Digital Strategy for the Social Inclusion of Survivors of Domestic Violence

Research Report

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Table of Contents

Tables

Figures

1 Executive Summary

For most of us advances in digital technology have made our lives easier, by providing access to information and services whenever and wherever we want. In a perfect world this should be true for Survivors of domestic violence, with technology providing access to domestic violence support services at a time and place that is convenient to the Survivor, thereby arousing less suspicion from their partner.

Unfortunately the technologies Survivors are using to access help and support (i.e. mobile phones and Internet browsers) are recording a trail of "electronic footprints" which can be followed; consequently Survivors are being prevented from accessing the services that have been provided to help them. Related research shows that *intimate partner cyber stalking* represents a genuine threat to Survivors, with a proven link between the stalking behaviour and the controlling / abusive behaviours common to cases of domestic violence.

The aim of this research was to improve the ability of Survivors to access domestic violence support services. This has been divided into two objectives, the first objective is to make the services more accessible (easier to find and more targeted in the information they provide), the second objective was to give Survivors the tools they require to erase their electronic footprints so that they can access support services safely (and thereby be more willing to use the services provided).

To achieve these objectives the project looked at existing support services, carried out a survey of Survivors to find out what they needed from the services, identified the issues with existing Internet and mobile phone technologies and proposes new and innovative solutions to help Survivors access the services they need.

In this document we present a case study based on our work with the Angelou Centre, this case study serves as the core of our research, in which we outline the technology issues facing survivors and present number of technology solutions that can be used to address these issues. The technology requirement of each survivor and each organisation providing domestic violence services is unique, so the proposed solutions presented in this document are intended to be used individually or in combination as is most appropriate for the survivor and / or organisation providing the service.

2 Introduction

The popularity of the Internet allows new domestic violence support services to be designed in order to assist survivors who are unable to access services currently provided. As more and more people are embracing this services provided thru digital media, various concerns have been raised with regard to the security and privacy issues associated with such applications.

When it comes to the consequences of privacy violation, a very poignant example can be drawn from our experience in designing and implementing a system to assist survivors of domestic violence (the term "survivors" is used rather than "victims", as it more accurately describes the individuals who have lived with domestic abuse). In this document, we focus on a case study involving survivors who attend the Angelou Centre, a women's support centre for Black and Minority Ethnic (BME) based in Newcastle upon Tyne. Data collection was performed using an online survey through several sessions organised by the support centre's staff, in which groups of survivors as well as women from the control group completed the online survey.

This case study provides us with important insights and experience in the design and development of socio-technical systems where privacy is one of the key features. It also allows us to come up with novel ideas on how new technologies can be used for ensuring privacy. Some of these ideas are still to be implemented, but we are confident that they will contribute positively in improving users' privacy, while being usable and practical at the same time. We are also planning to carry out evaluation of the whole system once it is fully implemented. It is often stated that human players are usually the weakest link when it comes to computer security [2][4][5], so it is very important to provide a system that requires minimum effort from its users.

2.1 Project Team

Emma Moir - LCJB Project Manager
Prof. Aad van Moorsel - Newcastle University - project consultant
Martin Emms - Newcastle University - project lead
Gemma Rendall – Newcastle University - development
Umme Imam – Angelou Centre – centre manager
Rosie Lewis – Angelou Centre - coordinating the survey

2.2 Acknowledgments

We would like to thank the staff at the Angelou Centre for providing invaluable insights into the survivors' story; Safe Newcastle team for advice and guidance on the subject of domestic violence; Northumbria Local Criminal Justice Board (LCJB) for facilitating the partnership between Newcastle University, the Angelou Centre and Safe Newcastle; Simon Parkin (Newcastle University) for the original "good virus" idea and Budi Arief is funded by the UK EPSRC Trustworthy Ambient Systems platform grant. This project has been funded by Newcastle University and Northumbria LCJB. Aad van Moorsel is supported by the UK EPSRC Hub on Social Inclusion through the Digital Economy.

Angelou Centre	http://www.angelou-centre.org.uk/
Safe Newcastle	http://www.safenewcastle.org.uk/
Northumbria Local Criminal Justice Board	http://www.northumbrialcjb.org.uk/
SiDE (social inclusion through the digital economy)	http://www.side.ac.uk/
Engineering and Physical Science Research Council	http://www.epsrc.ac.uk/Pages/default.aspx

3 Related Work

There are a number of published works which highlight the issues of *intimate partner cyber stalking* and that there is a clear link with domestic abuse [3][6]. There are two aspects to the issue: first, an intimate partner (ex or current) has a greater level of access to and knowledge about the habits of the survivor; second, the cyber stalking is a new and powerful weapon which adds to the ways in which the survivor can be controlled and/or coerced. These works also highlight that the survivors who are being stalked by their partner or ex-partners are of a greatly increased risk of being harmed, and that stalking behaviour could be viewed as a warning sign of an escalation towards violence. Earlier work by the US Department of Justice notes that 81% of women who were stalked by partners were also assaulted by the same partner [8].

