

# Design vs. Disability

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## Introduction

As a web designer, it is often easy to be pigeon-holed as simply a person within the creative industry, approximately somewhere between a graphic designer and computer programmer. However, we must not just consider the visual and structural aspects of our work, but also how the user interacts with our work. We cannot always assume that the person viewing our web site uses it in the same way we - the designer - do. We must take into account disabled users, and how the methods we have employed to create a web site impact upon them.

I will examine the issues as experienced by both disabled users and web designers, and question whether making provision for disabled users on the web affects a designer's freedom of creativity. I will put forward suggestions on how we, as designers, can improve support for disabled users without negatively impacting the user experience of non-disabled users.

In the course of the document, I will reference government legislation, peer-reviewed publications on web accessibility, and government or public sector web sites.

## Section I: Understanding disability

As of 1995, rights to access goods and services for the disabled has been protected by the Disability Discrimination Act<sup>1</sup>. In effect, a disabled person must be permitted access to aforementioned goods or services without discrimination. Further amendments to the legislation<sup>2</sup> ensure that service providers make "reasonable adjustments" to their premises in order to provide adequate access to the disabled. Most commonly, on the high-street, this involves providing wheelchair access to a building.

Amongst the web community, there is a great deal of confusion over legislation covering disability law on the web, primarily because neither the 1995 or 2005 acts directly make reference to the web. However, the *Codes of Practice*<sup>3</sup> of the Disability Discrimination Act, published by the Disability Rights Commission states that:

*"The Act makes it unlawful for service providers to discriminate against a disabled person in relation to the service in question."*<sup>4</sup>

Since many websites offer goods and services to the general public, the same legislation that applies on the high-street must also apply on the web. A bank that provides wheelchair access must also ensure that their web site is accessible. Although the Disability Discrimination Act has never been used in a UK court to hold a business or individual accountable for an inaccessible web site, successful legal action has taken place overseas in order to prosecute businesses or organisations for running inaccessible web sites. If a case did come before a judge in the UK, decisions made overseas in countries with similar disability legislation would be considered. One of the most high-profile

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<sup>1</sup> HM Government. (1995). *Disability Discrimination Act 1995*. Available: [http://www.opsi.gov.uk/acts/acts1995/ukpga\\_19950050\\_en\\_1](http://www.opsi.gov.uk/acts/acts1995/ukpga_19950050_en_1). Last accessed: 10 November 2009.

<sup>2</sup> HM Government. (2005). *Disability Discrimination Act 2005*. Available: [http://www.opsi.gov.uk/acts/acts2005/ukpga\\_20050013\\_en\\_1](http://www.opsi.gov.uk/acts/acts2005/ukpga_20050013_en_1). Last accessed 10 November 2009.

<sup>3</sup> Disability Rights Commission. (2006). *Codes of practice*. Available: [http://83.137.212.42/sitearchive/drc/PDF/CoP\\_Access.pdf](http://83.137.212.42/sitearchive/drc/PDF/CoP_Access.pdf). Last accessed 10 November 2009.

<sup>4</sup> Disability Rights Commission. (2006). What is unlawful discrimination in relation to services and how can it be avoided? In: Disability Rights Commission *Codes of Practice*. London: The Stationary Office. p25.

cases involving web accessibility was *Maguire vs. SOCOG*<sup>5</sup> in Australia. In this case, an Australian citizen complained that the website of the Sydney Olympic Games was inaccessible. This was upheld by the court, and the Olympic Game Committee was fined and reprimanded after refusing to make necessary changes to the site to aid accessibility.

Whether or not there is legal precedent for web sites to be accessible to disabled individuals in the United Kingdom, there is certainly moral obligation to provide an equivalent level of support that exists in the non-virtual spectrum.

Quantifying the challenges faced by disabled users on the web is not simple, especially from the point of view of a non-disabled web user. Many disabled users cannot experience web sites in the way they were originally intended. Blind or partially-sighted users may not be able to read text or see images on a screen, users with motor disabilities may not be able to navigate a site with a mouse or keyboard, deaf users may not be able to take advantage of multimedia content, and so on. Those are but a tiny selection of issues faced by the disabled on the web.

Understanding how users with disabilities access the web is a crucial component of accessibility. It is more useful to consider the solutions to specific accessibility issues than to approach the problems from the disability's point of view. By breaking the contextualisation of a web site down, I will argue it is easy to define where specific accessibility issues occur and how best to manage them.

