

RESPONSIVE eLEARNING

DESIGN & DEVELOPMENT

10
YEARS
2004-2014
 UPSIDE
LEARNING

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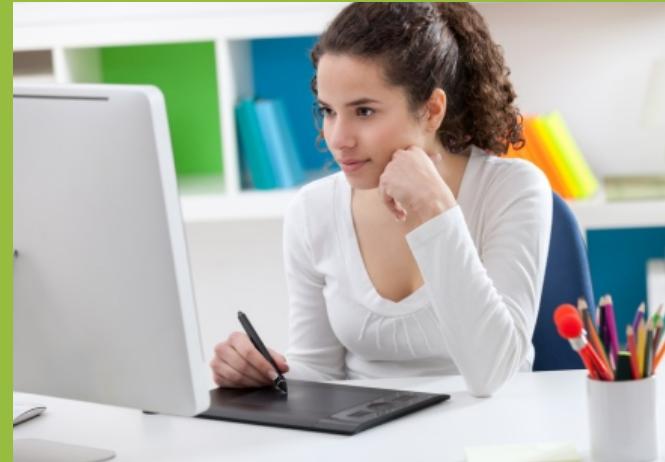
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A Responsive World

1.1: How It All Began

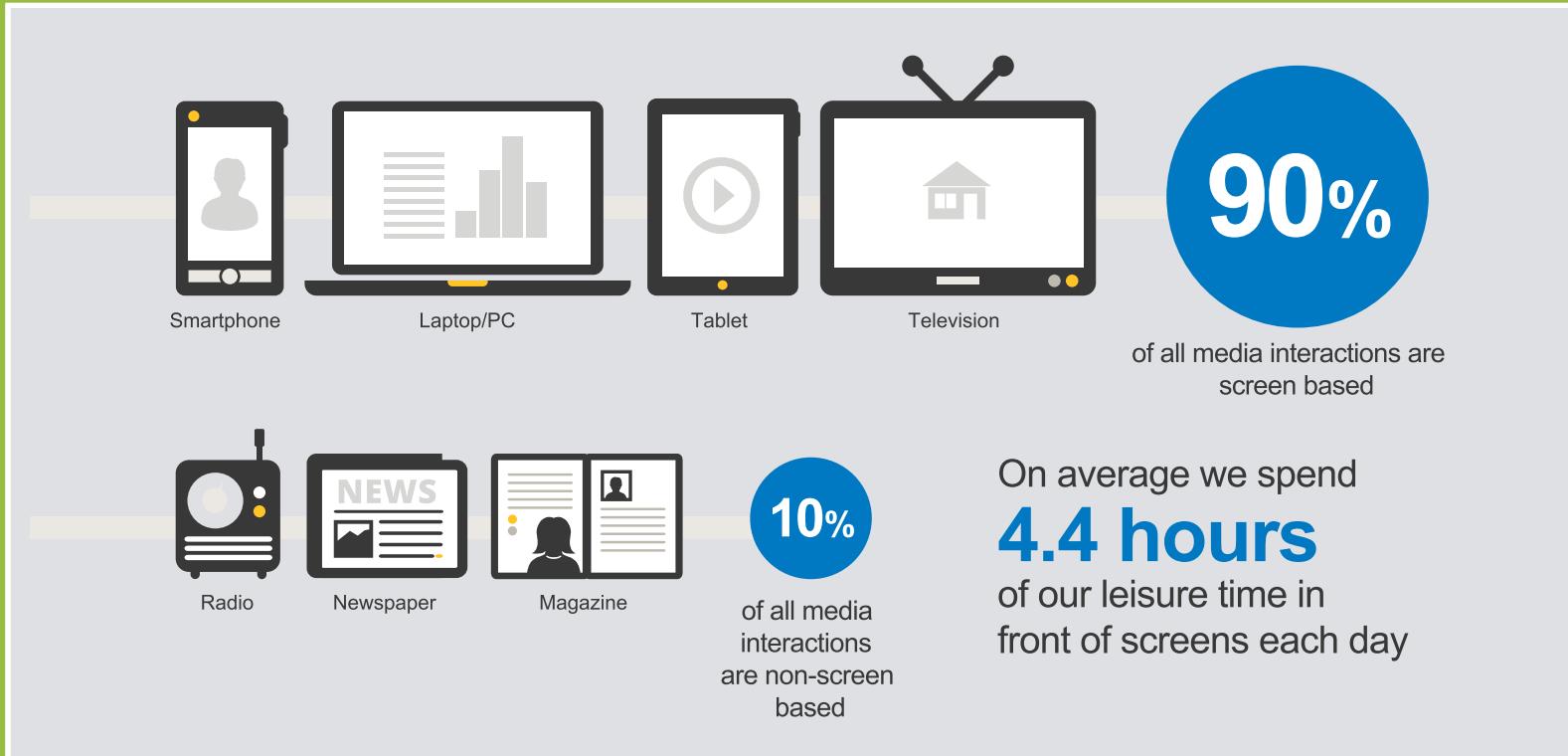
From the launch of desktop PCs and laptops to the mass adoption of tablets and smartphones, the world of connected devices has expanded—and how! Today, individuals own multiple devices and shift seamlessly between them depending on task, location and time of day. The primary device that connects them to the World Wide Web is likely to be anything from a smartphone or phablet to a tablet or PC.



A Responsive World

1.1: How It All Began

In 2012, [Google released a comprehensive report](#) on the emerging use of multiple devices. This report states that 90% of our daily media interactions are screen based, with our time online primarily spread between four devices—television, desktop PCs/laptops, tablets and finally smartphones.



A Responsive World

1.1: How It All Began

Computing trends are changing at a breakneck speed. [A report from mobile manufacturer Ericsson](#) states that by 2015, 80% of the populace will be accessing the Internet from mobile devices.

By **2015**

80%

of the populace will be
accessing the Internet
from mobile devices

What this means for those who create and deliver online eLearning services, is the emergence of the need to develop a solution that works uniformly well on every device.

Enter responsive web design and the use of responsive design in eLearning.

A Responsive World

1.2: Responsive Design: Understanding the Term

Before we move to responsive eLearning design, it is important to understand responsive design in general.

The term 'responsive web design' (RWD) was coined by [Ethan Marcotte](#), a web designer, in an article in [A List Apart](#) in May 2010. He further described the theory and practice of responsive web design in his [book titled Responsive Web Design](#).

According to Marcotte, responsive web design means designing for optimal viewing experiences on different devices by using technology to make designs flexible and more adaptive to the media that renders them.

A web design approach aimed at crafting sites to provide an optimal viewing experience—easy reading and navigation with minimum resizing, panning and scrolling—across a wide range of devices (from mobile phones to desktop computer monitors)

[Wikipedia](#)

A Responsive World

1.2: Responsive Design: Understanding the Term

Responsive design does not target particular resolutions or screen sizes; rather, the aim is to design for multiple screens in such a manner that content responds to the target environment and reflows to fit into different layouts and treatments on the basis of the display size and type.

Simply put, a smartphone screen has less space than a PC screen, so you cannot fit everything onto it - at least not in exactly the same way. Besides, people using mobile devices may be on the move and are likely to experience connectivity issues. This can lead to a lag in downloading content. A responsive design framework considers all these issues and ensures a graceful alignment of onscreen content and layout elements depending on the target device.



A Responsive World

1.2: Responsive Design: Understanding the Term

Marcotte states that in order for a web design to be considered 'responsive', it needs to have three key features:



Fluid grids

For a design to 'respond', the site should be built on a fluid or flexible grid foundation within which on-screen elements adjust to the display area.



Flexible images

Images form an integral part of a site and for a design to be responsive these images should be flexible - that is, they should scale proportionately depending on the size of their display container.



Media queries

Media queries provide a way of detecting the device dimensions and other physical properties that then directs the fluid grids and flexible images to align appropriately to fit the device screen.

A not so technical aspect that cements these features is lateral thinking. Lateral thinking enables developers to bind the three features together and implement a truly responsive design.

2 Understanding Responsive eLearning Design

2.1: The Need for Responsive Design in eLearning

The factors that have driven the need for responsive design in eLearning include:

Device Availability: Multiple devices have multiplied learners' expectations. The mobile masses demand both flexibility and convenience and expect content to be available at the point-of-need and time-of-interest.