Studies carried out in America [6] and statistics provided by the US Department of Justice [1] identify telephones and mobile phones as the most commonly used technology in cases of cyber stalking. This is reflected in our case study, where the staff at the Angelou Centre indicated mobile phones as an area of concern, as a number of survivors had reported that their partners would regularly view the phone history. Our case study also talks extensively about the issues of survivors' activities being recorded by the technology they use. However, some optimism can be drawn from the work of Spence-Diehl [7], as she notes that technology is also recording the actions of abusers, the evidence of which can be used as evidence against them, although this is quite difficult and expensive to achieve.

Statistics published by the US Department of Justice [1] show 2.4 million victims of cyber stalking, of which 30.3% were staked by a current or ex-partner, which equates to around 730,000 cases of cyber stalking during 2008. This is an alarming figure for the UK, where as a nation we tend to follow the trends of the US. The same report also provides details of the high-tech methods used to monitor the activities of survivors, including spyware, video and webcams, listening devices and GPS; fortunately the statistics show that the incidence of such high tech stalking to be very rare.

4 Case Study based on Survivors at the Angelou Centre

The Angelou Centre, Newcastle University and the Northumbria Local Criminal Justice Board (LCJB) have collaborated to investigate the technology issues which most affect survivors of domestic violence. The purpose of the study was to better understand the technology issues facing survivors of domestic violence and thereby improve the accessibility of support services aimed at helping survivors. The research shows that survivors have two major barriers to successfully accessing the support services that they require:

- locating the support services and the organisations that provide them, and
- fear of provoking further abuse if their abuser discovers that they have been seeking help.

In effect, survivors are being excluded from the socio-technical systems that the rest of us take for granted. This document proposes a digital strategy for the social inclusion of survivors. The strategy incorporates several technology-based solutions and a training strategy, which together will help to overcome these barriers. The strategy aims to publicise domestic violence support services in a way that is most accessible to survivors, while at the same time providing technological solutions that help survivors avoid leaving telltale *electronic footprints*. It will also provide easily accessible training that teaches survivors how avoid leaving *electronic footprints* using the technology which is available to them.

4.1 Problem Statement

As we go about our daily lives we are unwittingly leaving *electronic footprints* which can easily be followed to see what we have been up to. This is because the technologies we use in our everyday lives (such as Internet browsers, mobile phones, land lines, and GPS units) maintain records of our activities, which for most of us serve as a convenient aide-mémoire so that we do not have to remember “the number of someone who called yesterday”, “the meeting time agreed in an SMS” and “the URL of the website I visited”.

In addition to these passive data gathering features there are also a number of incredibly useful monitoring applications aimed at keeping our children safe online. Tools such as CheckStick – http://www.checkstick.com/, which pro-actively gathers data to tell us what your kids are looking at online and who they have been interacting with online. Pre-authorised online mobile phone tracking services, such as ChildLocate – http://www.childlocate.co.uk/, which lets you know where your kids are at any time. In most cases, these tools are very valuable to keep their users safe, but for survivors of domestic violence, these convenient features and monitoring applications can become an instrument of abuse, in that it allows an abuser to track the survivor’s activities even when the abuser is not present, and thereby control and restrict the activities of the survivor. For example, the abuser can control who the survivor can communicate with, monitor what the survivor looks at online and trace where the survivor travels. All these lead to the *intimate partner cyber stalking* mentioned earlier.

The reality for a survivor is that any attempt to seek help, either from friends and family or from support organisations, is likely to attract attention and possibly further abuse. This has the effect that although technology is providing more convenient ways for survivors to access the help they require, it is also preventing survivors from accessing those resources. Current Internet browser and mobile phone technologies make it relatively easy for an abuser to review the electronic records that the survivors have collected; conversely it requires a much greater level of technical knowledge and quite a lot of work on the part of the survivor to cover their tracks.

Therefore the technologies that are designed for our convenience inadvertently put survivors at a technological disadvantage. One way to address this problem is by erasing survivor’s *electronic footprints*, but this is not as straightforward as it sounds. Internet browsers and mobile phones will (by default) record their actions, but using a “clear all” approach leaves large gaps in the history, which can also alert the abuser to the actions of the survivor. To make matters worse for the survivors, each technology stores data in a different way, requiring extra knowledge and effort to effectively remove the traces of their activities. In some cases, data such as mobile phones billing records cannot be altered by the user, leaving them with very limited or even no options.

4.2 Method and Implementation

The overall aim of this case study is the *"social inclusion of survivors through technology"*, and to achieve this, the project's tasks have been divided into a number of sub-goals:

- Understand how survivors currently relate to technology, new technologies that would be useful to survivors and the technology issues that they face.
- Propose a digital strategy to make domestic violence support services more accessible to survivors.
- Propose a range of technology solutions that help survivors avoid leaving telltale *electronic footprints*
- Design an easily accessible method of teaching survivors to avoid leaving *electronic footprints*.

In order to address these goals, we have worked closely with the staff at the Angelou Centre to understand the technology issues faced by survivors. The guidance given by Angelou staff has been invaluable in the development of the technology strategy. In addition, Northumbria LCJB and Safe Newcastle (http://www.safenewcastle.org.uk/) have provided advice and guidance during the case study.