The first issue to consider is visual. Usually, web sites are interpreted via computer monitor, or another form of digital display device. This means that users that cannot interpret information visually are at an immediate disadvantage. This does not only cover blind users, but also the partially sighted and others who may not be able to view a screen. In this case, a user can make use of software known as a "screen reader" which literally reads the content of a web site aloud on a user's machine, allowing them to digest the information on a web site. The reader also allows them

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<sup>5</sup> Australia Human Rights Commission: Bruce Lindsay Maguire v Sydney Organising Committee for the Olympic Games.  
[http://www.hreoc.gov.au/disability\\_rights/decisions/comdec/2000/DD000120.htm](http://www.hreoc.gov.au/disability_rights/decisions/comdec/2000/DD000120.htm)

to navigate the site with a keyboard or other input device. However, other forms of visual impairment which would not necessarily require the use of an intermediary piece of software also require consideration. Hardware devices that convert on-screen information into Braille are also available, though less prevalent.

Local government and authorities have an obligation to provide printed materials in large print and Braille formats, and the same issue applies on the web. Low vision, where a user may be able to interpret information visually, but only if displayed at a certain size is also a common issue to consider, particularly amongst elderly web users. It is important to ensure that most elements of a web site are resizable so that these users can easily read and digest the information on a site.

Colour blindness is a common disability that requires careful consideration by web designers. On a web site, changes in colour are often used to denote importance to certain elements of a document, just as in every day life. Commonly, colour can be used to signify a hyperlink, a navigational element which sends a user to another location. If colour is the only signification of this element, colour blind users may miss this information entirely. They must then use their own judgement, or trial and error, to determine which elements are hyperlinks and which are not.

Sufferers of seizures triggered visually are also a consideration on the internet. Other forms of media, such as television, have set guidelines on flashing imagery and other potentially dangerous elements, and these can apply to web sites too.

Audio is an important aspect of many web sites. With the prevalence of video content on the internet, there is a great deal of multimedia content which is inaccessible to deaf or hearing impaired users due to lack of closed captioning or subtitles. Providing these facilities where there is relevant informational audio is therefore very important for accessibility. It is also important to consider where it is important to use subtitles in these instances, and where it might be appropriate to use British Sign Language (BSL). Since many deaf people's first language is BSL, which is very

different from written or spoken English, subtitles must be carefully written with BSL users in mind who may not have a firm or fluent grasp of English.

Motor disabilities, in this case being those in which a user cannot or has difficulty using their hands to control a human interface device such as a keyboard or mouse, are another set of issues for designers to consider. Users with motor disabilities may have issues navigating a web site in order to access information, and it is therefore important to build a web site that can be modified by the user to enlarge certain elements to ease navigation.

Learning disabilities are also a major area of consideration on the web. Studies have estimated that 2% of the population in the UK suffer from some form of learning disability<sup>6</sup>. How information is displayed and written is crucial to its accessibility by users with learning disabilities. Using plain language and displayed relevant and useful illustrative elements is important when considering users with disabilities such as dyslexia.

These disabilities are the primary obstacles web accessibility attempts to overcome, by using techniques and practices explained in the Web Content Accessibility Guidelines<sup>7</sup> (or WCAG), published by the World Wide Web Consortium<sup>8</sup> as part of the Web Accessibility Initiative<sup>9</sup>.

On March 8, 2006, the British Standards Institution<sup>10</sup> produced a Publically Available Specification, named PAS 78<sup>11</sup>, which described the best practices expected for a website to comply with the Disability Discrimination Act. This document has been written to educate those businesses and organisations covered by the act of what is expected to meet the minimum accessibility requirements in order to deploy an inclusive, non-discriminatory user experience. It outlines and

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<sup>6</sup> Eric Emerson and Chris Hatton. (2004). *More about learning disability*. Available: <http://www.mencap.org.uk/page.asp?id=1708>. Last accessed 10 November 2009.

<sup>7</sup> W3C. (1999). *Web Content Accessibility Guidelines 1.0*. Available: <http://www.w3.org/TR/WAI-WEBCONTENT>. Last accessed 15 November 2009.

<sup>8</sup> W3C. <http://w3.org>.

<sup>9</sup> WAI. <http://www.w3.org/WAI/>.

<sup>10</sup> British Standards Institution. <http://www.bsigroup.com/>

<sup>11</sup> PAS 78: *Guide to good practice in commissioning accessible websites*. [http://www.cabinetoffice.gov.uk/media/cabinetoffice/corp/assets/publications/government\\_it/consultations/pdf/delivering\\_inclusive\\_websites1.pdf](http://www.cabinetoffice.gov.uk/media/cabinetoffice/corp/assets/publications/government_it/consultations/pdf/delivering_inclusive_websites1.pdf)

summarises the guidelines laid out in the WCAG, and advises and directs readers to appropriate resources to deploy in future or current projects.

The document makes very clear the legal requirement for government organisations to provide accessible services to the public. It states:

*1. The minimum level of accessibility for all Government websites is Level Double-A of the W3C guidelines. Any new site approved by the Cabinet Sub-Committee on Public Engagement and the Delivery of Service (DA(PED)) must conform to these guidelines from the point of publication.*

*2. Continuing standalone sites must achieve this level of accessibility by December 2008. Websites which fail to meet the mandated level of conformance shall be subject to the withdrawal process for .gov.uk domain names, as set out in Naming and Registering Websites (TG101).*

This is a strong statement to designers and web professionals producing sites or projects for the government.