Device Orientation: Most mobile devices come with dual orientation. Learners therefore expect their content to align as per their orientation choice—portrait or landscape.



BYOD: Another trend that has seen a rise in recent years is people's insistence on bringing their own devices to the workplace or to centers for learning. Schools and universities have been encouraging students to bring their own devices to the campus to better exploit the potential learning, interaction and even collaboration experiences that these devices can afford. Companies too support this trend and promote it to save both time and money. The practice of bringing your own device, popularly known as BYOD, allows individuals to take eLearning courses on their phone, for example, while on their way to the office or a class, continue the course at their desk and then complete it on their tablet while returning home.

2 Understanding Responsive eLearning Design

2.1: The Need for Responsive Design in eLearning

The factors that have driven the need for responsive design in eLearning include:

Context is King: While content accessibility is important in the eLearning environment today, it alone cannot be considered as the driving force for the introduction of responsive design. It's crucial to understand that ensuring instructional integrity across all devices is an essential part of responsive design. And this cannot always be done by simply shrinking content and getting rid of heavier images. [Google's multi-screen world report](#) tells us that context drives device choice. Given that context plays a vital role in the selection and use of a specific device, the instructional goals we set out to achieve must also align to the needs and purposes associated with learners' device use.



Understanding Responsive eLearning Design

2.2: Key Features of Responsive Design

Before you plan your responsive eLearning design strategy, it is important to understand some fundamental responsive design features and characteristics.

A responsive design relies on HTML5, JavaScript and three key elements of Cascading Style Sheets (CSS) which combine to adjust content and layout for each device. These key elements—fluid grids, flexible images and media queries—work together to deliver a functioning responsive design by detecting screen size and orientation in order to resize and align components accordingly.



Fluid grids



Flexible images



Media queries

Understanding Responsive eLearning Design

2.2: Key Features of Responsive Design

Fluid Grids: A traditional website design consists of tables, frames and images. Each element is assigned a fixed or absolute value in pixels, which specifies exactly how wide or long these would be when displayed on the webpage. With a fluid grid design, the size of each cell in the grid and its contents is defined in relative terms, in proportion to its container. Containers, fonts and images are assigned relative rather than absolute values, expressed as percentages or ems. However, this doesn't mean abandoning working with pixels in image-editing software. All it leads to is the application of basic math to the design process.



Flexible Images: The responsive design's fluid grid design allows images to move and be scaled proportionately as per the screen size. Another option is to use CSS to crop (rather than scale) images around a focus area. Scaling and/or cropping images eliminates the need to upload multiple versions of the same image on the server.



Media Queries: In June 2012, media queries became a [W3C](#) recommended standard. Media queries return information on devices' physical specifications (width, height, orientation, resolution, etc.), allowing different styles to be delivered to different devices in order to offer the best experience to each user. Media queries aid designers in building multiple layouts, but are not specifically a mobile solution or a tablet solution. They ask the 'right' question to the device and based on the response direct the fluid grid and flexible images to align to the device dimensions.





Understanding Responsive eLearning Design

2.3: Adaptive Vs. Responsive Design

Similar to responsive design is a parallel branch of design called adaptive design. Both adaptive and responsive designs render device-friendly content, but in slightly different ways.

The term adaptive web design (AWD) was coined by [Aaron Gustafson](#) in his [book titled Adaptive Web Design](#). In an adaptive design, fixed pre-defined layouts are developed for different screen sizes (breakpoints).

In a responsive design, content gets realigned, resized and or restructured within a fluid grid at as well as between breakpoints.

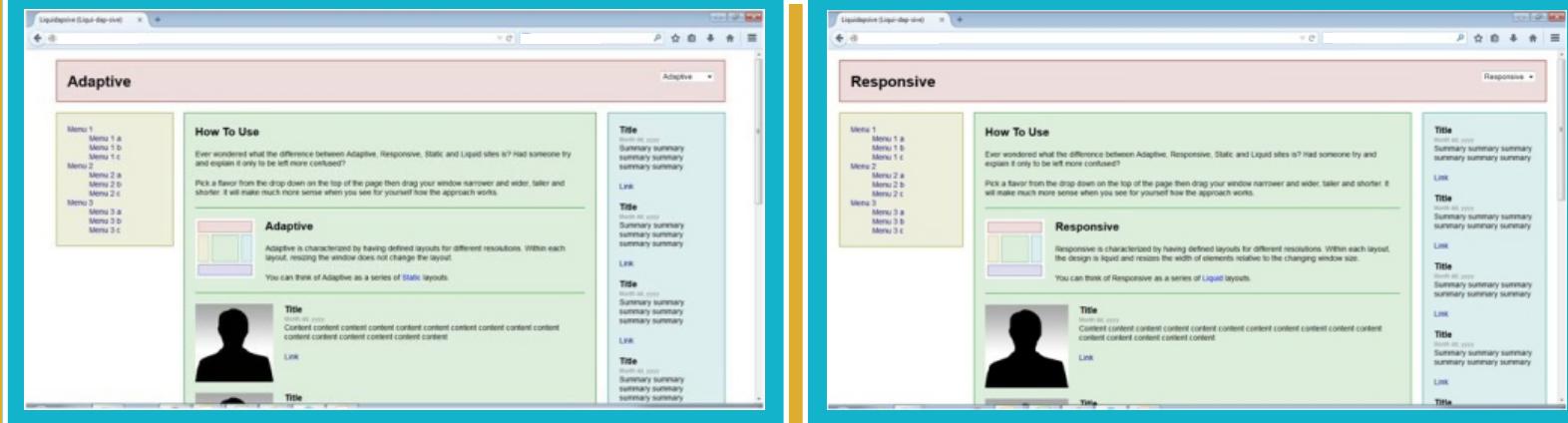


Understanding Responsive eLearning Design

2.3: Adaptive Vs. Responsive Design

You can get a good idea of the difference between these two approaches from this website: <http://liquidaptive.com/>. Here are some sample screenshots from that site:

We begin with the same layout for both approaches.



Understanding Responsive eLearning Design

2.3: Adaptive Vs. Responsive Design

On reducing the window size a bit, the display width has become smaller. Text wrapping has accordingly changed, and there is more white space on the sides because of the narrower display width.

On reducing the window size a bit, you can see that while the display remains full width, the text wrapping has changed due to the display width being reduced.

Understanding Responsive eLearning Design

2.3: Adaptive Vs. Responsive Design

Here, the content has remained intact. The only thing which has changed to accommodate the reduced window width is the space on both sides, which has decreased.

The screenshot shows a desktop browser window titled "Liquidaptive (Liqui-dap-itive)". A dropdown menu at the top right says "Adaptive". The page content is divided into sections: "How To Use" (with a sub-section "Adaptive" containing a diagram of three boxes), "Title" (with a sub-section "Summary" containing a list of items like "summary summary summary summary summary"), and "Link" (with a sub-section "Title" containing a list of items like "title title title title title"). On the left, there's a sidebar with "Menu 1" (containing "Menu 1 a", "Menu 1 b", "Menu 1 c") and "Menu 2" (containing "Menu 2 a", "Menu 2 b", "Menu 2 c"). Below the sidebar is another "Menu 3" section (containing "Menu 3 a", "Menu 3 b", "Menu 3 c").

On reducing the window size further, the same behavior is seen. Text wrapping has again changed while the display width continues to occupy the full window.

The screenshot shows the same browser window but with a dropdown menu set to "Responsive". The layout is more fluid. In the "How To Use" section, the "Adaptive" sub-section is no longer present; instead, it has a red box around the text "Pick a flavor from the drop down on the top of the page then drag your window narrower and wider taller and shorter. It will make much more sense when you see for yourself how the approach works.". The other sections ("Title" and "Link") remain similar to the adaptive version. The sidebar and menu structures are identical to the adaptive screenshot.

2 Understanding Responsive eLearning Design

2.3: Adaptive Vs. Responsive Design

Here, the content has again remained intact, and there is now almost no space left on the sides.

