures no user can access the singup.php page without an invite.

6.2.4 Server-side programming with PHP

PHP serves as the primary scripting language used in this project, allowing interaction with the MySQL database , processing of user inputs, and generation of dynamic web pages to display the community projects. The PHP scripts are organized within the "admin" folder and "includes" directory.

Each page within the "admin" folder initiates sessions using 'session_start()' and checks if the user is logging in with 'isset($_SESSION['author_role'])'. If not, users are redirected to the login page. This authentication system provides secure access to restricted areas of the website.

Additionally, PHP pages comes with the inclusion of ‘connection.php’ and ‘functions.php’ files after stating the session. These files contain the database connection information and essential functions.

Interaction with the MySQL database is sanitized with PHP’s ‘mysqli_real_escape_string()’ function before sending queries to the database, minimizing the risk of SQL injections. Form submissions are handled using ‘$_POST’ array, with validation performed using the ‘filter_var()’ to check email formats and for empty fields.

The posts.php file is dedicated to the dashboard of the website, offering the ability to add, edit, and delete projects. Meanwhile, ‘index.php’ dynamically displays the community projects with implemented pagination functionality.

The index.php page retrieves project data from the ‘post’ table through SQL queries via ‘mysqli_query()’ functions. The project data includes the project title, image, author, and content. This is then integrated into HTML using iterative while loops to generate project cards, containing each project, to be added to the page. The page also features quick links to add and edit projects based on the user’s role.

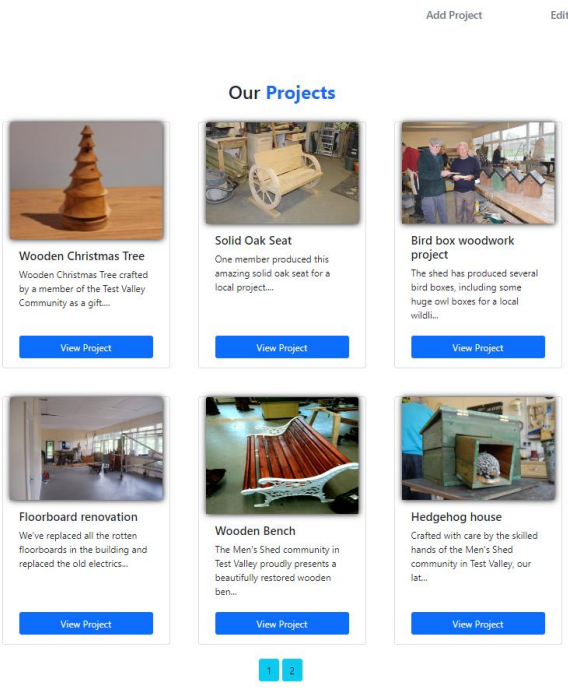

Figure 14 The screenshot shows the completed dynamic projects page of the community website with pagination functionality. Available at https://www.testvalleymensshed.com/

The pagination enables users to navigate through the projects efficiently by dynamic calculation of total project counts and generation of navigation links, providing a user-friendly navigational experience of the community projects.

The pagination limits each page to display 6 projects. The total number of projects (‘$totalposts’) is fetched from the database, and then the total number of pages (‘$totalpages’) is calculated based on the predefined limit of 6 projects per page:

```php
//pagination
$sqlpg = "SELECT * FROM `POST`";
$resultpg = mysqli_query($conn, $sqlpg);
$totalposts = mysqli_num_rows($resultpg);
$totalpages = ceil($totalposts/6);

//pagination get
if(isset($_GET['p'])){
  $pageid = $_GET['p'];
  $start = ($pageid*6)-6;
  $sql = "SELECT * FROM `post` ORDER BY post_id DESC LIMIT $start, 6";
} else {
  $sql = "SELECT * FROM `post` ORDER BY post_id DESC LIMIT 0,6";
}
?>
```

Figure 15 Screenshot of PHP code used to implement the pagination functionality of the projects page displayed in the community website at https://www.testvalleymensshed.com/

The pagination links are then generated at the bottom of the page as needed using a for loop that iterates over each page number, starting from page 1 and ending at the total number of pages.

A smooth user experience is achieved on all pages with efficient Error handling, providing useful feedback messages in the header of the page. This message is created by a PHP Script with custom styling and fades away after 5 seconds with the help of JavaScript code.

The add project page contains a form ,where users can input the project’s Title, category, description, and image, with a ‘Post’ method. After submission and validation, the PHP script executes the SQL query to insert the new project information into the ‘post’ table. Finally, the user is provided with a feedback message.

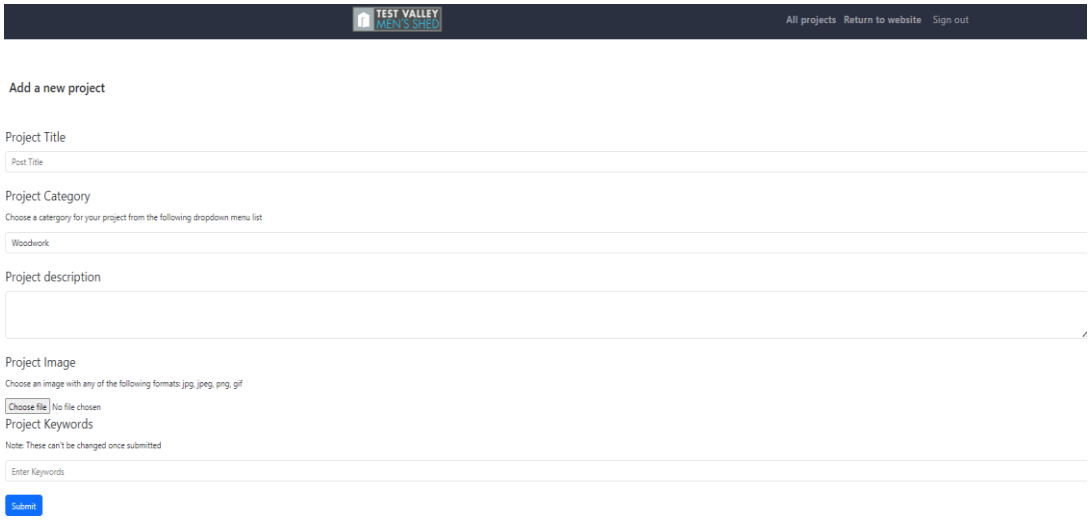

Figure 16 Screenshot of the 'Add a new project' page, displayed on the community website at https://www.testvalleymensshed.com/

To edit projects, the form is similar to the add project page, Here the user is provided with the current project's information using PHP echo commands in the form inputs, where the user can type in the new information or select a new image. Once the "update" button has been clicked, the PHP script retrieves the edited data from the form fields using '$_POST' and validates the data. Finally, the script provides feedback of either a successful update or display appropriate error messages.

