YEAR IN COMPUTING PROJECT REPORT

COMP5800

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Enjoyable Research for Students

Introduction

For my project, I have decided to create a research website which targets university students as users. The purpose of this website is to make the research process enjoyable for students, to increase their academic ability; providing a trustworthy platform they can rely on. Students can search for articles, books or reports; find and download them through keywords and access them for their assignments. They also have the option to purchase hard copies of the material. To make the research experience for students more efficient, I designed a platform that is tailored to their needs. Therefore, it is different in comparison to the majority of research websites as its creative direction is user centred to emote amusement rather than seriousness; focusing on visual stimulation through imagery and colour (Nielsen,1990).

During this Year of Computing, I have enjoyed the computer lessons and assignments attained in the web development process. For instance, I appreciated the "Capstone Project for a PHP Website" and the "Simple Web Pages" assignments. In these assignments, I had to design and format a simplistic website and utilise PHP to access a MySQL database and display the results of SQL queries on the web pages. I am a creative person so these activities were captivating as I was able to be hands-on and in control of the creative process. I also liked the formulation aspect of coding, putting the pieces together that can create an entire entity. As a result, I decided to focus on creating a website which allows me to be creative while coding. The programming languages, HTML, CSS and JavaScript in the first term were fascinating (Robbins,2012). Therefore, I wanted to strive to practice these languages and go deeper to explore their higher levels; how to implement them and create an effective, interactive website.

The project concept was formed through my three years as a Social Sciences student, where a majority of my assignments were heavily based on research techniques. I had the responsibility of finding the necessary evidence for my essays and arguments. Based on my personal experience of this process, I have had potent moments where the experience has been either a struggle or inefficient. Thus, this was the motivation for my project. The overall outcome I desire is for my work to be implemented within university culture to help students who study courses that are heavily based on gathering high-quality evidence without the process being time-consuming or daunting. Conducting research should not be tedious, it should be enjoyable to help students maintain the passion they have for the subjects they are studying. I wanted my website to resemble, research websites I have used personally which have aided me, in finding what I need as soon as possible with easy access. I desire to propose this website to the university itself to create better research

platforms with user-friendly features that would make the research process more positive for students (Nielsen,1990).

Essentially the focal point of my website is to allow users to search and shop for articles, books or reports through a database.

Background

In my background research, I focused on other research websites that provide articles, reports and journals for a wide range of students from different academic disciplines. For example, I explored high-profile sites such as Google Scholar, JSTOR, Springer, Research Gate and others. I did this because I needed to observe how these organisations formatted their websites and how they designed the platform in mind for researchers, and students. Therefore, I had an insight into how I should structure my website and what I should include to make it more appealing to users.

In the following, I will focus on Google Scholar and JSTOR in particular and explore their weakness and strengths and how this has affected my approach to implementing my website. Google Scholar is a search engine where users can search for scholarly literature from different disciplines. This is researcher-centred focusing on the work they have produced (Antell,2013). Moreover, JSTOR is a digital library that provides its users with academic journals and primary sources in full-text searches (Schonfeld,2012).

