Click Here to Exit: An Evaluation of Quick Exit Buttons

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ABSTRACT

Accessing online support services can be dangerous for some users, such as domestic abuse survivors. Many support service websites contain "quick exit" buttons that provide an easy way for users to escape the site. We investigate where exit buttons and other escape mechanisms are currently in use (country and type of site) and how they are implemented. We analyse both the security and usability of exit mechanisms on 323 mobile and 404 desktop sites. We find exit buttons typically replace the current page with another site, occasionally opening additional tabs. Some exit buttons also remove the page from the browser history. When analysing the design choices and shortcomings of exit button implementations, common problems include cookie notices covering the buttons, and buttons not remaining on the screen when scrolling. We provide recommendations for designers of support websites who want to add or improve this feature on their website.

CCS CONCEPTS

• **Security and privacy** → **Usability in security and privacy**; • **Human-centered computing** → *Usability testing*.

KEYWORDS

Security, Privacy, HCI for Development, Usability Study

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1 INTRODUCTION

There are a wide range of issues which cause a person to seek out support. Support services often have a website to provide information and enable users to get in touch, however it is not always safe for users to access these sites, such as in domestic abuse cases. Domestic abuse is a serious offence which often affects victims for the rest of their lives, and it is unfortunately incredibly common. One in three women and one in six men will be victims of domestic abuse in their lifetime [15, 24]. Technology is increasingly used both by abusers to monitor their victims [7, 31] and to cut them off from other support [5]. Victims also often use technology to learn more about domestic abuse and how to escape their relationship, which is made more difficult and dangerous by the abuser's use of the same technology for malicious purposes. Furthermore, Dragiewicz et al. [6] found that technology-enabled abuse often escalates when the victim attempts to leave the relationship. Technology-focused safety tools for victims are a necessity, however very limited research has been done on safety features for domestic abuse victims.

In domestic abuse, the victim risks their abuser seeing the support services they have contacted and the information visible on their screen, or searching their browsing history later and discovering that they believe the relationship is abusive. This could result in the abuse escalating and the victims being cut off from the support they were trying to access. To mitigate this risk, many sensitive websites provide functionality to hide the user's presence on the current site through a quick exit button, such as the examples shown in Figure 1. Though many are easy to locate and use, some of them had prominent issues, such as blending with other content on the screen or not effectively hiding the web page that the user had visited. As this feature is likely to be useful for the safety of domestic abuse victims, we set out to explore how the design of these buttons can be improved to better help users who need them. Furthermore, we decided to explore which other online services use quick exit buttons, as they are likely to be beneficial in many more situations than domestic abuse.

There has previously been some controversy around whether quick exit buttons are a beneficial or detrimental feature, centered around the transgender children's charity Mermaids UK. People against escape features describe it as a safeguarding issue as it encourages children to hide the sites they visit from their parents. However, there are circumstances in which it would be dangerous for children to be "outed" to their family through their browsing history, and the quick exit button helps to keep children safe in these situations. Many of the concerns about the exit buttons are alleged to be transphobic [10] rather than opposing the exit buttons in general. This suggests that exit buttons are more likely to be a beneficial feature than a detrimental one, and we should work towards improving these buttons to aid users of the sites that require one.

Emergency exit buttons work in a variety of ways: the most common approach is to redirect to another website so that the user's screen does not show the sensitive site. While this does prevent shoulder surfing, it does not clear the user's history, or prevent the back button from showing the content. As it is common for abusers to either force the victim to give them access to the device, make them reveal their browser history, or covertly access the device at

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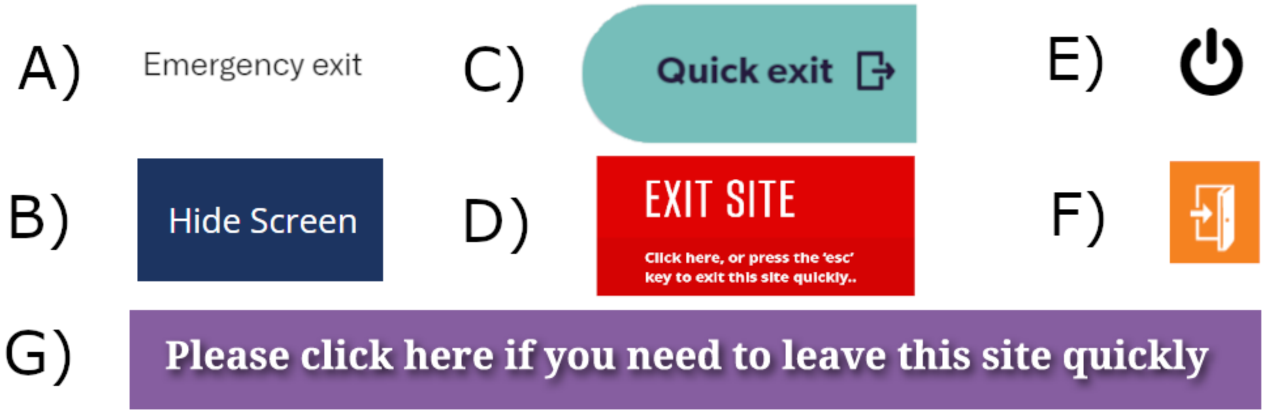
A)
Emergency exit
C)
Quick exit
E)
B)
Hide Screen
D)
EXIT SITE
Click here, or press the 'esc' key to exit this site quickly..
F)
G)
Please click here if you need to leave this site quickly

Figure 1: Examples of Different Types of Quick Exit Buttons. A and B are text, C and D are buttons, E and F are icons, and G is a banner.

a later time[7], this will not be sufficient in the majority of cases. There are limitations to what exit buttons can do. For example, it is not possible for a website button to clear all of the browser history. However, our evaluation reveals that some websites do use more creative implementations that provide better solutions to the problem.

This study evaluates the prevalence and implementations of quick exit buttons on support websites. This evaluation is split into four parts: the first explores English-language support service websites providing support for a wide range of issues to identify if they have quick escape mechanisms, and observe where they are present and what implementation they use. In the second component of the study, we perform security and usability requirements analysis for the exit mechanisms to generate a set of criteria to evaluate the implementations against. The third part involves manually annotating the sites according to these requirements, obtaining measurements of how secure the quick exit button implementations are. We also gather metadata about the buttons to allow us to identify which design decisions impact the usability of the quick escape mechanisms. The final part of the study aims to identify the impactful design choices and create guidelines for implementing an exit button, allowing websites to quickly and easily add an effective emergency exit button to their website.

2 RELATED WORK

2.1 Technology-Enabled Domestic Abuse

There is a growing body of work investigating how domestic abusers use technology for abuse. Freed et al. [7] look at how technology is being used by abusers through focus groups and interviews with Intimate Partner Violence (IPV) survivors and professionals who have worked with survivors of IPV. They identify four categories of threats: ownership-based access, account or device compromise, harmful messages or posts, and exposure of information. They also discuss the "UI-bound adversary": a threat model for people who do not have sophisticated computing skills, and can only interact with a system through the user interface. This threat model describes abusers and other adversaries in the context of escape mechanisms well.

In addition to understanding the threat model, it is useful to understand the process of a victim escaping an abusive relationship and how this impacts their technology use. Matthews et al. [14] look at the privacy practices and challenges facing survivors of an abusive relationship. They identify three key phases of an abusive relationship: physical control, when the abuser has access to the victim and their devices; escape, where the survivor attempts to leave the relationship and has to remove any access the abuser has; and life apart, where the survivor builds a new life away from the abuser while attempting to hide their contact information and location. The abuser is most at risk in the second phase, but has a constant risk of moving from the final phase back to the first.