Due to the sensitive nature of the subject, it was not appropriate to use standard user interview techniques to gather the data required. It was felt that an online survey would be a less intrusive way to gather the data, as this could be carried out in the familiar surroundings of the Angelou Centre with the assistance of its staff, without requiring a member of Newcastle University research team to be present. The women who completed the survey were selected from women regularly attending services provided by the centre. There were two groups of women: survivors of domestic violence, and a control group of women who attend the centre for other activities (not related to domestic violence). The data were collected from the control group to minimise the influence of other factors common to all women attending this centre, such as socio-economic and/or ethnic group.

The survey collected information relating to the following topics: (i) the location of the computer the women used to access the internet (ii) websites visited, including any online support services used (iii) other communications channels such as instant messaging (iv) type and capabilities of mobile phones used (v) indication of age range (to eliminate any age related trends) (vi) did survivors feel they were being monitored (vii) which support services would survivors like to see implemented.
Two online survey forms were used to collect the data, one for survivors and one for the control group. The control group were not asked questions specifically relating to domestic violence. A multiple-choice format was utilised to obtain the granularity required and ensure the uniformity of terminology used in responses. The forms can be viewed at:

http://research.cs.ncl.ac.uk/surveys/survivors-survey.html
http://research.cs.ncl.ac.uk/surveys/womens-survey.html

There are two competing considerations when deciding which support services would best serve the needs of the survivors:

- preference of the survivors – there is no point providing services which survivors do not want or will not use
- affordability/running costs – it would be counter-productive to create a support service for survivors which has to be withdrawn because it is too expensive to run

Our choices regarding which technologies to use are therefore influenced by these factors and we also endeavour to develop a system that is as easy to use as possible.

4.3 Lessons Learnt

This project commenced in June 2010, and it has involved close collaboration with the staff at the Angelou Centre. It is from this collaboration that we have been able to draw insights and conclusions about the issues faced by survivors and the support services which are utilised by survivors. Significant contributions to the information contained in this document have also come from staff members at Safe Newcastle and from the Northumbria LCJB.

Intimate partner cyber stalking is not a new problem, however it is an issue which evolves with the release of each new technology. It is therefore a good idea to regularly review new browser and mobile phone technologies to ensure that some newly introduced feature does not compromise the safety of survivors.

One of the major challenges that survivors face is that it requires more effort and more technical knowledge for them to erase their *electronic footprints,* than it does for their abuser to follow them. Therefore redressing the balance in favour of the survivor will require a range of measures including redesigned websites, history cleaning technologies and training.

A survey of survivors was also performed as part of the case study, to capture first-hand their opinions. A total of 22 women completed the online survey, the results of which have provided valuable insights into the technology usage of survivors. Table 1 provides a summary of the survivors' usage of technology as compared to that of the control group. The survey results show that the survivors in our sample are 29% less likely than others in their socio-economic/cultural/ethnic group to be regularly using the Internet and the support services it provides. Encouragingly, the survey also shows that mobile phone usage amongst survivors is pretty much equal to that of the control group of the sample.

Category	Survivors	Control
Access to the Internet	71%	100%
Have access to computer outside the home (friends, relatives, library)	29%	87%
Used Internet communications such as Skype and IM	43%	87%
Mobile phone usage / ownership	86%	87%

Table 1 – Technologies Usage of Survivors

The survey also presented survivors with a list of domestic violence support services and asked which one(s) they thought they would use if it were available. The results are presented in Table 2. It can be seen that while most of the survivors still prefer to use the traditional telephone support line, it is encouraging to see that there are certain modes of interaction on the Internet that they are prepared to use. Internet directory of local support services (with no direct involvement of other people such as social care volunteers while accessing the Internet), and Internet forum supported by other survivors seem to be acceptable for them. It is also interesting to notice that the survivors seem to be aware of the feature of Internet browsers to record the history of the pages they have visited, and the survivors are keen to be able to avoid this.

Service	Survivors Preference
Telephone support line	86%
Internet directory of local support services	86%
Internet forum support staffed by survivors	86%
Internet browser that does not record history	57%
Mobile phone SMS text support line	43%
Online support for mobile phones browsers	29%
Mobile phone that does not record history	29%
Video instruction on avoiding being checked	29%
Internet support line staffed by volunteers	14%

Table 2 - Survivor's Preferred Services

Based on the results of the survey, we propose several ideas that can be used to assist the survivors. In particular, we would like to facilitate services that the survivors have indicated that they have a strong preference to use, namely Internet directory of local support services, Internet forum support staffed by other survivors, and an Internet browser that does not record history. Although survivors did not express a strong preference for an Internet browser that does not record history, it is felt from our reading of related works [1][3][6][7] that this will be a valuable tool to implement for survivors.

5 Proposed Technology Solutions

The results of the survey clearly show that Survivors have a wide range of technology experience ranging from expert users of mobile phones to complete technophobes. From this we have concluded that a single solution approach would not work for every Survivor, and that the best approach is to propose a number of technology solutions which can be used individually or used in combination to match the profile of the survivor who needs help. It is also clear from our research that each different domestic violence support provider will require a solution tailored to the needs of their users.