Administrators can also click the delete button on a project via the dashboard of the website. This triggers a request to the 'delete.php' providing the project ID. This file then processes the deletion of the project through an SQL query to remove it from the 'post' table in the database.

User profiles are available to view to registered users, where their current information is populated by PHP from the author table in the database. The user's role is reflected at the top of the page under their name, and below a form allows users to view and edit their name, Email address, password, and Bio. Upon submission of the 'update' button , php script checks the data for any changes or empty fields. If changes had been made, the script validates the new data and updates the information in the 'author' table. If the password had been changed then the script redirects the user to the login page to start a new session with their updated information. Otherwise, the script will display appropriate feedback messages on the current page.

6.2.5 Member Chat

The member chat is a restricted section exclusively for registered users. The solution was inspired by a tutorial published to the public by Gabriel Nava on 'How to Create a Simple Web-Based Chat Application' at https://code.tutsplus.com/how-to-create-a-simple-web-based-chat-application--net-5931t (Nava, 2021). Nava's example showcases a simple messaging chat box requiring an input name via a form before entering which is used throughout the chat. This is powered by PHP, CSS, and jQuery. This solution was deemed as a perfect solution due to its simplicity, aligning well with the project requirements, tailored to older gentlemen of the site that may just like to send a couple of messages to fellow shed members while using the site.

From this example, an enhanced version was implemented onto the community website, featuring different access methods and styling aimed at providing quicker and more efficient accessibility for site members. The members chat solution on the Test Valley Men's Shed website doesn't require a name input, rather it uses the website's existing database to retrieve the registered member's names through PHP. This username is displayed as a welcome message at the top of the chat and alongside their messages within the chat box.

PHP code, like all the site's restricted pages, was implemented to continuously check if the user is logged in before displaying the chat, redirecting users to the login page if this condition is not met. The session variables from the database table "author" were implemented for chat functionality and retrieval of member's usernames ("$_SESSION['author_name']"). The additional styling was implemented using custom CSS from 'shed.css', and bootstrap classes. The html and styling provide new colours to fit the website's colour scheme, a full-width chat area, and additional buttons.

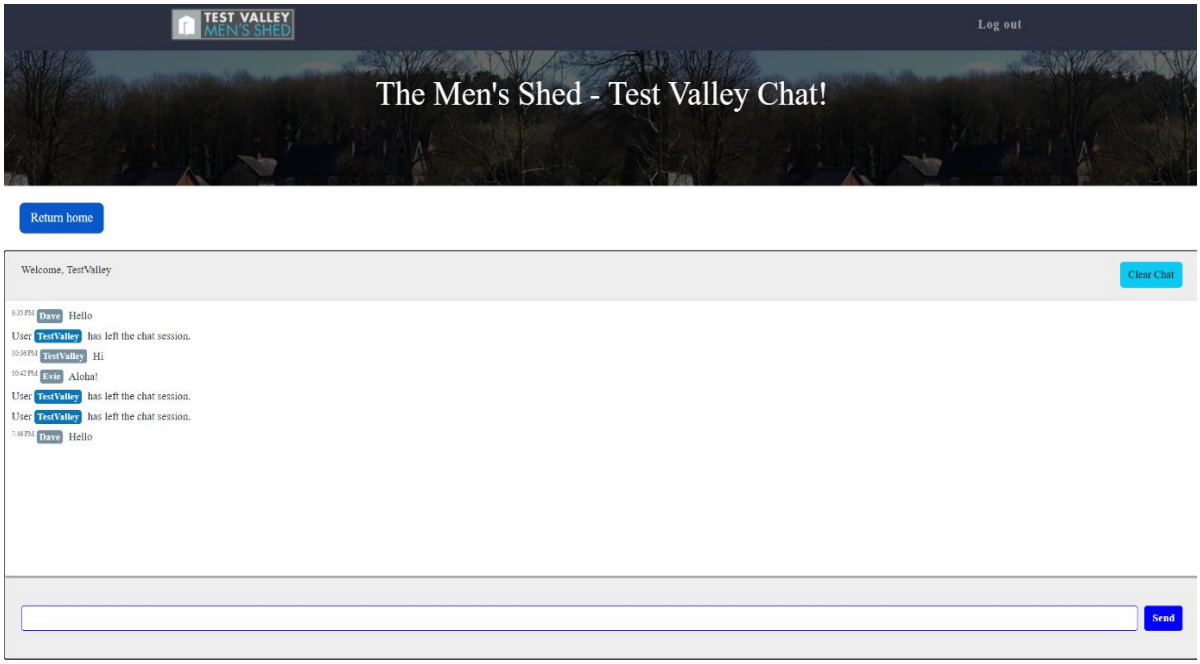

Figure 17 The screenshot image displays the Test Valley Men's Shed Chat, exclusively accessible to registered users of the community website, featuring enhanced styling and functionality. Available at https://www.testvalleymensshed.com/

The chatroom operates using three files: index.php, post.php, and log.html in the same directory. The chatbox displays chat history retrieved from a 'log.html' file. Users can also clear the chat if they are registered as an admin, otherwise the "clear chat" button won't be visible. The chat box includes a text input and a submission button to send messages to other members of the site.

To handle message submission, jQuery is used to send the message content to the post.php file using a 'POST' request. The content of the message, along with a timestamp and the user's name retrieved from the session, is then constructed into a html message, and appended to the log.html file, which serves as the chat log to store messages.

Additionally, PHP code periodically updates the chat by fetching the latest chat log from the server using AJAX requests. This eliminates the need for page refresh, displaying real-time updates of the chat conversion. Furthermore, a logout functionality is provided, allowing users to end their chat session and log out from the website. A "return home" link is also provided to allows users to go back and forth to the website from the chat without ending their chat session.

6.3 Functionality, accessibility , and security testing

6.3.1 Testing the functionality and usability of the website

Every specific function offered by a website to meet user requirements must undergo testing (Yu, 2019). This involves black box testing, which contains the following test items, (Yu, 2019): The visibility of texts that are shown on the website, the correct display of images, completeness of data on submission forms with proper validation, all links to individual webpages, data consistency in the database and existence of any output errors, and possible abnormal operations performed by users on the website.

This is known as functionality testing, a type of software testing that ensures the functionality of the system against the user requirements (Savage, 2022).

Functionality testing of the community website started with a thorough examination of Hyperlinks, buttons, and php redirects across all pages. Each link was reviewed to ensure ease of navigation. To aid this process, SiteChecker, an online tool accessible at https://sitechecker.pro/ , to detect any broken links (Free On-Page SEO Checker – Get Your SEO Score Now, 2024). By utilizing the free version of SiteChecker, a comprehensive list of links, including redirections, was generated, facilitating necessary adjustments to ensure full functionality of all links.

