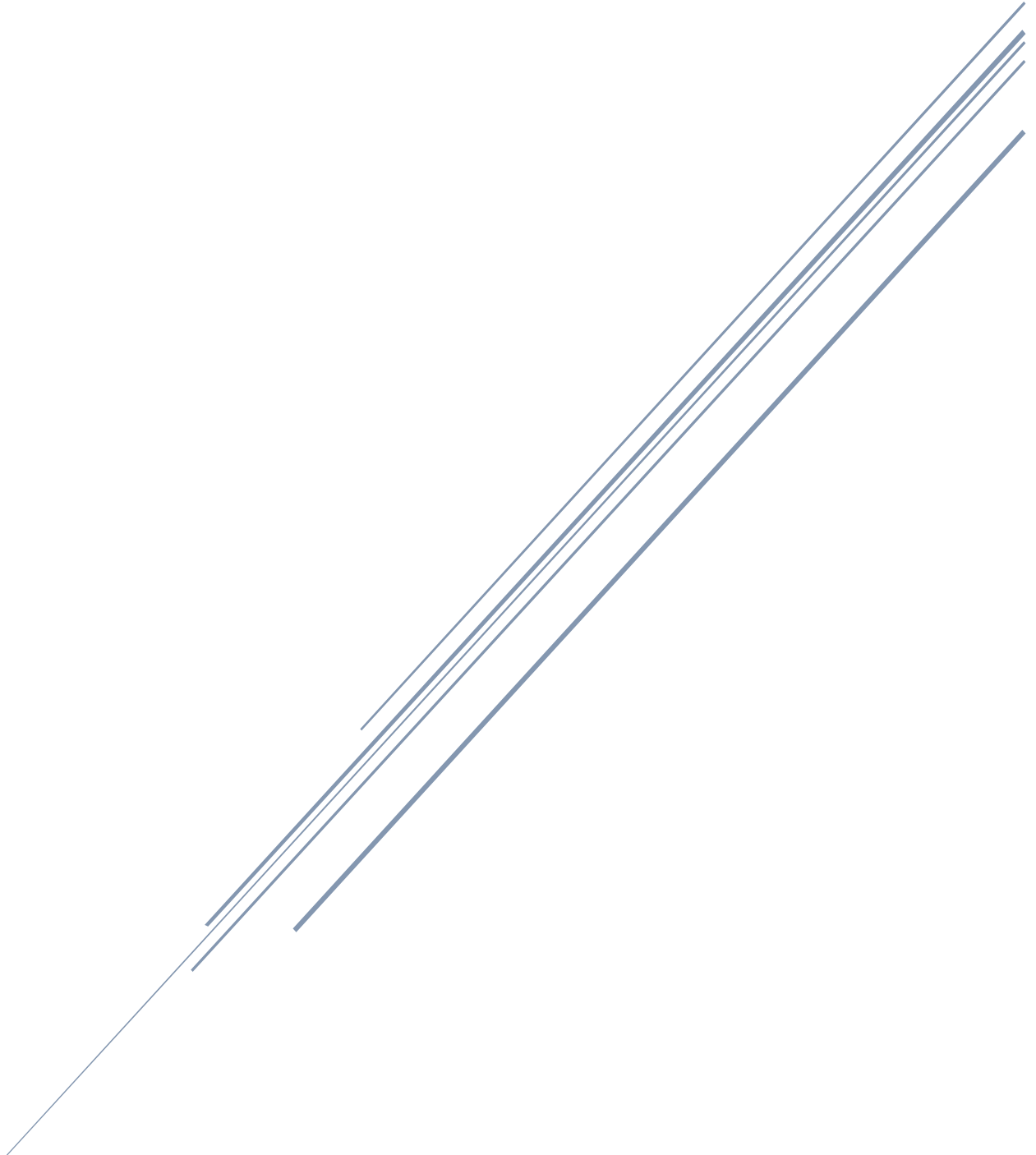


# Social Engineering Training Tool



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CTEC3451 – Development Project (First Deliverable)

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## Literature Review

Since the turn of the millennia, Social Engineering attacks have only increased. The range of attacks and frequency of them has proved difficult to prevent and mitigate. Social Engineering attacks are primarily targeting large businesses who have assets of financial value. Not only that, but threat actors are also targeting individuals, such as attacks in the financial sector on unaware or uneducated users. These attacks influence more than just the user themselves, but also society. It is becoming increasingly common knowledge that a Cyber Security infrastructure is only as strong as the individuals who use these systems. Cyber criminals are now looking towards the users of the systems as the key for entry, instead of traditional methods such as malicious payloads. This is because it is often quicker and cheaper to manipulate a human than a system, with the primary cause being that the user has a lack of education on the topic. The review will highlight Social Engineering as a wider topic, how they work and the forms they are executed in, and their societal impact. The literature in relation to the most effective type of user learning will then be explored, with an overview of the type of information that the user needs to consume in order to gain effective Social Engineering knowledge. Finally, a group of training tools that currently exist will then be analysed, in order to conclude by highlighting the key features required to make a training tool effective and user friendly.

Social Engineering attacks have increased in recent years, with the awareness of the topic varying dependant on where the attacks are being executed in. The literature suggests that although there is an increase in the awareness of attacks via email, as this is the most common communication vector, there is a lack of awareness in areas such as cloud services and social networks. (Krombholz, Hobel, Huber and Weippl, 2015). Social engineering attacks are proven to be an increasing threat, and geographically the three largest targeted nations are US, Germany, and Japan. (Salahdine, Kaabouch, 2019). The costs of these attacks in the US is estimated to be \$122 Billion, who are targeted due to their highly valuable companies, and when targeted cause a wider global impact than is initially recognised. (Salahdine, Kaabouch, 2019). The literature highlights the potential damage that Social Engineering can have, with Salahdine and Kaabouch going further to argue that an estimated “84% of cyber-attacks are conducted by social engineers with high success rate”. (Salahdine, Kaabouch, 2019). This highlights the importance to get the defence mechanisms right within businesses and wider society, as the impact often goes far beyond just the business itself.

Social Engineering can be presented in many forms, with the most noticeable attacks being categorised within one of the four attack vectors. These are physical, technical, social and socio technical. (Krombholz, Hobel, Huber and Weippl, 2015). Salahdine and Kaabouch explore these items in detail, such as that “Social-based attacks are performed through relationships with the victims to play on their psychology and emotion.” (Salahdine, Kaabouch, 2019). These attacks are the most dangerous and likely to be the most successful attacks as they involve human interaction, which is typically weaker than an online system. Examples of these attacks are baiting and spear phishing. Technical-based attacks are conducted through internet via social networks and online services, and they gather desired

information such as passwords, credit card details and credit card details to gain access into online systems. Physical-based attacks refer to physical actions performed by the attacker to collect information about the target, as this is at times a suitable alternative. An example of such attacks is searching in dumpsters for valuable documents". (Salahdine, Kaabouch, 2019). The varying forms that these attacks present themselves in means that individuals within society now have to be aware of attacks from multiple vectors, and the increasing manipulation of these attacks.

The recent shift towards a more remote, work from home state should also be noted, as this has enabled the use of cloud services attacks. An example of this is via manipulation that allows a malicious file to be placed within the victim's cloud environment, and then social engineering is used to force them to execute the malicious file. (Krombholz, Hobel, Huber and Weippl, 2015). These attacks are not only effective on individual users, but even large corporations can be vulnerable and consequently targeted, "Google's internal system was compromised in 2009 [2], the RSA security token system was broken in 2011 [1], Facebook was compromised in 2013 [4], as was the New York Times". (Krombholz, Hobel, Huber and Weippl, 2015).