## Section II: Designing with disability in mind

Designing with the principles of web accessibility in mind is a relatively new concept on the web.

Along with web standards and usability, it has enjoyed recent widespread coverage due to the work by the W3 and championed by leading designers in the web community such as Jeffrey Zeldman.

Part of this effort has been through published works such as *Designing with Web Standards*<sup>12</sup>, which described methods to create attractive web sites built with accessibility in mind.

Before the advent of this recent development, web design was largely a purely visual operation.

How a site was made, how it was used, the way content was displayed and the media it contained was of little consequence compared with its visual appeal. Clients wanted a professional look, or a clean look, or a creative look, and designers considered this their only priority.

Over time, businesses running sites realised their sites were creating problems. Their site might be poorly constructed and use an inordinate amount of bandwidth - costing more money than they anticipated. Their site might be difficult or impossible for some people to interact with, and consequently their web site loses business. Their site might be altogether impossible for those with disabilities to use at all. Though failing to adhere to web standards and usability can cost a business revenue, not adhering to web accessibility might well now be illegal. Therefore, it is of great importance to a business and the professionals running the web site that web accessibility is of paramount concern to them.

The WCAG breaks down web accessibility guidelines into "priorities". The document states<sup>13</sup>:

*Priority 1: A Web content developer **must** satisfy this checkpoint. Otherwise, one or more groups will find it impossible to access information in the document. Satisfying this checkpoint is a basic requirement for some groups to be able to use Web documents.*

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<sup>12</sup> Jeffrey Zeldman (2009). *Designing With Web Standards*. New York: New Riders.

<sup>13</sup> W3C. (1999). *Web Content Accessibility Guidelines 1.0*. Available: <http://www.w3.org/TR/WAI-WEBCONTENT/#priorities>. Last accessed 15 November 2009.

*Priority 2: A Web content developer **should** satisfy this checkpoint. Otherwise, one or more groups will find it difficult to access information in the document. Satisfying this checkpoint will remove significant barriers to accessing Web documents.*

*Priority 3: A Web content developer **may** address this checkpoint. Otherwise, one or more groups will find it somewhat difficult to access information in the document. Satisfying this checkpoint will improve access to Web documents.*

Thus, when a site is evaluated for accessibility, it can be denoted as Conformance Level "A" for meeting all Priority 1 guidelines, Conformance Level "Double-A" for meeting all Priority 1 and 2 guidelines, and Conformance Level "Triple-A" for meeting all guidelines.

Meeting these conformance levels is achieved by adhering to the guidelines within the document, and the W3C state that meeting at least the second level of conformance "*will remove significant barriers to accessing Web documents*". The WCAG breaks down the requirements into fourteen separate guidelines<sup>14</sup>:

1. *Provide equivalent alternatives to auditory and visual content.*
2. *Don't rely on colour alone.*
3. *Use mark-up and style sheets and do so properly.*
4. *Clarify natural language usage*
5. *Create tables that transform gracefully.*
6. *Ensure that pages featuring new technologies transform gracefully.*
7. *Ensure user control of time-sensitive content changes.*
8. *Ensure direct accessibility of embedded user interfaces.*
9. *Design for device-independence.*

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<sup>14</sup> W3C. (1999). *Web Content Accessibility Guidelines 1.0*. Available: <http://www.w3.org/TR/WAI-WEBCONTENT/#Guidelines>. Last accessed 15 November 2009.

10. *Use interim solutions.*
11. *Use W3C technologies and guidelines.*
12. *Provide context and orientation information.*
13. *Provide clear navigation mechanisms.*
14. *Ensure that documents are clear and simple.*

Though not all the guidelines in the document are equally relevant to this discussion, several are worthy of clarification to understand from the designer and user's point of view.

Providing "*equivalent alternatives to auditory and visual content*" is primarily about ensuring that content which cannot be converted to another format easily is provided alongside alternative descriptive content. This could be a photograph provided with a description as metadata, or a video with an audio track provided with subtitles. A site with poor web accessibility may provide photographs or other imagery with no descriptive content that would be presented to a user with a screen reader as merely "image", providing no useful information whatsoever.

Not relying on colour to signify importance or a change in content is to ensure that colour blind users do not miss information that may be present to non-colour blind users. This commonly affects hyperlinks in documents which are not provided with enough contrast compared to other text on the site, making them difficult or impossible to detect from standard text. Using a low-contrast colour scheme can render an entire site difficult or impossible to view for certain colour blind individuals. The guidelines suggest using other methods of differentiating content alongside colour, such as boldening content, underlining, and so on.

