Report:

Summary:
The web application is built with Javascript for both front and backend, alongside with HTML and CSS. The technology used for testing is Jasmine. The features include listing products, adding new products, adding items to the cart, removing items from the cart, adding discount, and synchronously displaying prices before and after tax.
Url for the app: https://csc301-fall-2022.github.io/assignment-2-93-zijin523-jess-zhai/src/checkout.html

1. UI/frontend:
React, **HTML (JavaScript)**, Angular
We have considered three technologies to use for the front end of this web application: React, HTML (JavaScript), and Angular. We have selected to use HTML with CSS.

Comparing the ease of development: Since one of our members is familiar with html, it is the best choice for him to write this price-checker. The other member is unfamiliar with Javascript and html, so we decided it would be best to go step by step and learn basic html syntax before moving on to more advanced functionalities. None of us was familiar with Angular and it is hard to get hands on. Plus, because we decided to use React for our project, we did not choose to learn Angular for this assignment. React is comparatively easier to learn than Angular, it allows clear structure and makes the app easy to maintain and change, but we decided that html and css would be a great first step. Familiarizing with html and css would be a great help when learning React. Therefore, our frontend was Javascript, html, and css. Angular is based on JS and TypeScipt, while React uses JSX - a way to use html in JavaScript(freeCodeCamp, 2020).

Maturity of the technology: HTML was released in 1993, it is often used with Javascript and it only focuses on how the web page will look like. Javascript was released in 1995, only minor changes were released in the past few years. React was released in 2013, and Angular was released in 2016 (Google, 2022).

Domains covered by the technology: Angular has a collection of libraries (even though no additional library is needed and restricts how the application should be designed, it is component based and has model, controller and view structure. React mainly focuses on the UI, and forces to use libraries, it is also component based but only support view. HTML and CSS only focuses on the look of the webpage, and javascript could be used on both frontend and backend(freeCodeCamp, 2020).

Popularity: From JetBrains Developer Ecosystem report, Javascript is the most popular language(JetBrains, 2021). React is the most used library for front end, and while Angular has a large community as well, it can not compare with React.

Performance: React is designed for single-page web applications, it is robust and flexible with reusable components. When pages have interactive components, Angular becomes slow. Angular is optimized with change detection, and React is optimized with virtual DOM.

2. Logic/backend:
Python, **Javascript**, Go
Even though we used Javascript for both tech stack, we did consider several other tools for the backend.

Ease of development: Both members have experience with Python, but none have used Go before. Go is easy to learn, but both members in this assignment will work on the front end of the final project, therefore we did not select it. Go is a statically typed language that binds the variables with their type, and python give more freedom of code when interpreting. One of our members has some experience with Javascript, and since the final project uses React, learning Javascript in this assignment would be a great help.

Maturity of the technology: Python has more than 137000 libraries / packages (Google, 2022), and three main types of framework: full-stack, micro-framework, and asynchronous, easy to use and efficient. Go was released in 2012, it has a standard library to satisfy most backend needs, and it has many open source packages. JavaScript has more than 80 libraries including popular ones like React, Vue for the frontend, and jQuery for the backend(Google, 2022). JS uses npm as library manager, and has more than 350000 packages.

Domains covered: For web application development, even though Python is mainly used for backend (Django), it could be used in the frontend as well (with pyScript). It could also be used for machine learning, GUI, game development, data analysis and graphing, etc (Marek, Joanna, Paweł, & Andrzej, 2020). Go is backend only and could be used for system programming, machine learning, cluster computing etc., which requires robustness and safety. JavaScript is both front and back end, it can add interaction to web pages, build web or mobile apps and servers, and could be used for game development (Marek, Joanna, Paweł, & Andrzej, 2020). It's Node.js library is event driven, while python is not, and would have to use CPython module (Nihar-Raval, 2022).

Popularity: Python was the mostly used one overall (Java is the most used main language), Go is gaining popularity quickly (top 5 languages developers want to migrate to) and is used by companies like Google, Amazon, Facebook, etc (JetBrain, 2021). Javascript is not commonly used as a backend even though it is capable. As of January 2022, Django and Flask of Python has been the most popular technology for web backend development (statsCanada, 2022).

Performance: when used as a backend and without jQuery, JS would get messy very quickly as the project grows in size. Python and Go would be clear and simple, easy to change and maintain. Go is lightweight and procedural, mainly for building an API, while Python is object oriented and mainly used for backend of web applications. Go has an inbuilt concurrency handling, so it would handle requests faster than Python (held back by its diverse types and takes longer to interpret code) (Marek, Joanna, Paweł, & Andrzej, 2020). JavaScript's processing time is very quick compared to Python using Node.js, as it is a compiling language.

3. Database

MongoDB, PostgreSQL, Oracle RDBMS

We did not use database technologies in the assignment to keep it simple. However, to store what the user selected in the cart and to robustly store all the products, a database will be needed.

Ease of Development: MongoDB is easy to learn, efficient and flexible. PostgreSQL is also beginner-friendly, and Oracle is relatively harder without knowledge in Linux and SQL. Plus, Oracle is a closed database, while the other two is open sourced (Smallcombe, 2020).

Maturity of technology: Oracle was released in 1979, MongoDB was in 2009, and PostgreSQL was released in 1996 (Google, 2022).

Domain: Oracle is an RDBMS that is object-relational, while postgreSQL is a relational database which supports both SQL and JSON. MongoDB is a non-relational database, and uses BJSON that support floats, long, and date datatypes (Geeksforgeeks, 2020). Oracle has better security features than PostgreSQL, and it is compatible with Solaris, Linux, OS X, and Windows. MongoDB supports Solaris, Linux, OS X, Windows, AIX, and HP-UX (Geeksforgeeks, 2020).

Popularity: Oracle is the most popular one as of August 2022, PostgreSQL and MongoDB have similar popularity (Google, 2022). But Oracle costs money and is less available for us.

Performance: Oracle provides more transactions per second than postgreSQL and mongoDB (Statista, 2022). PostgreSQL is more compatible with operating systems. PostgreSQL allows free expension of dataset, and any size of data could be stored. MongoBD processes large volumn of data as the data is semi-structured(Geeksforgeeks, 2020).

We would choose to use MongoDB if we're to move a step further. MongoDB allows management of flexible data structure, supports cloud storage, and uses document data model that is easy to use for application developers.

Reference:

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