Furthermore, the textual content on the website underwent rigorous testing to enhance readability. Shorter sentences and appropriate font sizes were employed to improve comprehension, complemented by visually appealing backgrounds. A readability analysis tool from WebFX, was employed to assess the readability of each paragraph. The results, indicating an average reading ease of about 72.8 out of 100, confirmed the text's accessibility to most users.

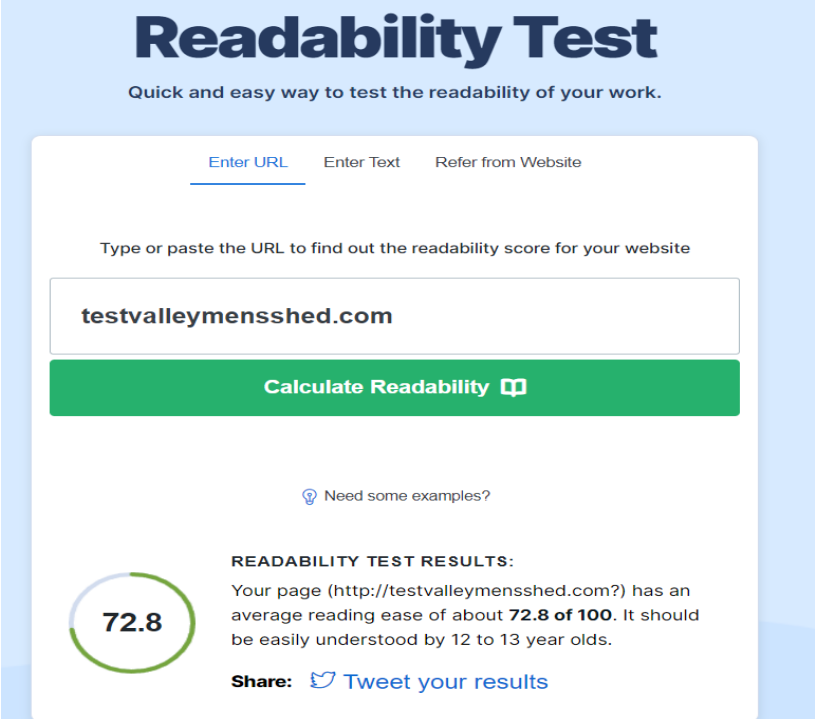

Figure 18 Screenshot of the readability test performed on the community website. Available at https://www.webfx.com/tools/read-able/

Similarly, responsiveness testing was conducted for all images using LT Browser, a software application designed to test responsiveness on various devices. Additionally, forms underwent thorough testing, simulating various user scenarios such as sending messages through contact forms and inviting fictitious members for registration. These tests involved entering invalid data, ensuring error message consistency, and reviewing compatibility across different web browsers and devices. Lastly, the functionality to add, edit, and delete projects was tested, ensuring accurate display on dynamic web pages while accommodating different user roles.

6.3.2 Testing the accessibility of the website

Accessibility testing refers to making digital content accessible for everyone, evaluating usability for people with disabilities that may require assistive technologies such as screen readers (Initiative (WAI), 2021).

To ensure accessibility to all users, the following elements have been integrated into the website:

1. Alternate text for images: Every image has been given appropriate alternative and title attributes to help define them.

2. Links and buttons: These have been given helpful aria-labels so that they can easily be found using assistive technologies.
3. Forms: Forms also have been provided with helpful aria-labels or labels before the form fields using <label>.
4. Colours and contrast: These can be carefully adjusted for better clarity and verified using website accessibility evaluation tools such as 'WAVE', found at https://wave.webaim.org/ (WebAIM, 2021), as well as colour picker tools from chrome's developer tool extension found at https://chromewebstore.google.com/detail/web-developer/bfbameneiokkgbdmiekhjnmfkcnldhhm (Web Developer, 2024)
5. HTML language declaration: HTML pages have their language defined in the head section.
6. Hidden Skip links to major sections of a web page were implemented to help assistive technologies navigate through the website.

To test this, the WAVE web accessibility evaluation tool was used to identify accessibility elements of the website and any further modifications such as aria-labels, missing alternative texts on images, contrast issues, and much more. Wave is an excellent accessibility tool that helps developers make web content more accessible to individuals with disabilities, offering precise details and locations on accessibility content on a web page in real time (WebAIM, 2021).

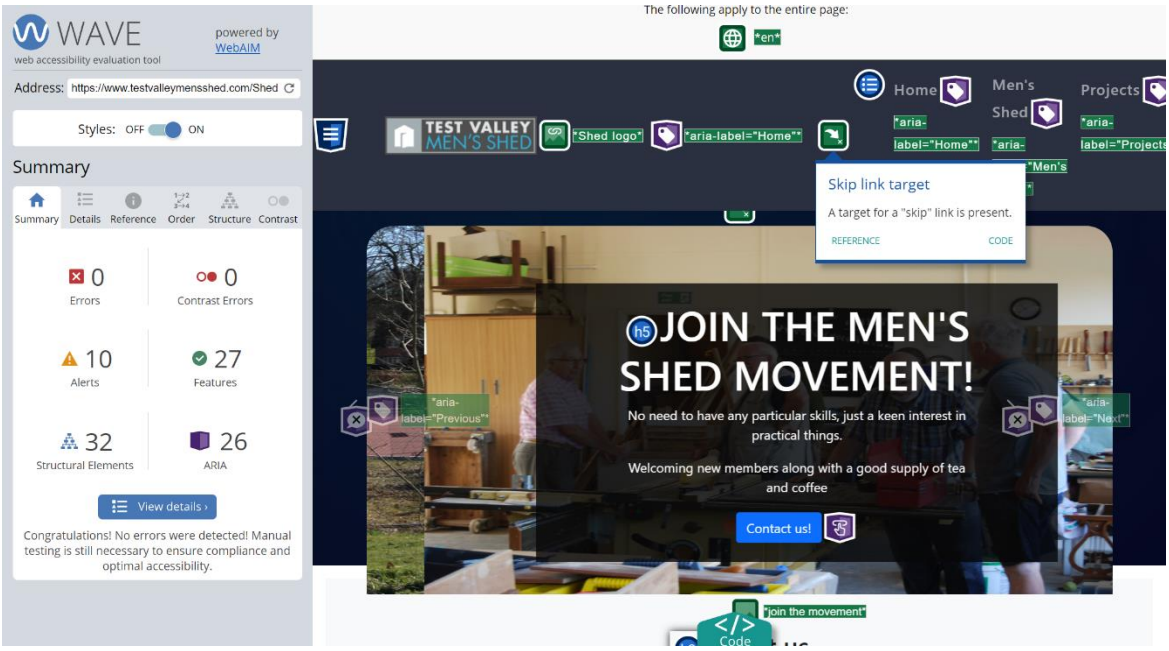

Figure 19 Screenshot of the web accessibility evaluation tool called WAVE to test the accessibility of the homepage on the community website. Available at https://wave.webaim.org/ (WebAIM, 2021)