Other researchers have also looked into the problem of technology-enabled domestic abuse ("tech-abuse") and related issues. Sambasivan et al. [22] look at online abuse experiences of people in South Asia, including cyberstalking, impersonation, personal information leaks, and physical harm. They find that 66% of participants reported instances of cyberstalking, while up to one in six people experience other forms of online abuse. They also investigate how people cope with this abuse, and find that most participants turn to family and friends for support rather than law enforcement or online platforms. Douglas et al. [5] interviewed 55 survivors with a focus on coercive control to identify the most common and impactful forms of abuse. They find 83% of women reporting technology being used for abuse, including harrassment, monitoring and stalking, isolation, social-media-facilitated-abuse, and image-based abuse. They also find that smartphones are the main tool used for technology-enabled domestic abuse, though social media, email, and recording devices are also used.

There are further perspectives to consider in addition to victims/survivors and abusers. Tanczer et al [25] look at the support service sector to see how they are handling tech-abuse. The identify four key themes of issues: technology-facilitated abuse; IoT-enabled tech-abuse; data, documentation, and assessment; and training, support and assistance. Lopez-Neira et al. [12] build on this work by detailing specific issues within each category, including the emerging threat of IoT based abuse. While other research has detailed how technology is being used for abuse, the use of IoT is a relatively new issue that has otherwise not been explored, and is likely to become the next big issue within tech-abuse.

Others have also investigated how support services deal with tech-abuse. Tseng et a [27] focus on how interventions for abuse were delivered during the start of the COVID-19 pandemic. They identify three fundamental challenges: ensuring the safety of both the victims while contacting support, and the consultants providing the support; the increased difficulty of remotely assessing and improving device security; and additional burdens for the support workers.

2.2 Surveillance

Maher et al. [13] identified different forms of technology used for surveillance, which is a common theme in research by Woodlock [31], and Dragiewicz et al. [6]. Woodlock finds that abusers use technology to get 24-hour access to their victims, using this access to isolate them from support networks such as friends and family as well as using information found from their surveillance to punish and humiliate their partners. Dragiewicz et al. find similar uses for surveillance, as well as discussing how abusers restrict victims' access to technology. Furthermore, they detail identity crimes used by abusers, including accessing the victim's accounts, and impersonating both the victim and other people online to separate the victim from support.

Several studies have investigated discussions on online forums to identify how both victims and abusers find technology being used for abuse. Leitão [11] explores three forums dedicated to supporting victims and survivors of domestic abuse. They identify the same abuses of technology for surveillance, harrasment, and restricting victim access to technology as prior studies. They additionally explore how victims use technology to their benefit, including recording evidence and using social media to contact others. Tseng et al. [26] similarly look at online forums, instead focusing on online infidelity forums to determine the abuser's perspective on using technology for surveillance. They identify four ways abusers spy on their victims: using tools that are planted on the victim or their technology; using shared access to accounts and reverse lookup without needing physical access to technology; coercing a partner to get full access, or using fake social media profiles to access their partner's information; and hiring private investigators to spy on their partner.

As technology-enabled surveillance is one of the most common forms of abuse throughout these studies, privacy-enhancing technologies and features are a necessary intervention for modern domestic abuse. Chatterjee et al. [3] focus on how different forms of malicious software are used for surveillance in abusive relationships. They find that although some spyware is used for abuse, a much more common problem are "dual-use" apps — software created for a good purpose, such as child monitoring and parental controls, which is then used for a secondary, malicious purpose, such as domestic abuse.

2.3 Usability

Usability of security has historically been a major issue [1, 9, 23, 29, 30] and continues to be a problem within tech-abuse. Parkin et al. [19] build on the results of Freed et al. [7], Lopez-Neira et al. [12], and Matthews et al. [14] to analyse the usability of IoT interventions for tech-abuse. They define overarching goals of abuse victims and survivors related to each stage of abuse and identify usability violations of IoT systems with respect to these tasks. One of the main goals during the escape phase (defined by Matthews et al. [14]) is removing records of the user's activity, which is the goal of the exit buttons at the core of our study. The most common usability violations during the escape phase were consistency, feedback, and help and documentation.

There are several studies which explore topics related to the components we evaluate in this study. Barbosa et al. [2] test the effectiveness of using keyboard commands for websites to aid visually impaired users. They find that keyboard commands greatly improve the experience of visually impaired users and also help users who are not visually impaired. This suggests that the use of keyboard shortcuts as an escape mechanism would be useful for all users, especially visually impaired users.

Another of the components of our study is looking at the advice given to users on how to browse the web safely. Redmiles et al. [21] evaluate the quality of security and privacy advice on the web. They find that the majority of online advice is actionable and efficient, however it is not often adopted due to an excessive proportion of the advice being deemed "high-priority" — advice that users would need to act upon as soon as possible and prioritise above other information. Geeng et al. [8] look at the experience of LGBTQ+ people with online security advice, identifying where users go for advice and common reasons why users sometimes reject security advice. The most common barriers for adopting advice are that the advice interferes with income or relationships, distrusting the source, the advice being out-of-date, and a sense of futility.

3 SITES CONTAINING QUICK ESCAPE MECHANISMS

The first phase of our study involves identifying which sites contain quick escape mechanisms, shortcuts, explainer texts and safe browsing pages. Section 3.1 discusses how we explore websites and identify these safety features, and Section 3.2 discusses where these features are more and less commonly found.

3.1 Generating the Site List

The first part of the study involves creating a list of websites which are frequented by users who may benefit from quick exit buttons. To do this, we first created a list of different categories of support services for which a quick escape mechanism would be beneficial by brainstorming categories across victim support, online safe spaces and marginalised groups, sensitive/privacy-critical topics, health related sites, and other relevant categories with our research group. These include online services for domestic abuse, rape and sexual assault, LGBTQ+, ethnic minorities (services such as healthcare and certain types of abuse specifically targeting people of colour or of certain religions), sobriety, stop smoking services, gambling addiction support, family planning and abortion services, parenting, services for children's needs, homelessness and housing support, sexual health, mental health, physical health, disability, elderly support services, past offenders, victims, police, and a further miscellaneous category.

For each of these categories, we began by looking for websites which listed support services of that type and saved the sites that they provided. We also used queried search engines with terms such as "domestic abuse support" to find additional support services. We snowball sampled by visiting the sites of any other services linked to on the websites that we found through these methods. Finally, we repeated these processes for different locations, both by adding country and region names to our search queries, and by using a VPN to make these search engine queries from different locations around the world. The vast majority of sites in our dataset were identified from search engine queries, with a minority of sites linking to others not found through search engines. We found listings of support services for domestic abuse and rape/sexual assault in the UK and USA which accounted for approximately half of websites in these categories for the respective countries, and a list of state-wide family planning services in the USA for which we evaluated all sites in addition to nationwide services from search engines. We also found a list containing multiple categories of services in Ireland, and a list of domestic violence services in Australia, which each account for approximately a quarter of sites in these categories/countries.

We looked at services in the UK, Canada, the USA, Australia, and New Zealand as these are primarily English-speaking countries which have English websites. After exploring websites for the UK, we limited our site list to 20 sites per category per country to limit the number of websites that we need to evaluate later; the single exception to this is family planning and abortion services in the USA given the recent overturning of Roe vs Wade. In the majority of cases, we used the first 20 unique sites shown by search engines as appearing high on search results is a reflection of how many users these sites have. When looking at existing service lists, we took a random sample of the services provided. A summary of the quantity of sites in our dataset for each category and country is shown in Table 1

For each site in this generated list, we note if they have a quick exit button present, if they have a quick exit keyboard shortcut, if there is an explanation of the usage of quick exit mechanisms for this site, and if there is a safe browsing/staying safe online page. We also visited these sites on a mobile device and recorded the same information, as some of the sites have different mechanisms on the desktop and mobile versions of their site.