The research proposes a number of technology solutions to improve survivor's access to domestic violence support services. In general, there are three strands of services that we envisage provisioning:

- Implementing targeted domestic violence support services
- Making domestic violence support services more accessible
- Erasing the digital footprints of survivors

5.1 Targeted Domestic Violence Support Services

The purpose of the proposed technology is that it will help survivors to find local support services which are targeted to their specific needs. A successful implementation would include the following functionalities:

- Locate the support services that are closest to the location of the survivor.
- Indicate which services are currently open/available.
- Supply details of the opening times of services that are currently closed.
- Support a wide spectrum of hardware platforms (e.g. Internet, Smartphone and mobile phone), this will ensure that survivors are not excluded due to compatibility issues.
- Provide rapid response to questions submitted by survivors, the speed of the response in many cases can improve the outcome for the survivor. However providing a fast response can have a significant impact on the cost of providing the service.
- Simple to use for non-technical users, since ease of use is a major factor in whether users will utilise an online service.

The technology will link together the directory of domestic violence services for Newcastle and a number of online support services to create an integrated support solution for survivors. We propose three concrete implementations of this kind of services, and based on the results from the survey (see Table 2), the first two are likely to be the most preferred options by the survivors.

5.1.1 Directory of Domestic Violence Services

Newcastle, South Tyneside and several of the other Local Authorities provide directories of local services. With their permission, these directories can be digitised and indexed, based on the category of service, the postcode of the service provider, and the opening time of the service. The Directory Service is the central service that links all of the other services together into a single cohesive strategy. It creates a single entry point that allows users to access traditional support services and the new online services.

The online directory application will accept keywords, postcode/suburb and the date/time as search terms which will sort the list by services offered, distance from the survivor, and whether they are currently open/closed. The directory will list the phone numbers of the nearest (most appropriate) support service where the survivor can go for assistance, the telephone numbers of support lines, as well as the URLs for online support services.

5.1.2 Internet Forum Support Staffed by Survivors

This "survivors supporting other survivors" type of service has credibility as the women giving the advice have similar life experiences as the women asking the questions. There are a number of factors to consider when setting up this kind of service. To start with, the quality of the service depends upon the volunteers being un-moderated and calling upon their own experiences to provide their answers. Responses to questions may not be immediate, and since the women who are answering the questions will be volunteers, it will be slightly more difficult to plan staffing levels (as compared to having fixed employees). On top of these, different volunteers may have different opinions on any given question, and some volunteers may hold particularly strong opinions that do not necessarily follow the intended message of the service. And last, but not least, there may be legal implications due to the sensitive nature of the questions being posted on the forum.

5.1.3 Internet Support Line Staffed by Volunteers

Online support line technology is readily available and relatively simple to implement. The main difference between the Internet support line and the Internet support forum is that the support line provides instant responses to the questions asked. However the cost of this kind of implementation is much more prohibitive than a forum as it requires support staff to be available 24x7. In cases where a telephone support line is also available, users will often opt to pick up the phone, and speak to a person.

Even though volunteers-staffed Internet support line does not seem to be favourable in our initial survey (see Table 2), we believe it is worthwhile to implement it and to conduct a proper evaluation afterwards to find out the reasons behind it, or whether the survivors' opinion might change once they have tried using the service.

5.2 More Accessible Domestic Violence Support Services

These are technologies that can improve the accessibility of support services by ensuring that survivors are not excluded because they have limited access to technology or they do not know that the support service is there.

5.2.1 Embedding Information in Real World Objects

Two methods of embedding data are considered: (i) Quick Response (QR) codes, which are printed two-dimensional barcodes (Figure 1 and Figure 2) that can encode a URL or a SMS text message and can be read by a mobile phone with a camera or a laptop with a webcam, and (ii) Near Field Communication (NFC) and Radio Frequency Identification (RFID) tags, which are a class of wireless information storage device that can store much more data than a QR code and can be read by some mobile phones and computers.

Imagine that you are a close friend or family member of a survivor who is still in an abusive relationship and you want to help by letting her know about online support services which can help, without alerting her partner. What is required is a way of hiding the URL in an everyday object that will not arouse suspicion. QR codes can be printed on self-adhesive labels, making it easy to attach a URL to any real-world object; this could be a poster or flyer advertising the support service or an everyday object such as a postcard from a friend or on the base of a mug thereby disguising its meaning.