Ensuring "*that pages featuring new technologies transform gracefully*" concerns ensuring that sites which use certain technologies - which may not be accessible to certain users, perhaps those with screen readers - can still use a site. Many web sites are designed using Adobe Flash<sup>15</sup>, which is not

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<sup>15</sup> Adobe Flash. <http://www.adobe.com/products/flash/>

by default readable by a screen reader, and thus not accessible for that individual. A site deploying this technology should then also provide a HTML version with the same content in order to ensure equality between users. This can also apply to sites that use certain client-side dynamic features, such as AJAX, which may cause problems with screen readers due to the way they are rendered.

Ensuring "*user control of time-sensitive content changes*" concerns content on a site which moves, changes or flickers, and may cause issues for users with motor disabilities or epilepsy. Content which moves on the screen, particularly navigational, can create a huge obstacle for users with motor disabilities that may have issues moving their interface device to select that particular area.

Designing "*for device independence*" is primarily about a designer putting the traditional image of a user sat in front of their computer monitor, with keyboard and mouse to hand aside, and designing for a multitude of user interface devices. Thus, a designer cannot create content which can only be accessed with a keyboard or mouse, but must also be accessible using disability support devices such as screen or Braille readers.

Providing "*context and orientation information*" is perhaps as much a usability issue as an accessibility one. It concerns the proper labelling and marking up of elements of a site in order to aid the understanding of a user. This may be applied by properly labelling a form, or providing a clear hierarchy to a large area of content. This is of particular concern to users with learning or cognitive disabilities who may have difficulty relating significance to certain areas of a web site.

Providing "*clear navigational elements*", much like clearly denoting context, is about ensuring a user understands where and how to use the navigational aspects of a web site, in order to quickly access certain information. Applying good practices learned from studying usability and information architecture should ensure that this is always the case when designing a navigational structure.

Ensuring "*that documents are clear and simple*" is perhaps one of the most important, yet overlooked, aspects of web design. Often we, as designers, create and develop from our own point

of view, creating sites which are structurally and visually appealing and understandable to us, but may not be for many users. We may also use language and turns of phrases which are too complex or esoteric for some web users. Ensuring that a web site is not visually or contextually daunting to users is a huge aspect of web accessibility.

I have mentioned in this section just a few of the broad guidelines which designers must consider when attempting to adhere to the WCAG<sup>16</sup>. In its minutiae, the techniques which are suggested and the methods to deploy them are near infinite, and cannot be considered within the scope of this discussion.

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<sup>16</sup> W3C. (1999). *Web Content Accessibility Guidelines 1.0*. Available: <http://www.w3.org/TR/WAI-WEBCONTENT/#priorities>. Last accessed 15 November 2009.

## Section III: The conflict: design vs. disability

A designer with no knowledge of designing for accessibility would have to seriously alter his or her workflow in order to begin designing websites with accessibility in mind. Moving from designing in a purely visual way, to considering the needs of users who must interpret information on a different level is a mammoth task. A designer must go from evaluating the visual effectiveness of an element on a page, to considering its value to a whole new audience. A button becomes not only an element to provide visual navigation feedback to the sighted user, but also a design problem. How does a user using a screen-reader interpret it? Extra data in the mark-up of the element must be provided in this case. How does a user with motor difficulties access this element? Navigation without a mouse must be considered. The potential extrapolations are huge in number, and they all must be considered by the designer.

The conflict occurs where a designer must compromise his or her creativity in order for a piece of work to be considered accessible. At this point they have sacrificed creative freedom in order to meet a set of guidelines. What must be determined is whether this is acceptable in order to meet the moral obligation of accessibility. It is also important to consider whether future advances in the field will render this problem irrelevant, or whether the dynamic shift to designing with accessibility in mind will become an integral part of a designer's working process.

During the latter stages of development on a web project it is important to engage in the testing of accessibility with a three-pronged approach. At a most basic level, a website can be run through an online tool which validates the code, structure, semantics and architecture of said site and produces a report to advise how closely a site follows the W3C guidelines. The W3C has produced tools for this to validate both the HTML<sup>17</sup> and CSS<sup>18</sup> markup of a document. The W3C has recently produced other tools for checking elements of a site, such as broken hyperlinks and XML validation. These

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<sup>17</sup> W3C Markup Validation Service. <http://validator.w3.org/>

<sup>18</sup> W3C CSS Validation Service. <http://jigsaw.w3.org/css-validator/>

tools do not directly test the accessibility of a site, but explore the site's conformance to web standards. If these standards are not met, certain user agents or browsers (such as screen readers, Braille readers, etc.) may find it difficult or impossible to render and interpret a document correctly. Thus, it is important at a most basic level to ensure that a site validates correctly.

In further testing, a designer can use automated accessibility testing tools, such as the Web Accessibility Evaluation Tool (WAVE)<sup>19</sup> or Cynthia Says<sup>20</sup> to determine a site's conformance to guidelines laid out in the WCAG<sup>21</sup>. These tools can automatically and accurately determine a site's conformance to the WCAG guidelines, and produce a report containing details of where a site could improve its experience for disabled users.