To identify which countries and categories are more likely to provide a quick exit button, we use a chi-squared test to test if the distribution of escape mechanisms significantly deviates from the expected distribution of (overall likelihood of button) × (number of sites in country/category). We use mosaic plots to display the results of the chi-squared tests visually. The colours represented in the mosaic plots identify which of the countries and categories deviate from this expected distribution (red indicates higher than expected frequency, while blue is lower than expected).

3.2 Presence of Quick Exit Mechanisms

From our list of 2 045 websites across 6 countries and 20 categories for our study, we found a total of 404 websites with at least one type of quick exit mechanism. As shown in Table 2, 401 (19.6%) of the sites in our dataset contain a quick exit button when viewing the desktop version of a website. Of these, 323 (80.5%) also have an exit button on the mobile version of the website, and 20 (5.0%) have a keyboard shortcut to escape the site. Three of the sites with a keyboard shortcut did not have an exit button, giving a total of 404 sites with an escape mechanism.

The exit buttons are significantly more common for certain categories of support sites, $\chi^2(19, N = 2\,045) = 725.09, p < .001$, as shown in Figure 2. Of the 132 domestic abuse service websites we visited, 80.3% have an exit button. Victim support services had the second highest proportion of sites with exit buttons (63.5%), followed by sexual assault/rape support services (61.4%). Sites for LGBTQ+ people (19.7%), black and minority ethnicity people (17.2%), family planning and abortion services (14.5%), homelessness (17.5%) and the police (24.0%) were statistically insignificant compared to the overall dataset. All other categories had significantly fewer exit buttons than the baseline. For homelessness, all except 3 sites with exit mechanisms are offering "transitional housing" services for victims of domestic violence. This means that homelessness services do not generally have exit buttons, except for those providing services for victims of gendered violence.

The presence of exit buttons also varies by country, $\chi^2(5, N = 2\,045) = 79.55, p < .001$, as shown in Figure 3. The UK has a significantly higher presence of exit buttons on websites (30.8%), while the USA (14.8%) and New Zealand (4.82%) have significantly lower rates.

Of the sites in our sample, 70 (17.3%) of the sites with a desktop escape mechanism did not have one on mobile. This is primarily due to websites putting exit buttons in headers which have different code on mobile, and omitting the exit button from the mobile version of the code. The overall trends in presence of exit buttons on mobile are the same as on desktop, both by category and by country.

Very few of the websites in our dataset have a keyboard shortcut. Only 20 sites (0.01%) in our dataset have a shortcut on desktop, and only one site had a shortcut for mobile users to exit. Though this feature is rare, it is still potentially useful for users.

Of the sites with any escape mechanism, 32 (7.9%) had text explaining how to escape the site, and 61 (15.1%) linked to a page explaining how to browse the web safely. Both of these are heavily concentrated in domestic abuse sites, with 14 of the explainer texts (43.75%) and 30 of the safe browsing pages (49.2%) being for domestic abuse support services. Neither correlate with the country the service is located in.

4 IMPLEMENTING QUICK ESCAPE MECHANISMS

The second phase of our study analyses how quick escape mechanisms have been implemented. Section 4.1 describes our security analysis and resulting criterion for the different implementations. Section 4.2 details the different ways that websites have implemented these features, as well as which of these implementations

Table 1: Number of Support Service Websites for Each Category and Country, Grouped By Similar Categories

Category	UK	Ireland	USA	Canada	Australia	New Zealand	Total per Category
Domestic Abuse	33	23	21	20	20	15	132
Rape/SA	82	18	20	20	20	6	166
LGBTQ+	66	12	20	20	20	4	142
BAME(R)	36	7	20	20	15	18	116
Sobreity	37	12	20	20	20	21	130
Smoking	4	2	11	10	11	5	43
Gambling	9	4	15	12	15	5	60
Family Planning	21	7	97	20	21	13	179
Parenting	7	9	20	20	20	17	93
Children	8	3	20	20	13	20	84
Sexual Health	14	1	20	20	20	12	87
Mental Health	27	19	20	20	20	21	127
Physical Health	35	6	20	20	20	19	120
Disability	16	20	20	20	20	20	116
Past Offenders	6	3	20	20	20	9	78
Victims	3	3	20	21	6	4	57
Police	20	1	20	20	11	3	75
Homelessness	14	12	20	20	20	17	103
Elderly	3	15	20	20	20	18	96
Other	26	3	1	6	4	3	43
Total per Country	467	180	445	369	336	250	2045

Table 2: Presence of quick exit mechanisms on websites by platform

Platform	Number of sites	Exit button	Exit shortcut	Escape mechanisms explainer	Safe browsing explainer
Desktop	2 045	401	20	32	61
Mobile		323	1		

are more secure according to our criteria. Section 4.3 looks at where the quick escape mechanisms send users after being used, as well as which of these choices are potentially detrimental to the users the feature aims to help.

4.1 Security Analysis

The key threat in this scenario is breaching the confidentiality of the support the user was seeking. Ideally, the exit button will hide the current site the user is visiting, as well as obscuring it from their history so that an adversary cannot discover the sites that they have been visiting. Another threat in this scenario is the user being unable to explain what they are doing, for example if clicking the exit button brings up a page the user cannot reason about or if the button makes the screen appear blank. This may raise suspicion and lead to a negative outcome for the user.

Previous research has identified that technology-enabled domestic abusers can be treated as a "UI-bound adversary" [7]. Based on this assumption, we can narrow down the threats that the quick exit button needs to mitigate to those posed by the UI. In a modern browser, an abuser may be able to use the back or refresh buttons, the recent tabs page, and the browser history to identify the pages that were previously open in the browser. They can also identify the other tabs currently open, and information about the current site such as its URL and the page title.

Based on this, we can create a security checklist to evaluate the different quick exit buttons on websites:

- The page does not remain on the screen after the button is clicked
- The URL changes after the button is clicked
- The page does not remain in an open tab after the button is clicked
- The page shown after exiting the site is plausible
- The back button does not show the sensitive website on the screen
- The refresh button does not show the sensitive website on the screen
- The browser's recent tabs list do not show the sensitive website
- The browser history does not show the sensitive website

4.2 Observed Implementations

The exit buttons and shortcuts in this study use one of seven observed implementations. The frequency in which these implementations are observed by mobile and desktop sites with exit buttons

