Technical Specifications

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Appendix:

1.Introduction

1.1 Abstract

"Hobby Project Generator " is a web application that supports browsers that runs .NET framework 5 and the upcoming .NET 6. The application finds and recommends projects based on the users' available tools and preferences.

1.3 Scope

"Hobby Project Generator" is a web application that is intended to recommend physical projects to hobbyists based on the available tools as well as their preferences. In addition, the application serves as a place for users to post personal projects with step-by-step guidance for others to follow.

Our web application is currently limited to the North America region only with language support only for English.

1.4 Technical requirements

1.4.1 Operating Systems

Operating system to run our web application with normal behavior:

+ Windows 8, 10 64-bits
+ Linux distribution: Ubuntu, Kali, Debian 64-bits

1.4.2 Web browsers:

"Hobby Project Generators" require Chrome browser version **94.0.4606.61** and the latest version of Chrome as of **05/20/22**

1.4.3 Hardware requirements:

Minimum hardware requirements:

● CPU: Intel Pentium or AMD FX Series
● 3GB Ram
● Graphics: Intel HD graphic

Recommend hardware requirement:

● CPU: Intel 7th generation or AMD Zen 2 architecture
● RAM: 8GB
● Graphics: Intel HD graphic

1.5 Non-goal

- We will not be supporting a mobile application to access the website

1.6 Future goals

The addition of software projects along with the addition in the set of user's preferences and skill sets to accommodate software projects. The web application also recommends projects to users based on programming languages they know such as Python, C++, C, Java, ...

Product recommendation feature where users will be presented with links to third party sites to buy tools that are required for projects.

1.7 Assumptions and Dependencies:

The operating system is assumed to be functional and stable internet connection

2. Technology Stack

2.1 C# Programming Language

2.1.1 Why use C#

- Most web applications are developed using C# due to its compatibility with the .NET framework
  - The language and framework were created by Microsoft
- An advantage of C# is the faster development time with a large library. It also has high scaling capability
- Another advantage is that C# has fewer problems that involve memory management
  - An example would be memory leaks through the use of automatic garbage collection

In addition, C# also comes with disadvantages. C# has a lot of libraries that provide a lot of functionality. Coders then can use these tools for development if they know what they are doing.

Furthermore, C# is tied to the .NET framework which tends to prefer parallel processes. Although having parallel processes increases productivity, it creates race conditions and will require mutex locks and semaphores to ensure data integrity. For our web application, there will be microservices that run simultaneously as individuals

processes therefore ensuring data integrity and communication between different processes will be crucial.

2.2 ECMAScript 11+ / TypeScript 4+ Language

2.2.1 Why use ECMA 11+ / Typescript4+

- Both support many different web browsers and web applications, but specifically, it works well with Chrome.
- TypeScript takes advantage of Intellisense in Visual Studio Code, this helps with finding common errors and correcting them quickly
- Both can safely refactor and rename files.
- TypeScript is compatible with ECMAScript and allows any .js file to be renamed to a ".ts" file and run through the compiler.
- ECMAScript supports backward compatibility so that JavaScript code and syntax will also run on it.

ECMAScript 11 also comes with disadvantages. Javascript is mainly used for web development and built based on the standards set by ECMAScript. Javascript source code of "Hobby Project Generator" will be visible to everyone which can then be used for malicious purposes. This can cause a security issue for our web application.

2.3 HTML5

2.3.1 Why use HTML5

- Used to create pages and layout of our web application including the headers, paragraphs, and infographics of our web application.
- HTML5 is usually combined with CSS and Javascript to format the appearance of our web application
- It has become a standard language for building anything on the web
- HTML5 replaced Adobe Flash Player because it has fewer security issues

On the other hand, HTML5 also comes with disadvantages. HTML5 can only run with modern browsers such as Google Chrome, Firefox, Microsoft Edge, … which will limit the accessibility of our web application to only modern web browsers. Furthermore, ensuring the website's consistent appearance across different devices from desktop to mobile devices can be a hassle with HTML5. Although we are not currently supporting mobiles' web browsers, this would become a testing and maintenance issue as our project expands and grows to allow more accessibility.