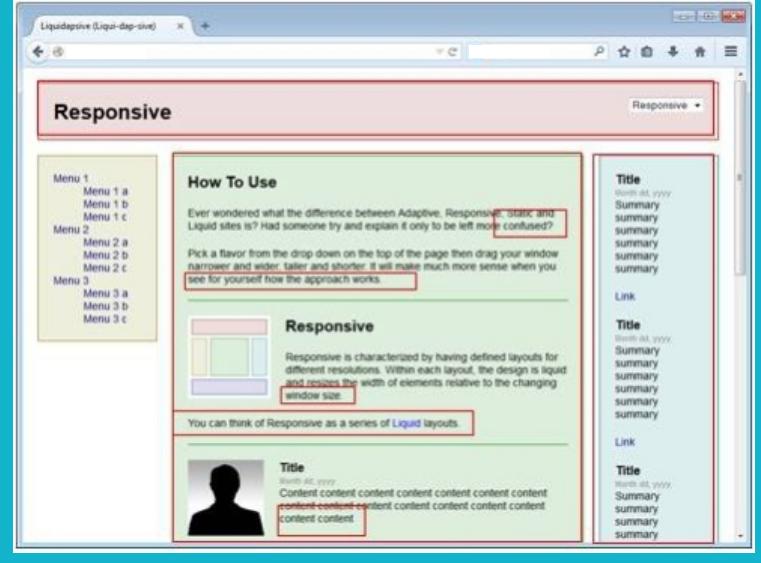
Adaptive



The screenshot shows a desktop browser window titled "Liquidadaptive (Liqui-dep-site)". The page has a top navigation bar with three dropdown menus: "Menu 1" (with items 1a, 1b, 1c), "Menu 2" (with items 2a, 2b, 2c), and "Menu 3" (with items 3a, 3b, 3c). Below the menu is a section titled "How To Use" with a sub-section "Adaptive". It contains text about adaptive design and a diagram showing a fixed layout with three columns. A large central content area contains a profile picture of a person and several lines of placeholder text. On the right side of the content area, there are two vertical panels: one pink panel containing a "Title" section with summary text, and a green panel below it also containing a "Title" section with summary text. At the bottom of the content area is a "Link" section.

On reducing the window size further, the display continues to occupy the full window. The width of the pink and green panels have reduced, and text has wrapped further.

Responsive



The screenshot shows the same browser window and URL as the previous image, but with a smaller window size. The layout has changed significantly. The top navigation bar remains the same. The "How To Use" section now includes a sub-section "Responsive" with text explaining its nature and a diagram showing a layout that changes width. The central content area now has a single large green panel containing a "Title" section with summary text. The "Link" section at the bottom is also present. The pink and green panels from the adaptive version are no longer visible.

Understanding Responsive eLearning Design

2.3: Adaptive Vs. Responsive Design

Here too we hit a breakpoint and the layout changes. There is again white space on both sides, which is what will get cut as window width decreases, until the next breakpoint.

The screenshot shows a web browser window titled "Liquidaptive (Liqui-dap-ive)". A dropdown menu at the top right is set to "Adaptive". The page content is divided into two main sections: "Adaptive" and "How To Use". The "Adaptive" section contains three vertical menus labeled "Menu 1", "Menu 2", and "Menu 3", each with three items. Below these is a diagram illustrating an adaptive layout with three distinct columns of different widths. The "How To Use" section contains text explaining the difference between adaptive, responsive, static, and liquid sites, and includes a link to "Adaptive". At the bottom is a "Title" section with a placeholder for "Title" and a "Link" section with a placeholder for "Link".

On reducing the window size further, we hit a breakpoint, so the layout changes. The new layout still occupies the full window width. Holders and text will continue to resize and wrap, occupying full window width, until the next breakpoint.

The screenshot shows the same web browser window, but the dropdown menu is now set to "Responsive". The layout has changed significantly. The three vertical menus are now stacked vertically on top of each other. The "How To Use" section contains text explaining the difference between adaptive, responsive, static, and liquid sites, and includes a link to "Responsive". The "Adaptive" section is no longer present. At the bottom is a "Title" section with a placeholder for "Title" and a "Link" section with a placeholder for "Link".

Understanding Responsive eLearning Design

2.3: Adaptive Vs. Responsive Design

A better understanding of the benefits of each design approach can be achieved by discussing their fundamental differences.

Attributes	Adaptive (AWD)	Responsive (RWD)
Device Identification and Content Delivery	AWD uses client-side code or server to detect devices. The most appropriate set of HTML and CSS files (based on screen size) are then selected and delivered.	RWD uses media queries to detect the device media features. The same HTML and CSS files are delivered, through which fluid grids and flexible images kick in to align the content according to the screen size.
Content Optimization	Information is pre-selected and only device-friendly assets are downloaded.	All assets are downloaded regardless of whether they are used or not. Information for every device is included.
Device Optimization	For each template, separate options are developed based on screen sizes and housed on the server.	For each template, a single file is created with multiple breakpoints that can handle displays on multiple screen sizes.
Approach	A layered approach is applied in an adaptive design framework. This approach utilizes scripting to detect the device or browser properties, and then delivers the matching or closest-match template.	A responsive design framework applies a comprehensive approach which addresses all the features that the browsers on the various devices can support. This can include defining fallback options (e.g. Flash), image and video resolutions, etc.

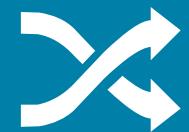
Understanding Responsive eLearning Design

2.4: Benefits of Responsive eLearning Design

A responsive eLearning design offers the following benefits:



Multi-Device Ready: Responsive eLearning dynamically responds to varying screen sizes. HTML 4/5 architecture ensures support for a wide variety of devices and platforms, and lower browser configurations. Responsive output can also be configured for LMS delivery, or can be packaged to be delivered as an app.



Seamless Learning Flow: A responsive design allows the presentation of content in a structured manner, which in turn ensures that the learner flows naturally through the course. Thus the learners can have a very smooth and optimized experience on their mobile device as well as on their desktop PCs.



No Redundant Clicks: Responsive eLearning goes well with device-specific actions like swipe, slide, pinch, wave or shake to allow learners to navigate through the course in different ways.

Understanding Responsive eLearning Design

2.4: Benefits of Responsive eLearning Design

A responsive eLearning design offers the following benefits:



Continuity Across Devices: Greater and easier accessibility was one of the primary reasons for the development of responsive design. Responsive eLearning allows learners to start a course at their desk, continue it on their phones and complete it on their tablets.



Cost and Time Effective: The principle of responsive eLearning is 'one size fits all'. A single responsive design can be launched on multiple devices. And managing and maintaining a single course with minimum content is an uncomplicated task, both in terms of time and money.



Ease of Reporting and Tracking: With a single responsive course, a single condensed report can be obtained which tracks the user's journey across devices.

2 Understanding Responsive eLearning Design

2.5: What Does a Responsive eLearning Design Look Like?

The easiest way is to look at some examples. These are from sample courses that have been created using our in-house HTML-based Framework for Responsive eLearning Development (FRED).

Simple Presentation



Desktops: The graphic and or image and text combination is laid out horizontally on desktop monitors.



Tablets: On tablets, the layout changes to vertical from horizontal. This is to avoid a horizontal scrollbar from appearing on screen. Vertical scrolling (with a swipe action) may be introduced based on the length of the content.



Smartphones: The functionality and layout both change to suit the reduced screen size when the course loads on a smartphone. A layer of interactivity gets introduced. Single pieces of content will appear at a time with their relevant images and or graphics. Learners can view the next piece of content by tapping internal navigation elements, like an internal 'next' and 'back' or by swiping as you would in an 'image gallery' interactivity.



2 Understanding Responsive eLearning Design

2.5: What Does a Responsive eLearning Design Look Like?

Story/Scenario



Desktops: The introductory content appears on top, with a single comic panel (which may include a graphic or an image and text in the form of speech or thought bubbles) appearing at a time. Learners can navigate through the comic strip using internal back and next buttons or numbered navigation elements placed below the comic panel.