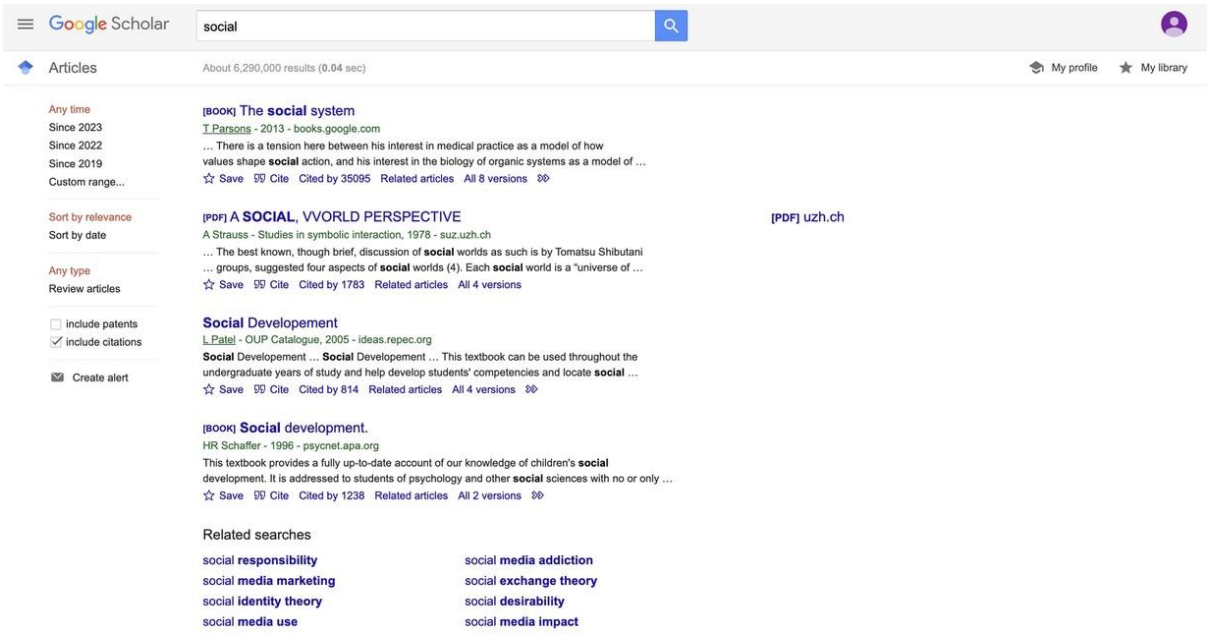


Figure 1: Google Scholar search engine

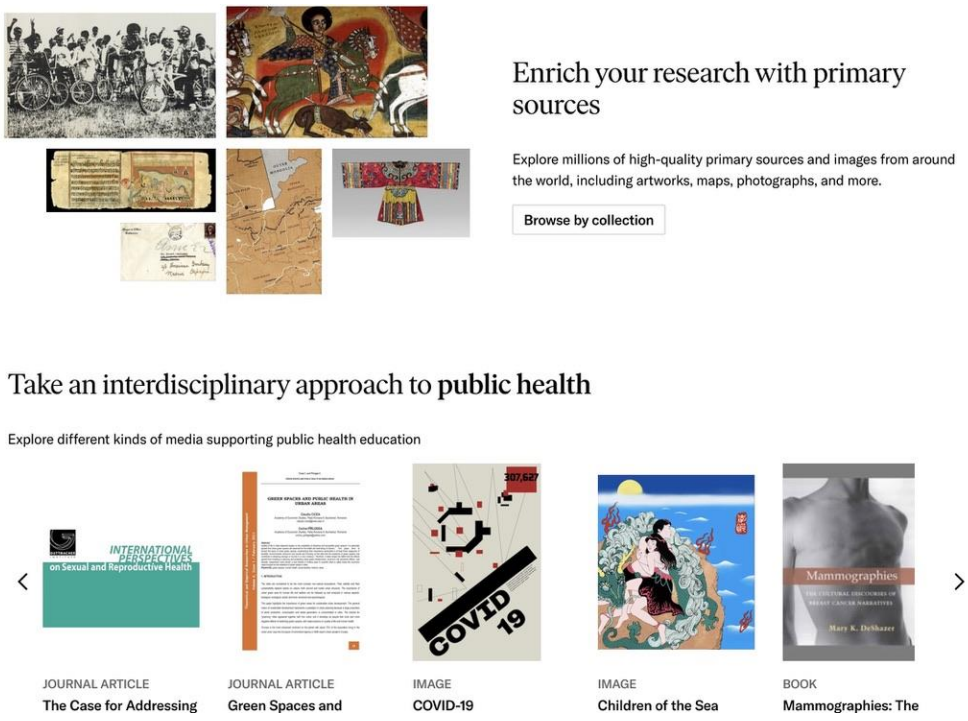


Figure 2: JSTOR home-page

For example, I noticed that Google Scholar did not provide a pleasant user experience because of its simplistic and mundane design layout. Therefore, I wanted my website to stand out regarding the colour scheme and design. I intentionally made each section prominent so users would be aware of what it is and why it exists. For instance, Reinecke (2014) highlights that a medium to high level of colour makes up the most appealing website designs, while a low to medium level of visual complexity makes up the least appealing ones.

A limitation of Google Scholar is that it does not provide consistently high-quality articles, books, or journals; however, the quality of the content can vary. Therefore, when selecting what content to use for my website to populate my database, I made sure to only select high-quality research documentation for my users to access. I gathered them by grading their value on TLDRthis as I wanted to keep consistency to increase reliability and trust. After all, they are students who want to achieve the highest grades and need a platform to aid in this process, especially for those who have just started university (first years) that do not have a lot of experience regarding how to research or what to research for. Thus, it is my responsibility to ensure that I make the process as easy as possible.

Moreover, there is the issue of Google Scholar not clearly labelling the type of content they are providing to users once searched. Pelet (2020) illustrates the significance of labels as they increase viewer attention and reduces visual complexity. Without this element, it forces the user to either click the link which redirects them to the source of the content or download it to find out whether it is a book, article etc. This is an issue, especially if the user requires a particular type of content to use for their assignments and it is unfortunate this information is not at the forefront. This creates another unnecessary step for the user to take. Therefore, when I designed the table input for my search bar, I decided to include the type of data that is being presented to the user so they can access this immediately.

Furthermore, Google Scholar will display only citations of content rather than the full text. It is possible they do not have access to some content or they have a limited database. This is an issue as this restricts users from being flexible in their research experience. Therefore, they will "hit a wall" in the journey of collecting data and it can be off-putting reducing the reliability of users coming back to the website. Mohammad (2020) suggests that flexibility in a website increases user satisfaction. Considering my database, I decided to provide my users with full-text documentation of all my content, so they can conduct research on my website without restriction.

Overall, not enough time was taken in catering to the user's, visual experience instead developers focused more on, just providing simplistic features to access the content. This is emphasised by Brayda (2015) who suggests that in web development visual experience is vital.

Although there are major improvements that are necessary for Google Scholar to adapt, they do have some effective advantages that cannot be ignored. For instance, the platform is fast and easy to use to get as much information in one place. Secondly, they also give users the ability to cite content with various options available such as MLA, Vancouver, Harvard etc. This optimizes time as users won't need to manually construct their citations. Thirdly, this platform rigorously, and constantly updates content with dated or irrelevant information so they provide current and reliable data offered to users.

As a final note, I have reviewed a unique website called JSTOR that has positive aspects that I tried to incorporate into my website. For instance, this includes the imagery, colour and layout of the website as users can search for images, not just articles and journals. The website is interactive as the users can scroll through the visible content they provide, they also have a footer, which includes all the contact information for the user to access and to seek help if needed. JSTOR has a drop-down search bar that focuses on finding what the user inputs in their many categories of stored data. The experience was

extremely user-friendly (Charleygrey,2022). Consequently, I have incorporated the positive aspects of JSTOR into my website design and adapted from Google Scholar's design to correct its shortcomings.

Implementation/ Technical part

During the process of implementing my system, I decided to challenge myself by learning new libraries and frameworks to execute my website. The following are the main technologies I have used in my work:

Node.js framework

Node.js is a JavaScript engine which is capable of developing high-quality applications (Mardan,2018). It can build applications that can handle a large number of connections. It also has a vast quantity of modules for developers to utilise such as HTTP requests (Mardan,2018). Moreover, it also connects with systems such as npm which is a Node Package Manager. This has proven to be very helpful in the development process of my website as I can install packages easily.