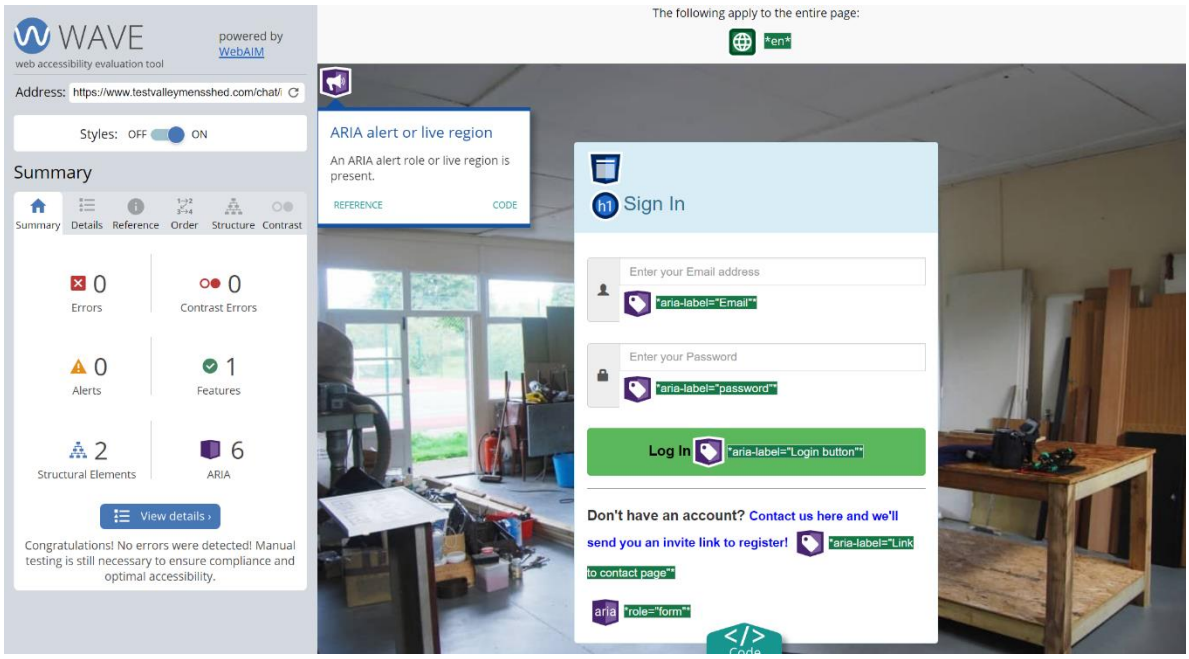

Figure 20 Screenshot of the web accessibility evaluation tool called WAVE to test the accessibility of the login page on the community website. Available at https://wave.webaim.org/ (WebAIM, 2021)

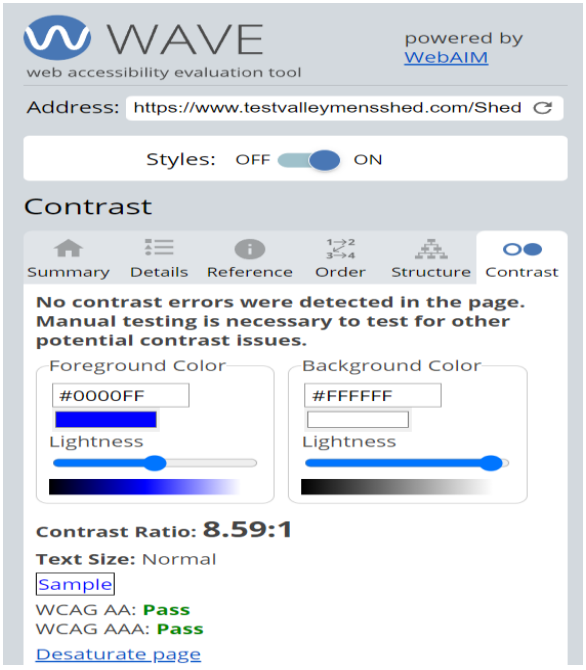

Figure 21 Screenshot of contrast page on the web accessibility evaluation tool called WAVE to test the accessibility of the community website. Available at https://wave.webaim.org/ (WebAIM, 2021)

While there is always room for improvement when to comes to making the website accessible for everyone, the site currently performs moderately well in accessibility testing in terms of contrast, alternate and title attributes on images, appropriate aria-labels on forms and links, as well as quick links to facilitate navigation to major areas of the web page using assistive technologies.

6.3.3 Testing the responsiveness of the website

The responsiveness of a website refers to its ability to adjust to difference screen sizes and viewports, allowing the website to be accessible from various devices such as smartphones, tablets, and laptops (simplilearn, 2015).

The most common screen sizes found in today's devices are: 1280x720 for desktops, 360x375 for smartphones, and 1280x800 for tablets (Kalachova, 2022). This information is useful to keep in mind when thinking about responsiveness for your website.

The bootstrap grid system consisting of containers, rows, and columns used throughout the community website has had a positive impact in terms of responsiveness. This, alongside some media query adjustments with custom CSS for specific screen sizes, has achieved a remarkable responsive layout on all pages of the website.

To test the responsiveness, a helpful emulator called Lt Browser was used. This emulator offers over 50+ devices to choose from for responsive website testing, with integrated project management tools. (Pros and Cons of LT Browser 2024, 2024). Other techniques used for ensuring responsiveness included free website scanning tools, and inspection of web pages via several browsers, adjusting the height and width as needed, to visualize the content responsiveness during development. Finally, the website was viewed on multiple physical devices such as an android phone, iPhone, iPad, desktop, and laptop.