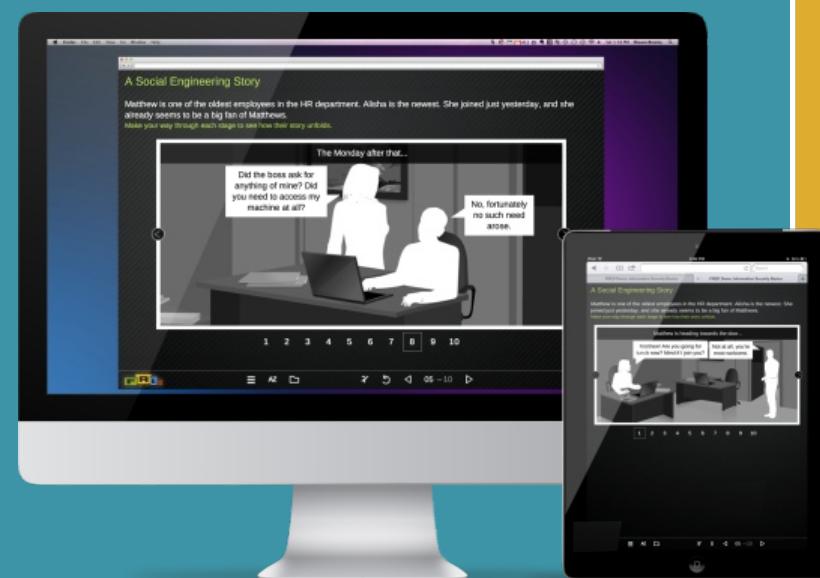


Tablets: The layout remains more or less the same on tablets, but the comic panel is scaled down. Learners can navigate through the comic strip by tapping the internal back and next buttons or the numbered navigation elements. Additionally, they can also navigate through the comic strip by swiping across the screen to bring up the next or previous comic panel.



Smartphones: On smartphones, the layout and functionality change completely to avoid scaling the panel down to a size where its contents can be difficult to decipher.

The introductory content still appears on top, but it is no longer followed by a typical comic strip. The story is now shown in the form of a conversation, with text for speech/thoughts appearing alongside characters' mug shots in a non-interactive vertical layout. Learners can read through the story by swiping up or down.



2 Understanding Responsive eLearning Design

2.5: What Does a Responsive eLearning Design Look Like?

Comic Strip

Desktops: On desktops, the comic strip is displayed in a 3-column scrollable layout.



Tablets: On tablets, the panes of the comic strip rearrange themselves into a 2-column grid which is vertically scrollable.



Smartphones: On smartphones, there is a single column display; learners can keep scrolling down to see how the story progresses.



2 Understanding Responsive eLearning Design

2.5: What Does a Responsive eLearning Design Look Like?

Click and Reveal Interactivity



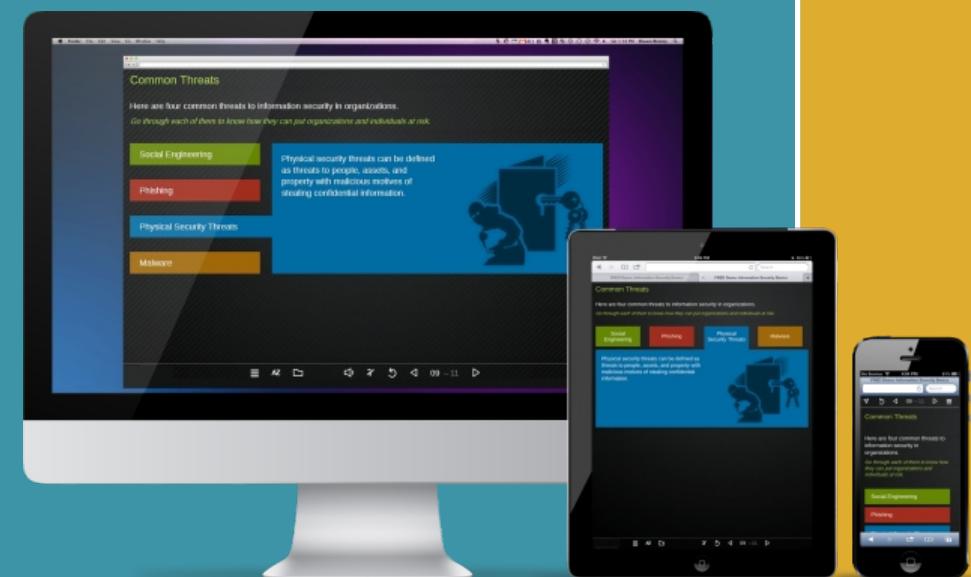
Desktops: Buttons or interactive elements are placed vertically, one below the other, under the introduction text. Selecting each interactive element opens a popup with text and a graphic/image next to the interactive elements.



Tablets: On tablets, the buttons or other interactive elements are placed horizontally, next to each other, below the introduction text. Selecting each interactive element opens a popup with text and a graphic/image below the set of interactive elements.



Smartphones: On smartphones, the functionality changes to an 'accordion' type of interactivity. The learners need to tap the horizontal bars to reveal the layered content.



Understanding Responsive eLearning Design

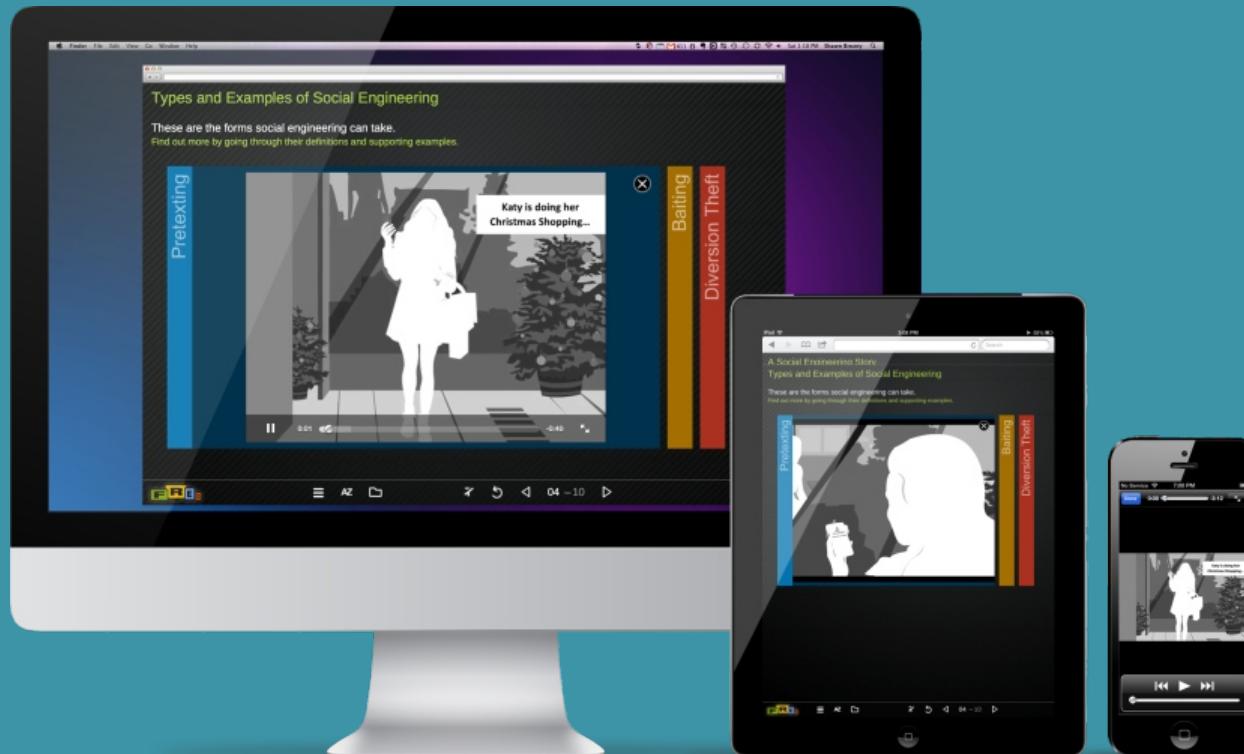
2.5: What Does a Responsive eLearning Design Look Like?

Animation/Video



Animations and videos can be incorporated into interactive or non-interactive pages.

The videos play on clicking/tapping a Play icon, and scale depending on the device dimensions. However, for smartphones, the videos may be launched within a separate/external video player.



Determining A Responsive eLearning Design Strategy

3.1: When to Use Responsive eLearning Design

A lot of thought needs to go into developing a responsive eLearning course. A responsive design is closely related to mLearning, and [Dana Alan Koch](#), learning strategist at Accenture, has [suggested conducting a self evaluation](#) to check if mLearning is right for your business.

Ask yourself these questions when evaluating the need for a responsive eLearning design:

-  Do you need to increase the speed of uptake and or ease of access to training by your target audience?
-  Is your target audience highly mobile and crunched for time?
-  Do you have a sufficient number of target audience members with supported devices?
-  Is the content you need to provide primarily knowledge-based content and can it be put in small chunks?