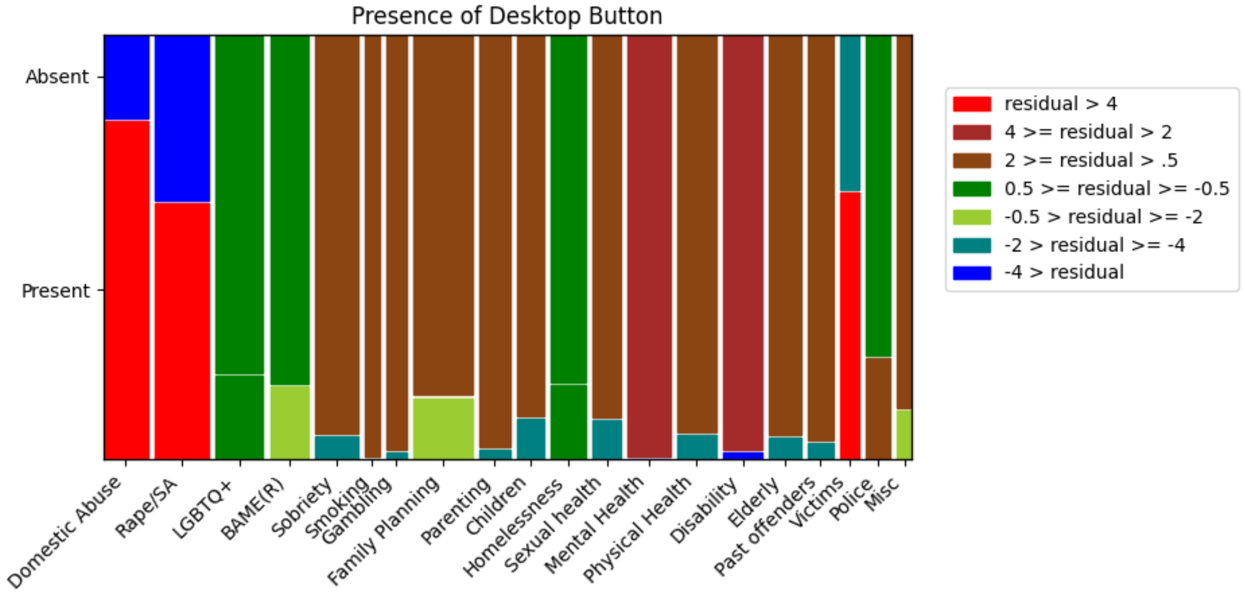

Figure 2: Presence of exit buttons on desktop by category

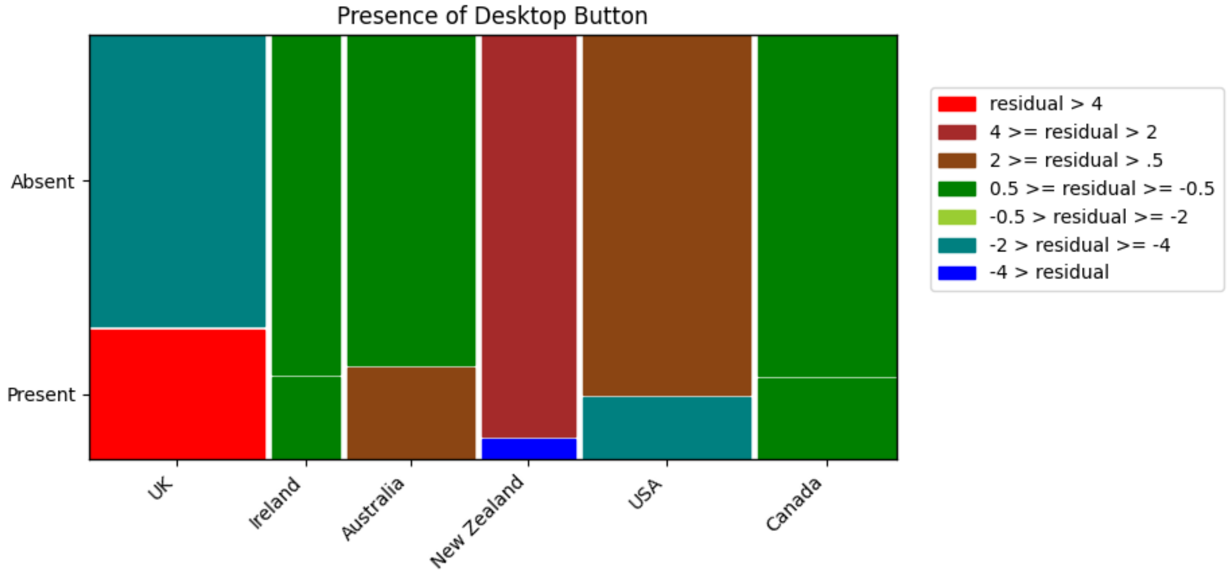

Figure 3: Presence of exit buttons on desktop by country

and shortcuts is shown in Table 3, and the security of these implementations according to the criteria defined in Section 4.1 is shown in Table 4. The most basic versions are a link to another website, opening a new tab, or both together. This is simple to implement, but pressing the back button or looking in the browser history reveals the site visited. The most common improved implementation is to use JavaScript to overwrite window.location, which changes the current URL to one specified in code. This replaces the current website in the browsing history, preventing the back button from showing the website and removing the site from the user's history. Some sites use this in addition to a new tab.

There are two more complex implementations of the exit button. The first modifies the current page in some way: either deleting the content of the page and leaving a blank screen, or modifying it to look less suspicious by replacing the sensitive content with other information. This can be undone by refreshing the page or visiting it later from the browsing history, and does not change the URL displayed by the browser. The other implementation is to fill the user's history with other websites, either by going to a URL which redirects many times to other sites while opening another site in a new tab, or by opening a large number of new tabs and overwriting the original one. While this may make it more difficult to locate the sensitive site in the internet history, many redirects or tabs rapidly being opened at once is likely to catch an observers' eye and may cause suspicion instead of diverting it.

The majority of websites (74.6%) use a simple link to redirect the user to another website and may additionally open a new tab. The simple but improved implementation of overwriting the URL is used by 23.4% of sites, and eight sites use less common implementations. This does not vary significantly by country or by category of website with three exceptions. Australian sites more often overwrite the URL (39.7%) than redirect, as do family planning/abortion services (34.6%) and police websites (61.1%). For the police, this is because most UK regional police services use the same exit button on their websites with the overwrite URL implementation.

There were no significant differences between how exit buttons were implemented on mobile compared to desktop, however 21 of the sites did have different implementations of their exit buttons on different platforms. The keyboard shortcuts tend to have more secure implementations than the buttons. Only 25% of the desktop shortcuts used the simple redirect, while 65% overwrite the URL and may additionally open another tab. Although few sites have a shortcut, those that have considered exit mechanisms in enough detail to add a shortcut are more likely to have also considered how best to implement them, leading to a larger proportion of the shortcuts using an improved implementation.

4.2.1 Implementation Security. Different implementations of how exit buttons hide a website have varying security when considering a UI-bound adversary. A summary of the security of each implementation of the quick escape mechanisms according to our security criteria is shown in Table 4.

According to our criteria, the least secure implementation is to modify the current page to try to hide the sensitive content. This only prevents shoulder-surfing users from identifying the site, and adversaries who can interact with the browser in any way are able to discover the site that the user attempted to exit from.

Using a new tab was slightly more effective, as the page does not remain on screen. On the other hand, the page is still open in the previous tab (unless used in combination with a redirect or overwriting the URL), and so this is an ineffective implementation.

The most common implementation is for a button to redirect the user to another page. This is not the worst implementation, but the exited site can be seen through the back button, the list of recently closed tabs, or in the browser history. Despite its prevalence, this is not the best implementation that an exit button can use.

The most secure implementation of an exit button is to overwrite the current URL with window.location. This replaces the current URL in the browsing history and prevents the back button revealing the site that the user exited from, and meets all of our security criteria.

Additionally, filling the user's history with various tabs can be an effective implementation. To meet all of the security criteria, it must be combined with overwriting the URL. If a redirect is used instead, the original site will remain in the user history and can be accessed by pressing the back button on the first tab. Caution should be taken with this implementation however, as opening a large quantity of tabs on screen simultaneously can draw an adversary's attention and cause suspicion rather than avoiding it.

4.3 Landing Pages

The web pages shown after using a quick escape mechanism fall into several distinct categories. The most common type of landing page is a search engine homepage, such as google.com, followed by news websites and regional weather sites, then a blank new tab page. The least common landing page was a specific search within a search engine, such as "recipes" or "cute animals".

Most of these categories are good choices for landing sites. Search engines and new tabs make the user appear to be between tasks (although having nothing on screen may be suspicious), while weather and news sites are very common for users to visit. However, sending the user to a specific search result can potentially be problematic. After using the quick escape feature, the user may have to justify a query which they are unlikely to search — for example, someone who never cooks will have difficulty explaining why they are looking at recipes. We recommend that exit buttons send users to one of the other categories of landing pages.