I had to download and set up Node.js as this was going to be the main platform to operate my website (Mardan,2018). I had to do my research to learn and understand how to navigate the framework. This is because I was limited to in-class activities with the main focus on JavaScript so I worked hard to learn tutorials online so my project would be established well. For instance, I learned how to make my code executable, connect my pages to the local host, and implement other programming languages, such as HTML, CSS and the additional features and tools of JavaScript. This was difficult at first but I managed to get a good understanding.

One advantage of using Node.js is that its developers can use the same programming language on the server and client side in the process (Mardan, 2018). Thus, this explains why it is so highly trusted and popular to use for web applications. To utilise Node.js I used the “express” module and the “app.use” method to establish a middleware function, the “express static()” to retrieve files from my created public dictionary and any other dictionaries that I have (Mardan, 2018). Finally, I used the “app.set” function to access my views, dictionary and engine and retrieve them all as “.ejs” pages (Mardan,2018).

MongoDB and Studio 3T

This is a type of NoSQL database program that uses BSON and JSON documents (Hoberman, 2014). It stores data in collections of documents instead of in tables. This is a beneficial element because it makes it easier to store flexible data. This is also, popularly used for web development. This database can support different types of data such as arrays and strings. Moreover, it also has a quality that changes the transfer of data across different servers to increase efficiency. I used Studio 3T to connect to MongoDB to store my data where I was able to access my articles, books and reports (Hoberman,2014). Studio 3T is a well-known MongoDB client which can provide various tools to manage the database (Zhu,2021). It has been extremely helpful as it was quite easy to connect it to my MongoDB database and find my collections to query. I was also able to create complex MongoDB queries to test out, how they would display my data and how I would like to present it. This was a database I had to learn how to use to execute the different MongoDB “find queries”. I had to install the database program on my computer, find articles and content to then populate and format, each piece of content into separate JSON documents, and store them in MongoDB by connecting to Studio 3T.

Example JSON document:


```
{"_id" : "6423c365a079dd2da9fc279c",

"Title" : "Police Corruption: What Past Scandals Teach about Current Challenges ",

"Authors" : ["David Bayley", "Robert Perito"],

"Year" : NumberInt(2011),

"Abstract" : "Police corruption is a universal problem, but it is a particular challenge in countries in crisis and emerging from conflict. This report is based on the lessons gleaned from a review of public commissions of inquiry into police misconduct worldwide and their possible application in stability operations, such as those in Iraq and Afghanistan. The study attempts to determine whether past scandals can help us deal more effectively with the contemporary problems of nation building and police reform.",

"Keywords" : ["Police", "Corruption", "Past", "Scandals", "Challenges"],

"File" : "reports/24-DavidBayley.pdf",

"Type" : "Report"}
```