Typescript is not a true type declarative language like Java, C++ which can cause problems when compiling due to the editor does not check for the correct type.

2.3.3 HTML5 History API

We are using HTML5 History API because we are implementing a SPA design pattern for project "Hobby Project Generator" which only has one HTML page being

sent to the user. Requests after the initial HTML page will not be responded with a separate HTML page but a portion of it. Having the HTML5 history API allows us to track which portion of the HTML page will need to be loaded for the users.

Similar to HTML5, HTML5 history API only supports modern web browsers which again limit the accessibility of our web application to only users with modern web browsers.

2.4 CSS

- Formats the appearance of our web application "Hobby Project Generator" along with HTML.

Similar to HTML, CSS works differently depends on the browsers that are being used. This would cause testing issues as "Hobby Project Generator" expands to support more browsers to support the increasing user base.

2.5 Front End Language:

2.5.1 Why use React?

React is a Javascript Library that is used to develop a graphical user interface (GUI) of web applications.

Pro:

- It has high scalability
- It has continuous support for large libraries and is maintained by a Facebook corporation
- It is on par in terms of speed with its biggest competitor Vue
- React can be used for rendering on the server-side
- Many websites with large user bases use React as their foundation

React also comes with many disadvantages such as not being an open-source software like Vue does. This could mean that if React becomes a proprietary language at some point, our project will have to face with spending fee to keep using it or to change to a different front-end library like Vue.

2.6 Backend Framework .Net 5+ / 6+

2.6.1 Why use .Net Framework?

- Increases compatibility between old and new applications
- .Net Framework is not language-dependent and can support all data types along with their constructs.

- Supports memory management tasks by taking care of garbage collection on the heap using a garbage collector.
- .Net framework supports languages with static typing such as C, C++, C#, Java, ... and it also supports dynamic typing languages like Python.

.NET framework's downside would be that its ecosystem is only limited to Microsoft products. This means that using the .NET framework for "Hobby Project Generator" will make the web application dependent on Microsoft products and can be subject to licensing fees if Microsoft changes its policies. In addition, the development team of our web application will have less control over the framework since it is not open source.

2.7 Data Store

2.7.1 Why use SQL server 2019 Dev/Express Edition?

- SQL Server 2019 can be installed just by running an executable making the installation process simple and convenient.
- Supports data encryption using symmetric or asymmetric keys for increased security.
- Most commonly used database system.
- Free for education purpose

On the other hand, the software can come with a very expensive licensing fee. That means that if our project expands beyond college and makes a profit (if we do monetize it). We have to face paying expensive licensing fees to operate and maintain our web application.

2.7.2 What is SQL Server Management Studio?

SQL Server Management Studio is a software application with graphical user interface design to interact with the servers that run SQL. It is used to access data that is stored within the server. Configure the server as well as providing other administrating tools.

2.7.3 Why use SQL Server Management Studio?

- Designed for use with SQL Server
- Gives us the ability to access data, configure server settings, and administrating tools

SQL Server Management Studio is within the Microsoft ecosystem which means it is improved and maintained by Microsoft and our team does not have a lot of control over the software.

2.8 IDE

2.8.1 Visual Studio Code 1.59+

Visual studio code is a code editor designed for windows, linux, and MacOS. It is optimized for debugging and building web or cloud applications.

2.8.2 Why use Visual Studio Code 1.59+

- It was developed by Microsoft, so each version that releases expects to be stable.
- Community support has turned it into one of the best code editors that rival IDE's and it supports virtually every language.
- Built-in version control support that is compatible with Git and Github.
- Supports code completion to save time from typing whole functions, variables, class names.

In addition, VS Code does not have strong community support. It also requires a lot of plugins to run external different programming languages. New releases of VS codes are also not very stable. More prone to error since Intellisense sometimes does not pick up on the error before compiling.

2.8.3 Visual Studio 2019 Community Edition

Visual studio community edition is a robust IDE designed by Microsoft. The IDE contains a code editor, debugger, compiler, and a wide array of tools to assist in software development.

2.8.4 Why use Visual Studio 2019 Community Edition

- Built-in support for C family languages compared to other IDE.
- Developed and used by Microsoft, this ensures that using Microsoft languages and frameworks will work well together.