5 USABILITY OF QUICK ESCAPE MECHANISMS

The third and final stage of our study looks at the usability of the escape features identified in Section 3. Section 5.1 details our usability criteria and how we generated it, and Section 5.2 details how we used this to evaluate the usability of the websites. We then discuss how we identify the impactful design features from this in Section 5.3, and present our results in Section 5.4.

5.1 Usability Analysis

The usability analysis requires creating a usability specification: a checklist of usability attributes and methods of measuring them. This specification is generated from a set of usability goals applied to the quick exit button, exit shortcut, and explainer text. The key usability goals specified by Preece et al. [20] are effectiveness, efficiency, safety, utility, learnability, and memorability; alternative principles specified by Norman [17] include visibility, feedback, constraints, mapping, consistency, and affordance.

The usability specification is a component of usability engineering [16, 28], a broader concept which aims to identify how usable different versions of a system are and track improvements over time. For this study, we are evaluating many different sites instead

Table 3: Frequency of Implementations of Exit Mechanisms

	Desktop buttons	Mobile buttons	Desktop shortcuts	Mobile shortcuts
Redirect	284	229	5	0
Redirect & new tab	15	11	0	0
Overwrite URL	38	32	9	1
Overwrite URL & new tab	56	45	4	0
Fill history & new tab	2	2	0	0
Modify current page	1	0	2	0
New tab only	5	4	0	0
Total	401	323	20	1

Table 4: Comparison of the security of different exit mechanism implementations

Criterion	Redirect	Overwrite URL	Fill history	Modify page	New tab only
Page not on screen	✓	✓	✓	Modified	✓
URL changed	✓	✓	✓	✗	✓
Page not in open tab	✓	✓	✓	✗	✗
Back button does not show site	✗	✓	Depends	✗	✗
Refresh button does not show site	✓	✓	✓	✗	✗
Hidden from recent tabs list	✗	✓	Depends	✗	✗
Hidden from browser history	✗	✓	Depends	✗	✗

of improving a single site, which allows us to simplify the usability checklist. Whiteside et al. [28] provide several checklists that can be used to help choose measurement options, criteria, and levels, as well as providing a set of cautions for the specification.

Our usability criteria is shown in Table 5, divided into objective criteria which can be recorded by a single evaluator and subjective criteria which require multiple manual annotations. The objective criteria can be measured at the same time as the metadata about the exit mechanisms is being collected, such as the buttons' location and size on the screen. For the subjective criteria, we created an annotation tool[1] to allow a set of evaluators to rapidly visit and evaluate a range of websites, using a Likert scale for each criterion to determine which websites meet the criteria and which do not. As well as displaying desktop sites, the tool uses Selenium to emulate mobile sites in the browser.

5.2 Evaluating existing implementations

The third component is to evaluate each site identified. The criteria generated in the previous stage was applied to all sites identified by the steps outlined in Section 3.1. Both evaluators visited all of the sites and recorded if each usability and security criterion is met. The button implementations were tested separately, as all buttons which use the same mechanism will meet the same criteria.

To evaluate the subjective criteria, the annotation tool visited the sites containing a quick escape mechanism in a random order. After presenting each site, it asks the user to click on the exit button (if present) and then measures the time taken to do so. If the site also provides a keyboard shortcut, the tool prompts the annotator to find out what this is and deploy it. Again, the tool times how long it takes the annotator to finish this task. If the site contains a page explaining how to stay safe online, the time taken to visit this page is also recorded. The tool then takes the annotator to a survey (hosted on Qualtrics) which provides a series of Likert scale questions for the relevant components for completion. The survey also provides an open response section for each relevant component for annotators to note any particular issues with the site. Upon completing the survey, the same timing tests are performed again to measure the memorability of the quick escape mechanisms.

To record the metadata of the buttons and the objective criteria, a separate tool was created which visits all sites in order. For each site, the annotator is presented with a window containing either an entry or a series of options for each of the properties of the button to be collected as well as each of the objective criteria. These are then filled in by the annotator and saved, and the next site is visited. For the exit buttons, we record the button colour, the background colour (to measure contrast), the size of the button on screen, the location on the page, the type of button (text/button/banner/image or icon/menu item), if the button stays on screen when scrolling, if the button is visible/covered/not visible when first viewing the page, the label of the button if present, and the number of clicks required to exit the site.

The two authors of this paper provided annotations for the subjective criteria for each website. The first evaluator has experience with designing and evaluating UI, and the second evaluator has experience teaching HCI at University. The annotators met before beginning annotations to discuss the process of using the tool and annotating the sites. After completing annotations, the annotators met to discuss the cases where they had disagreed for each Likert scale question for each site. The annotators discussed each common cause of disagreements and specific sites where there was no pattern in the disagreements, and decided on a reconciled score for these cases. The annotators' choices per site were then aligned so that all sites had a single scoring per question.

[1] The source code for the annotation tool is available at: https://github.com/KiTeoki/quickExitButtonAnnotations

Table 5: Usability Criteria

Attribute tested	Measurement method	HCI principle(s)
	Objective criteria	
Button Visibility	Is the button visible on page load	Visibility
Scrolling	Does the button stay visible when scrolling	Visibility, Consistency
Button Efficiency	Number of clicks required to exit the site	Efficiency
Button Labelling	Is the button labelled as an exit button	Affordance
Shortcut Efficiency	Number of key presses to exit the site	Efficiency
Shortcut Complexity	Unique keys needed to exit the site	Efficiency
Explainer Visibility	Is explainer text visible on page load	Visibility
Safe Browsing Efficiency	Number of clicks to access safe browsing page	Efficiency
	Subjective criteria	
Locate Button	Measure time to click button after page load	Efficiency, Learnability
Re-locate Button	Measure time to click button after completing survey	Efficiency, Memorability
Button Discovery	Likert Scale: "The button is easy to find"	Learnability
Button Distinct	Likert Scale: "The button consistently stands out on the page"	Affordance, Consistency
Identifying Shortcut	Measure time to identify and use shortcut to exit site after page load	Efficiency, Learnability
Re-locating Shortcut	Measure time to identify and use shortcut to exit site after completing survey	Efficiency, Memorability
Shortcut Discovery	Likert Scale: "The keyboard shortcut was easy to discover"	Learnability
Intuition	Likert Scale: "The keyboard shortcut is intuitive"	Affordance, Memorability
Explainer Distinct	Likert Scale: "The quick exit explainer text stands out on the page"	Affordance
Explainer Digestability	Likert Scale: "The quick exit explainer text is easy to understand"	Efficiency, Learnability
Locate Safe Browsing	Measure time to visit safe browsing page after page load	Efficiency, Learnability
Re-locate Safe Browsing	Measure time to visit safe browsing page after completing survey	Efficiency, Memorability
Safe Browsing Discovery	Likert Scale: "The safe browsing page is easy to locate"	Learnability

5.3 Identifying Impactful Design Choices

The next stage of our study is to identify which of the design choices correspond with faster timing tests and positive Likert scores. We therefore have a choice of several non-parametric tests: Kruskall-Wallis, multi-level models, and logistic regressions.

Kruskall-Wallis identifies if a category has an impact on the usability of the button, but does not indicate which options are more impactful (for example, it may tell us that the location on the page is impactful, but not which location to put the button). It also has an increased risk of false positives as it requires running multiple independent tests each at 5% confidence. On the other hand, logistic regressions measure the impact of each factor simultaneously, providing a set of statistically significantly impactful features and a measurement of each options' impact based on the model created.

Multi-level models are a more complex test which are able to identify collinearities and inter-coder effects during the analysis, in addition to impactful factors and choices. This assumes the data fits the parametric assumptions, however our timing data is positive skewed. Although prior research has identified that these tests yield the right answer even when the assumptions are violated [18], we do not believe that this is the most appropriate test for our dataset as we are primarily concerned with the effects of the design choices rather than effects from the evaluators, and we have reconciled the data from evaluators before this stage to better focus on the relevant effects.