User learning in regard to Social Engineering has traditionally been seen to be challenging, particularly as there is a lack of awareness programs that cater to those with varying levels of awareness. (Aldawood, Skinner, 2019). This has meant programs are not always as effective as they could be, as due to cost or other external factors, they are static in nature. Users are also often found to have a lack of interest and personal motivation towards the training, meaning they are a security risk to themselves and their peers. There is also evidence to suggest that effective training will still have the user return to pre-trained levels within a number of weeks. (Pirocca, Allodi and Zannone, 2020). Since these tools are used by a range of people, the GUI (Graphical User Interface) should be user-friendly, and well designed to increase overall functionality. (Pirocca, Allodi and Zannone, 2020). Game-based training tools have also shown to be effective in user learning, as the exposure of cyber security, particularly regarding Social Engineering through games and quizzes improves the users understanding of the overall security threats. It also means they are more likely to be invested in putting the work required to keep themselves safe. (Dincelli and Chengalur-Smith, 2020). Game based training tools are shown to be more effective in providing the user with the required information, when presented in a way that is fun and engaging.

The benefits of game based learning are well documented, particularly through engaging the user through the game design. When done right, the benefits are shown by Anastasiadis to be improved decision making, along with critical thinking and positive learning experience, something the literature has shown to not always be a given. (Anastasiadis, Lampropoulos and Siakas, 2021). Game-based learning is also effective in showing where the gaps in knowledge exists for the user, as the 'yes'/'no' process allows for direct and transparent feedback. This is important as the clarity in design helps identify these gaps. (Ross et al., 2018).

One method used to improve the functionality and effectiveness of training tools is gamification. Gamification is described as “game-based mechanics, aesthetics, and game-thinking to engage people, motivate action, promote learning, and solve problems”. (Krath et al., 2021). One key element of gamification is feedback, as this allows the user to adjust their answer, whilst also learning and not becoming discouraged while using the training tool. This is something that has been identified as being a significant element of training tool design. (Ross et al., 2018, Pirocca et al., 2020). There is also evidence to support the idea that scoring, and progression bars are significant features that increase motivation and overall user satisfaction, particularly when navigating through exercises. (Ross et al., 2018, Pirocca et al., 2020, Erhel & Jamet, 2021). From this, there is a clear need to create a game that is efficient and fun to play when being used from an educational perspective, as Girard et al identifies the positive and present relationship between user motivation and the time spent using the educational tool. (Girard et al., 2012).

There is currently a range of training tools available, most notably business owned applications that are invested in to keep them up to date, and accessible for their employees. There is also some open source training tools, such as Maltego and Metasploit, which can be used to test attacks against and then identify methods to mitigate these attacks. Programs such as SETA (Security, Education, Training, Awareness) has also been noted as being “the most effective tool in combating cyber security threats”. (Aldawood & Skinner, 2020). The key features used by these tools lead to an increase in the quality, and overall effectiveness in teaching when taught digitally through engaging and easy to use games. (Ross et al., 2018, Pirocca et al., 2020,). These tools are most effective when they are scenario based, and are most importantly, interactive with an ability to allow the user to learn at their own pace. Alkhamis & Renaud, (2016). This is particularly important when aimed at standard users, who are not in a corporate setting and could have reduced awareness to potential attacks.

The key principles that make a good training tool are allowing the user to learn at their own pace, with the gamification methodology applied to motivate and challenge the user. From this, transparency and consistency in answers has also been identified as being significant in creating an effective training tool, with a clean and easy to use User Interface being a key component of a well-received training tool. There are specific features that have been identified as supporting the accessibility and overall effectiveness of the training tool. One key feature that has been identified is “Object oriented design elements, such as buttons, windows, allow fast development cycles”. (Peter Dey et al., 2019). Another key feature is the size of the buttons, as using large buttons, and increasing the size of icons to increase usability of the tool. (Darejeh, 2013). The benefits of using a progress bar was also identified within the literature, “In education tracking the students’ progress is essential to achieve the learning objectives”. This also helps to visualise the users progress and gives them a tangible measures of how far they have progressed through the exercise/s. (Kiryakova et al., 2014). There is also a need to create a consistent and engaging scoring experience for the end user in regard to their end feedback, so that they are motivated to continue and surpass their previous score. (Lee et al., 2017).

The literature has been analysed to identify any areas of research which are either lightly researched, or yet to be explored. Whilst the psychology behind Social Engineering attacks is explored in depth, the key area of research that requires more research is the direct comparison of available training tools, as there is little to no research published within this area. This could be due to the lack of good quality training tools, or that they may only be produced in a corporate setting for a specific business for a third party, meaning the comparisons made could be difficult and non-linear. There is also a lack of literature in statistics related to social engineering. This could be due to the main published statistics being put under the 'Cyber Security' label, meaning Social Engineering attacks in particular are a sub category of the data, and as such, under-reported or missed.

In conclusion, threat actors are now looking to take data from not only large corporations, but also individuals within society. These people commonly have either low Social Engineering awareness, leaving them susceptible to attacks, and also have a desirable amount of targetable goods, such as financial assets. The risk for attackers is also reduced when attacking individuals, as these attacks typically have little defence mechanisms in place, as their knowledge and awareness is the only defence mechanism in place to prevent common attacks such as email phishing. The same protection that would be commonly found within organisations is not present in individuals, increasing the need for a training tool that can educate and inform on how to mitigate these risks to prevent future damage.

Word Count: **1954**

### Functional Requirements:

In order to produce a training tool that can be used by a variety of individuals to educate on Social Engineering issues, it is essential to illustrate the system functionality that the user will interact with. This detailed overview will allow the system to be designed as fit for purpose, and effective. From this, a Use Case Diagram (UCD) and Use Case Specification (UCS) were produced to simply illustrate how the core system will function, and how the system will respond to the user actions.

The UCS will provide an overview of each use case, and the relevant conditions that must be met in order to satisfy the use case. This specification is significant as it allows the developer a clear idea of what is required during the development stage, with any relevant changes made using the agile methodology. This also leads to an overall reduction in the amount of changes made, meaning the developer can develop the website as designed. The UCD will show the actor, in this case the user, and the interaction that can be had between the user and the system. This has been illustrated in a tree-branching style, so that each input from the user can be tracked to show the next stage of the navigation process. This is beneficial to the developer during the system development, as it can be referred back to throughout and also allows for a clear picture of the system design, ensuring the project stays within its remit and an effective Social Engineering training tool is designed and implemented.

## Use Case Diagram:

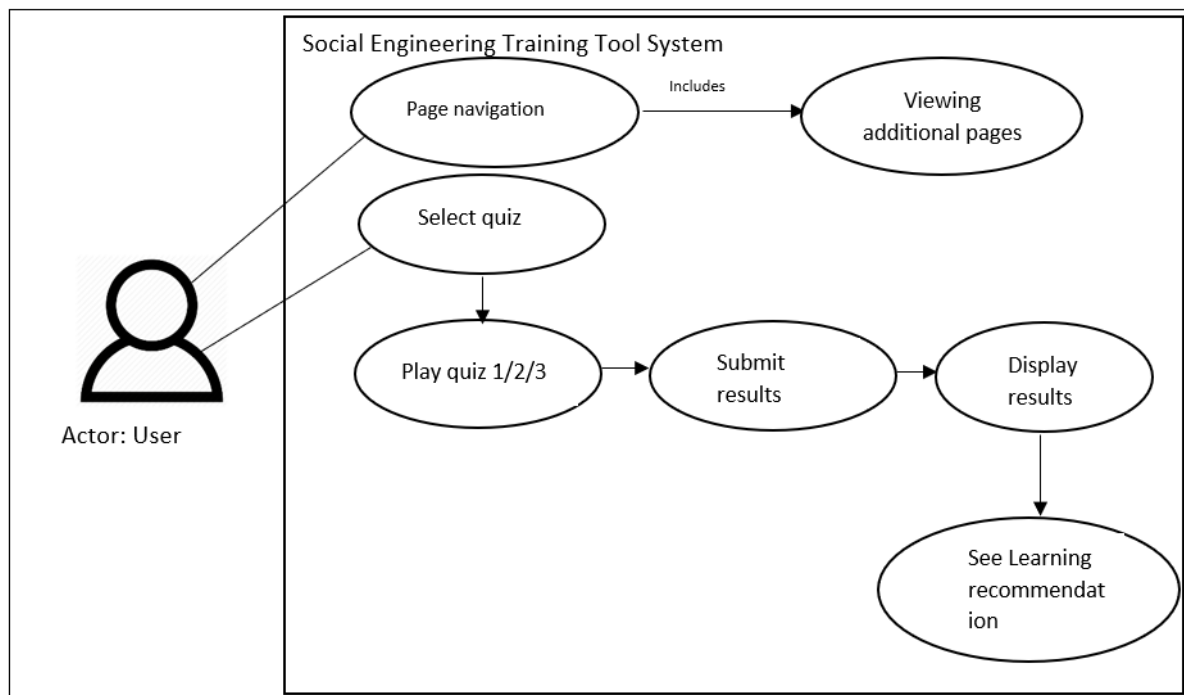


Figure 1 - Use Case Diagram

## Use Case Specification:

The following use cases below identify the relevant and necessary functionality to be used by individuals using the training tool to learn about Social Engineering. These use cases include page navigation as expected with the tool, and other expected items such as viewing additional sources to assist the user in their learning of the subject. The cases also cover learning related outcomes, such as beginning the quizzes, submitting their results and then the interaction with the results screen, which will identify the recommended actions dependant on their overall score.