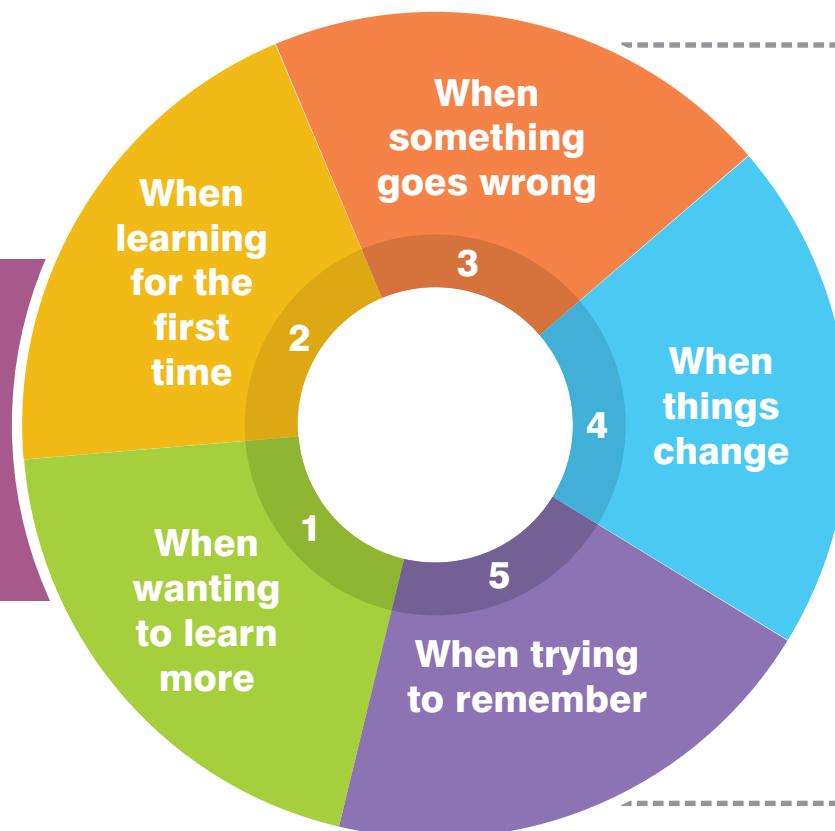
Determining A Responsive eLearning Design Strategy

3.1: When to Use Responsive eLearning Design

Learning Moments

Another angle to consider could relate to when we really have a need to learn. According to [Dr. Conrad Gottfredson](#) and [Bob Mosher](#), there are [five moments of learning need](#).

The first and second 'moments of learning need' focus on the acquisition of knowledge and are therefore aligned with the more traditional modes of learning and training.



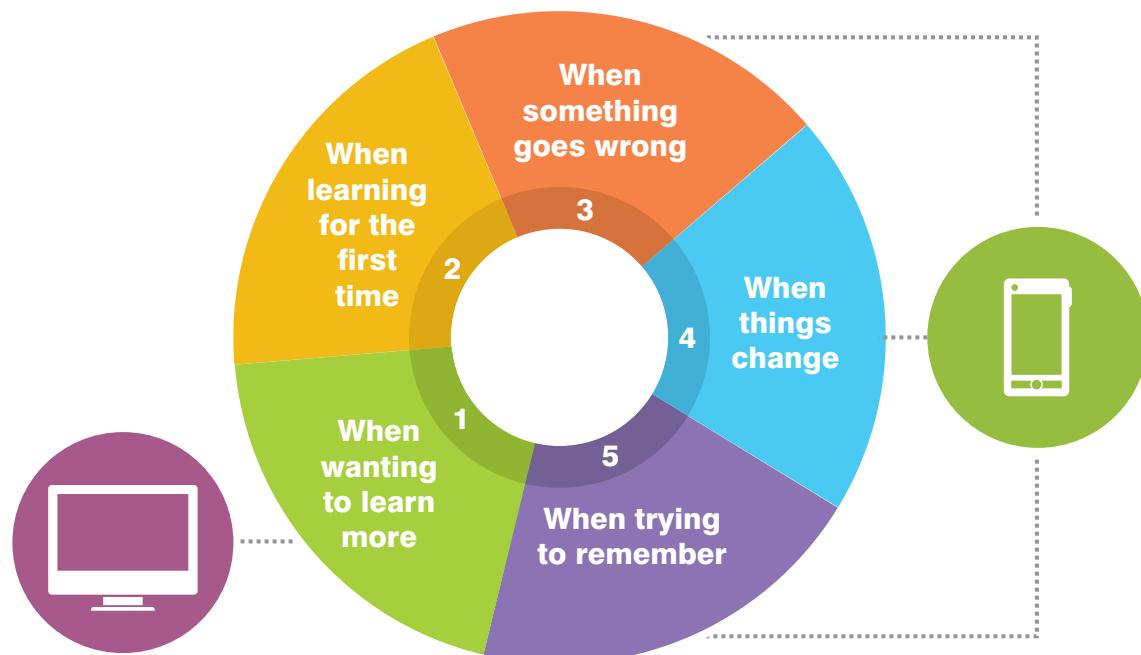
The next three 'moments of learning need' align with performance support or in simple terms 'doing'.

Determining A Responsive eLearning Design Strategy

3.1: When to Use Responsive eLearning Design

This raises the question of why you would consider making an eLearning course intended to meet the first moment of learning need available on smartphones? The 'responsibly' responsive thing to do here could be to create a course to address the first need—learning for the first time—for a desktop. And this could then be supplemented with a 'responsive, multi device, performance support solution' that addresses learning moments three, four and five.

It is therefore imperative to consider the learning need(s) when implementing a responsive design.



Determining A Responsive eLearning Design Strategy

3.2: Getting Started Responsively

Designing, developing, testing and launching a responsively designed eLearning course requires intricate planning and execution. While there are a few frameworks and tools to assist designers in developing a responsive course, the process still is time consuming. Hence planning plays a pivotal role when developing a responsive eLearning design.

Here are some best practices to keep in mind when planning for a responsive course:

Start Preparing Sooner: The sooner you begin planning and preparing, the better it is. It is vital to start thinking about the design upfront. This allows design teams to make a commitment to support multiple devices within their respective planning processes.

Play for the Team: A responsive design comes to life through the collated efforts of programmers, graphic designers, instructional designers (content developers), testers and project managers. The team needs to work together to address all the content, design and technical aspects to create a successful responsive course. Understanding responsive design truly is an iterative team exercise, so allow plenty of time for discussions and joint reviews.

Determining A Responsive eLearning Design Strategy

3.2: Getting Started Responsively

Progressive Enhancement or Graceful Degradation: Progressive enhancement and graceful degradation are two sides of the same coin. In the graceful degradation technique, courses are designed with desktops and possibly tablets in mind as primary display devices, and the content is then restructured for smaller devices. With progressive enhancement, the primary target device is the smartphone. The design is focused around smaller display sizes, and content is then readjusted for larger screens. The choice of design approaches depends upon the nature and scope of the project, but making the right choice is vital.



Target Devices: Clearly identify the targeted primary and secondary devices right at the outset. This will help determine whether to go with a desktop first or a mobile first approach, and the design and development approach can then be aligned accordingly.



Content Treatment and Use Contexts: Understand the nature of the content and the overall learning outcomes, as well as the context in which the learning material will be accessed. Sometimes, it may not be possible - or even necessary - to effectively display all content on a smaller screen by simply shrinking or resizing it. It is important to identify such content in the beginning stages, and work out alternative approaches where required.



Determining A Responsive eLearning Design Strategy

3.2: Getting Started Responsively

Delivery and Compliance: Online and/or offline delivery mechanism(s) should be considered during initial planning, especially from the technical viewpoint. It's also important to know what learning standards and compliances will need to be adhered to.



Testing, Testing and Some More Testing: Remember you are designing a course that can be launched on a variety of different devices running different operating systems and through different browsers. For the product to run seamlessly it takes a great deal more testing. This testing should be conducted on as many device and browser combinations as possible. Never forget to allocate ample time for the testing exercise.



Determining A Responsive eLearning Design Strategy

3.3: Challenges and Solutions

From thinking about how a course will look and behave on just one fixed display, designers now need to think about content and interactions in relation to different devices. While this does throw in a whole bunch of challenges, it also paves the way for a new set of solutions.

