The Importance of Website Usability - Regardless of Screen Size

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ABSTRACT
Online resources are used across many domains in today’s connected world, however the usability of these resources is often overlooked. Usability is a key factor in determining how successful a resource will be and how much utility its users will get from it. This paper is part of a larger project in developing an online aftercare resource for patients recovering from an ACS event. A literature review has been conducted to find information into how websites formatted for any size screen can be designed to improve the user's experience and content absorption.

INTRODUCTION
The recovery from an Acute Coronary Syndrome (ACS) event, more commonly referred to as a heart attack, is an aspect of medicine science understands relatively well. However patient recovery rates and adherence to treatment plans in certain populations can be very low. This literature review is part of a larger project focusing on how some form of an online aftercare resource could better deliver patients the information they need throughout their recovery.

Good design of an online health resource is absolutely vital in creating an effective means of communicating with its users. Poor design and usability lead to a lower perception of quality of the information contained within the resource and also cause lower levels of user satisfaction which will decrease the number of return visits. This literature review will investigate what steps can be taken to improve the level of usability for an online health resource in order to best help the user through their medical recovery. Not only will the usability of full sized websites be investigated but also how the smartphone plays out in the space as well. It is important that we reach patients in whatever means is most convenient and effective for them, so all avenues must be considered.

Literature was gathered by using the Google Scholar search engine. A restriction was imposed requiring all but one seminal article to be published later than 2010. This lead to the discovery of six current papers investigating similar but different angles of this topic. The papers were read and the most important points summarized. A short section was then written for each of the six articles on how they relate to the topic and the larger project as a whole. The final step of the process, this report, is where the findings from the six papers are brought together and reflected upon to reveal the overarching themes.

The most critical aspect of this report is the finding of the correlation between an increase of perceived ease of

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<td>Mobile web usability: developing guidelines for mobile web via smart phones.</td>
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use/usability and user satisfaction. A more satisfied user is far more likely to return to the online resource and therefore get more value out of it. In our case, a patient getting information about their ACS recovery process. This is extremely valuable when it comes time to design our solution as it shows us where we need to channel our focus.

**PROBLEM**
Cardiovascular disease is the leading cause of death in New Zealand, accounting for 30% of deaths annually. This equates to one New Zealander dying every 90 minutes from heart disease [7]. However many of these deaths are preventable not only through lifestyle changes before a heart event but in the time following one also. The recovery process following cardiovascular disease, or what we are referring to as ACS, an umbrella term for situations where the blood supplied to the heart muscle is suddenly blocked, [8] can greatly affect how long the patient will live following the event. Poor recovery could lead to death after a couple of years whereas proper recovery could lead to the patient living for a great deal longer.

Knijnenburg et al. discuss the low levels of adherence to online health interventions, however live contact with health professionals, educational attainment, tailoring of information and user experience are said to be positive influences on this.

The goal of this project is therefore to implement some kind of web application which can deliver a patient recovering from an ACS event the information they need at the time they need it, in a way which keeps them engaged and adherent. This may be anything from reminding them to take their medication right through to tracking their physical activity and letting them know how they are progressing towards their activity goals.

Brief initial contact has been made with a Clinical Nurse Specialist in Heart Failure from Waikato Hospital, Catherine Gallagher. Catherine has a wealth of experience in this area and is extremely excited by what a solution such as the one being proposed by this project could mean for her patients. She has many ideas and is looking forward to working with the group on this project as we move forward.

**USABILITY STUDIES**
All of the reviewed articles perform usability studies, usually evaluating a particular website in order to learn from that implementation’s mistakes and go on the make recommendations on how it can be improved.

Lee et al. performs a usability study on an online shopping website then goes on to make recommendations on how to improve website usability for a given goal, in this case, getting the user to purchase items on Amazon.com. The study used a total of 689 participants to evaluate the website using a questionnaire with a seven point Likert scales.

Belanche et al did a very similar study only this time looking in to the usability of a Spanish bus ticket selling website. 214 participants answered a closed-question questionnaire.

Lee et al. went on to use extremely mathematical methods on the gathered data to develop a causal map and nomological networks. These communicate the relationships between the seven usability constructs the study was proposing (consistency, supportability, learnability, simplicity, interactivity, telepresence and readability).