<b>ID:</b>	<b>SYS001</b>
<b>Title:</b>	Selecting Quiz
<b>Description:</b>	Three clickable buttons that when clicked upon, will then begin the relevant game.
<b>Primary Actor:</b>	User
<b>Preconditions:</b>	Website must be opened.
<b>Postconditions:</b>	The relevant quiz is displayed
<b>Success Scenario:</b>	The user can select from the available buttons for the game they would like to play, and once done this will load the game
<b>Extensions:</b>	If there is a programming related error, the game is unlikely to be displayed when the user interacts with the menu buttons
<b>Frequency of Use:</b>	Low
<b>Status:</b>	Working
<b>Owner:</b>	Michael Green
<b>Priority:</b>	High

Table 1 - Selecting Quiz



<b>ID:</b>	<b>SYS002</b>
<b>Title:</b>	Page Navigation
<b>Description:</b>	The ability for the user to navigate the website, including viewing additional educational pages
<b>Primary Actor:</b>	User
<b>Preconditions:</b>	Website must be opened; buttons must be working.
<b>Postconditions:</b>	The user can successfully navigate the tool
<b>Success Scenario:</b>	Any interactivity within the website design can be used simply and effectively by the user.
<b>Extensions:</b>	N/A
<b>Frequency of Use:</b>	High
<b>Status:</b>	Working
<b>Owner:</b>	Michael Green
<b>Priority:</b>	High

*Table 2 - Page Navigation*

<b>ID:</b>	<b>SYS003</b>
<b>Title:</b>	Play Quiz
<b>Description:</b>	Landing on the quiz page will allow each quiz to start
<b>Primary Actor:</b>	User
<b>Preconditions:</b>	Website must be opened; user must be on one of the quizzes
<b>Postconditions:</b>	The quiz will start
<b>Success Scenario:</b>	The user can select the quiz which will then load the quiz
<b>Extensions:</b>	N/A
<b>Frequency of Use:</b>	Medium
<b>Status:</b>	Working
<b>Owner:</b>	Michael Green
<b>Priority:</b>	High

*Table 3 - Play Quiz*

<b>ID:</b>	<b>SYS004</b>
<b>Title:</b>	Answer Questions
<b>Description:</b>	The user will be able to select a single answer or a selection of answers.
<b>Primary Actor:</b>	User
<b>Preconditions:</b>	Website must be opened; user must be on one of the quizzes.
<b>Postconditions:</b>	The user has selected their answers
<b>Success Scenario:</b>	The user has selected the answers and is ready to click the submit button.
<b>Extensions:</b>	N/A
<b>Frequency of Use:</b>	Medium
<b>Status:</b>	Working
<b>Owner:</b>	Michael Green
<b>Priority:</b>	High

*Table 4 - Answer Questions*

<b>ID:</b>	<b>SYS005</b>
<b>Title:</b>	Submit Results
<b>Description:</b>	The user can submit their results and the view results page becomes accessible.
<b>Primary Actor:</b>	User
<b>Preconditions:</b>	The user has completed the quiz
<b>Postconditions:</b>	The user is ready to submit
<b>Success Scenario:</b>	The user can submit the results without errors and is taken to the results page
<b>Extensions:</b>	Message box is displayed if there is an error such as the user not giving an answer on a specific question
<b>Frequency of Use:</b>	Medium
<b>Status:</b>	Working
<b>Owner:</b>	Michael Green
<b>Priority:</b>	High

*Table 5 - Submit Results*

<b>ID:</b>	<b>SYS006</b>
<b>Title:</b>	Display Results
<b>Description:</b>	The user, after submitting their results on a particular quiz, is displayed with the results page, and learning recommendations.
<b>Primary Actor:</b>	User
<b>Preconditions:</b>	The user has submitted the relevant answers using the 'Submit' button.
<b>Postconditions:</b>	The results page is displayed with the correct information regarding the selected answers.
<b>Success Scenario:</b>	The assessments results page is displayed with the relevant learning recommendations within the same page.
<b>Extensions:</b>	N/A
<b>Frequency of Use:</b>	Medium
<b>Status:</b>	Working
<b>Owner:</b>	Michael Green
<b>Priority:</b>	High

*Table 6 - Display Results*

<b>ID:</b>	<b>SYS007</b>
<b>Title:</b>	View Additional Pages
<b>Description:</b>	The user can view additional pages provided to support their learning before they are quizzed.
<b>Primary Actor:</b>	User
<b>Preconditions:</b>	The user has navigated to the relevant learning pages.
<b>Postconditions:</b>	The user can view the relevant learning pages.
<b>Success Scenario:</b>	The user can submit the results without errors and is taken to the results page.

<b>Extensions:</b>	N/A
<b>Frequency of Use:</b>	Medium
<b>Status:</b>	Working
<b>Owner:</b>	Michael Green
<b>Priority:</b>	High

Table 7 - View Additional Pages

### Software Layout Schema:

The software schema provides a high-level overview for the Social Engineering training tool and highlights the relevant navigation on how the application is logically designed for both the designer and end user. Figure 2 details the path of navigation available to the user, and in what order the user can expect to see items and pages with the navigation. Whilst the figure below provides the ideal and preferred route of navigation for the end user, there is buttons that remain at the top of the website regardless of what page the user is on along with some that vary depending on where the user is located. This is to ensure the user is not stuck in relation to their navigation at any point. These banners are logically stored within the banner of the website and can be found within the [UI Design section](#).

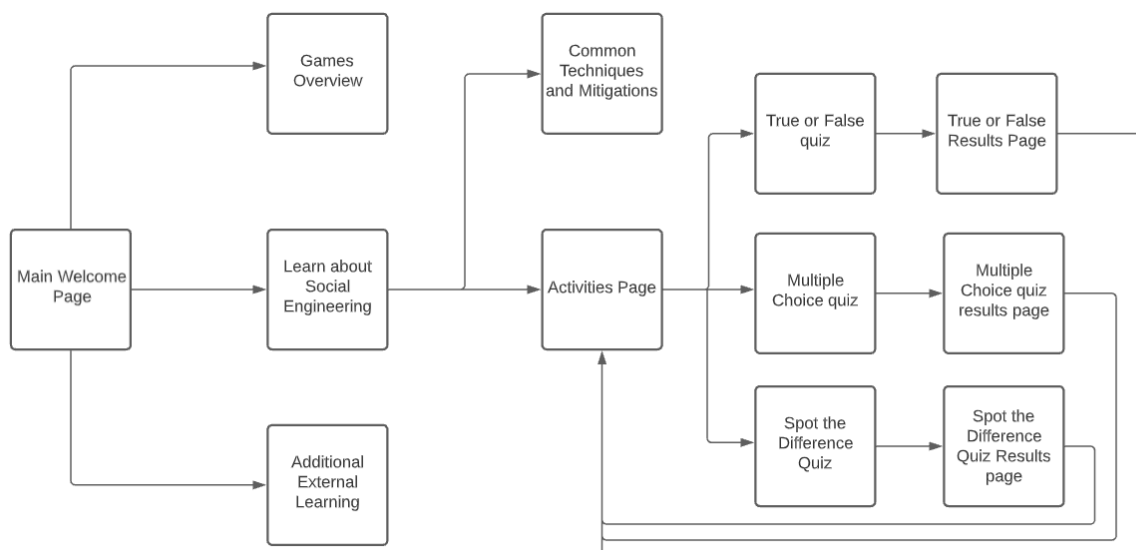


Figure 2 - Logical layout Overview

## System Documentation:

### UI Design:

The User Interface (UI) was designed to be simple to use and engaging, which is of particular importance as the tool requires user interaction. To allow for easy navigation, the UI in principle was split into two parts, with the buttons and navigation split in contrast with the page content. The consistency allows for a familiar user experience when navigating each page, as the three-button layout remains consistent across the top of each page. This improves efficiency as the code is replicated onto each page, with some variation in the redirection and content of each button depending on where the user is on the website. As shown within the Software Layout Schema, the

split in design allows for the implementation of the page navigation without compromising the user experience.