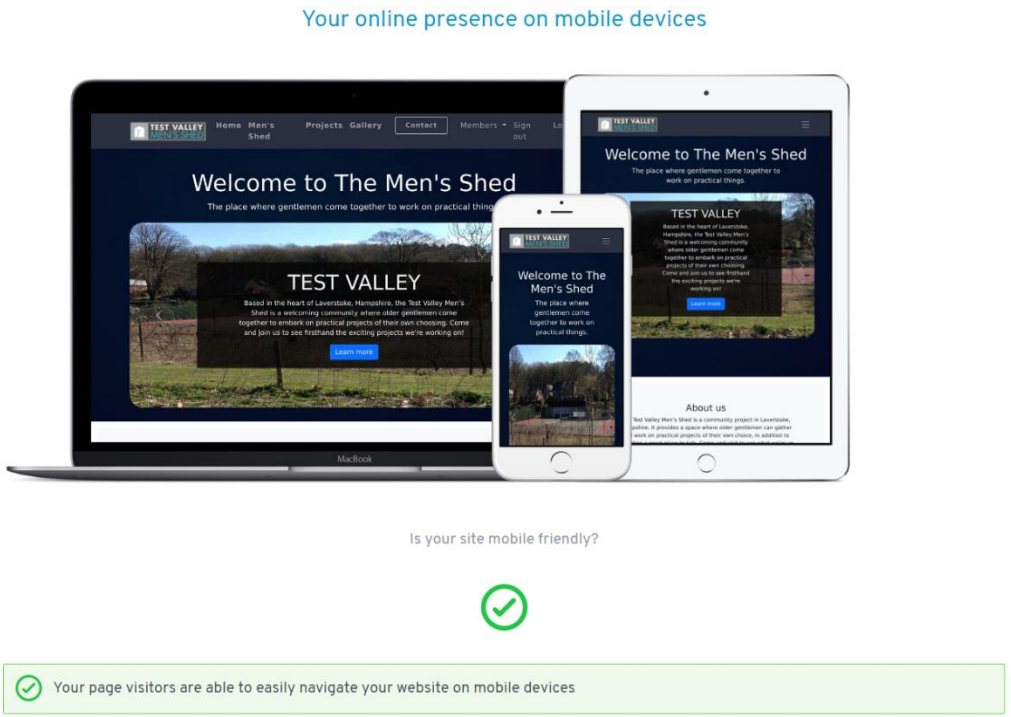

Figure 23 Screenshot of the responsiveness test result provided by a search engine visibility tool. Available at : https://www.ionos.co.uk/marketing/rankingcoach-result (Result of the SEO Checker, 2024)

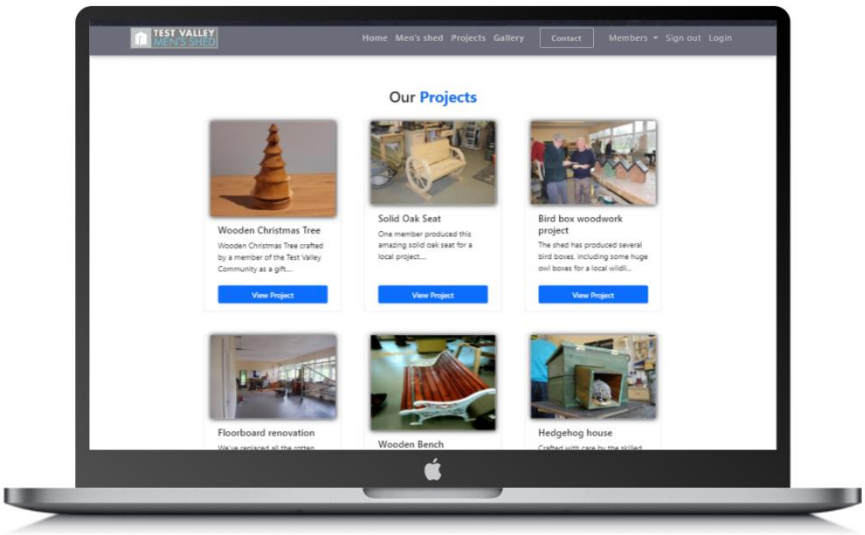

Figure 24 Screenshot of the projects page of the community website displayed on a MacBook via an emulator called LT Browser. Available at https://www.lambdatest.com/support/docs/lt-browser/ (LT Browser - Test Website For Responsiveness Easily | LambdaTest, 2023)

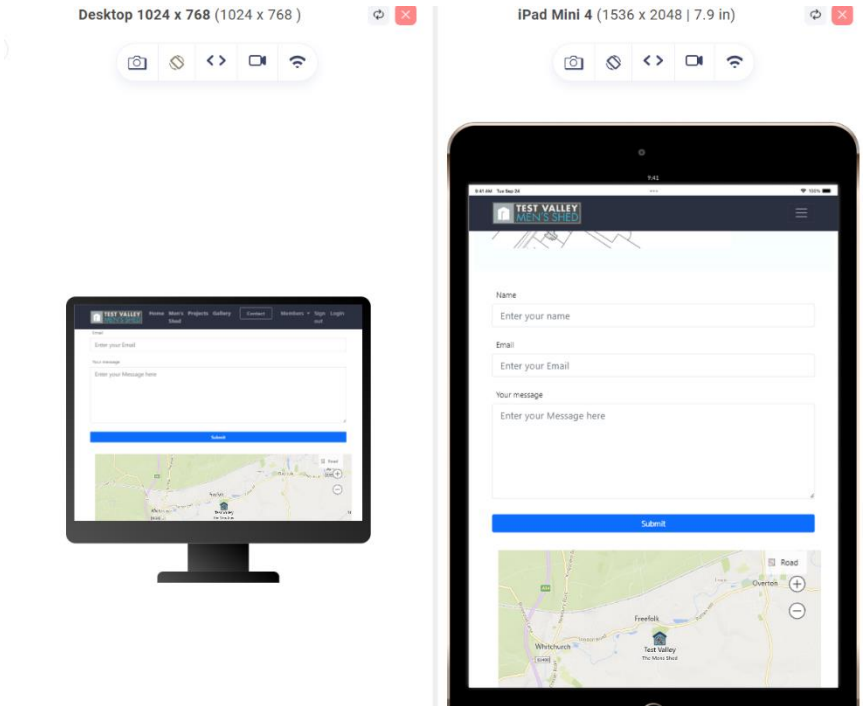

Figure 25 Screenshot of the contact page displayed on a desktop an iPad mini 4 via an emulator called LT Browser. Available at https://www.lambdatest.com/support/docs/lt-browser/ (LT Browser - Test Website for Responsiveness Easily | LambdaTest, 2023)

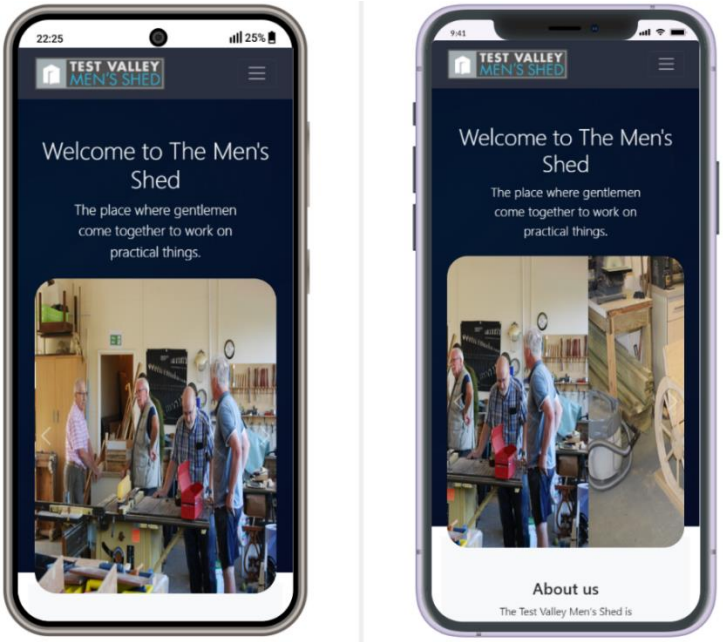

Figure 26 Screenshot of the homepage of the community website displayed on a Samsung galaxy and an iPhone Pro 12 via an emulator called LT Browser. Available at https://www.lambdatest.com/support/docs/lt-browser/ (LT Browser - Test Website For Responsiveness Easily | LambdaTest, 2023)