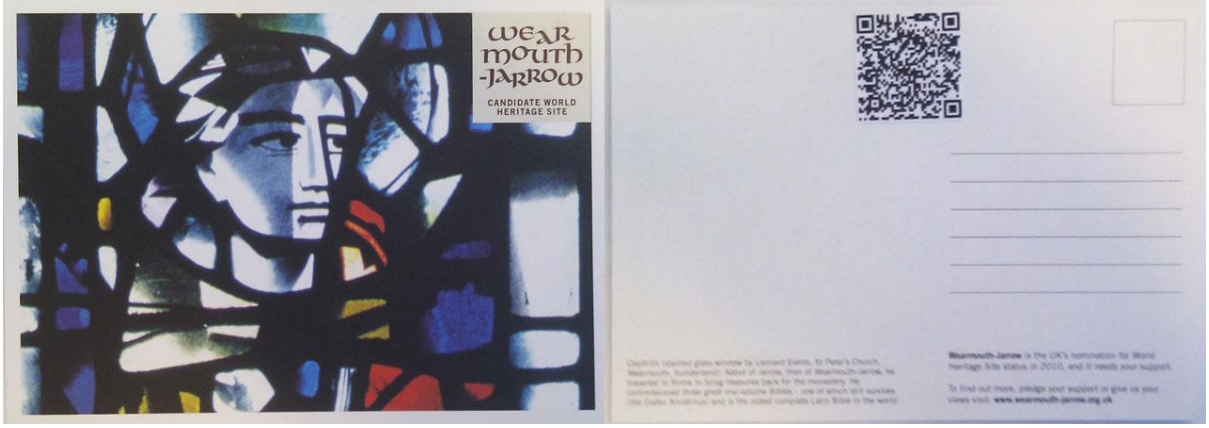

Figure 1 – Postcard with Embedded QR Code

An example of a QR code embedded in an innocent-looking postcard can be seen in Figure 1, which shows the front (left) and the back (right). The QR code in Figure 2 can be read with a mobile phone and contains a URL http://research.cs.ncl.ac.uk/cybercrime/no-follow-url.php?access-code=123456 which points to a live demonstration of single use URL access codes.

The Kaywa QR code generator software was used to produce this demonstration (http://qrcode.kaywa.com/).

Figure 2 – QR Code with embedded URL

QR codes are very cost effective because free software applications can be used to print them, so the only costs are the printing and the sticky labels. This compares very favourably with the cost of NFC, currently around £1.50 per item. NFC tags are much more expensive than QR codes so their use would be limited to applications where the additional functionality they provide is worth the extra expense. NFC objects can carry a great deal more information than QR codes, this provides the opportunity to embed more data. For example, an NFC tag could be used to store a list of all support services in the local area. These tags could then be attached to posters advertising support services, and the survivors can download and view the whole list on their phone without having to connect to the Internet.

NFC tags can also give a unique response to each person who accesses the information; this would allow posters to be created that will hand out a different single use URL to each mobile phone that accesses the poster. This functionality requires a custom mobile phone application to read and update the NFC tags.

5.2.2 Mobile Internet Pages

All of the pages provided by the proposed technology solution should also be provided in mobile Internet compatible format. This allows users to seamlessly access the same services irrespective of the hardware platform. It is relatively easy (and inexpensive) to design websites that are compatible with both PC-based Internet browsers and mobile phone browsers.

5.2.3 SMS Text Back

When a survivor sends a text message to a given text back service number containing their postcode/location, the text back service will send the phone number of the nearest support service provider to the survivor.

The text number, postcode and message can be built into a poster via a QR Code, and this set of information can be automatically sent by the survivor simply by pointing their mobile phone camera at the poster and pressing the send button. For mobile phones without QR-code functionality, the phone number and message content would also be printed on the flyers so that the user can enter them manually.

All response messages sent by the SMS text back service would end with a reminder to delete the message once it has been read.

5.3 Erasing the Digital Footprints of Survivors

Allowing survivors to freely access online resources whilst hiding their activities from their abusers is a complex problem which does not have a single solution. This proposal consists of a number of complementary technologies which provide layers of protection:

5.3.1 Technology Courses for Survivors

Educating survivors is the most important aspect of this proposal, as survivors will only use the services and utilities proposed in this case study if they have the knowledge of how to use them, *and* the confidence that their activities cannot be tracked. It is envisaged that a number of short YouTube videos could be created to help educate survivors in basic online survival techniques that will help them avoid being monitored. The proposal is that these YouTube videos, once created, can be played back to groups of survivors as teaching session, or can be accessed by survivors from any computer at any time, or can even be part of a printed media campaign using QR codes.

These videos would assume that the audience has limited technical knowledge and would be a play back of what would be seen on the computer screen whilst the user performs the task together with a voiceover explaining what is being done and why. It may be possible to rerecord the voiceover in different languages. The content of these videos could provide information for techniques such as: how to find local domestic violence support services, how to know if you are monitored, how to use private browsing and what to do if my computer does not have private browsing, how to delete SMS text history, how to use mobile internet services safely, how to use the history deletion agent and the monitoring detection utility, and how to use USB stick tools/utilities.

5.3.2 Single Use URL Access Codes.

Given that a survivor may not be aware how to use the private browsing feature included in the latest browsers or how to clear their history after accessing domestic violence support services online, it is proposed that specific sections of domestic violence websites could incorporate an automatic means of sanitising the browser history of anyone who visits the website.