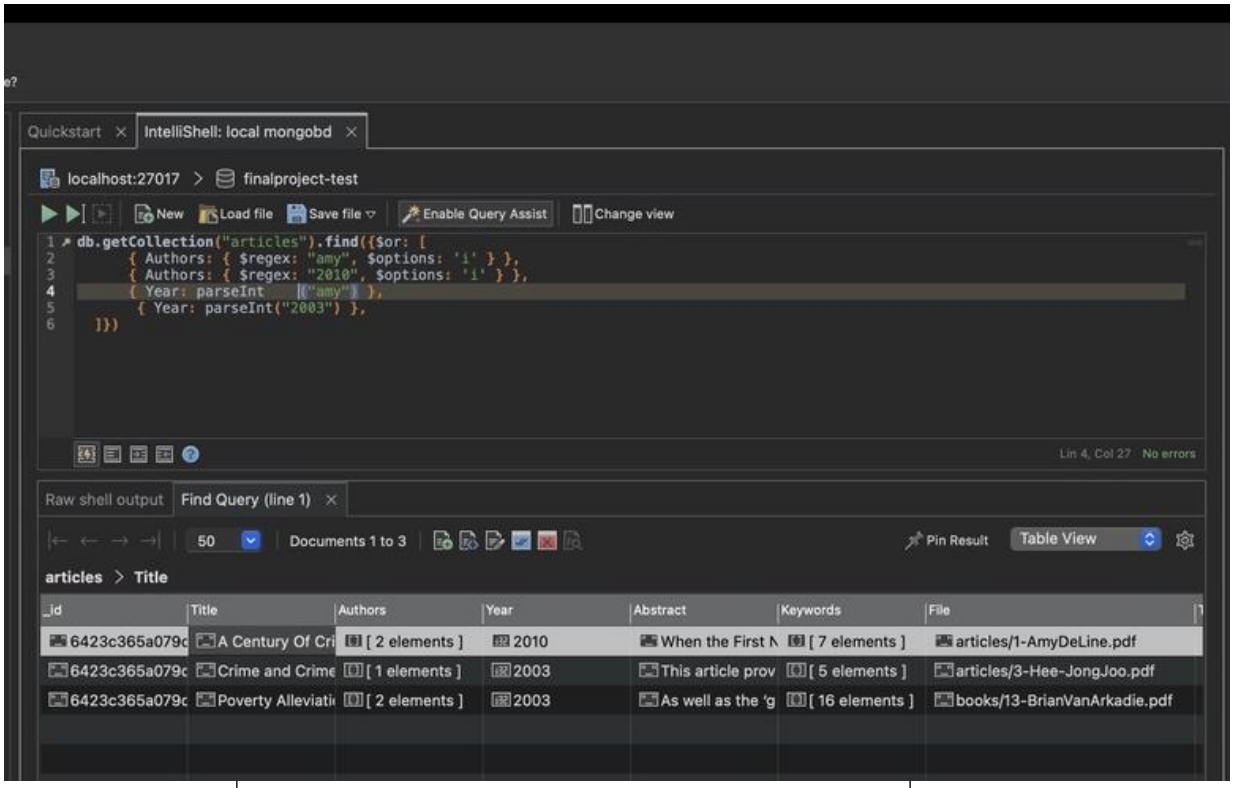


Figure 3: Studio 3T data with a find query example

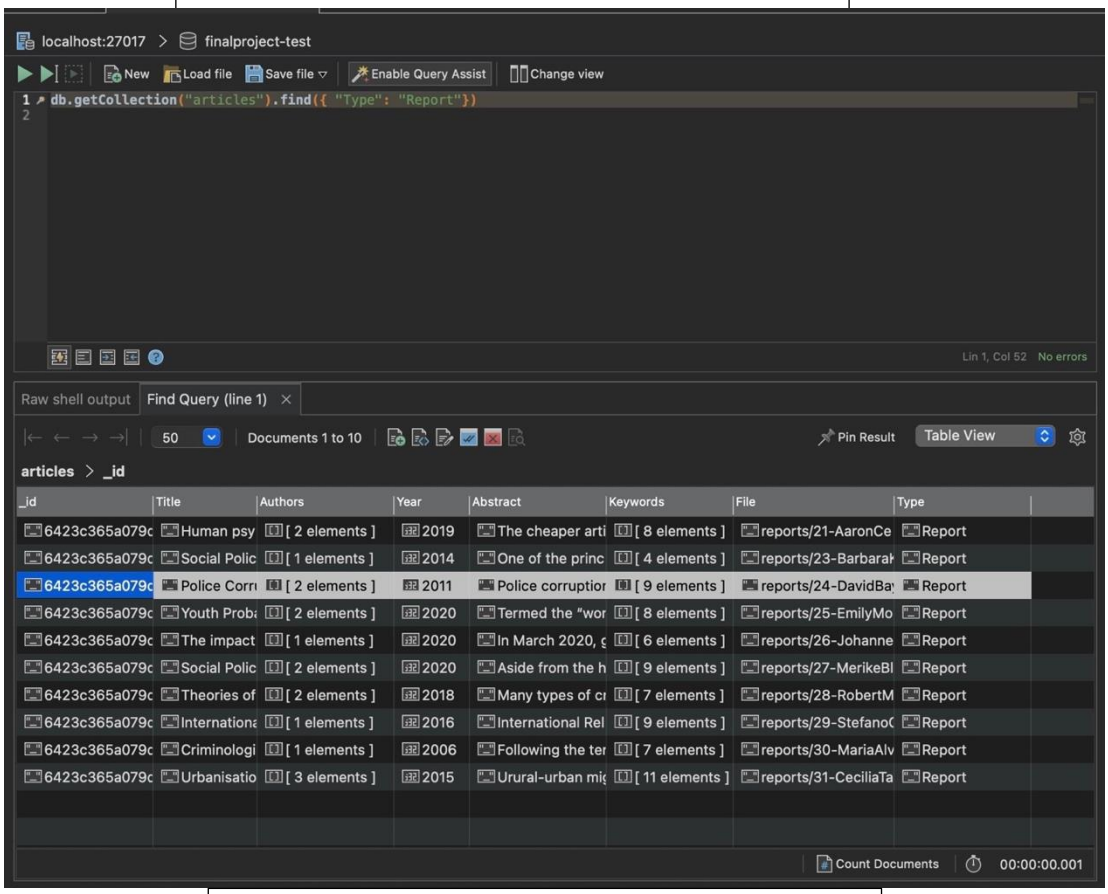


Figure 4: Studio 3T data with a find query example

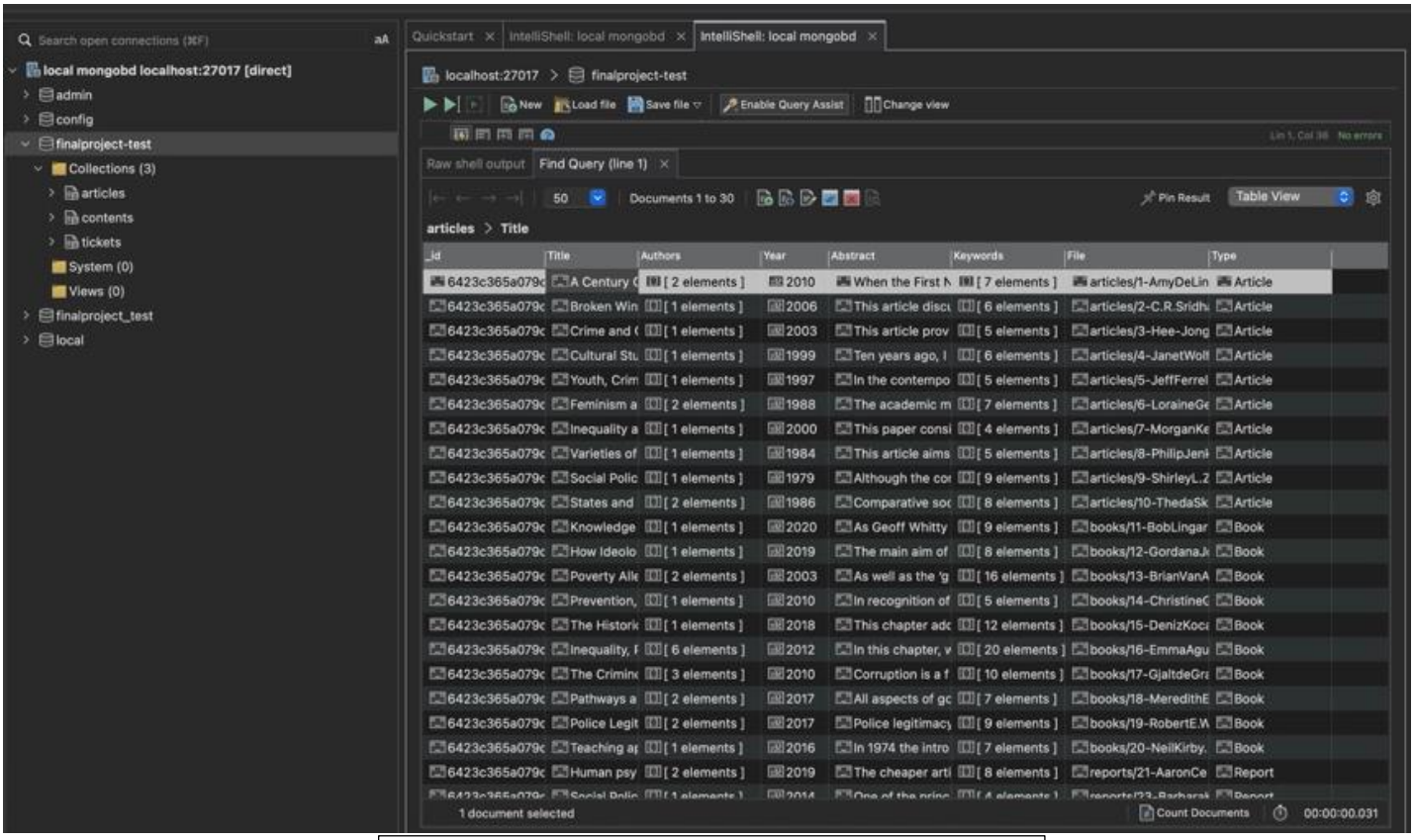


Figure 5: Studio 3T data with a find query example

Mongoose

This is an object data modelling library used for Node.js to connect to MongoDB (Holmes,2013). Therefore, I could define my models and read and update my data. The platform was appealing as I had control and flexibility regarding the processing of my data comfortability. Mongoose has been helpful as it has a function where I can optimize my performance such as query catching. Thus, I had the opportunity to use a pleasant library.

I also had the option to try and use a different method to connect to the database by using MongoClient which is a command-line interface that can connect to the MongoDB database as well (Chellappan,2019). This also provides the ability to manage collections to query data and update documents. Mongoose is my preferred library because it makes the process of query creation much easier. To use Mongoose effectively I had to install the function through npm and connected it to my database through the "mongoose.connect()" connection string (Holmes,2013).

Key aspects

This website is primarily designed for research purposes and enables users to easily search for articles using keywords such as author names or titles to then filter the results through the content type or year. Another functionality is the ability to shop for this content and receive hard copies delivered. I added minor interactive dynamics to my website to keep the user interested and stimulated. In the following, I will discuss each page and its functionality:

Home page

I included a navigation bar (on every page) that includes a large title, home, an explore and a shop link; a contact form, a signup form, a basket button and a profile button. The contact and sign up button once clicked displayed forms for the user to fill out with their information. This was important as I could allow the user to feel attached or connected with the website and gave them access and the ability to ask for help if they discovered any errors on the website or help regarding any further navigation that they need. This was important to reiterate the importance of establishing an enjoyable research experience to boast academic ability. Another interactive element I added was an automatic slideshow with description text and moving images further down the page to keep the user visually stimulated. This page also links to the explore page through the search functionality (search bar) and the explore button.

Figure 6: Design of website home-page

Explore page

