LSEP and PPE issues and considerations related to Greenwich Ride Finder, a carpooling web application for residents of the Borough of Greenwich.

Introduction

The first part of the report will discuss the Legal, Social, Ethical and Professional issues and considerations relating to the carpool web application developed for Practical Coursework 1 of COMP-1687. Each heading will start off with a broad discussion about issues and considerations from the perspective of the web developer and the web application before leading to a conclusion of how these findings relate to, and are managed by the final application.

Following on from this, the second part of the report will focus on the Philosophical, Political and Economic issues and considerations (PPE) from the perspective of the Greenwich carpooling web application.

Report Part 1 – LSEP Discussion

Legal

One of the main legal factors in web development is web accessibility which focuses on making web applications available to everyone, especially people with some form of disability or illness. The range of disabilities considered for the guidelines is extensive and includes things such as visual or hearing impairments, limiting flashing images for people with epilepsy and use of language and meaning for those with learning disabilities.

In the UK, the government states that services must meet at least level AA of WCAG 2.0 (Web Content Accessibility Guidelines), as well as function on assistive technologies and include disabled people in user research (Gov.uk, 2017). To help developers conform to this, W3C have published much documentation including an interactive version of the WCAG guidelines that are broken down into 4 principles: Perceivable, Operable, Understandable and Robust (W3C, 2017), which are each further broken down into specific guidelines. To give some examples, guidelines include definitions regarding:

- Use of colour
- Use of contrast
- Use of text labels
- Use of alternative text for images
- Use of language on a page

It could be argued that some of the guidelines are too complicated to implement in all applications, especially those that are complex or are too extensive (overkill) for simple websites designed for a small audience. It should however be noted as mentioned above that UK law requires web services to meet level AA of the WCAG 2.0 guidelines.

After looking closely at the guidelines, it has been found that the developed Greenwich carpool application largely meets the requirements of level AA of WCAG 2.0. It was found some of the guidelines are covered automatically as the website does not make use of certain features, for example, flashing images or text. Other guidelines such as the selection of colours and contrasting have been covered through the process of good design and have again been met without any real conscious thought.

There are a however a couple of guidelines that the web application may not fully meet. One of these issues is the lack of a text alternative for the CAPTCHA image. Solving this is not completely straight forward as if a plain text version of the CAPTCHA code is presented on the website it may be possible for a machine to get past the verification page. Referring again to W3C, the organization has published some thoughts and alternatives such as using a "honeypot" method of tricking a machine into filling in a hidden field, which is used to mark the user as non-human (W3C, 2017).

Another guideline that is not fully met is the ability to use the application with just a keyboard. This guideline is published as some users may not be able to make use of a mouse and may rely on other assistive technologies to browse web applications. The reason this is not fully met is because although it is possible to operate the site with just a keyboard if JavaScript is disabled (no map selection/text-inputs only), if the user is using the main version of the site they will not be able to select start and end points from the embedded Google map. At the time of implementation this seemed to make sense as accurate geolocations (Latitude and Longitude) were needed to suitably find and sort the results, however it is now clear this feature should have been developed in a more accessible way.

The next area of legal discussion is the protection of data, otherwise known as the Data Protection Act (DPA). The DPA is essentially a set of principles put in place to ensure personal information is not abused by organisations, businesses or the government (Gov.uk, 2017), and as stated by amityweb (2009), is the "*main piece of legislation used that governs the protection of personal data in the UK*". A full list of principles that must be strictly adhered to can be found at: https://www.gov.uk/data-protection.

Even though the developed web application only stores limited data it is still required by law to meet all principles set out by the DPA. Evaluation of the application against the DPA principles concludes that the application does indeed meet the requirements of the legislation fully and for example, user information is lawfully processed, used for limited purposes, is not shared and is kept in a secure manner.

A final point to make about the legal issues and considerations is that of the EU cookie law. In the words of Solon (2012), this law requires service providers to give users the option to consent to, or reject the use of cookies before the application makes use of them. As cookies were used on the Greenwich carpool website, users should have had the option to opt-in or opt-out of their use and the website should have featured a privacy policy, describing what information was being stored in the cookies, and how the information was being used. Due to limited time leading up to the deadline this was not fully implemented and users receive no warning of the use of cookies on the website; this was recognized in the report and the self-assessment was marked to reflect this.

Social

According to a definition from Wikipedia (2017), a social issue is something that influences a majority of people/s in a society. From the view of the carpooling website it could be argued that encouraging residents to communicate and spend time together (by carpooling) could generate a more interactive and happier society. A study conducted by Lanquentin (2017), stated that a negative effect generated by widespread dependence on internet use has created a society where people are missing out on social activities, including meeting and conversing with others. By having a system on the internet, it could be found that these people who are lacking on social experience may find it easier to make initial communication online (via the carpool application) and then gain from the social benefits of communication and interaction with new people.

Another social benefit of the carpooling application is that it could encourage a greener community. It was said in the specification itself that the borough was aiming to reduce pollution and congestion, a view that could only be good for society, considering current worries about climate and the environment.

A negative social effect is the potential loss of jobs and economic input into the transports sectors of industry. This will be discussed in the Economic section of this report however it is important to note here as job losses and lack of funds to public resources would affect society and may invoke argument, protest or rejection of technologies; one only has to look at the case of the Uber ridesharing service and London Back Cab drivers to see the potential for social unrest.