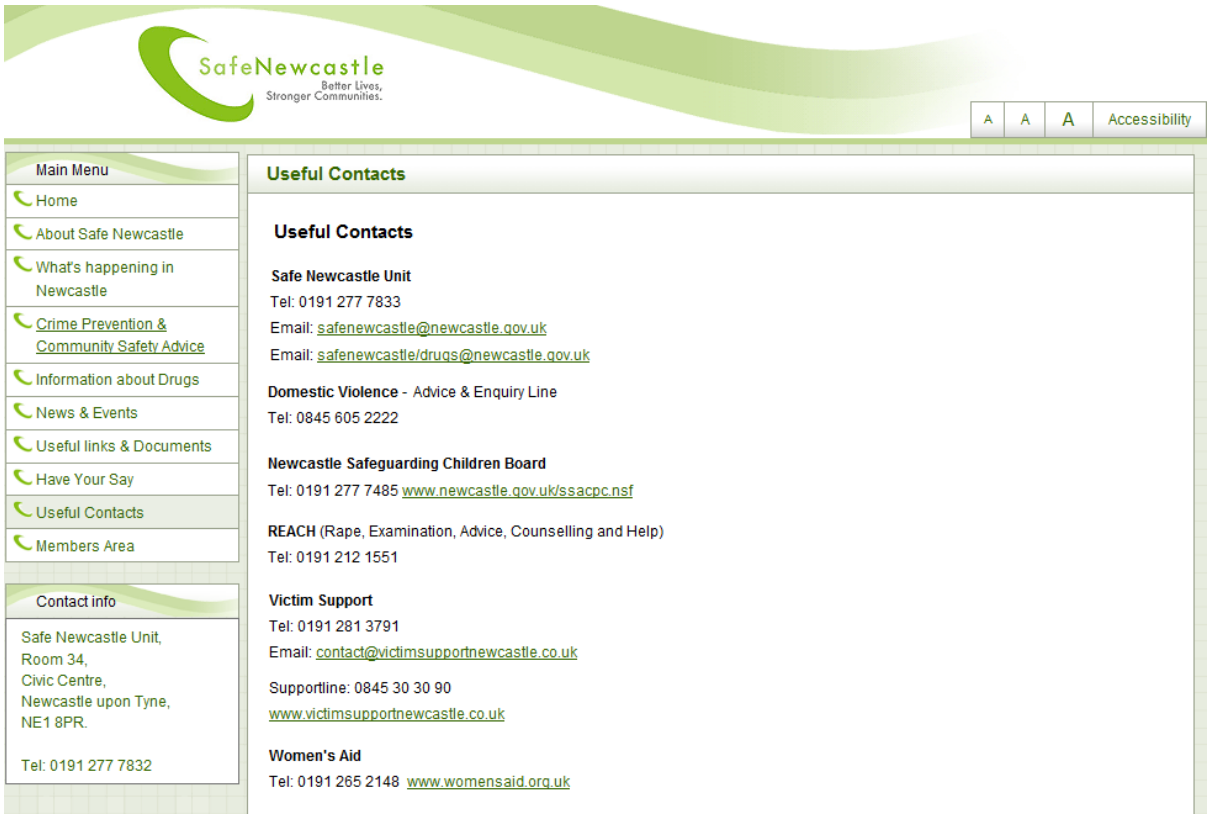

Figure 3 – Example Domestic Violence Support Page

The proposed solution hides pages relating to domestic violence support services (Figure 3) behind innocent pages (Figure 4) from a real website that the survivor would quite legitimately use. The website is designed with both innocent pages and domestic violence pages, anyone entering the website without a valid access key would be given innocent pages only. Access keys are used to access domestic violence pages, the access key is added to the URL as a query string, and in the example below, the access key is 123456.
http://research.cs.ncl.ac.uk/cybercrime/no-follow-url.php?access-code=123456