We chose to use logistic regression due to the improvements over Kruskall-Wallis, however as the test requires that the output variable be dichotomous, we chose to have the model predict whether or not the time taken to learn or recall the location of a feature would be less than or greater than the average time for the relevant test.

As we have a large number of possible predictor variables, we use recursive factor elimination to identify the most impactful factors for each score. This method generates a model, identifies the worst performing factor, and then removes it before creating a new model and repeating the process. After repeating until there are no remaining factors to remove, the model with the highest performance is selected as the final model. This resulted in 11 factors being selected for each model, and the factors differ for each model. Due to multicollinearity issues, a number of factors were excluded from each of the models (an assumption of logistic regression is that independent variables are not highly correlated).

We tested for statistical significance with each value of each property. We then present our recommendations for designing quick escape mechanisms based on the design choices which have a statistically significant impact on usability, alongside common issues noted by the annotators from our survey.

5.4 Logistic Regression Results

5.4.1 Locating the Button. The first logistic regression model was statistically better at predicting positive average Likert scores for the "button is easy to locate" question ($\chi^2(11, 721) = 266.50, p <$

Table 6: Summary of Usability Score Distribution for Likert and Timing Tests. Timing test results are measured in seconds.

Test	Median	Mean	Range	Standard Deviation
Button Easy to Find	2	1.29	[-2, 2]	1.19
Button Stands Out	2	0.82	[-2, 2]	1.45
Shortcut Easy to Find	2	1.68	[-2, 2]	0.98
Shortcut Intuitive	2	1.75	[-1, 2]	0.61
Explainer Stands Out	2	1.16	[-2, 2]	1.21
Explainer Easy to Understand	2	1.79	[-2, 2]	0.68
Safe Browsing Easy to Find	2	1.06	[-2, 2]	1.29
Time to locate button	2.80	4.33	[0.51, 82.89]	5.43
Time to re-locate button	1.56	2.21	[0.23, 65.42]	3.22
Time to use shortcut	1.67	5.91	[0.53, 81.35]	12.96
Time to re-use shortcut	1.38	1.90	[0.51, 7.17]	1.61
Time to locate safety page	3.40	8.12	[0.51, 89.03]	13.79
Time to re-locate safety page	2.10	4.04	[0.52, 76.65]	9.48

Table 7: Logistic regression model predicting average button discoverability score is positive. Significant p-values are in bold

	Coef	SE	p	OR	Lower	Upper
Location top left	0.849	0.670	0.205	2.338	0.628	8.697
Location top	0.539	0.457	0.237	1.715	0.701	4.195
Location top right	1.051	0.331	**0.001**	2.860	1.496	5.468
Location content	-1.417	0.571	**0.013**	0.242	0.079	0.742
Location right	0.902	0.442	**0.041**	2.465	1.036	5.865
Location bottom left	0.788	0.660	0.233	2.198	0.603	8.012
Type button	1.048	0.390	**0.007**	2.852	1.328	6.123
Type banner	2.312	0.720	**0.001**	10.090	2.462	41.347
Labelled	1.583	0.580	**0.006**	4.868	1.562	15.165
Visible yes	-0.924	0.512	0.071	0.397	0.146	1.082
Visible covered	-5.056	0.838	**0.000**	0.006	0.001	0.033
Visible no	-5.407	0.892	**0.000**	0.004	0.001	0.026

.001), and its output for each of the selected factors is shown in Table 7. Holding other factors constant, it was found that putting the button in the top right of the page increased the odds of a positive score by 186.0% (95% CI [1.50, 5.47]), and putting it on the right hand side increased the odds of a positive score by 146.5% (95% CI [1.04, 5.87]) compared to other locations on the page. Using a button instead of text or an image increased the odds of a positive score by 185.2% (95% CI [1.33, 6.12]), while using a banner increased the odds of a positive score by 909.0% (95% CI [2.46, 41.35]), suggesting that either a button in the top right or a banner across the page enables users to find the button more easily. Labelling the button with text like "Quick Exit" or "Leave this site now" also increased the odds of a positive score by 386.8% (95% CI [1.56, 15.17]).

On the other hand, if the button was part of the page content rather than in a corner or on an edge the probability of a positive score decreased by 75.8% (95% CI [0.08, 0.74]). If the button was covered by a cookie notice or other pop-up when first loading the page the probability of a positive score decreased by 99.4% (95% CI [0.001, 0.033]), and the button not being visible for any other reason (such as requiring the user to scroll or the button being placed in a menu) decreased the odds of a positive score by 99.6% (95% CI [0.001, 0.026]). This means that it is critical that the exit button is visible to the user as soon as the page loads.

5.4.2 Standing Out on the Page. The second logistic regression model was statistically better at predicting positive average Likert scores for the "button consistently stands out on the page" question ($\chi^2(11, 721) = 277.74, p < .001$), and its output for each of the selected factors is shown in Table 8. The button staying on the page when scrolling increased the odds of a positive score by 816.1% (95% CI [5.71, 14.70]). This implies that keeping the button on screen at all times, even when the user scrolls, is very impactful on the user consistently being able to access the button quickly.

There are also several factors which decrease the odds of the button being distinct on the page. Using a small button or icon reduced the odds of a positive score by 58.6% (95% CI [0.19, 0.89]), while using text instead of a full button or banner decreased the odds by 77.7% (95% CI [0.11, 0.48]). The button not being visible on load decreased the odds by 97.4% (95% CI [0.004, 0.181]), reaffirming the result of the first model.

5.4.3 Time to Learn the Button. The third logistic regression model was statistically better at predicting when the average time taken to first locate the button is under 10 seconds ($\chi^2(11, 721) = 142.87, p <$ .001), and its output for each of the selected factors is shown in Table 9. Placing the button in the top right increased the odds of finding the button quickly by 61.4% (95% CI [1.05, 2.48]), while

Table 8: Logistic regression model predicting average button distinctness score is positive. Significant p-values are in bold

	Coef	S.E	Sig.	O.R.	Lower	Upper
Size small	-0.882	0.392	**0.024**	0.414	0.192	0.893
Location top	0.484	0.360	0.179	1.623	0.801	3.290
Location top right	0.245	0.259	0.344	1.278	0.769	2.123
Location left	-1.369	0.766	0.074	0.254	0.057	1.141
Location content	-0.957	0.654	0.143	0.384	0.107	1.384
Location bottom left	0.461	0.597	0.441	1.585	0.492	5.114
Location menu	-1.209	1.052	0.251	0.299	0.038	2.349
Type text	-1.506	0.369	**0.000**	0.222	0.108	0.457
Stay on scroll	2.215	0.241	**0.000**	9.161	5.709	14.702
Labelled	0.359	0.444	0.418	1.432	0.600	3.418
Visible yes	-0.722	0.483	0.135	0.486	0.189	1.252
Visible no	-3.6435	0.988	**0.000**	0.026	0.004	0.181

Table 9: Logistic regression model predicting average time to find button is less than the mean. Significant p-values are in bold

	Coef	S.E	Sig.	O.R.	Lower	Upper
Location top left	0.418	0.462	0.365	1.518	0.614	3.755
Location top right	0.479	0.218	**0.028**	1.614	1.052	2.477
Location left	-1.583	0.754	**0.036**	0.205	0.047	0.899
Location right	0.439	0.317	0.167	1.551	0.833	2.889
Location bottom left	-0.434	0.403	0.282	0.648	0.294	1.428
Location bottom	0.844	0.463	0.068	2.324	0.939	5.755
Location menu	-2.133	1.126	0.058	0.118	0.013	1.077
Type button	0.594	0.225	**0.008**	1.811	1.166	2.812
Stay on scroll	0.546	0.212	**0.010**	1.726	1.140	2.614
Visible yes	0.000	0.255	0.999	1.000	0.607	1.649
Visible covered	-1.704	0.537	**0.002**	0.181	0.064	0.522
Visible no	-2.390	0.690	**0.001**	0.092	0.024	0.354

placing it on the left decreased the odds by 79.5% (95% CI [0.05, 0.90]). Using a button rather than a banner, just text, or an icon increased the odds of finding the button quickly by 81.1% (95% CI [1.17, 2.81]). Additionally, the button staying on screen when scrolling increased the odds by 72.6% (95% CI [1.14, 2.61]), whereas the button being covered decreased the odds by 81.9% (95% CI [0.06, 0.52]) and not being visible at all decreased the odds by 90.8% (95% CI [0.02, 0.35]).