The purpose of this page is for users to search through keywords for instance the year name or author to receive article books or reports in their results and filter the results with the filter bar. This page is used to display data, search for articles, download (in PDF) and read them online, and properly cite them. This connects to the user profile through the save button.

Shop page

The purpose of this page is for users to purchase the content of articles books or reports. Users can look at the price and continue to search for content further on the page if they need extra pieces of content with the search bar that is connected to the explore page. Therefore, they can select what to buy and check the price before adding it to the basket. This page also links to the order and confirmation pages regarding the ordering process for the content that is selected to go in the shopping basket.

Footer

Furthermore, on every page of my website, I have a footer which includes About Us, Our Services, Privacy Policy, FAQ, Shipping, Returns and social media links. This approach made my website feel more realistic and I made sure to design it to stay at the bottom of the page. It has a responsive layout to adapt to different screen sizes as well. Improves user experience to make it easier for them to find what they need or help faster.

Figure 7: Footer design

Design

The main colour that I chose to base my website on is light blue. In the human-centred design (HCD) approach, this colour represents that the developer understands the user and

is empathic (Nielsen,1990). This is an essential factor that I wanted to emote to the user which implies that their needs are my main priority. To focus on the objective of providing joy. Moreover, this colour helps the user stay focused and encourages them to be more explorative which is the purpose of the website (Mehta,2009).

As previously mentioned, there are three main focal points of the website. Firstly, it allows students to search for articles, reports or books to assist them with their assignments. They can download PDF files for easy reading or they can order a hard copy and the content will be delivered to them. To establish this there were functionalities that I had to execute. In the following, I will discuss this in further detail.

For instance, the **search bar**. I created a search bar that was able to query through my MongoDB collection of articles books and reports. I managed to input a results table that is generated once the user clicks the search button. This included the Title, Authors, Year, Abstract and a download link to the pdf files available for the user to read, the type of data in the table, citation options and the ability to save content to the profile page.