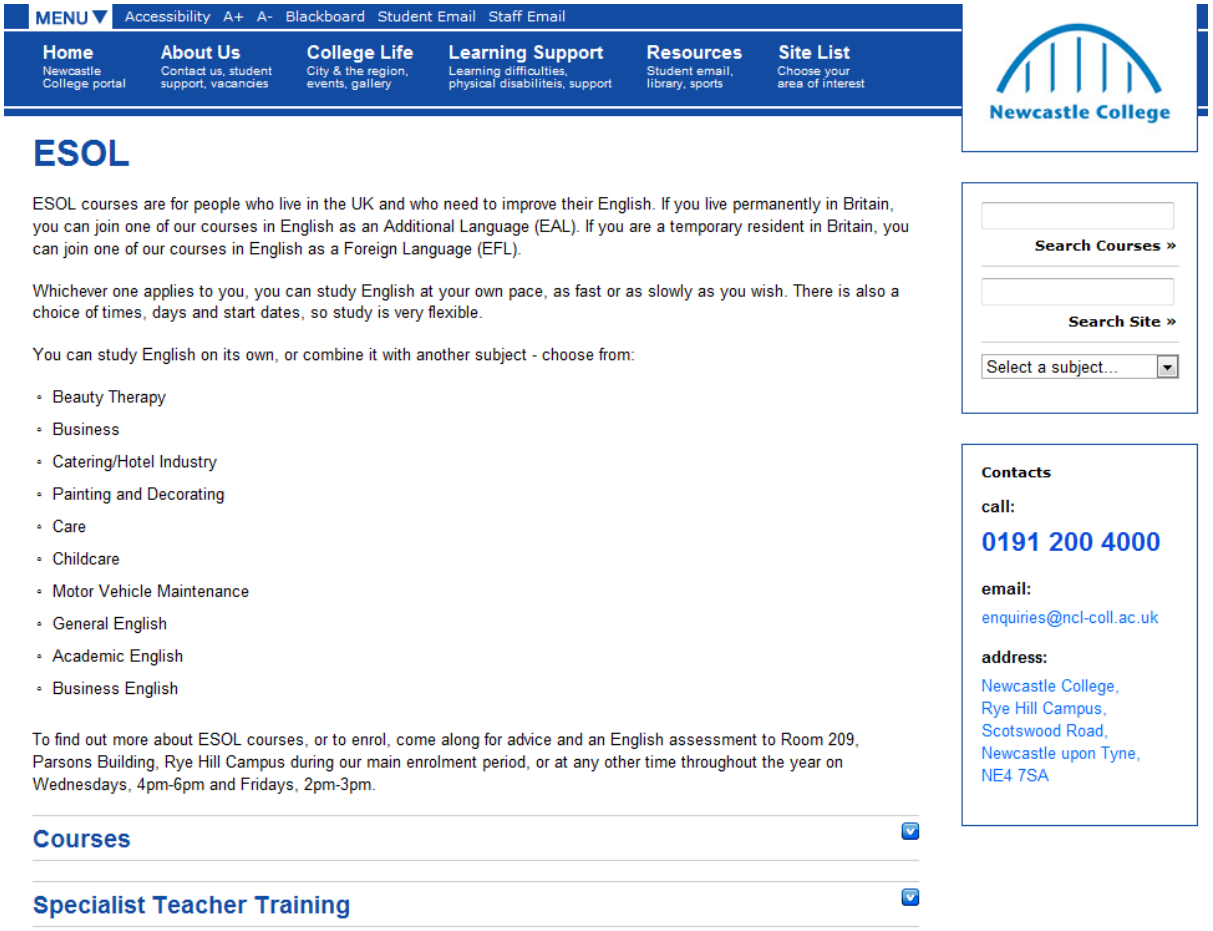

Figure 4 – Example Innocent Replacement Page

This example uses content for ESOL (English for Speakers of Other Languages) courses as the innocent pages (Figure 4), this matches the profile of the women who use the Angelou Centre's services, many of whom attend ESOL courses to improve their English. Different centres will use different innocent pages, to match the profile of the women attending the different centres. Each access key may only be used once; all subsequent attempts to access the domestic violence pages with a used access key (e.g. 123456) will result in innocent pages being presented (an example can be seen in Figure 3). This stops the abuser following the browser history to the domestic violence support pages.

Once the survivor is in the domestic violence support pages, the server would keep a session open for that computer so that the survivor can navigate around the pages without having to give a new access key for each page that they request.

The access codes can be distributed in various ways, the method selected should draw the least attention for the survivors who will be using them. Some of the methods we envisage using include: embedding QR codes on postcards, posters, flyers or objects, providing a USB stick containing tools that survivors can use, emailing the URL to survivors, printing the URL on tear-off strips at the bottom of a poster, and sending the URL as a text message.

An algorithm will generate access codes based on the date, so that codes will be valid for a limited time. The access code algorithm will incorporate a checksum to stop random numbers being accepted as valid access codes.

5.3.3 Targeted History Sanitisation Agent

The objective of History Deletion Agent is to automatically erase the digital footprints left behind when a survivor accesses specific domestic violence Support websites.

It is envisaged that the software can work both as an agent which is installed on the survivor's PC and runs in background all of the time, or as an executable on a USB stick or CD that the survivor can run on demand to cleanse the history. The agent will remove all history entries relating to domestic violence support websites; including temporary Internet files, browser history entries, and cookies.

The agent will leave intact all other history entries, thereby avoiding computer looking as if it has been cleaned. The agent will automatically download a list of domestic violence support websites, which it will use this to decide which entries to delete; the list will be updated when new domestic violence support websites go online.

History entries will be cleansed from all of the popular Internet browsers such as Internet Explorer (IE), Firefox, Chrome, Safari and Opera. This will ensure protection for 98% of UK computers used to access the Internet (based on figures for March 2011 [12]).

Mobile Phones are becoming an increasingly popular way if accessing online content, it is therefore proposed that versions of the history sanitisation agent are developed for Android and iPhone platforms. The mobile phone agent development would also investigate the ability to automatically cleanse the phone of unwanted entries in the call list and unwanted SMS text messages.

5.3.4 Portable Internet Browser Technologies

Portable versions of the popular Internet browsers Internet Explorer, Firefox, Chrome, Safari and Opera are available. It is proposed to install the portable browser on a USB stick which will be distributed to survivors. This will allow them to browse the Internet without leaving any history behind on the computer. As an additional safeguard, the portable browsers on the USB sticks will automatically start-up in private browsing mode.

5.3.5 Monitoring Detection Agent

There are a number of active Internet monitoring applications (e.g. CheckStick) which are designed to help parents monitor what their kids are doing online. These are extremely beneficial technology, which can record the content of web pages as well as history of the URLs visited the recorded data can then be viewed remotely from another computer. For example, Durham County Council is using CheckStick to monitor the Internet chat room traffic of children in care, looking for the early signs of Internet grooming [11].

Unfortunately these technologies can also be used to monitor the Internet activities of survivors. Nonetheless, because of its usefulness, we do not want to disable this monitoring feature, but instead we propose a "monitoring detection utility" which will warn survivors that a monitoring software is running on the machine they are about to use. The survivor can then decide whether to use a friend's or relative's computer instead.

5.3.6 Survivor protection utilities on a USB stick

It is proposed that survivors would be provided with USB sticks containing the utilities described in this case study (i.e. the monitoring detection agent, the targeted history sanitisation agent, a portable Internet browser and a single use URL access code generator). The utilities could also be put on a CD to allow for survivor preference, it would also reduce the cost of distribution.

6 Conclusion and Future Work

Through this work, we have demonstrated the need for solutions that will have a significant impact on social inclusion for survivors of domestic violence by improving the accessibility of domestic violence support service and by improving the ability of survivors to avoid leaving electronic footprints when they access these services.