Finally, it is customary to run user testing sessions, where a group of web users, with varying levels of web savviness, are given tasks to complete on the aforementioned website. The ease with which they complete these tasks, solve problems and the general feeling they get while navigating the site are all measured. Based on these results, the site is then fine-tuned. Often, these user-testing exercises are purely for usability purposes, and will involve very little - or no - testing for disabled users. By analysing how disabled users perform the same tasks as in a standard usability test, a site can be evaluated from an accessibility standpoint. This analysis could take place by combining the two purposes of testing into one session.

By designing purely to the guidelines set out in the WCAG, it is possible to create a site deemed "accessible" without any input from users who would theoretically benefit from such. However, ultimately, the end product will almost certainly be accessed by users with different accessibility requirements at some point, and the guidelines only present the bare minimum of legal obligation to create a usable site for disabled users. By involving said users in the testing and pre-deployment of a website, a designer can ensure a site is easily accessible and usable by a multitude of user groups.

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<sup>19</sup> WAVE. <http://wave.webaim.org/>

<sup>20</sup> Cynthia Says. <http://www.cynthiasays.com/>

<sup>21</sup> W3C. (1999). *Web Content Accessibility Guidelines 1.0*. Available: <http://www.w3.org/TR/WAI-WEBCONTENT/#priorities>. Last accessed 15 November 2009.

However, this is where another conflict occurs. This one is not necessarily with creative freedom, but with perceived value. Many organisations and businesses do not consider user testing of any kind a worthwhile expenditure of time or money. For example, a typical session of just five users engaging in a study over two hours could cost anywhere in the range of three or four hundred pounds to organise. This is money that must then be recouped from the designer's client directly. A designer who does not engage in such user testing would be able to offer a more affordable end-product, and through lack of education or idleness may not deem it important to express the importance of user testing to a client with any conviction.

Since there is no standards or regulatory body specialising in the web industry, there can be no enforcement of accessibility or usability guidelines. Currently, the only recourse available to disabled users is a full-on legal challenge (using the DDA<sup>22</sup>) to the owners or maintainers of a site providing a public service which is inaccessible for them. With a regulatory body in place a user would be able to directly report an inaccessible site or service. The organisation could then advise or work alongside the owners of the site in question to bring it to an accessible standard.

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<sup>22</sup> HM Government. (2005). *Disability Discrimination Act 2005*. Available: [http://www.opsi.gov.uk/acts/acts2005/ukpga\\_20050013\\_en\\_1](http://www.opsi.gov.uk/acts/acts2005/ukpga_20050013_en_1). Last accessed 10 November 2009.

## Section IV: Designing for disability

A shift in the way disability and accessibility are approached when designing could result in disability not being viewed as a problem on the web, but an opportunity to represent data and objects in different ways.

On the web, there has been a definite trend for some sites to broadcast almost entirely in hypertext. This may be because of technical or creative difficulties, or perhaps purely monetary. With the advent of high-speed broadband connections being available in most homes in the UK, higher bandwidth multimedia content is now a more realistic option for deployment. This means where content once might have been exclusively hypertext, it could now be reproduced as live video, animation or audio. Even a small shift in increasing the amount of visual content could massively improve the user experience of users with learning difficulties such as dyslexia.

Designing for disability should not purely be focused on ensuring content is accessible by assistive tools for the disabled. Designers should take it upon their selves to engage users affected by disability with different types and methods of content delivery. With this ethos we, as designers, can move away from considering disabled users as being covered by accessibility, and ensure they are part of our collective target audience.

## Section V: Case study

In order to demonstrate the ease of which a normal site can be modified in order to provide a more engaging and useful user experience for disabled users, I have developed two sites, both with identical text content. These two sites are examples of how a typical informational resource may be developed.

**View the case study examples at:**

**<http://sleepykyoto.com/dissertation/case-study/>**

# Operation Market Garden

Operation Market Garden (September 17–25, 1944) was an Allied military operation, fought in the Netherlands and Germany in World War II. It was the largest airborne operation of all time.

The operation plan's strategic context required the seizure of bridges across the Maas (Meuse River) and two arms of the Rhine (the Waal and the Lower Rhine) as well as several smaller canals and tributaries. Crossing the Lower Rhine would allow the Allies to outflank the Siegfried Line and encircle the Ruhr, Germany's industrial heartland. It made large-scale use of airborne forces whose tactical objectives were to secure a series of bridges over the main rivers of the German-occupied Netherlands and allow a rapid advance by armoured units into Northern Germany.