A final point to discuss is regarding the future of transport and ridesharing. Ridesharing applications like the Greenwich carpool website could give indication to how quickly and smoothly society will adapt to the technologies such as autonomous self-driving cars. It is reported by the Transport Secretary (Grayling, 2017), that a fleet of connected, autonomous taxis or shared personal vehicles could manage the same number of trips as current taxi services with 10% of the vehicles. This could be monumental in reducing emissions and congestion, and help to reduce the number of car related accidents that lead to loss of life. To give an indication of the statistics, the UK Department of Transport reported that between June 2016 and June 2017 there were 1710 road deaths, a number that was comparable to the figure for the previous year (Department for Transport).

A concluding remark for social issues and considerations relating to the Greenwich carpool application would state that the positive social effects outweigh the negative effects and it is felt that this statement could be taken further to say the applications like the one developed are necessary for the continual development of society.

Ethical

Web application development is part of the broader area of software engineering and therefore ethical issues and considerations will be looked at from a software engineering perspective. In his book Sommerville (2011), discusses how developers should behave in a morally responsible way and goes on to say that standards and law cannot cover all bases, and some things come down to professional responsibility. In the book, Sommerville (2011), states some of these as "*Confidentiality, Competence, Intellectual Property Rights and Computer Misuse".*

Confidentiality has been maintained throughout development of the web application and the final application largely maintains the privacy of user data. As users need a way to be contacted by other users, email addresses of users who have submitted a post are visible to members who have signed-up and signed-in to the application.

Competence is difficult to assess with regards to the coursework as it was not possible to misrepresent the level of competence to gain work as the coursework specification was created by the university. It could be viewed that competence has already been proven by completion of the courses in previous years.

Intellectual properties rights have been considered throughout the development lifecycle and the website does not infringe upon copyrights owned by other entities. To complete development of the application some code was borrowed from other sources such as W3schools and the COMP-1687 lecture notes, all borrowed code is acknowledged within the applications source code and is also noted in the report handed in with coursework 1. Another point to note with regards to copyright is the use of images on the website. To create the background, a small section of a stock (royalty free) image was taken, edited and tiled on

the site. A possible issue with image copyright is if a user or users were uploading copyrighted images to their posts; as no means of checking images is in place, it would be required that images are reported to the website admin who would then have the responsibility of removing the images.

The final point mentioned by Sommerville is computer misuse. A concern here would be using the website to manipulate the user into downloading malware or otherwise using skills obtained as a developer to misuse data provided from a user. No misuse of computers, skills or information was undertaken while working on the web application.

Professional

From a development perspective, the professional issues and considerations are largely based around topics that can be found codes of conduct such as those set out by the BCS (British Computer Society). In their document, the organization set out professional standards to be followed and are categorized under the following sections (BCS, 2015): "*Public Interest, Professional Competence and Integrity, Duty to Relevant Authority and Duty to the Profession*". In brief, the document describes the commitments and working practices required to design and develop software in a professional and ethical way and goes further to enable the protection of all parties involved and to generate trust between clients and the organizations members. Other codes of conduct include the IEEE code of conduct (IEEE, 2017), which contains similar principles relating to professional and ethical practice.

It is felt that the development of the carpool application has followed the principles set out in these codes of conduct and that the final application has been developed in a professional way, with consideration given to issues and considerations.

Report Part 2 – PPE Discussion

Philosophical

Applications like the carpool website loosely fit into the category of the sharing economy. From a philosophical sense, it should be clear that creating a society that is more active in sharing is a good thing and should lead to a society that is more open, accepting, empathetic and caring. More considerations with respect to the carpooling website include the creation of an environmentally friendly society that is sustainable, the building of a friendly community and encouragement to participate in society.

Political

Political issues relating to the final application could be concerned with the negative effects of adoption of ridesharing. For example, using the case study of ridesharing apps like Uber, taxi drivers have blocked the streets in protest in many cities around the world including London, Paris, Madrid, Rome and Berlin (McGregor, Brown and Gloss, 2017). The aim of these protests was to pressure governments into changing regulation or even revoking Ubers licence, claiming that Uber has been given free-reign (Topham, 2016).

Economic

There are many aspects that could be looked at with regards to carpooling application, the sharing economy and economics. One report (Penn and Wihbey, 2017) notes that a continuous argument is whether the sharing economy is creating more opportunities or displacing traditional jobs. In the case of Uber this would question whether the technology is creating more opportunity (anyone has the potential to participate by becoming an Uber driver), or taking money away from traditional taxi services such as London Black Cabs, which as mentioned in the previous section has resulted in large scale protests and disruption. Applied to the carpool application, where users are not paying for services, it could be argued that not only is money being taken away from taxi providers but it is also being taking away from public transport providers such as TFL.

It is thought however that these losses in economic wealth are more than made up for by the potential improvements to the environment, with focus on reducing emissions of harmful gases. Rideshare, a non-profit carpooling organization state on their website that from use of their services they have already helped save 27 million gallons of fuel (Rideshare, 2017). If carpooling was to become common practice, it should in theory cause significant reduction in the amount of fuel being consumed; as positive as this is, it could again cause economic problems with regards to fuel sales.

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