Consequently, as demonstrated in the Prototype UI section, the menu buttons on each page are located within the header of each web page, making them visible and easily accessible whilst also leaving sufficient space for the significant content that is on each page. Implementation of this also creates a cleaner look and creates more space for relevant information within each page of the tool. This also takes into consideration the significant design choices discovered in the literature review (Krath et al., 2021), designed to increase functionality and user satisfaction whilst using the tool.

This allows the system to have a familiar design and ensures simple and efficient navigation of the designed system as the page information can be stored in the area below the top row of buttons and displayed quickly after landing on the page. The simple design is necessary as it removes complexity that may of caused issues for users that are not as computer literate who would use the tool. Through the design, the user will have a clear idea of each page and its purpose, avoiding having 'filler' pages and information that are not of sufficient benefit to the end user. The consistency in design also reduces the chance of overcomplicating the User Interface, allowing the agile methodology to be applied with the design being repeatedly adjusted and improved.

UI Designs:

## Application UI – Welcome Page

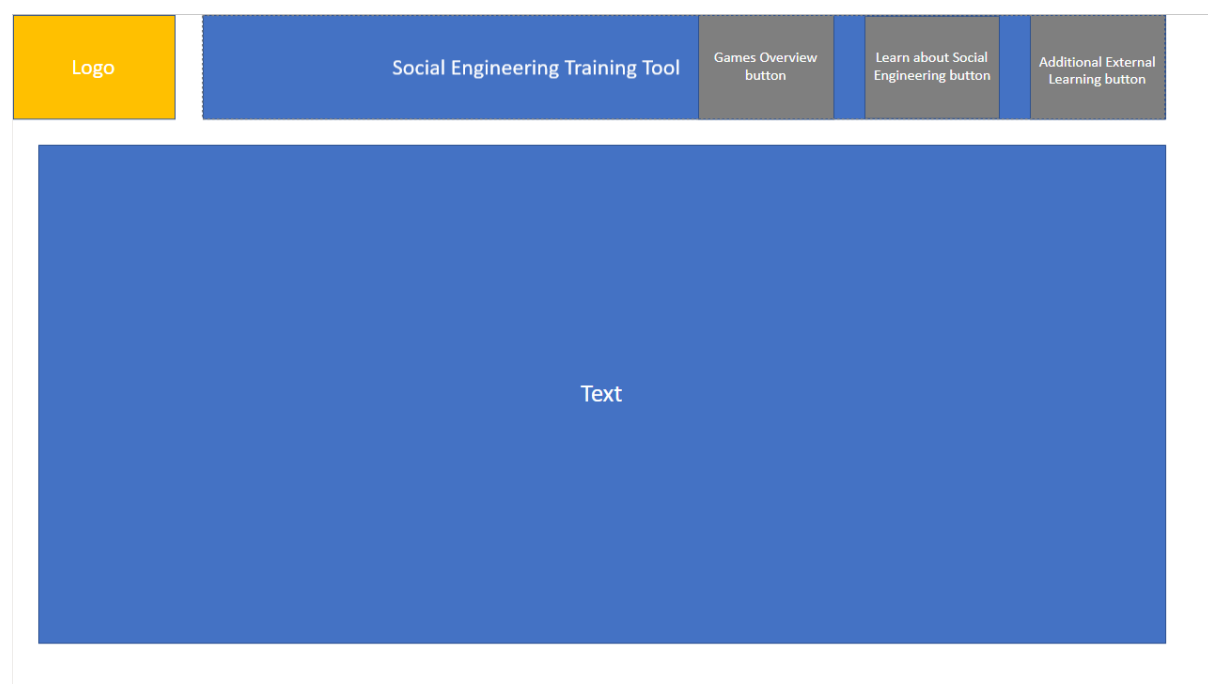


Figure 3 - Home Page