The case study shows that the existing technologies utilised by survivors, unintentionally, work contrary to these aims. Given that this situation is unlikely to change and there is a limited budget for this project, we have adopted a strategy that proposes a number of *bite-sized* solutions, each of which will be relatively quick implement at a modest cost.

We are planning to implement the novel ideas proposed in section *5 Proposed Solutions*, either as proof of concept demonstrations or as fully functional solutions, this will be followed by an evaluation of the developed solutions, and for this study.

We are also pursuing research into other socio-technical systems, with the main aims of assisting local communities and improving our understanding on how socio-technical systems impact society.

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Appendix A Survivors of Domestic Violence Online Survey

The aim of the survey is to identify the practical technologies that will assist Survivors of domestic violence to access support services in the Newcastle and surrounding area.

A.1 Survey Results and Conclusions

The survey results are given in section *4.3 Lessons Learnt*.

A.2 Survey Questionnaire

The survey is presented as an online form, this method of data collection was selected as it involved the minimum intrusion upon survivors as they could complete the questions at a time and place convenient to them. The Angelou Centre ran several organised sessions where survivors used the computers at the Angelou Centre to complete the survey

The questionnaire gathered information about which technologies are used by Survivors of domestic violence, other women in same demographic group who have not suffered domestic violence will also be asked to complete the survey to identify trends which are common to the socio-economic group.

A.2.1 Organised Survey Sessions

The Angelou Centre carried out initial data collection sessions using the online survey form. At the start of the session a password was issued to the survey participants will be issued with a password which validates the data as coming from an authorised source. A new password will be generated for each new data entry session. Figure 5 shows the online form used in the domestic violence survey (the form can be viewed online at http://research.cs.ncl.ac.uk/surveys/survivors-survey.html)

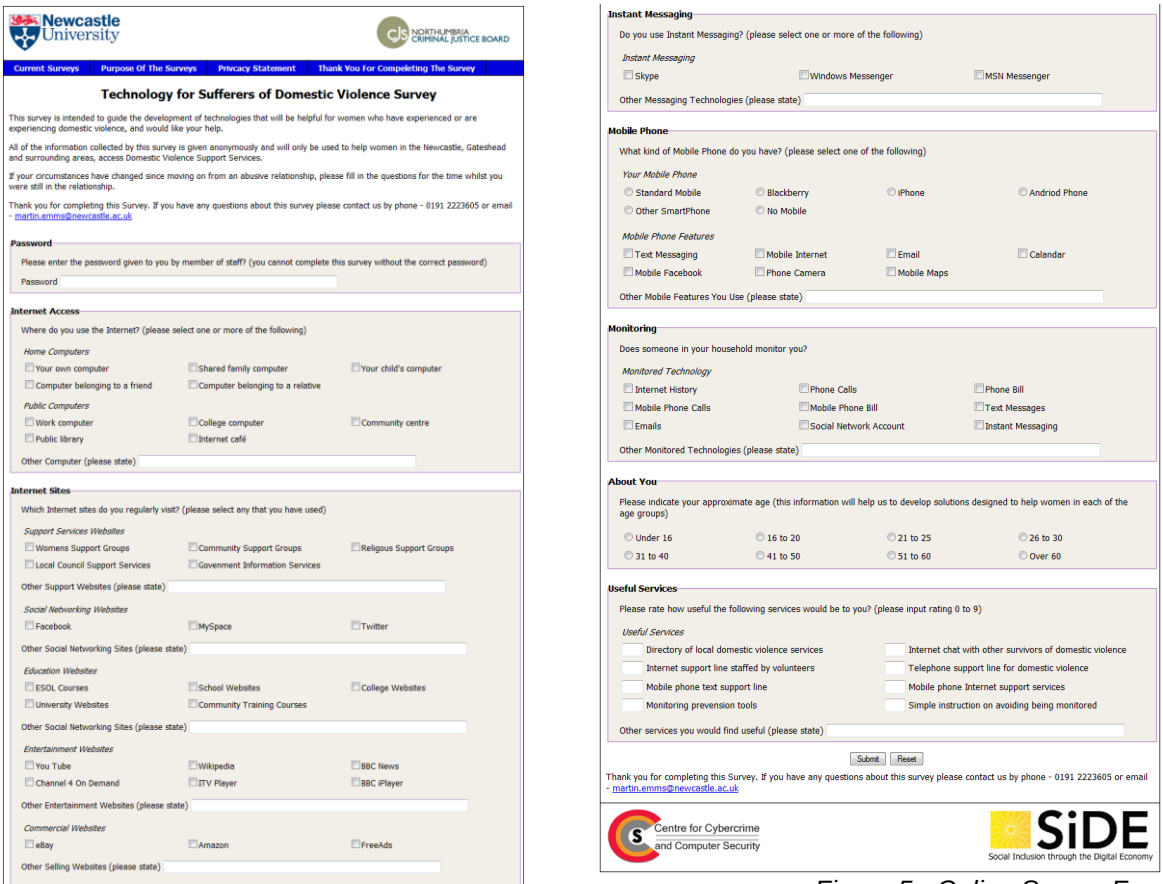

Figure 5 - Online Survey Form