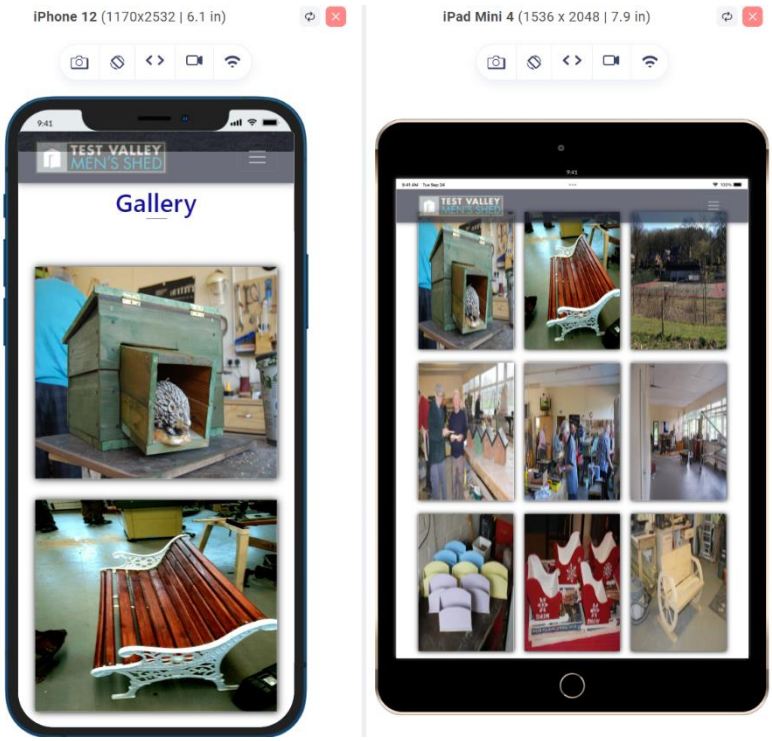

Figure 27 Screenshot of the gallery page of the community website displayed on an iPhone pro 12 and an iPad mini 2 via an emulator called LT Browser. Available at https://www.lambdatest.com/support/docs/lt-browser/ (LT Browser - Test Website For Responsiveness Easily | LambdaTest, 2023)

6.3.4 Testing the security of the website

The website provides security measures to protect user's data and potential threats. Passwords were checked to confirm they are securely hashed using PHP's password hash function , while user inputs are thoroughly sanitized via 'mysql_real_escape_string()' to prevent SQL injections. Further measures include session management and invite code verification using phpcode. Several scenarios were tested to ensure these measures were effective, ensuring access to restricted pages were redirected to the login page for unauthorised users. Members were invited to register and navigate the website, while attempts were made to access the registration page without a valid invite or with an invalid invite. This resulted in the page failing to load, accompanied by error messages indicating an absence of an invite code in the URL or the submission of an invalid one.

The hashed passwords that appear in the MySQL database were verified using a password Strength tester from the MalwareFox website (Passfault - Password Strength Tester, 2024) . As part of this process, a common unsecure password example, such as “password123” was input into the online checker. The resulting analysis indicated that it would take the computer less than a second to crack this password, thus highlighting vulnerability.

Subsequently, the hashed passwords from the database, with formatted strings like “$2y$10$zAlDyw1CR0/LqzAozfUOfumlzK” , underwent scrutiny using the same strength tester. The outcome revealed that it would take a computer centuries to crack these hashed passwords. This level of security confirmed the effectiveness of the hashing mechanism employed to safeguard user credentials within the website’s database.

Additionally, website security tools were used to scan the website for security vulnerabilities. These tools include the ‘Sucuri SiteCheck’ (sucuri.net, 2024), and SSL Trust’s Website Security Check (Free Website Safety & Security Check | SSL Tools, 2024) . These tools scan for malware and other potential security issues on a website. The results indicated no presence of malware or security vulnerabilities, affirming the website’s security against external threats. However, it is advised to remain vigilant and proactive in maintaining website security, despite the absence of detected issues.

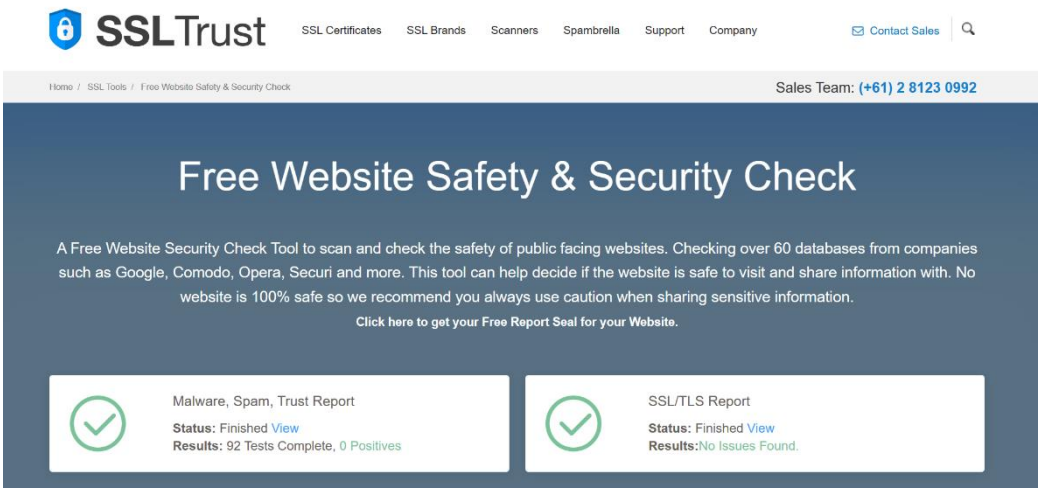

Figure 28 Screenshot of the safety & security check result, provided by SSL Trust’s website, for the community website. Available at: https://www.ssltrust.co.uk/ssl-tools/website-security-check (Free Website Safety & Security Check | SSL Tools, 2024)