Let's look at the challenges and the solutions involved in the design, development and testing of a responsive eLearning course.



Determining A Responsive eLearning Design Strategy

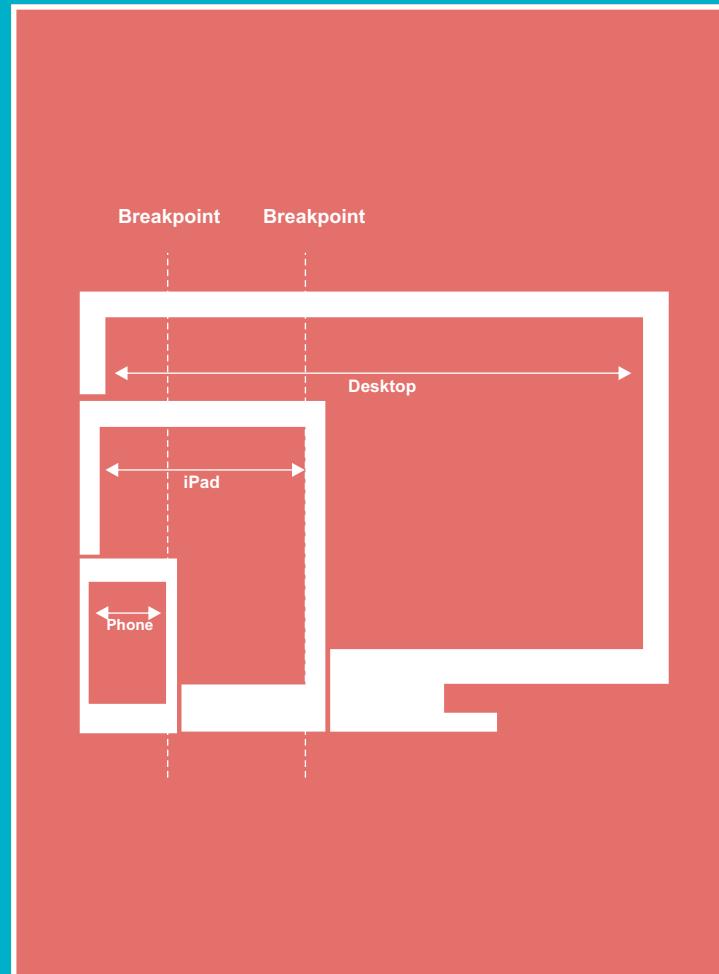
3.3: Challenges and Solutions

3.3.1: Design

Layouts Based on Breakpoints: Flexibility is the key when designing for responsive eLearning as the content and layout elements need to resize and align to fit different screen sizes and resolutions.

To achieve the desired level of flexibility, the design should be laid out based on breakpoints. In technical terms, breakpoints are pre-defined browser viewport widths where the display rules change. Media queries associated with these pre-defined widths control changes to the layout depending on the browser width detected.

Every responsive design is generally mapped to a minimum of two breakpoints—for tablets and smartphones. This gives designers three standard layouts—desktop, portrait iPad tablet and portrait smartphone—allowing them to cover the largest, medium, and smallest screen sizes.



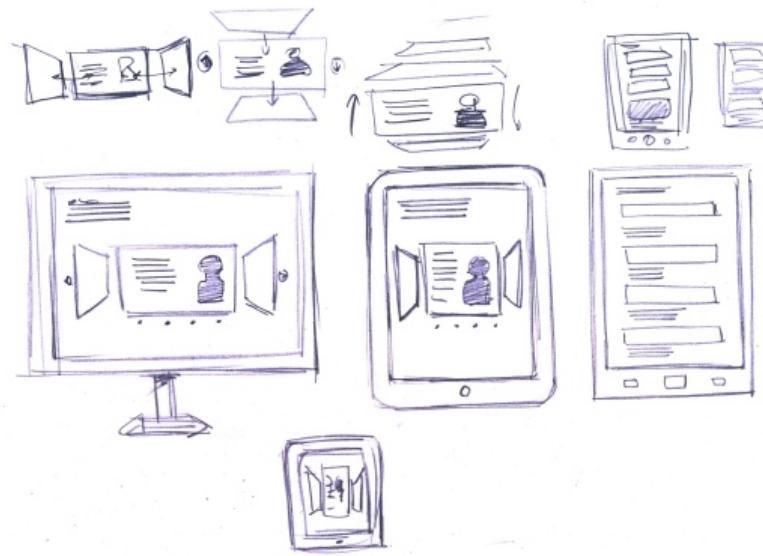
Determining A Responsive eLearning Design Strategy

3.3: Challenges and Solutions

3.3.1: Design

Think Device Classes: When thinking about breakpoints, it's vital that designers remember to consider about device classes. If you are thinking smartphones, tablets, laptops/desktops, TVs, you are in the right direction. But, if you are thinking about brand names, then you are going the wrong way.

Create Doodles: The importance of doodling when developing a responsive design cannot be stressed enough. Doodles should be more detailed than thumbnails, but shouldn't take a long time. It's a good idea to discuss your doodles with other team members. This ensures that the meaning of the information is retained and the functionality is viable. This certainly results in a more iterative approach, with greater cross-domain interdependence - at least to begin with. As the team gains experience, the interdependence tends to reduce, except when it comes to a new template or a variation of an existing template.



Determining A Responsive eLearning Design Strategy

3.3: Challenges and Solutions

3.3.1: Design

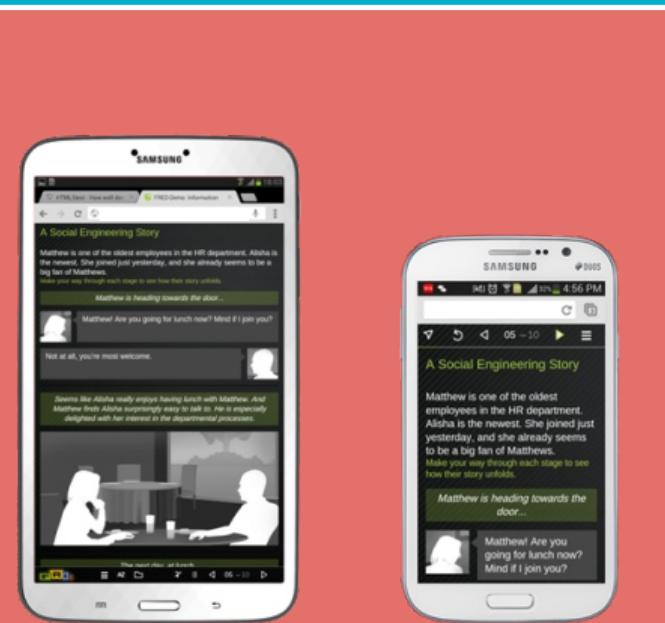
The Right Font: A major challenge in designing responsive eLearning is the selection of the right font. The right font ensures good readability across devices. When selecting the right font designers need to think about several considerations. We have listed a few here:

1

Size: Font sizes can look smaller or larger on different devices. For example, the same font size looks smaller on a high-density device like an iPhone 5 than on a low-density device like a desktop.

The solution for the size issue is using a relative sizing unit like "em", which dynamically sets font size and line spacing for optimal readability across screens.

The "em" takes its size relative to its parent unit. So assuming the browser to be the overall parent, we can set 1 "em" to be equal to the browser's default font size, which in most cases is 16 pixels. Depending on the structure of the page, relative font sizes in "ems" for texts in different containers can be set.