5.4.4 Time to Remember the Button's Location. The final logistic regression model was statistically better at predicting when the average time taken to relocate the button is under the mean ($\chi^2(11, 721) = 127.04, p < .001$), and its output for each of the selected factors is shown in Table 10. The button being in the top left increased odds of remembering the button's location quickly by 204.2% (95% CI [1.03, 8.99]), and placing it in the top right increased the odds by 93.0% (95% CI [1.30, 2.87]). Using a button increased the odds by 93.3% (95% CI [1.05, 3.56]), and ensuring the button stays on screen while scrolling increased odds by 157.6% (95% CI [1.79, 3.70]). Finally, the button not being visible on first load decreased the odds of remembering the button's location quickly by 84.9% (95% CI [0.04, 0.53]).

6 DISCUSSION

In this section we discuss the implications of our results in more detail. Section 6.1 discusses where exit buttons are currently in use and reason why this might be.. Section 6.2 discusses our recommendations for how to effectively implement an exit button to optimise both usability and security, while Section 6.3 details common design flaws in the exit buttons we have evaluated. We then discuss where exit buttons send users and some recommendations for this. Finally, we explore the limitations of this study, and provide suggestions for future work to build on this.

6.1 Where Buttons are Found

Quick escape mechanisms are predominantly found on gendered violence support services. These sites target users who are very likely to share a household with a person causing them harm, and it is extremely important for these support services to carefully consider their users' safety when they are visiting their website. The other common location for exit buttons are victim support services, whose users overlap with the gendered violence services. Their userbase is also very broad, and there are a wide range of possible circumstances where a person is a victim of a crime and remains nearby to the offender. These possibilities increase the likelihood that a user will benefit from having a quick exit button,

Table 10: Logistic regression model predicting average time to remember button location is less than the mean. Significant p-values are in bold

	Coef	S.E	Sig.	O.R.	Lower	Upper
Size average	-0.449	0.291	0.122	0.638	0.361	1.129
Location top left	1.113	0.553	**0.044**	3.042	1.029	8.989
Location top right	0.658	0.202	**0.001**	1.930	1.298	2.872
Location left	-0.996	0.768	0.194	0.369	0.082	1.664
Location content	-0.532	0.495	0.283	0.588	0.223	1.551
Location menu	-0.028	0.905	0.975	0.972	0.165	5.726
Type button	0.659	0.311	**0.034**	1.933	1.051	3.557
Type image icon	0.824	0.588	0.161	2.279	0.720	7.214
Type menu item	-1.426	1.279	0.265	0.240	0.020	2.945
Stay on scroll	0.946	0.185	**0.000**	2.576	1.793	3.699
Visible covered	1.136	0.752	0.131	3.116	0.714	13.585
Visible no	-1.890	0.643	**0.003**	0.151	0.043	0.533

and explains why this category of support service also commonly includes exit buttons.

There are several categories which use exit buttons less frequently. Services for LGBTQ+ people sometimes have exit buttons, as people may have to avoid unintentionally “coming out” to family and friends before they are ready to do so. The presence of exit buttons on these sites sparked the controversy discussed in Section 1. Services for black and minority ethnicity (BAME) people have a similar ratio of exit buttons, as do family planning and abortion services and homelessness support sites. There are a range of services within those targeting BAME people, including support for honor-based abuse, specialist healthcare services, and many other types of support which sometimes require BAME-specific services. The homelessness sites that contain exit buttons almost all target victims of gendered violence, while family planning services are beginning to need to consider their user’s safety as laws surrounding abortion are changing (such as the overturning of Roe vs Wade in the USA). Police websites also sometimes have exit buttons, however this is concentrated in UK police websites where most regional forces use the same exit button as the central police.uk website.

Exit button presence also varies by country, with more buttons in the UK, slightly fewer in the USA, and extremely few in New Zealand. One possible explanation for this is network effects: services that interact with other services which use quick escape features are more likely to add this to their own website, and countries with fewer exit buttons will not benefit from this. Due to the COVID-19 pandemic, there have been fewer international events in recent years, which has likely prevented this feature from spreading across borders.

6.2 Implementation Recommendations

There are a wide range of design choices to make when adding an exit button to a website. We considered a wide range of factors and found most of them to have an optimal choice, with some common issues arising for select factors. The optimal location for an exit button according to our analysis is at the right hand side of the screen, with some further benefit from placing it in the top right specifically. The top left corner is also beneficial in one of our four models, however as the left side is detrimental to usability it is likely better to use the top right corner. It is also important to ensure that the exit button stays on screen when scrolling down the page.

The button needs to be visible as soon as the user loads the website. Designers should avoid putting the button in a side menu or as part of the main content of the page. They should also check that there are no pop-ups or notices which cover the exit button, in particular cookie notices that are required in some jurisdictions.

Different formats of button, as shown in Figure 1, are more usable than others. Use of a labelled button or banner with text (e.g. Figure 1 C, D, G) is significantly better than just using text (e.g. Figure 1 A, B) or an image/icon (e.g. Figure 1 E, F). While annotators rated both buttons and banners as being easy to locate, they were significantly faster at finding buttons. Using an icon or image was more confusing for annotators, however it did not significantly affect the usability of the exit button. The colour and contrast of the button did not appear to affect usability in our study.

The most secure implementation of an exit button is to overwrite the current URL through JavaScript. The most common existing implementation is to use a simple redirect, however users with access to the browser can easily discover the site that was escaped from in several ways. Overwriting the URL in combination with opening other tabs to fill the user’s history also meets all of our security criteria, but has a risk of causing suspicion instead of avoiding it.

Providing a short explainer text on or near to the exit button is useful for helping users to understand how to use the button. Providing a separate page with information about clearing the user’s history is also useful to help users work past the limitations of quick exit buttons, such as not being able to hide the search engine queries that led them to the support site.

6.3 Common Issues to Avoid

There are several common problems with the existing exit buttons examined in our study. Some of these cause statistically significant impacts on the usability of the button, while others were common issues highlighted by our annotators. The first issue relating to the visibility of the exit button is whether it stays on the screen when scrolling. On 105 of the sites in our dataset, the exit buttons are not accessible after scrolling through the page content. As the quick exit button needs to be rapidly accessible at any time by the user, this is a major issue with the design of many exit buttons found in our study.

Another common problem is the visibility of the button when first loading the page. It is common for websites to contain cookie notices, email newsletter signups and other content in banners overlaying their page. In 22 cases in our study, we found that content like this covers the exit button that users need to be able to access. This prevents users from locating the button unless they have closed all popups during their visit to the site. Furthermore, some of the buttons require the user to scroll before they appear on the screen, either because they are part of the content of the page or because there is too much content at the top of the page for the exit button to be immediately visible. This impedes users who have just loaded a page and rapidly need to exit again.