## Application UI – Learn about Social Engineering Page

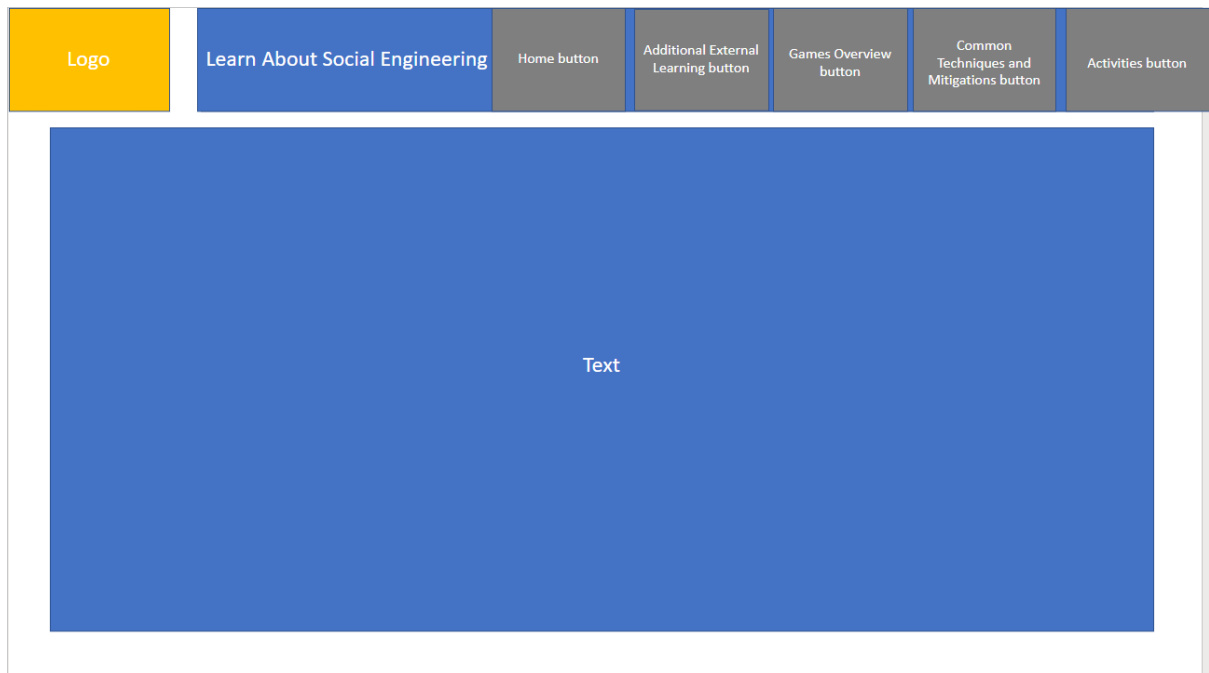


Figure 4 – Learn about Social Engineering Page

## Application UI – Games Overview Page



Figure 5 - Games Overview Page

## Application UI – Additional External Learning Page

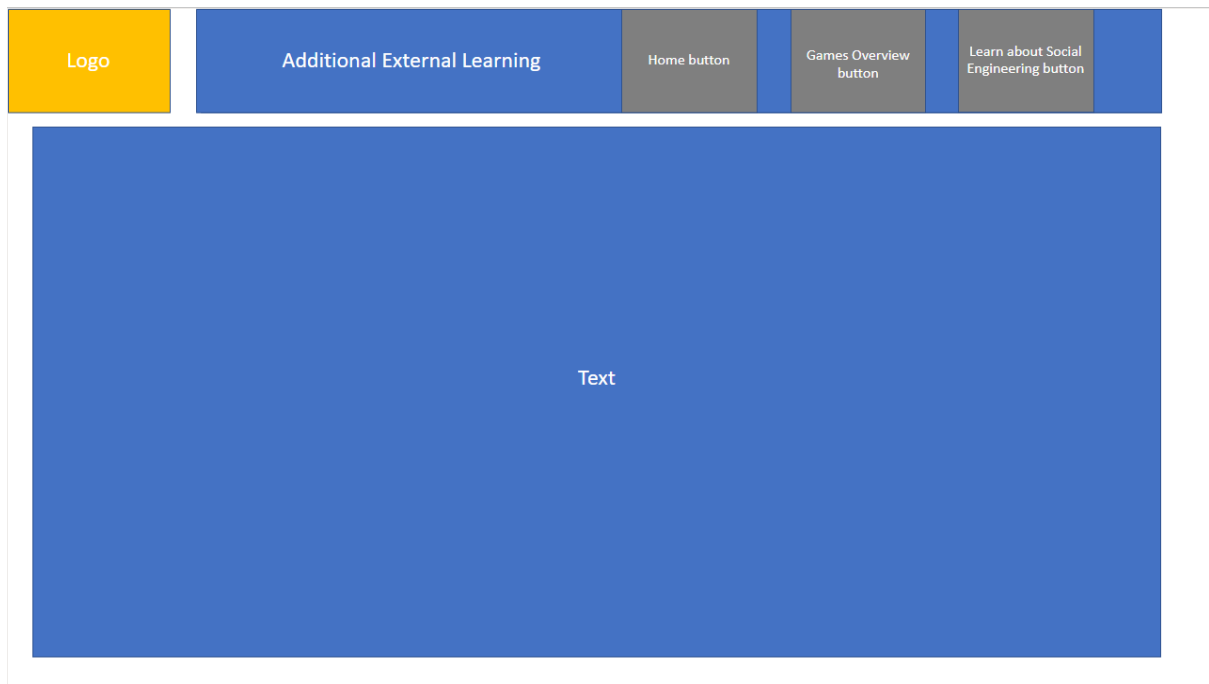


Figure 6 - Additional External Learning Page

## Application UI – Common Techniques and Mitigations Page



Figure 7 - Common Techniques and Mitigations Page

## Application UI – Activities Page

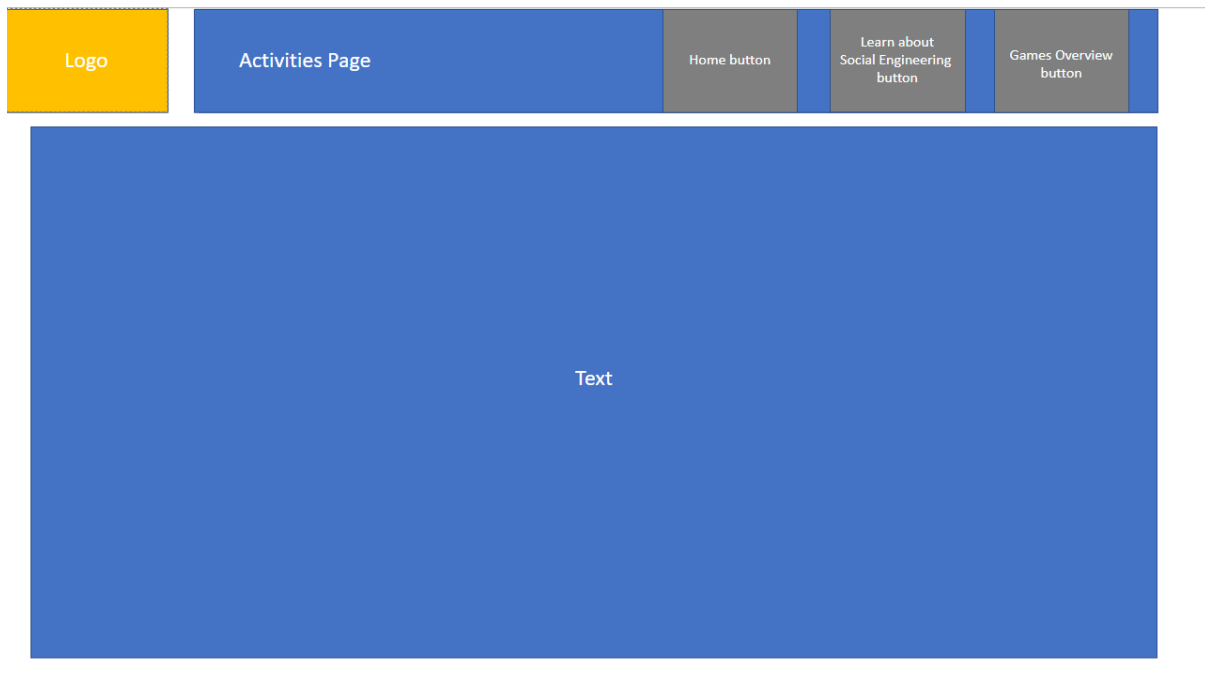


Figure 8 - Activities Page

## Application UI – Game 1 Page

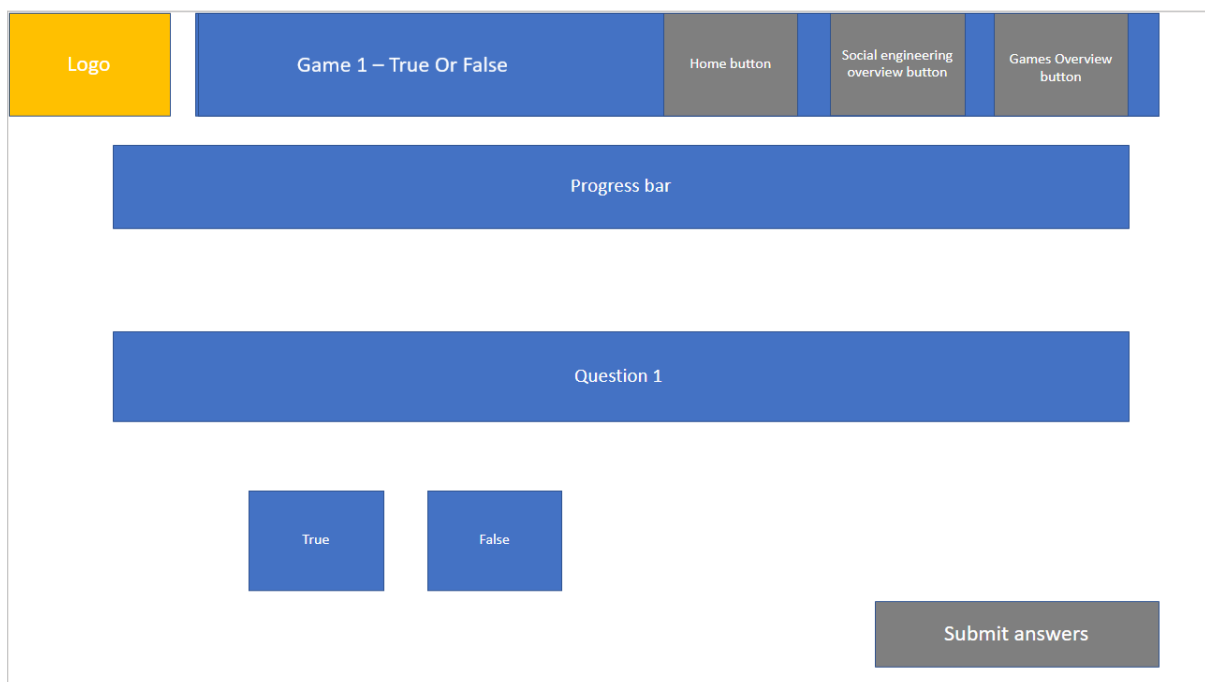


Figure 9 - Game 1 Page

## Application UI – Game 1 Results Page



Figure 10 - Game 1 Results Page

## Application UI – Game 2 Page

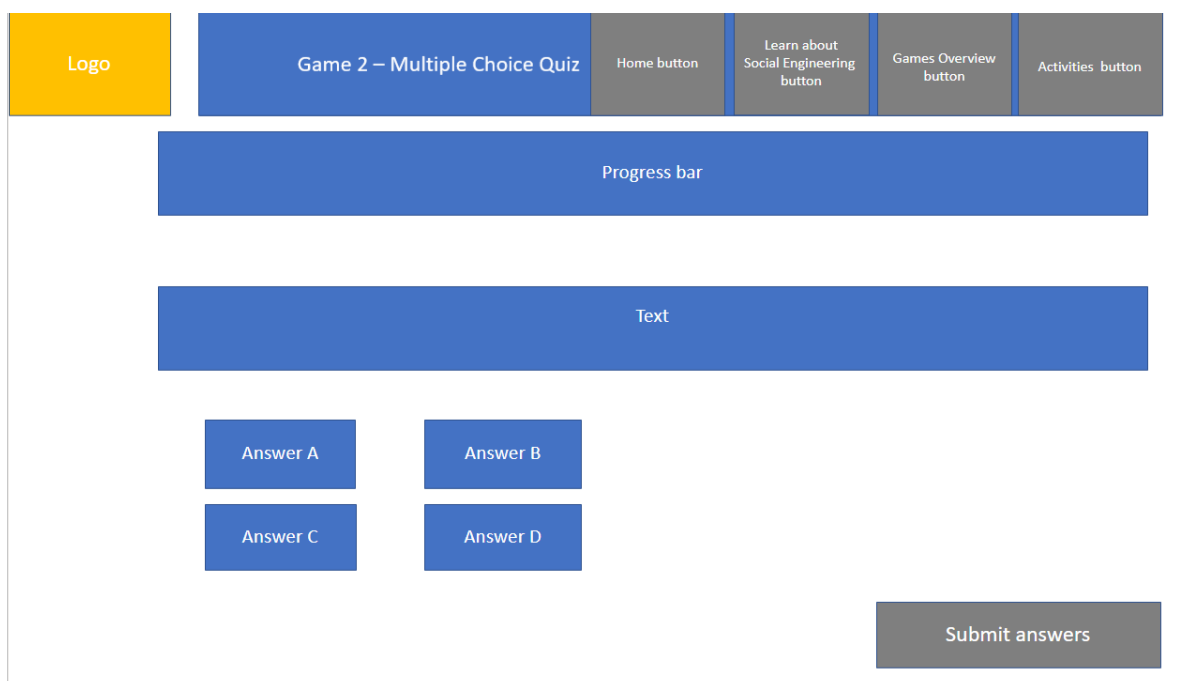


Figure 11 - Game 2 Page



## Application UI – Game 2 Results Page

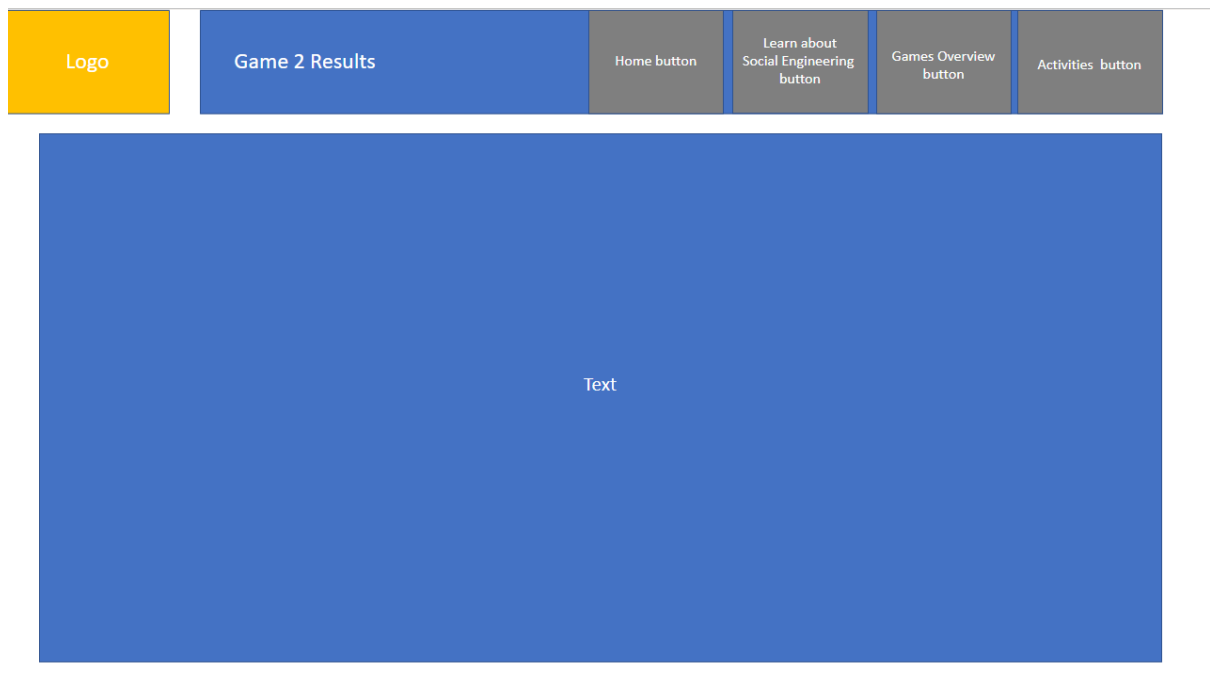


Figure 12 - Game 2 Results Page

## Application UI – Game 3 Page

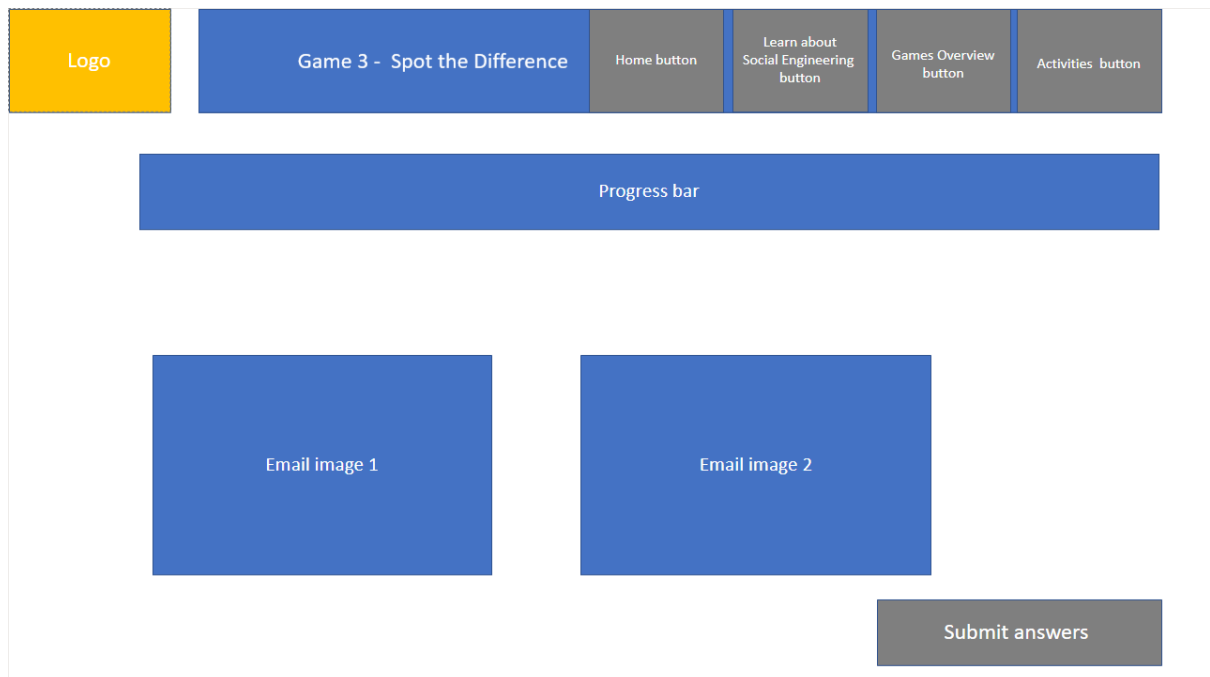
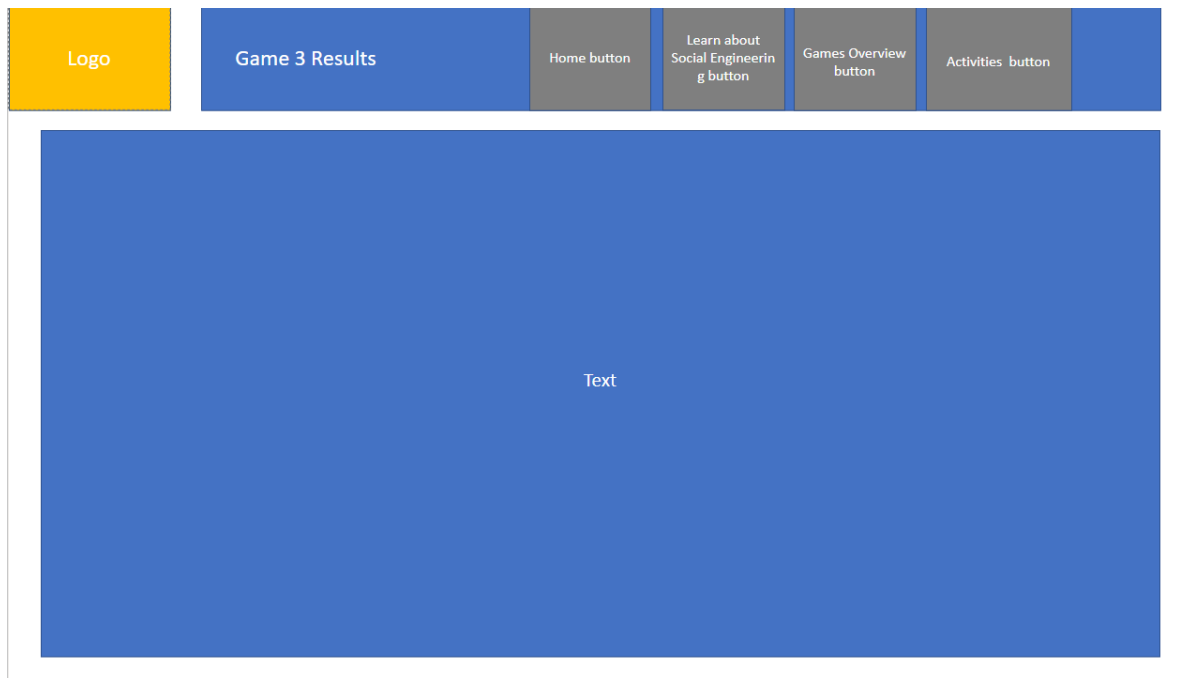


Figure 13 - Game 3 Page

## Application UI – Game 3 Results Page



*Figure 14 - Game 3 Results Page*

### Prototype UI:

Following the UI designs, a prototype and initial design was coded and implemented. As shown in Figure 10 and 11, the prototype UI has implemented the design considerations discovered in the literature review, with a clean design that keeps the consistency of buttons at the top