Knijnenburg et al. performed their usability using the System Usability Scale and a questionnaire allowed participants to provide their feedback.

The study Hinchliffe et al. conducted was very similar to that of the other studies however the goal was quite different. The study was not conducted to identify every usability problem with a website, but instead to show how implementing usability testing with a small number of users can identify a large portion of usability problems. An existing website was tested (The 10,000 Steps website) to identify common usability items which can be addressed and implemented by new and old health promotion websites.

Knijnenburg et al. used both qualitative and quantitative methods to gather data from user completing tasks on the website, they measured performance as well as observing the participant and conduction interviews and questionnaires with the participants. This approach was quite a lot more thorough than the other papers however they had a lot fewer participants.

All of these slightly varied ways of gathering information was very valuable to this report. It did not limit the scope of response to merely one type of study and mean we can make some fairly confident conclusions about the data which was gathered. There was a fairly strong theme of non-medical subject matter for the studies however this was not perceived to be a problem as the findings from the usability studies can be applied to any web or mobile interface. [1,2,3,4,5,6]

**WEB FINDINGS**
Full sized websites, although perhaps not used as much as once before are still a huge part of communicating with users across the internet. Four of the papers included in this literature review delved in to the usability of desktop websites.

A number of direct and indirect relationships were found between the different usability constructs and the intention of a participant to purchase. However the accuracy of the content had the most effect on purchase intension, which in our case could be seen as “adherence to treatment” or something of that nature.
Telepresence (the perception that the website is of high quality and well regard on the internet, like Amazon.com) also had a strong effect on the intention to purchase by the participants.

Interactivity, including the integration with social media sites was also found to be a strong contributor to the purchase intention of participants. Social network integration also further adds to the site’s credibility and therefore telepresence. It would be of huge value for our solution to be integrated with social media, or alternatively have a social component. Patients would then be able to share knowledge, stories and advice which would aid their recovery process.

It could be thought that these findings only relate to their specific domains, booking buses and shopping online, this is the case for things like “purchase intention”. However if you read between the lines, the findings shed light on the most important usability aspects for a website, backed up by well-executed user studies and strong mathematics. These findings can be applied to any website aiming to achieve a goal, in our case, giving a patient following an ACS event the recovery information they need. The points made Lee et al. about integration with social media are interesting and we could leverage this to allow the patients to share their experiences with other patients. [1,2,5]

MOBILE FINDINGS
In order to reach the most patients and for our solution to be of maximum effect it is imperative that we consider all possible avenues of communication. Smartphones are utterly pervasive in nearly all levels of society in New Zealand, there are exceptions to this however it wouldn’t be hard to argue that more people have access to smartphones than they do to traditional desktop computers. This makes for a very attractive communication medium for our solution, whatever it may be.

It is crucial that we consider either how our solution will look when presented through a mobile browser, or perhaps even what a mobile only solution in the form of a mobile application may look like.

It was shown by both papers which focussed on mobile web that it is imperative web pages are adapted in some form for mobile and their smaller screen sizes. One proposes a new ‘hybrid’ approach to scaling and reformatting webpages for these smaller screens. It integrates three existing techniques - tree-view, hierarchical text summarization, and coloured keyword highlighting.

It was found that a tree-view was the most effective way to both increase the participants’ performance navigating the website and finding the information they needed as well as the perceived ease of use of the website. If not a tree view, some other hierarchical format was found to be the best way to improve a user’s performance when browsing the internet on a mobile device.

Summarization of web pages was not found to increase performance or user perceived ease of use however the one of the authors expressed that this was of surprise and further research in to this area, perhaps with different methods may yield more positive results. It was certain however that any sort of webpage adaption was preferable when compared to displaying the full desktop version on a mobile device.

Hong et al. found that it was essential for full size websites to be scaled down or changed in some way as the small GUI elements often made websites very difficult if not impossible to navigate. The study suggests a set of guidelines for mobile web including, placing a search box at the top of every page. GUI elements should be scaled according to the screen size as opposed to conventionally by pixels. It also suggests a recommended layout where there is a minimum sizing for elements and how they should be arrange to make the best use of the smaller screen.