Field Marshal Bernard Law Montgomery

Initially the operation was successful and several bridges between Eindhoven and Nijmegen were captured. However the ground force's advance was delayed by the demolition of a bridge over the Wilhelmina Canal at Son, delaying the capture of the main road bridge over the Meuse until September 20. At Arnhem the British 1st Airborne Division encountered far stronger resistance than anticipated. In the ensuing battle only a small force managed to hold one end of the Arnhem road bridge and after the ground forces failed to relieve them they were overrun on the 21st. The rest of the division, trapped in a small pocket west of the bridge, had to be evacuated on the 25th. The Allies had failed to cross the Rhine in sufficient force, and the Rhine remained a barrier to their advance until the offensives at Remagen, Oppenheim, Rees and Wesel in March 1945.

After major defeats in Normandy in July to August 1944, remnants of German forces withdrew across the Low Countries and eastern France towards the German border by the end of August.

In the north in the first week of September, the British 21st Army Group under Field Marshal Bernard Montgomery was advancing on a line running from Antwerp to the northern border of Belgium with its British Second Army under Lieutenant-General Sir Miles Dempsey while its First Canadian Army under Lieutenant-General Harry Crerar had commenced its task of recapturing the ports of Dieppe, Le Havre and Boulogne-sur-Mer. To the south, the U.S. 12th Army Group under Lieutenant General Omar Bradley was nearing the German border and had been ordered to orient on the Aachen gap with Lieutenant General Courtney Hodges' U.S. First Army in support of Montgomery's advance on the Ruhr, while its U.S. Third Army under Lieutenant General George S. Patton moved eastward towards the Saar. The U.S. 6th Army Group under General Jacob L. Devers was advancing towards Germany after their landings in southern France.

Operation Market Garden has remained a controversial battle for several reasons. Allied tactics and strategy have been much debated. The operation was the result of a strategy debate at the highest levels of Allied command in Europe. Much post-war analysis has thus probed the alternatives that were not taken, such as giving priority to securing the Scheldt estuary.

Among the controversial aspects of the plan was the necessity of all the main bridges being taken in order for success. The terrain was also ill-suited for the mission of XXX Corps. Brereton had ordered that the bridges along XXX Corps' route should be captured with "thunderclap surprise". It is therefore surprising in retrospect that the plans placed so little emphasis on capturing the important bridges immediately with forces dropped directly on them. In the case of Veghel and Grave where this was done, the bridges were captured with only a few shots being fired.

Figure 1: Non-accessible version of the case study

# Operation Market Garden

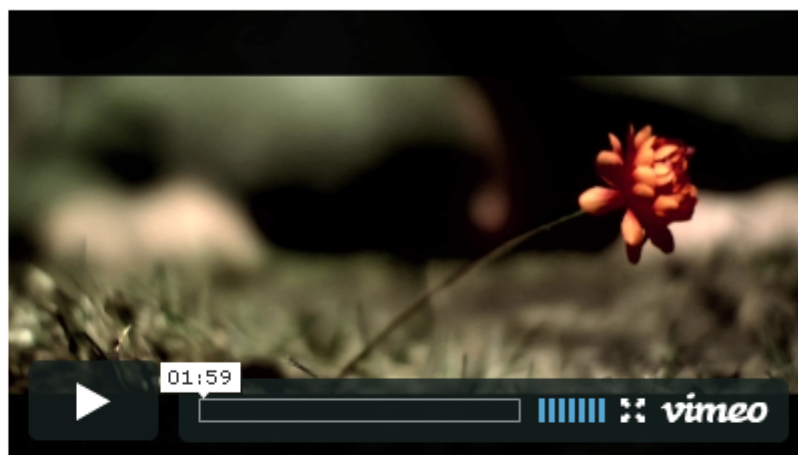


1. [Synopsis](#)
2. [Engagement](#)
3. [Controversy](#)

Operation Market Garden (September 17–25, 1944) was an Allied military operation, fought in the Netherlands and Germany in World War II. It was the largest airborne operation of all time.

## Synopsis

The operation plan's strategic context required the seizure of bridges across the Maas (Meuse River) and two arms of the Rhine (the Waal and the Lower Rhine) as well as several smaller canals and tributaries. Crossing the Lower Rhine would allow the Allies to outflank the Siegfried Line and encircle the Ruhr, Germany's industrial heartland. It made large-scale use of airborne forces whose tactical objectives were to secure a series of bridges over the main rivers of the German-occupied Netherlands and allow a rapid advance by armoured units into Northern Germany.



Reconstruction video ([transcript](#))



Field Marshal Bernard Law Montgomery

Initially the operation was successful and several bridges between Eindhoven and Nijmegen were captured. However the ground force's advance was delayed by the demolition of a bridge over the Wilhelmina Canal at Son, delaying the capture of the main road bridge over the Meuse until September 20. At Arnhem the British 1st Airborne Division encountered far stronger resistance than anticipated. In the ensuing battle only a small force managed to hold one end of the Arnhem road bridge and after the ground forces failed to relieve them they were overrun on the 21st. The rest of the division, trapped in a small pocket west of the bridge, had to be evacuated on the 25th. The Allies had failed to cross the Rhine in sufficient force, and the Rhine remained a barrier to their advance until the offensives at Remagen, Oppenheim, Rees and Wesel in March 1945.