of the page. This keeps a familiarity within the tool, that will increase engagement and time spent using the training tool. It should be noted that these designs are prototype, and as such as subject to change using the agile methodology to create the best end version of the training tool, with additional items to be implemented such as the logo and other aspects are also liable to change during the development process. An example of the change could be the top row of buttons being stacked vertically instead of horizontally as shown in the UI design, which could be adjusted during further development.

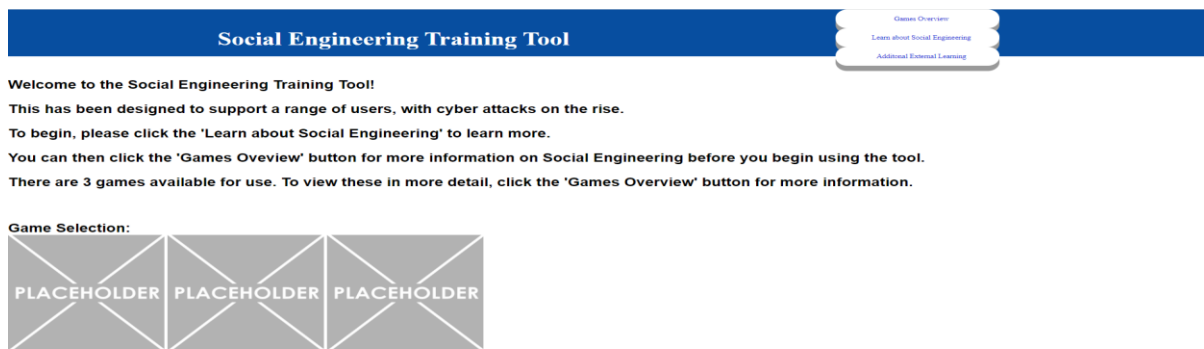


Figure 15 - Prototype UI Welcome Page

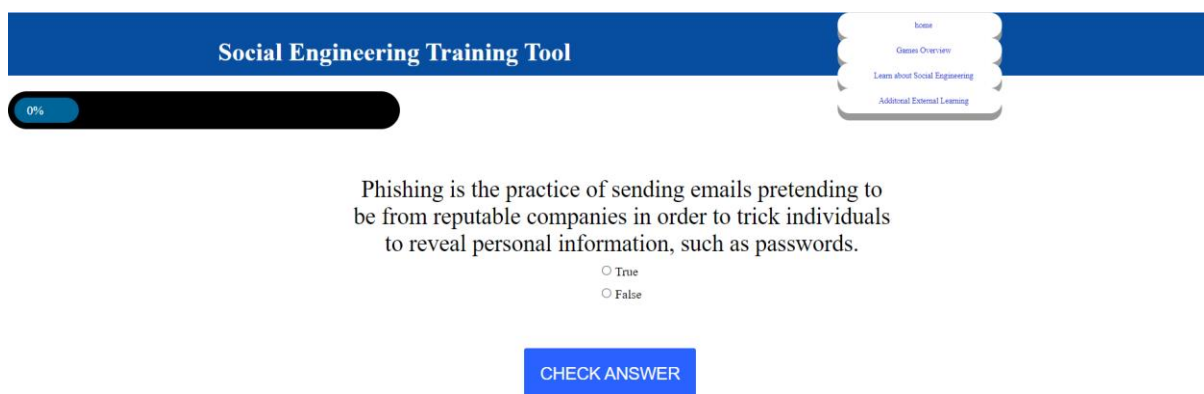


Figure 16 - Prototype UI Game 1

### System Architecture:

The System Architecture is designed to facilitate the use of a local user being able to run the training tool. This is due to the local aspect of the system design, as the requirements for the website being executable is simply a local database, such as the one provided on a users' device. From this, the user is able to interact with the local files, such as the JavaScript codes that are embedded within the HTML code throughout each page. The benefits of this being that the user will only need access to the relevant welcome page HTML file, in order to access and interact with the remaining functionality of the website effectively.