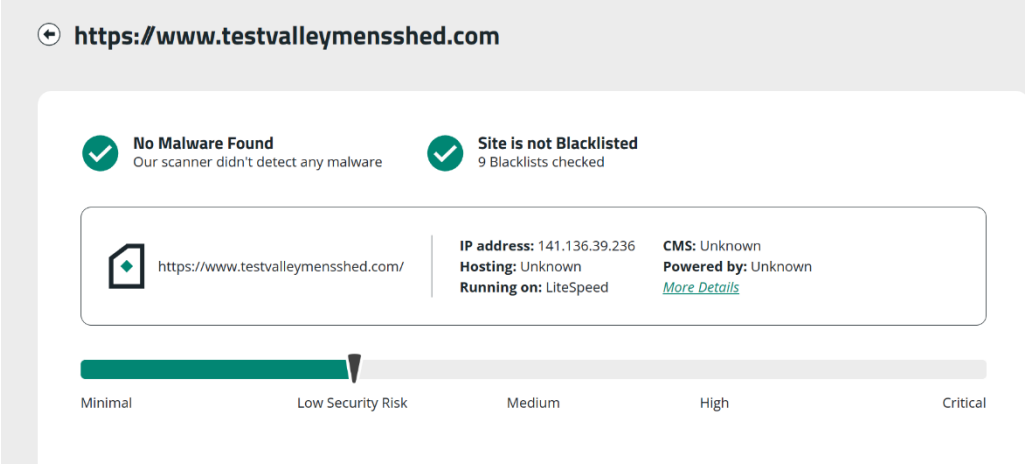

Figure 29 Screenshot of the security check result of the community website, provided by Sucuri SiteChecker. Available at: https://sitecheck.sucuri.net/. (sucuri.net, 2024)

6.4 Deployment and Hosting

After the website had been fully tested, the website was prepared for deployment using Hostinger as the hosting provider.

The first step involved creating an account on Hostinger and registering a domain name called “testvalleymensshed.com”. After this the settings were configured to the current version of PHP that the website is powered by (PHP 8.2) with the Apache extension.

Following, the website files current being help in a ‘htdocs’ folder on the local server, Xampp, were converted into a zip file and dragged into the ‘public_html’ folder of the Hostinger server using FileZilla. FileZilla is an FTP client used for file exchange between servers.

To setup the database, the data tables on PhpMyAdmin on my local server were exported and then imported on the PhpMyAdmin on the hosting control panel. A simple modification to the ‘connection.php’ file of my website was then necessary to connect to the new database. This simply involved a change in the username, password, and database name in the database connection information of the file, achieved using the file manager of the Hostinger control panel.

This ensured the Test Valley Men’s Shed website is accessible to the public with enhanced security, high speeds, and weekly backups.

7 LSEPI

Action has been taken to ensure the information and other resources used in this project are compliant with legal, social, ethical, and professional standards.

7.1 Legal considerations (GDPR)

The Data Protection Act 2018 consists of the following principles (GOV.UK, 2018):

- Lawfulness, fairness, and transparency: This principle refers to the procession of personal data. Information must be used fairly, lawfully, and transparently.
- Purpose limitation: Information must only be used for specified and explicit purposes.
- Data minimisation: Data must be used in a way that is adequate, relevant, and limited to only what is necessary.
- Accuracy: Information must be accurate and up to date.
- Storage: Information gathered must only be stored for the time that is necessary.
- Integrity and confidentiality: This principle refers to the way information is handled. Data must be handled appropriately , in way that is secure and protected, including protection against unlawful or unauthorised processing.
- Accountability: Data controllers are responsible for complying with the principles of data protection and must be able to demonstrate compliance.

The project of designing, implementing, and evaluating the community website ensures all data processing activities are conducted lawfully, fairly, and transparently in accordance with the Data Protection Act 2018. The website implements robust security measures to protect user data and mitigate potential threats, as evidenced by the secure hashing of passwords using PHP's password hash function and thorough sanitization of user inputs to prevent SQL injections. Furthermore, measures such as session management and invite code verification using PHP code are in place to enhance security. Rigorous testing of these measures through various scenarios has been conducted to ensure effectiveness, including attempts to access restricted pages without proper authorization, which resulted in appropriate error messages and page failures, reinforcing the importance of compliance with data protection principles.

The gathering of information, research, and visual content for the website adhered to proper referencing protocols. Consent for the utilization of all textual and visual materials featured on the website was diligently obtained from community members. This collaborative

approach ensured that all textual and visual materials featured on the website were utilized with permission, aligning with the principles of fairness and transparency. The website's content, including information about the community workshop's location, ongoing projects, and contact details, is accurate and provided directly by community members, ensuring relevance and reliability. Moving forward, the website will continue to uphold these principles by regularly updating information as circumstances change and maintaining accountability for data processing activities in like with GDPR requirements.

7.2 Social impact

The community website project has significant social impact, serving as a hub for fostering community engagement. One of its primary social implications is the facilitation of communication, interaction among community members and ability to attract new members. By providing a platform for individuals to share information, projects, and ideas, the website strengthens social connections within the community.

Furthermore, the project promotes inclusivity and accessibility by providing a space where members can participate and contribute to projects, regardless of background or status. This commitment to inclusiveness fosters a culture of mutual respect and cooperation within the community, enhancing overall cohesion and collaboration.

The platforms impact extends to people who are seeking connection, fulfilment, and engagement in practical activities. The platform fosters a sense of belonging and purpose among its members. For retirees and others passionate about woodworking, electrical work, or similar skills, the website offers a valuable opportunity to connect with like-minded peers. By facilitating these connections and providing a platform for collaboration, the website fosters a sense of belonging and purpose among its members, contributing to their overall well-being and satisfaction.

Feedback provided by community members regarding the website belongs to the individuals who submitted it. This approach ensures transparency and respects the valuable contributions of community members to the ongoing improvement and development of the platform.

7.3 Ethical considerations

Ensuring the privacy and protection of user data is paramount in the development and operation of the community website. This project adheres to the ethical principles by implementing secure features to safeguard information. These measures include obtaining informed consent from users before collecting personal data, implementing encryption and secure storage protocols to protect sensitive information.

The project is committed to promoting inclusivity and accessibility, ensuring that the website is accessible to all users, regardless of background or abilities. Ethical considerations include designing the website with accessibility features in mind, such as providing alternative text or images, ensuring compatibility with screen readers, and optimizing usability for users with disabilities.

Integrity and honesty are upheld throughout the development of the website, by providing accurate and truthful information to users, and openness in all communications and interactions within the community.

7.4 Professional standards

The project of designing, implementing, and evaluating a community website demonstrates a level of expertise and knowledge in website development. This expertise was used to craft a user-centric platform tailored to meet the diverse needs of the community.

Throughout the project lifecycle, autonomy and decision-making authority across various areas were exercised. This autonomy empowered decisions aligning with project objectives, while assuming accountability for project outcomes.

The project prioritizes ethical standards such as data privacy, consent, and inclusivity to ensure the website serves as a safe and respectful online space for community engagement. Adherence to these ethical principle's underscores project's commitment to ethical conduct and responsible community engagement.