Samsung 7" Tab with 600 x 1024 resolution

Samsung Grand smartphone with 480 x 800 resolution

Determining A Responsive eLearning Design Strategy

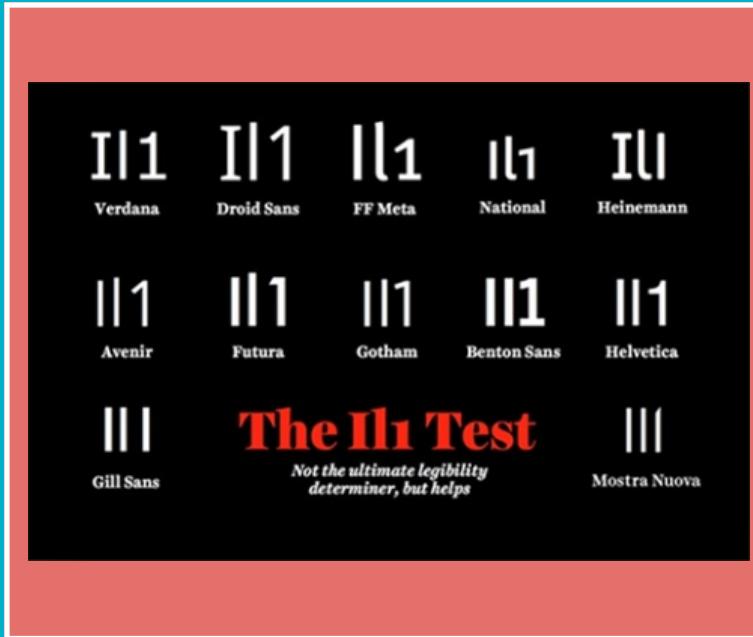
3.3: Challenges and Solutions

3.3.1: Design

2

Font Type: Another aspect that worries designers is the selection of the font type. Generally, sans serif fonts are recommended for digital devices. [Jessica Hische](#) recommends [the I1I test](#) to check readability of sans serif fonts, to see how well an uppercase "I", a lowercase "l" and a "1" are differentiable.

It is also recommended that the use of italicized sans serif fonts be avoided. An italicized font tends to get pixelated and can be difficult to read [especially for dyslexic users](#).



3

Images, Graphics and Animations: Most eLearning courses include images or vector graphics, and animations of varying complexities. When developing responsive eLearning, designers may encounter a number of challenges with regards to these layout elements.

The following page highlights some recommendations for handling these different visual elements in responsive eLearning projects.

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3.3: Challenges and Solutions

3.3.1: Design

a

Resizing JPGs and PNGs: Photos or vector graphics can be exported as JPGs or PNGs. There are a couple of options to resize JPGs and PNGs to fit different display sizes.

Scaling: Scaling is nothing but resizing images based on screen size. Scaling raster (bitmap) images may lead to quality loss. It is therefore recommended to use bigger images, and dynamically scale them down based on device size.

Cropping: When images are scaled to a very small size, details can no longer be seen and their meaning can get lost. An effective alternative is to crop the image around a focus area that holds the meaning. This means using a larger image, and then reducing its size by cutting non-essential areas.

Combination: The third and final option is to combine both the above approaches to dynamically crop and then scale images depending on device size.

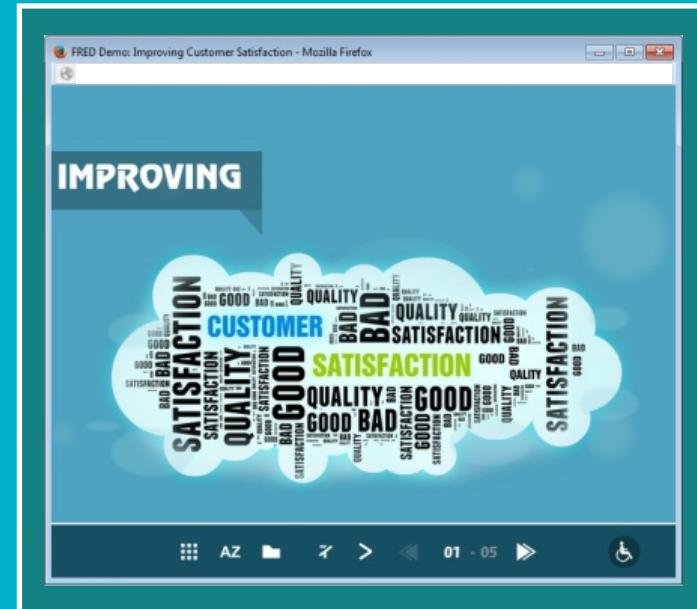
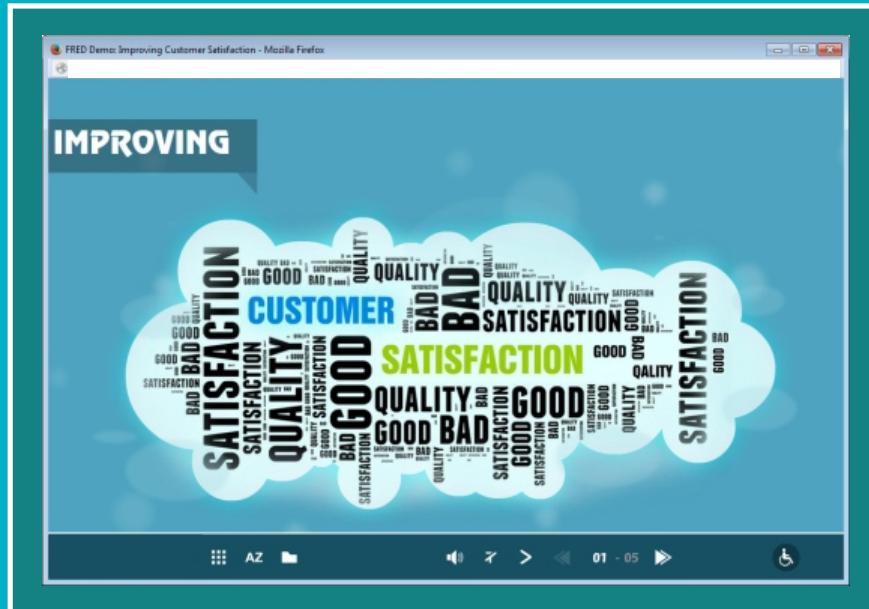
Determining A Responsive eLearning Design Strategy

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3.3.1: Design

Here's an example:

You can see that the complete word cloud reduces in size.



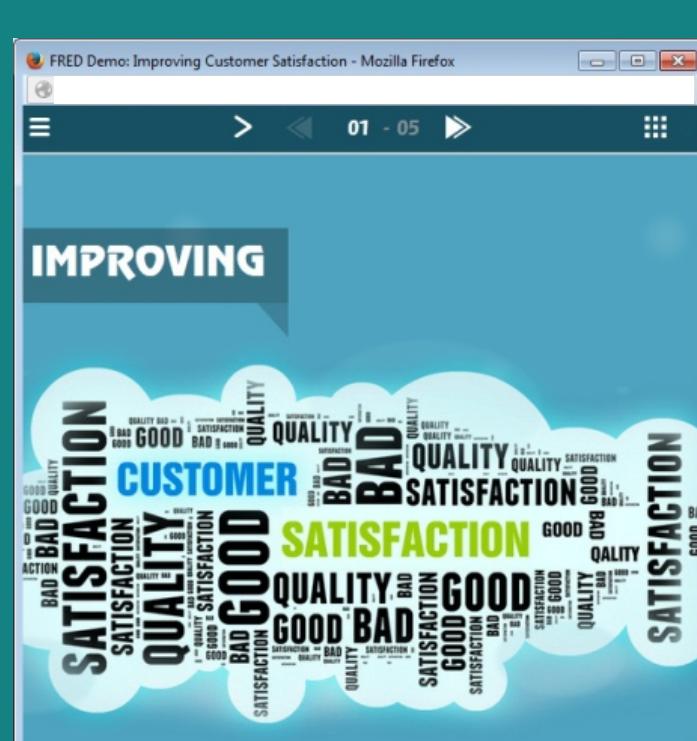
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Here's an example:

At one point, rather than reducing it further, it is cropped from the left and right sides so that the key portion (in this case, the words "Customer and Satisfaction") doesn't become too small.