The web application logic is created through JavaScript, which allows efficient and simple integration with the front end user view, being the HTML interface. From here, the user will be able to interact with the JavaScript functionality, as the functionality is linked into the relevant pages, and with thorough testing, will allow for a consistent experience as shown through the architecture.

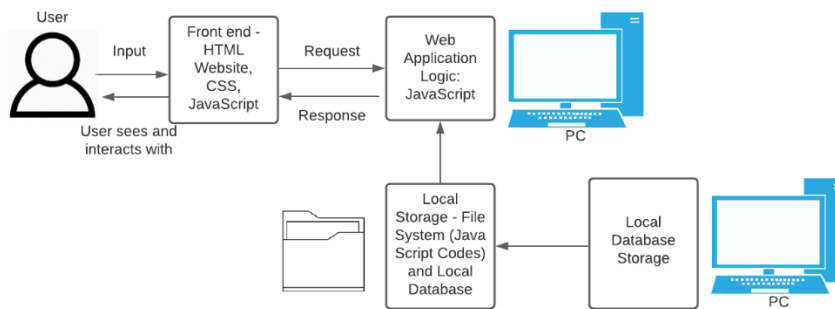


Figure 17 - System Architecture Diagram

## Testing:

### Testing Strategy:

The website is being developed using the Agile methodology, meaning that aspects of the functionality are built to be usable but not complete until improvements are made on a frequent basis until they are classed as complete, each page can be tested repeatedly throughout the course of its development with no impact on the wider piece. This will serve as a benefit to the overall development, as issues that arise are dealt with during the current stage of development, rather than being discovered in the testing phase, which in development models such as the waterfall model, is typically closer to the deadline. As such, if any significant changes are required, these can be coded and account for when needed, instead of at a specific phase which could delay the progress towards an agreed deadline. The agile methodology is also beneficial, as it allows for consistent testing throughout the development lifecycle, with smaller issues being addressed and fixed as development progresses, creating an improved training tool.