After major defeats in Normandy in July to August 1944, remnants of German forces withdrew across the Low Countries and eastern France towards the German border by the end of August.

## Engagement

In the north in the first week of September, the British 21st Army Group under Field Marshal Bernard Montgomery was advancing on a line running from Antwerp to the northern border of Belgium with its British Second Army under Lieutenant-General Sir Miles Dempsey while its First Canadian Army under Lieutenant-General Harry Crerar had commenced its task of recapturing the ports of Dieppe, Le Havre and Boulogne-sur-Mer. To the south, the U.S. 12th Army Group under Lieutenant General Omar Bradley was nearing the German border and had been ordered to orient on the Aachen gap with Lieutenant General Courtney Hodges' U.S. First Army in support of Montgomery's advance on the Ruhr, while its U.S. Third Army under Lieutenant General George S. Patton moved eastward towards the Saar. The U.S. First Army was moving towards Germany after their landings in southern France.



End of WWII Announced by Robert Trout ([transcript](#))

Figure 2: Accessible version of the case study

It is very important for designers to retreat from the idea that accessibility is designing for a blind user interacting with your site using a screen reader. It is so much more in-depth and colourful than that misconception. Good accessibility is not reams of properly formatted and marked up text. It's clear, clean navigation. It's rich, alternative media content for users with learning disabilities. It's well thought-out colour schemes for colour blind users. It's *designing for disability*, not designing with disability in mind.

I believe designing for disability to be more than just ensuring guidelines are met and a site is considered legal. With this in mind, I have not only conformed to the major guidelines suggested by the government and W3C, but considered how to enrich the experience of different types of disabled web users.

I have developed two different sites, both with the same core content. The first, denoted as the "non-accessible site", is a simple informational website with the bare minimum of accessibility and standards compliance. It is well within legal guidelines and is a good example of how many sites are designed and presented. The second site, denoted as the "accessible site", is one developed with disabled users in mind. It meets and, I believe, exceeds accessibility guidelines, and provides a more enriching user experience to both disabled and non-disabled users.

The version of the site with little forethought given to disabled users is relatively sparse and visually uninteresting. This is immediately a danger as a designer, since merit is often determined purely on first impressions. Many users with learning difficulties may consider the site daunting. Specifically, users with dyslexia, who are primarily visual learners, may see the site as useless due to the lack of visual material. Content on the page is not architecturally considered: section headings are not used, and disabled users may find it difficult to navigate and digest the information available.

Conversely, the site developed with disability in mind is much more immediately interesting. A lot more visual content has been provided on the site: several more images, video content, an audio stream, etc.



Figure 3: Text resizer

Considered ease-of-use is important for all users. People with poor or partial vision may require enlarged text for on-screen reading. By providing this functionality using a widget within the website, we can enrich the experience of many users. Whilst this functionality is available in all modern web browsers,

some users may be unaware of this, or consider it too much effort to manually change the text size.

Alternatively, many users may not even realise they find a site easier to digest with increased text size.

Using a text resizer on your site solves all these problems.



Figure 4: Table of contents

Deploying a table of contents on your site for pages with large, hierarchical content is of massive benefit to all users. It not only makes information easier to drop in and out of, but aids the understanding of users with

learning disabilities. Users browsing the site with the aid of a screen reader will find certain information easier to access and skip.

```
<ul id="access_links">
  <li><a href="#skip" accesskey="s">Skip to content <em>[s]</em></a></li>
  <li><a href="#resize" accesskey="r">Text resizer <em>[r]</em></a></li>
</ul>
```

Figure 5: Access keys in HTML markup

Access keys are an important part of accessibility guidelines. They are essentially keyboard shortcuts which allow users to skip to certain areas of a page or parts of a site with a key press. Since they are widely deployed on many sites, the government has suggested a standard for access keys, which follows<sup>23</sup>:

<sup>23</sup> UK Government accesskeys standard. <http://archive.cabinetoffice.gov.uk/e-government/resources/handbook/html/2-4.asp>

Access key	Page / element
S	Skip navigation
1	Home page
2	What's new?
3	Site map
4	Search
5	FAQ
6	Help
7	Complains procedure
8	Terms and conditions
9	Feedback form
0	Access key details

Figure 6: UK Government Access Key Standard

Alternative methods of content delivery are very important for users with learning difficulties. This can range from providing more visual content for dyslexic users, to providing more engaging content for those with ADHD. With this in mind, the site contains video content to supplement the text content.