Most websites labelled their exit buttons with text like "QUICK EXIT", "EXIT SITE" or "Leave Site". Other websites provide a simple icon, such as an "X", a power button, or an open door to indicate that this button is the quick exit. The use of these icons in place of text was noted many times by annotators as confusing as they were not sure if the button was a quick exit button until attempting to click it.

Websites use a variety of formats for their exit mechanisms that are not always exit "buttons" — buttons, banners, images or icons, and sometimes text on the page. Using just text had a significant negative impact on the usability of the exit buttons in our study, and designers should aim to use buttons or banners instead.

6.3.1 Mobile Escape Mechanisms. Many users use mobile devices to access the web more often than they use desktop computers. Support service websites therefore need to ensure that mobile users are still able to easily access quick escape buttons, however there are several issues specific to mobile implementations of mobile escape mechanisms.

The most prominent issue with mobile escape mechanisms is that websites do not have one. Of the websites with a desktop exit button, 70 did not have a button on the mobile version of their site. This is a clear issue for mobile users who do not have access to this safety feature that they would have access to if they had used a desktop or laptop computer.

Furthermore, there are design restrictions on mobile that do not apply to desktop sites — primarily screen space. Though some sites have an identical button on desktop and mobile, 134 redesigned the mobile version of their button, and 33 of these sites moved the exit button from the main content of their page into a side menu. Putting the button into a menu means that it requires more clicks to use, and it is not immediately visible to users — they have to either stumble upon it, or know that this feature is likely present on the site to go looking for it. This caused the mobile versions of these sites to perform worse than the desktop versions.

6.3.2 Shortcuts. Very few of the sites in our dataset contained keyboard shortcuts. Most implementations were easy for the annotators to use, however there were some issues in certain implementations. All of the shortcuts found asked users to press the escape key between one and three times. Shortcuts which required more keypresses were rated as less intuitive by the annotators and take longer to press. Although the impact on timings is small, it is useful to make the keyboard shortcut as short as possible to allow users to remember it more easily and use it faster when it is needed.

The other common issue is how the shortcut is advertised to the user. Most websites advertise the shortcut either in the label of the exit button or in explainer text nearby, making it clear to the user how to use the shortcut. Other sites provide a pop-up when they load the page that informs the user about the escape mechanisms which they must acknowledge before viewing the site. In some cases however, the information about the keyboard shortcut is hidden away on a separate webpage that the user must find and read at some point before they need the shortcut, making it significantly harder for them to learn the shortcut. We recommend that, if there is an escape shortcut on the site, that it is advertised with the exit button to allow users to quickly learn how to use the shortcut when they need it.

While keyboard shortcuts are potentially a useful addition to desktop sites, mobile users do not have a keyboard to be able to use these shortcuts, particularly as they always require an escape key. Only one site in our 2 045 site dataset added a version of their shortcut which also works on mobile (which involves tapping the screen three times in short succession). Having a mobile-friendly version of the shortcut is useful for the many mobile users who may need to exit a site at short notice.

6.4 Incognito/Private Browsing Mode

An alternative feature for user safety in domestic abuse cases is private browsing or "incognito" mode. All modern browsers provide this feature, in which user browsing history is not saved when the browser window is closed. This feature has the advantage that it is already supported by browsers, whereas quick exit buttons need to be implemented separately by all websites that deem them useful. Private browsing is also almost always recommended in the safe browsing information pages on websites in our study, however users must already be aware of the feature before it can be beneficial and must clear their history manually if switching from regular browsing to private to fully cover their tracks.

On the other hand, private browsing is not able to provide all of the benefits of quick escape mechanisms. The quick escape feature is able to prevent the user from using the back button to view the previous page, whereas private browsing requires the user to close the browser entirely to hide this. Furthermore, private browsing removes all content from the user's screen, which may be seen as suspicious, while quick exits replace the current site with another so that the user appears to still be doing something. As both of these features provide benefits the other cannot, the best case is for users to be aware of and able to use both features for improved privacy and safety.

6.5 Unintended Consequences

Although quick exit buttons are intended as a beneficial feature, it is possible for them to be abused if they are used all over the web. Chua et al. [4] create a framework of unintended consequences and harms based on several case studies. The framework includes displacement, insecure norms or complacency, additional costs, misuse, misclassification, amplification, and disrupting other countermeasures. The most likely unintended consequences for quick escape mechanisms are misuse, additional costs for website developers, and possibly disrupting other countermeasures

Historically, quick exit buttons were found on some web games, so that employees could play games at work and hide what they were doing when others passed by. Furthermore, it would be possible for abusers to hide what they are doing from victims if sites used by the abusers also featured exit buttons. Other misuses of this feature are possible, and it is important to consider them when discussing methods of making them better at hiding user activity. However, we believe that the safety and security benefits to vulnerable users are likely to be significant and therefore we should promote the improvements to quick escape mechanisms as discussed in this paper.

Adding quick escape features to many support services places additional burdens on the website designers, as they have to spend time designing and implementing this feature on their own websites. Some existing implementations are available for WordPress[2] and on GitHub[3], which reduce the amount of work for website designers. However, the recommendations provided in this study would be beneficial to implement in these shared implementations, to ensure that those that use them have optimal implementations. Furthermore, it is beneficial for escape mechanisms to also provide information about limitations of exit buttons (such as not completely clearing history, so users must either do this manually or also use private browsing), which remains extra work for website designers.

It is possible that providing additional information to users about quick escape mechanisms and other safety information related to them will cause confusion and may disrupt other safety measures taken. For example, users may use a quick exit button and assume they are now safe and do not need to clear history or use private browsing, but the exit button did not hide the site from their history which an abuser may check later. The poor prioritisation and arising confusion of safety advice is an issue raised by Geeng et al. [8]. To avoid this issue, websites should clearly state the additional steps users need to take to properly cover their tracks when browsing sensitive web sites.

6.6 Limitations

This study explores where and how quick exit mechanisms are currently implemented. It does not study whether or not these mechanisms are used by users of the support service sites, or how impactful they are at improving the safety of users. Instead, we have focused on how the exit buttons and shortcuts can be improved so that they are easier to use in the future.

One potential issue with having annotators find the exit buttons and shortcuts on over 700 websites is that they may get progressively better at finding exit buttons on websites. This means that the timing tests may get shorter over time, rather than purely depending on the usability of the buttons. Despite this, the dominant factor in how long it takes to find a button is the design of the button, and therefore this will have minimal impact on our overall results. To minimise the impact of this limitation, we randomised the order in which the annotators were presented with each website.

Another limitation of our study is that due to resource constraints we were limited to two evaluators. Although we would expect there to be less benefit to adding more and more annotators, it is possible that there are trends that are not found in this study that may become apparent when increasing the number of annotators.

6.7 Future Research

One limitation of this study is that we do not identify how useful the escape mechanisms are for users. A follow-up study could investigate how often the buttons and shortcuts are used by visitors to support service websites to determine their utility, or perform a user study with victims of gendered violence who may have used escape mechanisms before.

This study evaluates a specific safety intervention for the threat model of a user who can see what the user is looking at while seeking support. As UI-bound adversaries have been identified as the key threat model for technology-enabled domestic abuse in prior research [7], it would be beneficial for future work to investigate other UI-focused interventions.

Our study explores the state of exit buttons in mid-2022. A useful follow-up to this study could explore the changes in presence and implementations of exit buttons in a year's time. This would measure the impact of this study on how and where exit mechanisms are implemented, and additionally it would allow us to measure the impact of current events — for example, if escape mechanisms become more common on family planning and abortion sites following the overturning of Roe vs Wade in the USA.

7 CONCLUSIONS

In this study we have explored the existing presence and implementations of quick escape mechanisms on support service websites. We have identified where these features are most commonly found, and detailed how their usability and security can be improved in the future. We hope these recommendations will improve future implementations of this safety feature, and inspire more support services to include it on their website.

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