Visual Studio Community edition is a bit heavier weight compare to Visual Studio Code. Similar to Visual Studio Code, Visual Studio Community edition is also developed and maintained by Microsoft and it belongs to the Microsoft ecosystem.

2.9 Web Server

2.9.1 What is IIS 10+?

IIS is web server software to provide interaction and configuration with the server developed by Microsoft. IIS supports many different connection protocols including HTTP, HTTPS, SSL connections that use asymmetric encryption. IIS provides the basic functionality that is expected of a web server such as handling requests, authorization and authentication, …

2.9.2 Why use IIS 10+?

- Support .NET application
- Easy to update and install.
- IIS can be updated along with Windows update.

2.9.3 What is Apache HTTP Server 2.4+?

- Apache is an open-source web server software maintained under the name of Apache Software Foundation(ASF). The ASF consists of a group of contributors that go by the name of "Apache HTTP Project Management"(PMC). The PMC now determines the direction of the project. Apache is cross-platform and has support for many protocols such as HTTP, HTTP/2, and HTTP with OpenSSL certification(HTTPS). It also is able to handle everything that a web server should be able to do such as handling requests, authorization and authentication.The latest stable revision **2.4.49** was released on 09/16/21.

2.9.4 Why use Apache HTTP Server 2.4+?

- No cost association with the use of the webserver.
- Supports all of the industry-standard web protocols.
- Cross-platform ensures that the webserver will work on the three main Operating Systems(Linux, Windows, macOS).
- Static websites can be easily done when using technologies such as TypeScript 4+ with HTML.
- Allows for connection through a proxy where network rules of who can connect to the server can be set.

2.9.5 Analysis between IIS and Apache and Conclusion

Although both IIS and Apache can be used for our project "Hobby Project Generator", there are certain features that Apache has that will satisfy our requirements. As mentioned in the scope section of our project, we will only be supporting the North America region which will require the use of a proxy. Currently, only Apache web server software supports proxy and IIS does not which is a crucial part of our web application.

In addition, Apache is designed and developed by a dedicated community that respects free and open source which means that it will have a tendency of staying as a free software. On the other hand, IIS is developed by Microsoft corporation which tends to have a tendency to monetize their product. This means that our project is safe from monetization if Microsoft decides to charge for their web server software.

In conclusion, we chose Apache because we need the ability to use proxy to region lock our web application to limit the scope. With a dedicated community that supports Apache as well as the open source nature of the software which give it the advantage over the IIS.

2.10 Web Browsers

2.10.1 Chrome Internet Browser 94.0.4606.61 and latest version of Chrome as of 05/20/22 (64-bit)

Chrome browser, version 94.0.460661 is required for minimal support with our application.

2.10.2 Why use Chrome?

- Chrome has the most market share in terms of browser.
- It is compatible with all OS platforms and comes standard on ChromeOS.

2.11 Virtual Servers

2.11.1 Amazon AWS Lightsail

- Provide hardware to host our web application while still allow us to have high control over the server.
- Easy to scale depends on the project needs as the development process advance.
- No need to buy our hardware and put together the server.
- Lower management cost if we decide to change hardware that runs our applications.

Lightsail service offer by Amazon also comes with drawbacks. By using Amazon hardware, our web application security is dependent on Amazon's security. In other words, we cannot implement our security to protect the server. This works great for small projects and start-ups since it requires less capital but for a large corporation, this can be a huge issue to protect trade secrets.

2.12 Domain Name and SSL certificate:

2.12.1 Let's Encrypt Certificate Authority

- Obtained SSL certificate for a domain name through the virtual server by Lightsail.
- Free of charge for the certificate authorization
- Included with Amazon Lightsail service for better combability
- Increase the security of our website through OpenSSL security standards.

2.12.2 Namecheap domain name

We are using Namecheap domain name provider because they allow one free domain name per student account which we can then obtain for our web application. The downside of this would be that our web application is dependent on our access to

the student email account. This means once our team no longer has our student email accounts, we will have to pay to keep the domain name for our web application.

2.13 Authentication and Authorization

2.13.1 Why use Auth0 API?

- Ensure safe and secure login for users that create an account on our web application
- Decrease development time for our web application.
- Password store by Auth0 will not be in plain text.
- Free service for a smaller customers base.