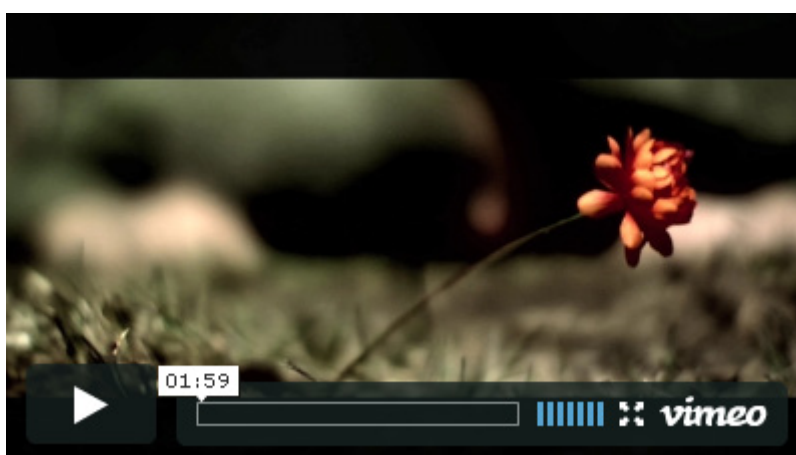


Figure 7: Video content

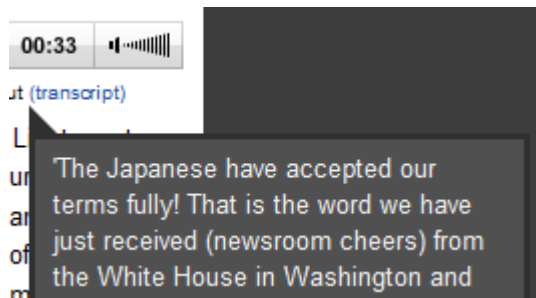


Figure 8: Audio transcripts

When providing audio or video content, the WCAG<sup>24</sup> suggests that any spoken dialog should be provided alongside descriptive text for deaf or hard-of-hearing users. In order to accommodate this, the site deploys roll-over transcripts of audio content.

Using only a few simple techniques, a site can be improved immeasurably for disabled users. It is important to mention that after developing the non-accessible page, I simply duplicated and modified the page to include the aforementioned accessibility improvements. This took very little time whatsoever (in fact, no more than thirty minutes) - this merely compounds the theory that a designer altering his or her workflow to take disabled users into consideration is worthwhile.

In order to measure the usefulness of the improvements made, it was important to canvas the opinion of several disabled web users and make a comparison between the two sites and their user experience. In canvassing the opinion of several anonymous disabled users online, I received uniformly positive feedback for the accessible site:

*The second site is definitely more satisfying to use. I liked the audio on the site, it definitely made it more interesting.*

*Text resizing is important for me. I think more big web sites should make the effort to include them on their sites. When I make the text bigger through my browser, some sites have huge fonts and I am forced to fiddle around whenever I visit them.*

*The roll over for the audio transcript is a great idea. A lot of sites just don't bother making sound files accessible for the deaf, which surely can't be legal.*

With feedback like this, I am certain of the benefits to disabled users from designing for disability.

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<sup>24</sup> W3C. (1999). *Web Content Accessibility Guidelines 1.0*. Available: <http://www.w3.org/TR/WAI-WEBCONTENT/#priorities>. Last accessed 15 November 2009.

## Section VI: Conclusion

In this project, I have researched and summarised some of the issues surrounding web accessibility, from the standpoints of both the web designer and disabled web user. By analysing some of the issues and techniques deployed in modern, accessible web design, I have been able to properly evaluate how a designer is affected creatively by web accessibility. Furthermore, in a case study, I have produced web pages to demonstrate the ease of which sites can be developed or retrofitted to provide an enriched user experience for disabled users.

I have examined some of the reasons web accessibility may be ignored by designers, and I can conclude that it must primarily be put down to lack of education. Many designers do not appreciate the legal and moral obligations that require them to practice good web accessibility on their projects. I believe that the web development community on the Internet does an excellent job of providing resources and advice, but it must be down to the government and education system to provide more visible documentation and guidance for designers or those in training.

I believe the way web accessibility is presented can attract a certain amount of negative stigma, as with any subject associated with disability. This stigma and an unfair amount of focus put toward certain forms of disability may have contributed to the way web accessibility is viewed in the collective consciousness of many designers, leading to a one-dimensional outlook. I have suggested different ways to approach web accessibility, and how designers must consider the needs of many different types of disability. Furthermore, I have suggested a different ethos to apply to web accessibility and web development as a whole: *designing for disability*, as opposed to designing with disability in mind. I believe that by considering web accessibility at a more fundamental level, designers can create a more enriching user experience for their entire target audience.

I believe that at a personal level, I have developed a far more in-depth knowledge of web accessibility, and through interaction with those affected by it, a deeper appreciation of accessibility and how to deploy a site with best practices and personal touches for the best impact.

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