Furthermore, the project is cantered around fostering an online community, facilitating a means to achieve a sense of belonging to members of the community, with shared interests and collaborative endeavours. This enhances overall cohesion and effectiveness.

Lastly, engagement in the project reflects a commitment to continuous learning and professional growth.

8 Project Evaluation

The project aimed at designing, implementing, and evaluation a community website for the Test Valley Men's Shed has been an overall success. Employing a structured project management approach following the Software Development Life Cycle (SDLC) ensured the fulfilment of all initial project objectives. These objectives included comprehending community needs, creating, and deploying the website, assessing its usability and accessibility, implementing security measures for data integrity , and ensuring responsiveness through evaluation tools and emulator software. Additionally, the project involved acquiring new technologies and skills through online courses, benefitting career growth as a developer.

The choice of technologies worked very well. PHP is a strong back-end programming language that was able to handle most complex tasks, resulting in a strong back-end performance with communication to the MySQL database. In reference to the Front-end, Bootstrap is a highly recommendable CSS framework that ensured tremendous responsiveness of the website, due to its sophisticated grid system. JavaScript accomplished tasks that proved more challenging with PHP, such as a fade out effect for error messages after a certain amount of time, and faded scroll effect of the navigation bar.

Challenges during this project included programming of the invitation system with use of PHPMailer, ensuring the additional security the website required. This was a great success upon completion, with invaluable skills gained from the process.

Working with a real community also was a positive experience, understanding community needs and tailoring a fully functioning responsive website that met their requirements. Upon completion and deployment of the website, positive feedback was received via the established online survey and email correspondence, from members of the community.

The survey indicated high satisfaction with the website. Members rated the ease of navigation as extremely easy to use, with most finding it easy to understand the information provided. Additionally, the website performed excellently on mobile devices in terms of responsiveness. The overall experience was rated highly, with most users giving it a rating of 9 or 10 out of 10. Users appreciated the clear text, attractive visuals, and the convenience of accessing project information. Some users also noted that the website helped raise the community's profile, leading to increased support from local authorities.

Please see appendix A for survey results and website feedback.

9 Conclusion

The successful completion of the Test Valley Men's Shed community website represents a significant achievement, providing the community with a fully functional and responsive online platform. Utilizing a structured project management approach and incorporating PHP, the bootstrap framework, JavaScript, and MySQL database technologies, a solution was delivered that met the community's goals and requirements. Testing methods ensured the website's security, functionality, accessibility, and responsiveness, providing an excellent user experience.

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Appendix A

Survey Responses

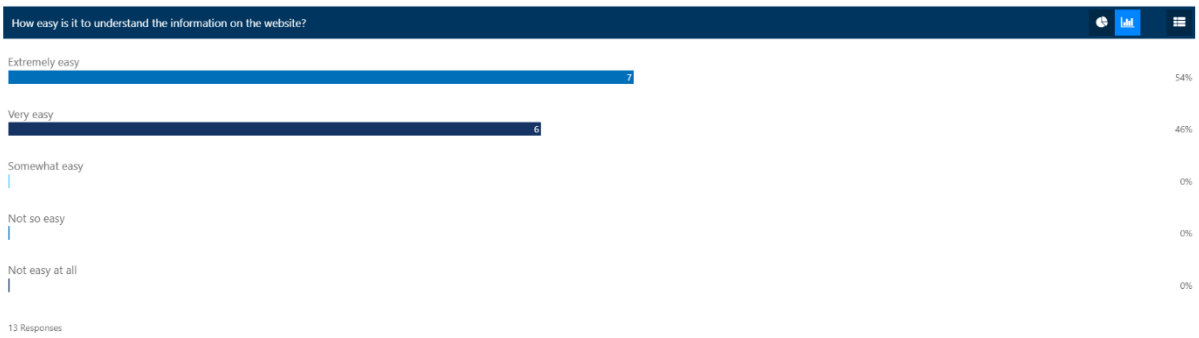
This Appendix shows the responses received from users regarding the Test Valley Men's Shed community website, available at https://www.testvalleymensshed.com/ (Test Valley, 2024). This was produced using an online feedback survey called Supersurvey, created at https://www.supersurvey.com/ (Survey Maker, 2024).

In summary, the survey indicated high satisfaction with the website. Members rated the ease of navigation as extremely easy to use, with most finding it easy to understand the information provided. Additionally, the website performed excellently on mobile devices in terms of responsiveness. The overall experience was rated highly, with most users giving it a rating of 9 or 10 out of 10. Users appreciated the clear text, attractive visuals, and the convenience of accessing project information. Some users also noted that the website helped raise the community's profile, leading to increased support from local authorities.

Question: How would you rate the easy of navigation on the website?

Appendix A 1 Screenshot of survey response, Question: *How would you rate the easy of navigation on the website* , produced using an online feedback survey called Supersurvey, created at https://www.supersurvey.com/ (Survey Maker, 2024)

Question: How easy is it to understand the information on the website?

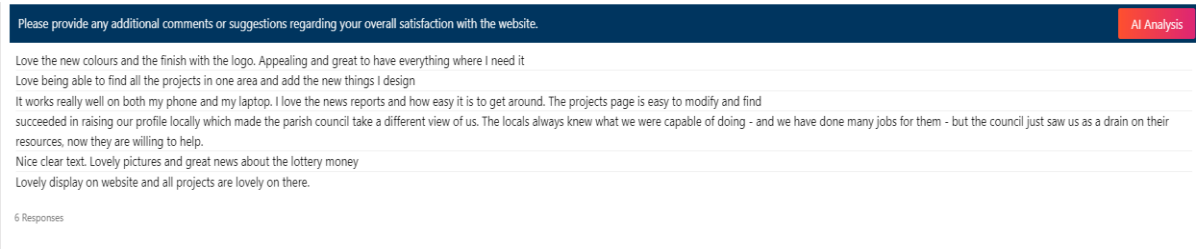


Appendix A 2 Screenshot of survey response, Question: *How easy is it to understand the information on the website?*, produced using an online feedback survey called Supersurvey, created at https://www.supersurvey.com/ (Survey Maker, 2024).

Question: How well did the website perform on your mobile device in terms of responsiveness?

Appendix A 3 Screenshot of survey response, Question: *How well did the website perform on your mobile device in terms of responsiveness?*, produced using an online feedback survey called Supersurvey, created at https://www.supersurvey.com/ (Survey Maker, 2024).

Question: Please provide any additional comments or suggestions regarding your overall satisfaction with the website.



Appendix A 5 Screenshot of survey response, Question: *Please provide any additional comments or suggestions regarding your overall satisfaction with the website*, produced using an online feedback survey called Supersurvey, created at https://www.supersurvey.com/ (Survey Maker, 2024).

Appendix A 4 Screenshot of AI analysis of user feedback comments, produced using an online feedback survey called Supersurvey, created at https://www.supersurvey.com/ (Survey Maker, 2024).