Within the agile methodology of testing, all features and aspects of the training tool are able to be tested to their complete functionality. This means that the testing carried out is both extensive and system based, reducing the amount of errors or additional work that would have to be carried out to improve the tool beyond the original development cycle. Beyond the completed piece, any additional work would be classed as feature improvements, and not something required to make the within scope piece become functional, such as debugging. There are some out-of-scope factors that could impact the agile testing. These would be performance related issues to the machine that the user is interacting with the tool on. As software develops, additional lines of code are added, which could introduce performance issues for the end user if they have a machine that struggles to deal with applications of a larger scale. However, this would be difficult to detect and mitigate, apart from ensuring the training tool is fit for purpose, and additional code is not added for minimal benefit to the overall product. Another problem that could cause issues with the agile testing is features and functionality that is based upon user input. The training tool is designed to have minimal user input, and predominantly be used with a mouse. Ideally, there is the potential to integrate input functionality into the training tool, however this is out of scope in regard to the design specification of the training tool. This is because of the vast range of characters that would have to be accounted for, which could cause issues and delay the progress of the design. It would also require additional development as these answers would have to be stored, in the same way that login functionality was considered, but not implemented into the design.

Considering the Agile testing and all advantages it provides, particularly the aspect of regular testing, it was decided that this testing strategy should be used. This decision took into consideration the disadvantages of Agile testing, the agreed deadline for the project and the numbers of developers working on this project, which is singular. Thus, Agile testing was chosen as the most desirable and effective testing strategy. As a result, a set of test cases were created to implement this strategy in order to gain the benefits from it and achieve the agreed objectives.

#### Test Cases:

Test Case ID	Test Scenario	Prerequisite	Test Steps	Expected Result	Actual Result	Pass/Fail	Comments
001	Test that the website can be opened, and the welcome page is loaded.	The software and files are available.  The main html file is opened in a compatible web browser such as Google Chrome.	Open the 'Social Engineering Training Tool' HTML file.	Website homepage is displayed correctly with all expected features and functionality.			
002	Test that the menu buttons when clicked display the correct page.	Website file is open and running.	Click the menu buttons located within the website header.	Each button navigates to the correct page.			
003	Verify that the Learn about Social Engineering is accessible.	The website is open, and the user has selected the 'Learn about Social Engineering' button.	Click the 'Learn about Social Engineering' button.	The page is displayed.			
004	Verify that the Games overview is accessible.	The website is open, and the user has selected the 'Games Overview' button.	Click the 'Games Overview' button.	The Games overview page is displayed.			
005	Verify that the Additional External Learning page is accessible.	The website is open, and the user has selected the 'Additional External	Click the 'Additional External Learning' button.	The Additional External Learning page is displayed.			

		Learning' button.					
006	Verify that the Common Techniques and Mitigations page is accessible.	The website is open, and the user has selected the 'Common Techniques and Mitigations page' button.	Click the 'Common Techniques and Mitigations' page button.	The Common Techniques and Mitigations page is displayed.			
007	Verify that the activities page is accessible.	The user is on the 'Learn about Social Engineering' page.	Click the 'Activities' page button.	The Activities page is displayed correctly.			
008	Verify that the True or False quiz displays the correct questions and available answers.	The user has selected the game from the activities page.	Select the game from the activities page.	The quiz is displayed correctly.			
009	Verify that the True or False quiz displays the correct output if the answer is correct.	The user has chosen correct answers.	Click the correct answers and click 'Submit'.	The 'Correct' answer display message is presented.			
010	Verify that the True or False quiz displays the correct output if the answer is incorrect.	The user has chosen incorrect answers.	Click the incorrect answers and click 'Submit'.	The 'Incorrect' answer display message is presented.			
011	Verify that the results page for the True or False quiz is presented.	The user has submitted their answers.	Complete the quiz and see if the results page is loaded.	The results page is loaded.			
012	Verify that the learning recommendations output is present on the True or False results page.	The user has been given a score for their performance in the quiz	Complete the quiz, and check the output of recommendation	The correct learning recommendation is presented on the True or False quiz page.			
013	Verify that the Multiple Choice quiz displays the correct questions	The user has selected the game from	Select the game from the activities page.	The quiz is displayed correctly.			

	and available answers.	the activities page.					
<b>014</b>	Verify that the Multiple Choice quiz displays the correct output if the answer is correct.	The user has chosen correct answers.	Click the correct answers and click 'Submit'.	The 'Correct' answer display message is presented.			
<b>015</b>	Verify that the Multiple Choice quiz displays the correct output if the answer is incorrect.	The user has chosen incorrect answers.	Click the incorrect answers and click 'Submit'.	The 'Incorrect' answer display message is presented.			
<b>016</b>	Verify that the results page for the Multiple Choice quiz is presented.	The user has submitted their answers.	Complete the quiz and see if the results page is loaded.	The results page is loaded.			
<b>017</b>	Verify that the learning recommendations output is present on the Multiple Choice results page.	The user has been given a score for their performance in the quiz.	Complete the quiz and check the output of recommendation.	The correct learning recommendation is presented on the Multiple Choice quiz page.			
<b>018</b>	Verify that the Spot the Difference quiz displays the correct questions and available answers.	The user has selected the game from the activities page.	Select the game from the activities page.	The quiz is displayed correctly.			
<b>019</b>	Verify that the Spot the Difference quiz displays the correct output if the answer is correct.	The user has chosen correct answers.	Click the correct answers and click 'Submit'.	The 'Correct' answer display message is presented.			
<b>020</b>	Verify that the Spot the Difference quiz displays the correct output if the answer is incorrect.	The user has chosen incorrect answers.	Click the incorrect answers and click 'Submit'.	The 'Incorrect' answer display message is presented.			
<b>021</b>	Verify that the results page for the Spot the	The user has submitted	Complete the quiz and see if	The results page is loaded.			

	Difference quiz is presented.	their answers.	the results page is loaded.				
<b>022</b>	Verify that the learning recommendations output is presented on the Spot the Difference results page.	The user has been given a score for their performance in the quiz.	Complete the quiz and check the output of recommendation.	The correct learning recommendation is presented on the Spot the Difference quiz page.			

## Implementation Report

A prototype application has been designed and implemented to demonstrate to the supervisor that the website is on track and to ensure the website fulfils the original objectives. Consequently, this short report will highlight the features that have been presented in the prototype application and methods taken to implement these features such as the UI designs and assessments that provide the relevant feedback needed for the project to progress.

The design process begins with the Visual Studio editor tool, through the creation of a .HTML file which essentially acts as a notepad file within the text editor itself. There is then a .CSS and .JS files created, with the Cascading Style Sheet (CSS) allowing for the styling that is present on the prototype design. The JavaScript file (JS) allows for the implementation of logic that is applied to buttons, such as those present in the quiz prototype. Both JS and CSS files are implemented into the original HTML code to allow the website to import and run the scripts to bring the website together. All files were iterated upon and tweaked using the agile methodology, to allow for efficient loading of the web pages.

With the design process, major functionality such as assessments via the game functionality, and page navigation have been implemented using the combination of HTML and JavaScript functionality of events. When an event is triggered, the outcome is executed depending on the written conditional logic that is called. The code for this function can be copied across to multiple buttons with some tweaks made, such as those on the homepage allowing for an easy-to-use interface and consistency of use for the user.

Word Count: **275**



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