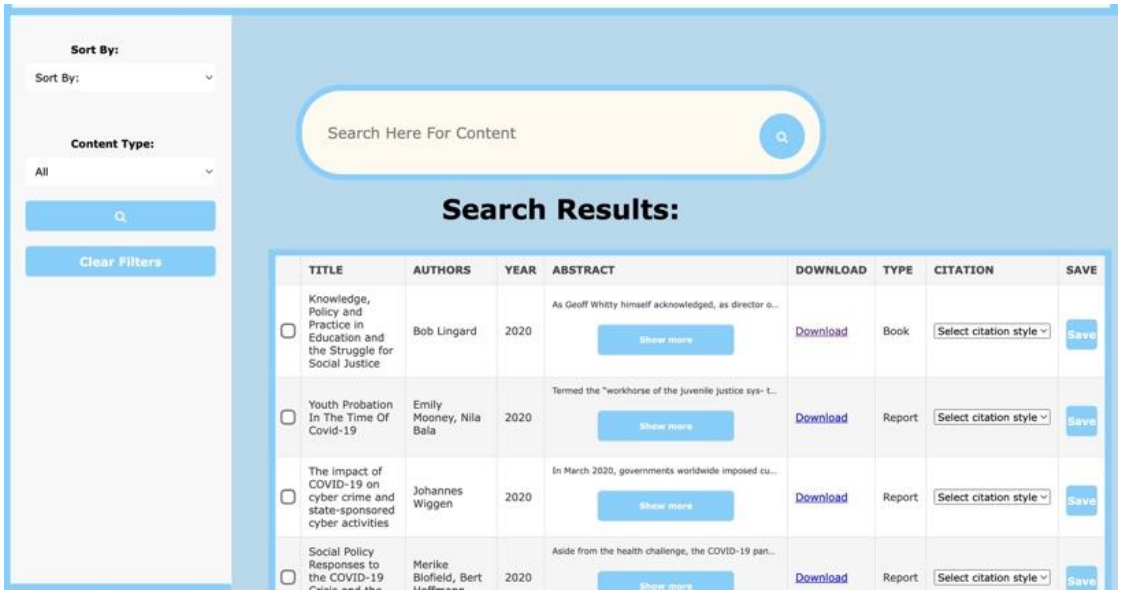


Figure 8: Search-page

I created a model with a specific schema for the documents within the collection. Therefore, the query searches for any documents in the database that match the fields declared. It does the same for any fields that include numbers as well. If the query is null then an array of “or” conditions is created to match the keywords in the collection. For example, if the keywords are a number then it is pushed to the “Year” field (Hoberman,2014).

The results from the query are passed through to the search page as an array and then displayed on the website. This allows the user to search and retrieve articles for the MongoDB database (Hoberman,2014). I adapted the query in such a way that the user can input more than one word to execute multiple queries at the same time for example, “Social Amy 2003”, “Amy 2006” than just “2006”. All the information about the data is retrieved on the website from the database so it is all dynamic and not hard coded.

I also added a feature to autogenerate suggestions in the search bar. This was a perfect added feature because it is time-saving and it improves the accuracy of the search query input. Therefore, this improves the user experience as it makes the search process user-friendly which was the aim of this website so students trust the ability of the platform to fulfil their research needs (Nielsen,1990).

Figure 9: Search bar with autosuggestions

Finally, if the user inputs, any keywords that are not within the database, then a message is printed of “No Results Found”. I had to learn a new coding method catered to the Mongoose library to execute this query. This method provides an efficient process to retrieve data without generating a complex SQL query. This also emphasises the benefit of Mongoose as it reduces the unnecessary difficulty of MongoDB query syntax while providing a practical solution (Hoberman,2014).

Concerning the search table that is generated I used the language HTML JavaScript and CSS. Within the abstract column, the first 200 characters are presented, once the user clicks the show more button the row expands and presents the full text. This was an essential feature to ensure that the user isn’t overstimulated with information and is not overwhelming to the eyes. Another feature is a column filled with checkboxes which generate pop-ups once selected by the user. The pop-up presents information about the selected articles the Year, Title and Authors.

This element is useful for users that have language or cognitive disabilities, which makes the information clearer for them to understand (Userway, No Date). I added a feature to the pop-up where users can adjust the formulation of the pop-up to suit themselves and their needs. This reduces unnecessary scrolling for the users. Although it is important to

mention that using pop-ups can be destructive for users, especially for those that are sensory sensitive that's why I have not overly populated my website with such (Wilson,2004).

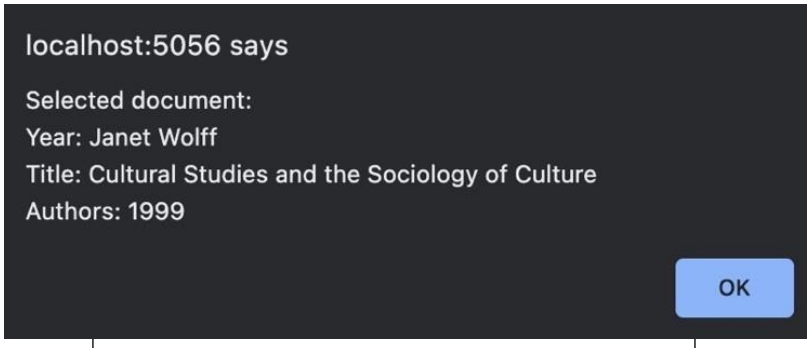


Figure 10: Content pop-up from results table

Finally, another advanced feature of the search table is that users can select different types of citations of the articles or books that they have an interest in. The options include Chicago, APA and Harvard citation styles (Lipson,2011). I made a select box which connects to a pop-up, which displays the citation, I tried to make the citations as accurate as possible. For the Chicago style, I made sure that the first, and last names were separated with commas. Regarding the APA and Harvard citations, I made sure to print the first name and the first letter of the second. To do this, I used split(), slice(), join(), and if statements to execute (Robbins,2012).