Hong et al. also deems that the optimum size for any touchable GUI element is 4.5mm wide by 6.5mm high. The specific dimensions for the recommended size of a touchable element is extremely valuable not only for this project but across all mobile development.

At this stage in the project the team is still exploring the problem space and it would be premature to declare the platform on which the solution will run however we can be almost certain that smartphones will be one of them. If our solution is not a mobile-only one, it will be viewed on mobile as well as the traditional desktop computer. The points it raises about how to restructure full website will be very useful in scaling our potential website or other implementation down for mobile devices. [3,4]

EFFECTS ON SATISFACTION
User experience is not always regarded by many as the most important aspect of a system. This say be fair when perhaps compared to the validity of the information however it has been found that good usability and overall design strongly correlates to user satisfaction. This in turn will determine how likely the user is to revisit the online resource and how much utility they get from it.

It was observed that usability had a great impact on customer behaviour but even more so on customer satisfaction. That is, a user may still use a poorly designed website, but they will not enjoy it so much and will be unlikely to use it again. From a study of past literature included in the paper it has also become clear that a user’s intention to use a website is strongly tied to consumer satisfaction, and usability is one of the drivers for this.

It was also found that good usability helped the participants overcome a perceived risk, be it from not trusting the website or doing things online for whatever reason. This is an extremely important point when we related it back to
ACS recovery. The users will be taking a huge personal risk when the put their trust in our solution, having good usability and polished design will certainly help them overcome this. [2,5]

DESIGN RECOMMENDATIONS
Almost all of the papers concluded by providing design recommendations for future implementations. This is the most helpful points we can take from this literature review and which will be most applicable when it comes to designing our solution.

Hinchliffe et al. found that design and navigation accounted for half of the unique problems faced by participants however the main area of findings from the study was the notion that with some simple and inexpensive usability testing and subsequent re-design can improve a health promotion website dramatically from the end users perspective. The testing carried out in the study not only found major problems with the target website but also many small “easy fix” issues which collectively made a great difference to the user’s experience. [6]

Ease-of-use above all else, was stressed to be the most important factor when going through the design process. Websites should also try and identify the needs of a customer to help them achieve their goal in a more efficient way.

Knijnenburg et al. found that patients recovering from cancer prefer a greater depth and scientifically backed information as opposed to general heuristic health information. However these requests came predominately from participants with higher education. This is an important consideration we must make, how to cater to different levels of education. To combat this the stratification of information is recommended. That is, ordering information in to a few layers of increasing complexity. The curator of the website must also stay as up to date as possible and update the website regularly with news to increase the perceived currency of the information and encourage frequent visiting by users.

FUTURE WORK
More research in how to develop one web application which can be viewed on both desktop and mobile could be extremely beneficial. Not so much in terms of technology and implementation but in terms of designing a user interface which can either adapt or scale to different screen sizes autonomously.

Research in to how to stratify information to suit the level of education or understanding for different patients could also be very useful as it would enable, like design for different size screens, the resource to change for the needs of different users without building different views for different levels of information.

Though touched on slightly by Knijnenburg et al. another area where focus could be valuable would be around how to design online resources for people recovering from various diseases. Specifically, how to have the user absorb this information in a constructive and non hypochondriactic manner.

SUMMARY
Some extremely powerful insights were found in the six papers which have been reviewed. These ranged from how to design a better solution from the beginning right through to how the solution should be evaluated by its potential users. The true value of this literature study will come to the fore when the final solution is being designed and it is referred back to in order to leverage the valuable contributions made by these authors.

A common theme across the papers was how strong user satisfaction and the perceived professionalism or credibility of the resource weighs so strongly on the trust a user will place in the resource and therefore the value they will get from it. This was found not only in the evaluation of an online shopping website but also in an aftercare resource for cancer survivors.

There is certainly scope to make a real difference to the lives of patients recovering from an ACS event, and we are now one step closer to designing a valuable user experience for these patients.

REFERENCES


http://aisel.aisnet.org/cgi/viewcontent.cgi?article=2944&context=misq