As our "Project Hobby Generator" grows, the user base will also increase which means we can no longer use their service as free but have to opt-in for the monthly subscription. Furthermore, we don't have control over the security that is used to protect the username and password of our user base.

2.13.2 Why use OAuth2?

We are using OAuth2 because it is the standard authorization protocol that is used in the industry. OAuth2 provides a framework to protect our data as well as our users. On the other hand, OAuth2 does not mandate a secure connection between the user and the server; therefore, the tokens that are sent through the connection are vulnerable to a man-in-the-middle attack.

3. Technology used for Project:

3.1 Version Control:

3.1.1 Github website

- We use Github to store documents and in the future the source code of our project.
- Github allows us to track changes between each version of our files through the use of commits.
- Collaboration and code testing is made easier by branching features and merging them.

3.1.2 Why use Github Desktop Client Version 2.9.3+ (x64)?

- Setting up a local repository to track local changes while being able to send changes to the server at any point.
- Graphical user interface allows for smoother version control when pulling, pushing and committing code.

● Built-in code differential feature allows us to solve merge conflicts

3.2 Communication Service:

3.2.1 Gmail

● Gmail is used for written communication between team members mainly using email.
● Sign in to utilize other services provided by Google such as Google Doc, Google Drive,

Although Gmail is a widely used emailing service, the application is known to mine user data and collect actionable data for their own usage. This could be for personalized advertisements or providing services that are personal to the user. As our communication involved passing around documents that are necessary for the origination of this website, Gmail could easily take the document as part of their data collection. Communication through Gmail is not encrypted but stored on the server as plain text.

3.2.2 Microsoft outlook

● Use for written communication between team members and the class instructor.

The negatives of using Outlook as our alternative method of emailing was that the security of outlook is not as well-structured as Gmail. To encrypt emails, outlook requires the user to turn on the option in the settings. The many features Outlook provides makes it difficult to do simple tasks such as replying to all CC'd and recipients.

3.2.3 Discord version 0.0.309+

● Discord is used to increase response time between team members since it is a real time chat service
● Main communication service utilize by the team
● Hold Scrum daily meetings through Discord calls.

Discord provides multiple features of communication, but caps users to a maximum upload size of 8MB, unless the user chooses to upgrade to nitro. However, this upgrade would need to be done for each member of the group as the upgrade is individually given. Other forms of limitation include the stream picture quality and voice quality.Communication through discord are not encrypted but stored on the server as plain text.

3.3 Document editor

3.3.1 Google Doc

● Use to write software documentation

- Record Scrum meeting minute.
- Changes are synchronous and allow multiple editors to work on at the same time.

3.3.2 Google Sheets

- Make an appropriate schedule for daily scrum meetings and deadline tracking.
- Changes are synchronous and allow multiple editors to work on at the same time.

3.3.3 Draw.io

- Used to make diagrams for our High Level Design, Site Map documentation.
- Make illustrations such as decision tree.

3.4 Workflow tools

3.4.1 Jira software

- Keep track of tasks and sprints by setting deadlines for tasks and sprint duration
- Log individual time spent on each task

3.4.2 Jira Mobile Application version 81.1.6+

- Convenient tasks and sprint tracking through the mobility of the application on mobile devices.

3.4.3 Slack Communication Software

- Real-time communication between individuals and groups that can be accessed via desktop or mobile applications.
- Useful in connecting groups working on large projects using dedicated channels or direct messaging.

3.5 Operating System:

3.5.1 Microsoft Windows 10 (64-bit)

- What we used to build the project:
  - Windows 10:
    - Version 21H1 build 19043.1237+
    - Version 20H2 build 19042.1237+
  - Windows 11:
    - Version 21H2 build 22000.194+
- One of the most popular operating system with intuitive graphical user interface
- High compatibility with desktop applications and web browsers such as Chrome version **94.0.4606.61+**

3.6 Web Browser

3.6.1 Chrome Client version 94.0.4606.61+ (64-bit)

● Used to access web applications that we use for written communication (email service), version control web service, documents editor, and workflow web application Jira.

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