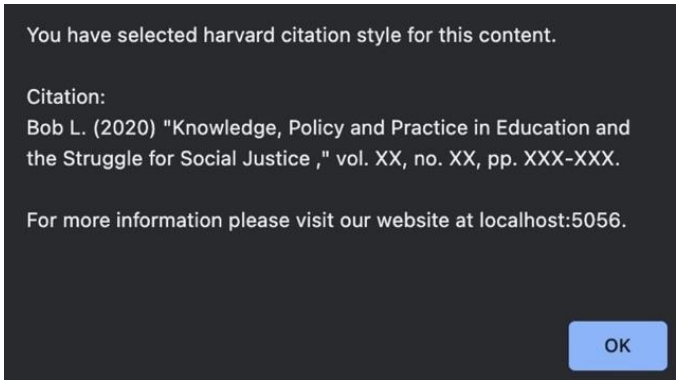
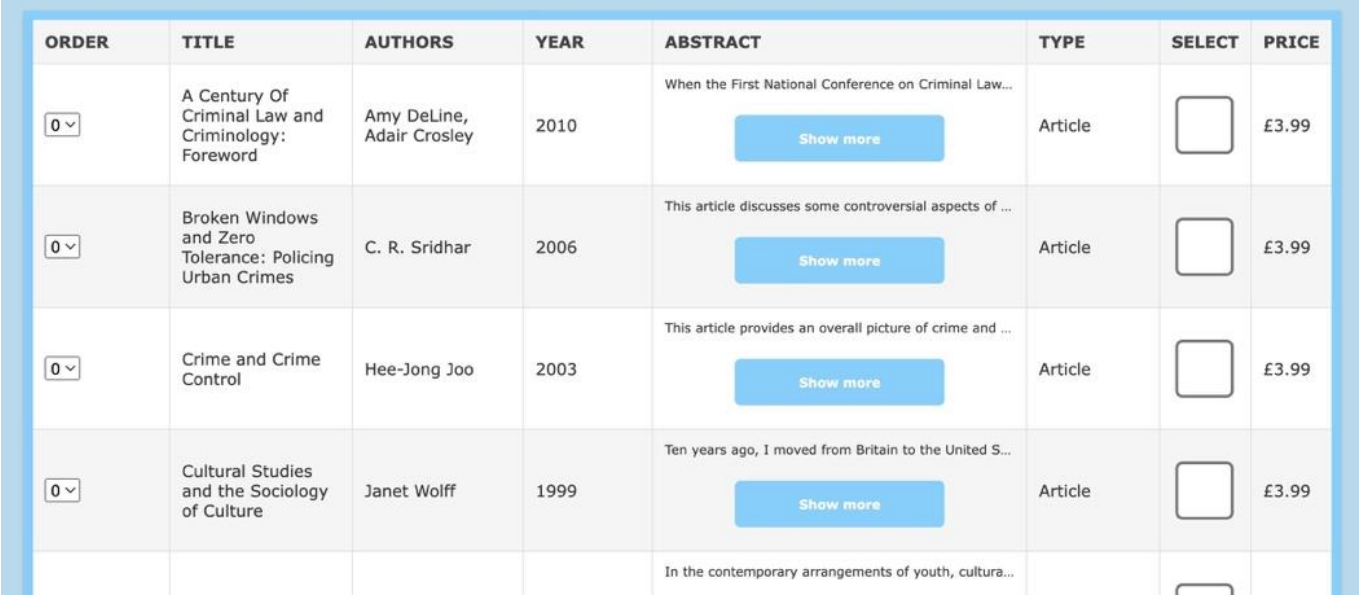


Figure 11: Harvard citation example

Another functionality is the **shop page.** I construct a page where users can purchase content. Firstly, the table displays a select option for users to select up to 3 pieces of material with the specific price presented. When the user clicks on the quantity they desire and then clicks on the shopping basket it redirects them to the order page which displays what they have input in their basket.



ORDER	TITLE	AUTHORS	YEAR	ABSTRACT	TYPE	SELECT	PRICE
0	A Century Of Criminal Law and Criminology: Foreword	Amy DeLine, Adair Crosley	2010	When the First National Conference on Criminal Law... Show more	Article		£3.99
0	Broken Windows and Zero Tolerance: Policing Urban Crimes	C. R. Sridhar	2006	This article discusses some controversial aspects of ... Show more	Article		£3.99
0	Crime and Crime Control	Hee-Jong Joo	2003	This article provides an overall picture of crime and ... Show more	Article		£3.99
0	Cultural Studies and the Sociology of Culture	Janet Wolff	1999	Ten years ago, I moved from Britain to the United S... Show more	Article		£3.99
				In the contemporary arrangements of youth, cultura...			

Figure 12: Shopping table template

This is done by information about the order being sent to the shopping basket icon which updates how much they have purchased and prints the information in the basket from the users. Using the information from the basket item stored in the local storage, the code generates the "Additemtobasket" function that updates the item code and stores all the items according to the quantity in the local storage (Robbins,2012). It also defines any change events from the drop-down element.

Figure 9: Update of shopping

For example, it prints the ID number of the article, the Title, the Author and the Year and Quantity. Shoppers have the option to either clear the basket or carry on with the purchase and fill out their billing form which requires their personal information such as their address, phone number, email and bank account information etc. Once these fields are filled in they can confirm their order, and a pop-up notification appears. Concerning the clear my basket button when the button is clicked the code removes the entire basket from the local storage and replaces the item count back to 0 once this is done it also removes any rows in the table from the order-items ID. The Additemtobasket function includes parameters which update the item code and store all the items regarding the information of quantity to the local storage (Robbins,2012). It also defines any change events from the drop-down element.

Another functionality is the **filter bar.** This gives the user further opportunity to filter the results that they have submitted. They can filter by ascending and descending in the Years and search for the type of content they desire from books, articles or reports.

This is an essential feature as it greatly transforms the user experience as they can specify exactly what they need. This gives a more efficient way of finding the necessary content. This also provides flexibility for the user utilising a tool to search through the heavy content provided on the website (Nielsen,1990). Thus, users would be more likely to use my website consecutively as this ensures an enjoyable research experience for students to boost their academic ability and trust in the platform.

Evaluation

In this section, I will be critically assessing the platform I have developed and examining its strengths and weaknesses. To properly assess this, this will be compared to the main objectives of the website.

Objective 1: To implement a platform where students can search and shop for research articles books or reports as they please.

Objective 2: The goal was for the website to be easy and accessible to use.

Objective 3: Provide a fun experience.

Objective 4: For universities to take a similar approach to this website, focusing on the students' experience when conducting research for their assignments; as during exam seasons when anxiety and pressure are high, the focus should be on removing unnecessary stress and pressure as the main priority.

Objective 5: provide visual stimulation

Advantages

One advantage is that my website has a fun and eye-catching design for research. I shifted away from the mundane boring approach and focused on user experience and emotions. I wanted to emote the emotion of happiness to my users when they choose my research website. This is evident in the colour and imagery that was presented (Nielsen,1990). Thus objectives 3 and 5 were achieved.

Another advantage is that my website has a realistic research design which makes it easy for users to navigate because there are familiar icon buttons, such as the basket icon for shopping. Overall, this has been a major advantage to achieve my goal. The features I have implemented in my website have saved students time in looking for their desired articles and improved their research skills through easy navigation. Therefore, it is likely that

this website will help to enhance their academic performance and perspective on positively conducting research. Students can use the functionality mentioned previously with ease including the search bar and shop page. This is important because students need a platform that does not introduce any confusion or time consumption. Thus objectives 1 and 2 were achieved.

Another personal advantage is what I have learnt about Node.js and MongoDB databases. I have gained programming skills and experience through my extended knowledge of JavaScript and other languages used.

Disadvantages

My website has a lot of advantages however, I have also noticed some disadvantages despite this it is apparent that the advantages greatly outweigh the disadvantages.

Ultimately, my website is not as advanced in comparison to the top utilised websites used for research today. The disadvantages include my filter bar which needs to be more complex to filter the results inputted by the user. This would make the experience of finding exactly what they need to be much smoother. A more dynamic filter would imply to the user that the developer had in mind their needs and flexibility (Nielsen,1990). For example, implementing a feature where users can search for the authors in the search bar and then filter search for particular topics, such as socialism, psychology, policing etc.

Moreover, if I had more time I would make my query in the search bar more complex at the moment the user can input more than one word into the good search bar, however, it can be taken a step further where the queries can be joined together instead to produce more precise results. Furthermore, I would also edit the auto-suggestions because I was unable to connect the keywords from the database to the search bar so I had to manually input the possible suggestions. Also, the suggestions are only present for the first word that is inputted and not for others. If this was improved this would positively change the experience of my website because this would improve the accuracy to prevent typos by the user which then will introduce faster typing as they would not have to type out the full word.

Also, I would have added more stages to the ordering process for instance if the user had a loyalty card to be able to use it to get a discount offer. This would be an incentive for users to come back to the website thus building loyalty and increasing the chance of them returning. Moreover, if I developed this process I would be able to collect information on the user and cater to their needs further. For instance, if they are more likely to use articles, books, reports or whether they are interested in content concerning crime. Furthermore, I would have liked to develop the click and collect options as well to search for nearby addresses for example to confirm the user's location with possible locations to select from. Finally, regarding the ordering process, I would have liked to add conditions where if the

users would not be valid for free delivery a pop-up would appear so I would write a code that would calculate the price of what is in their basket and announce whether they qualify for a discount, similarly for what needs to be done for the loyalty card.

Finally, if I was able to create a larger database which includes other types of content such as journals and newspapers for my users. This would produce more comprehensive results which are exclusive to find on my website and increase the diversity and credibility as users think that a larger database is more trustworthy (Nielsen,1990). Ultimately my website is not well developed enough thus objective 4 has not been achieved; it is improbable that there will be an instant shift in university culture, but changes are expected to occur gradually over time with users as the primary focus as I have established.

Overall the majority of the key objectives of my project were fulfilled which I am pleased about.

Conclusion

In conclusion, considering my lack of experience in computing I am tremendously happy with what I have produced with my project; how much of a risk I have taken to push myself to even learn new platforms and execute them effectively. I believe if I had more experience and time I would be able to produce a more advanced website. When I conducted my research on other research websites such as JSTOR, which was my main inspiration, I realized that I would have a lot of work to do if I wanted to create something of that magnitude. Thus, the time I had with the project was not going to suffice as websites such as this are filled with hundreds of intricate codes which have been adapted annually based on user experience and gradually trying to improve the platform as much as possible.

However, I can confidently state that my experience and intelligence regarding web development have improved. My approach to programming languages, such as CSS, HTML and JavaScript has reached another level. Reflecting on where I started this year with no computing foundation, whatsoever it is obvious that my skills have grown significantly. My approach to gaining knowledge through my classes, reflecting on feedback and my external research on computer websites and YouTube tutorials; have contributed to my growth. Through this project, I have been able to develop the ability to transfer my skills to different frameworks. Although I am confident in my HMTL and CSS skills I still need some work in regards to JavaScript. I wanted to implement more use of this language as it would have transformed my website greatly introducing more dynamic and impressive features. Thus, I will be focusing my efforts on trying to improve this lack of skill in my future journey in computing and attending more coding programmes or seminars.

There are a few examples of how I would extend my work. Firstly, I would adapt to the limitations that I have mentioned previously, and then proceed to create a more advanced platform. For example, I would have different types of content to offer my users, which would give my database, more flexibility and inclusivity so I can provide users with exactly what they need. This could be adding newspaper articles, journals, websites or images to my database. Moreover, to implement a workplace platform similar to JSTOR where users can save their interests on the platform and organise them into folders and go even further to create presentations with them. Adding this feature to my website would increase its versatility and provide my users with more ways to utilize it. I would also extend my website by including the search help section to advise users on how to better navigate the search bar to get the most out of their resources to help them narrow down the specific information that they need. This would be essential as it decreases time consumption so users can retrieve the articles that they desire and produce high-quality work. Lastly, it would have been helpful to have extended my work to add more features for people with disabilities, making my platform more inclusive and practical. Unfortunately, I was unable to execute these features which is disappointing if I was able to do so, I am certain it would have drastically advanced my website.

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Further links

MongoDB: https://www.mongodb.com/

Node.js: https://nodejs.org/en

Studio 3t: https://studio3t.com/

Mongoose: https://www.mongodb.com/developer/languages/javascript/getting-started-with-mongodb-and-mongoose/

MySQL: https://www.mysql.com/

JSTOR: https://www.jstor.org/

Google Scholar: https://scholar.google.com/

Springer: https://link.springer.com

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