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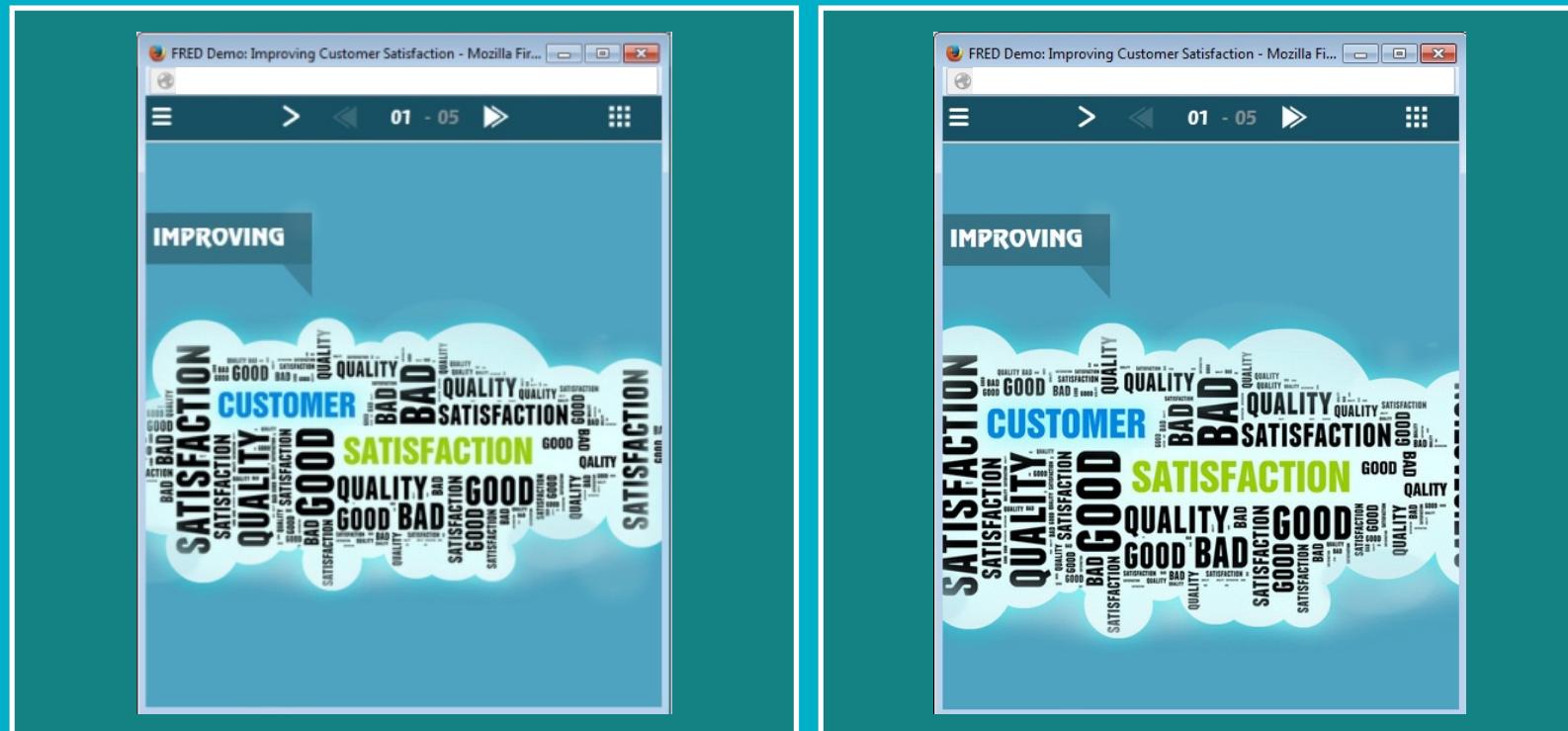
3.3: Challenges and Solutions

3.3.1: Design

Here's an example:

This cropped image is then scaled down, until it needs cropping again.

"Customer" and "Satisfaction" remain easily readable and in central focus throughout.



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3.3: Challenges and Solutions

3.3.1: Design

b

SVGs and SVG Animations: Converting vectors to images and then scaling them can lead to quality loss. A better solution is to convert vectors to Scalable Vector Graphics (SVG) format.

The SVG format offers the following benefits:

- It bypasses the problem of screen resolution.
- It is built with XML, and therefore gives a relatively lightweight file.
- It can be manipulated and styled just like any other element on a Web page.

SVGs can be static, animated (for short, simple animations) or interactive. Small animations created in Flash can be converted into SVGs [using Swify](#). But SVGs come with a disclaimer. Some older browsers like IE 8 and its earlier versions do not support the SVG format. So the best and recommended practice is to [verify browser support](#) in targeted browsers before using them.

Determining A Responsive eLearning Design Strategy

3.3: Challenges and Solutions

3.3.1: Design

C

Icon Fonts: An alternative to SVGs are icon fonts. These are font families that contain a set of predesigned icons. Icon fonts behave just like any other font—their color and size can be changed; a hover effect, varying levels of transparency or a shadow effect can be added. They can also be made interactive. Compared to SVGs, icon fonts are smaller in size and are supported on lower versions of IE. On the downside, icon fonts cannot be given gradients; and if not Web safe, they need to be embedded into the eLearning package.

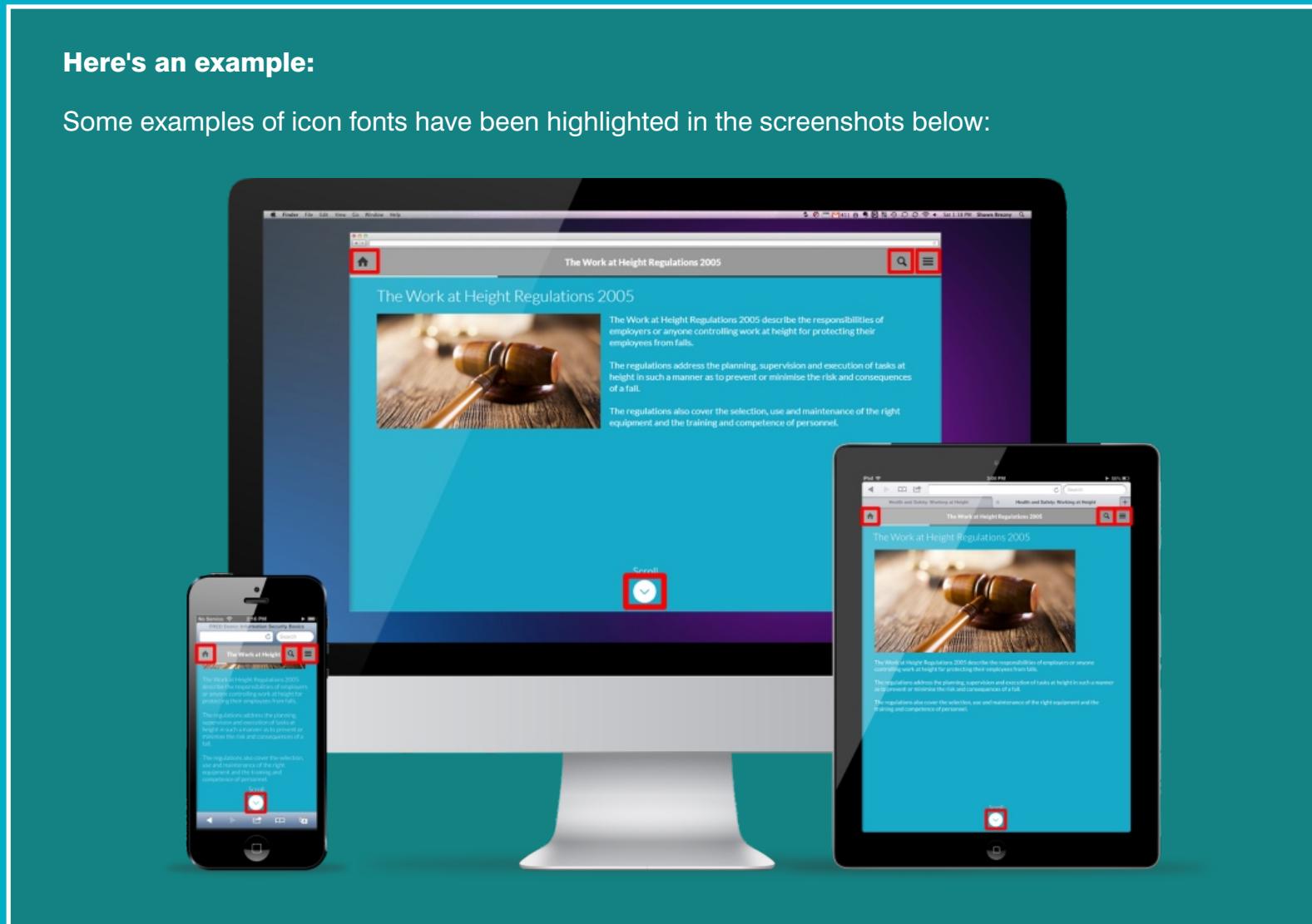
Determining A Responsive eLearning Design Strategy

3.3: Challenges and Solutions

3.3.1: Design

Here's an example:

Some examples of icon fonts have been highlighted in the screenshots below:



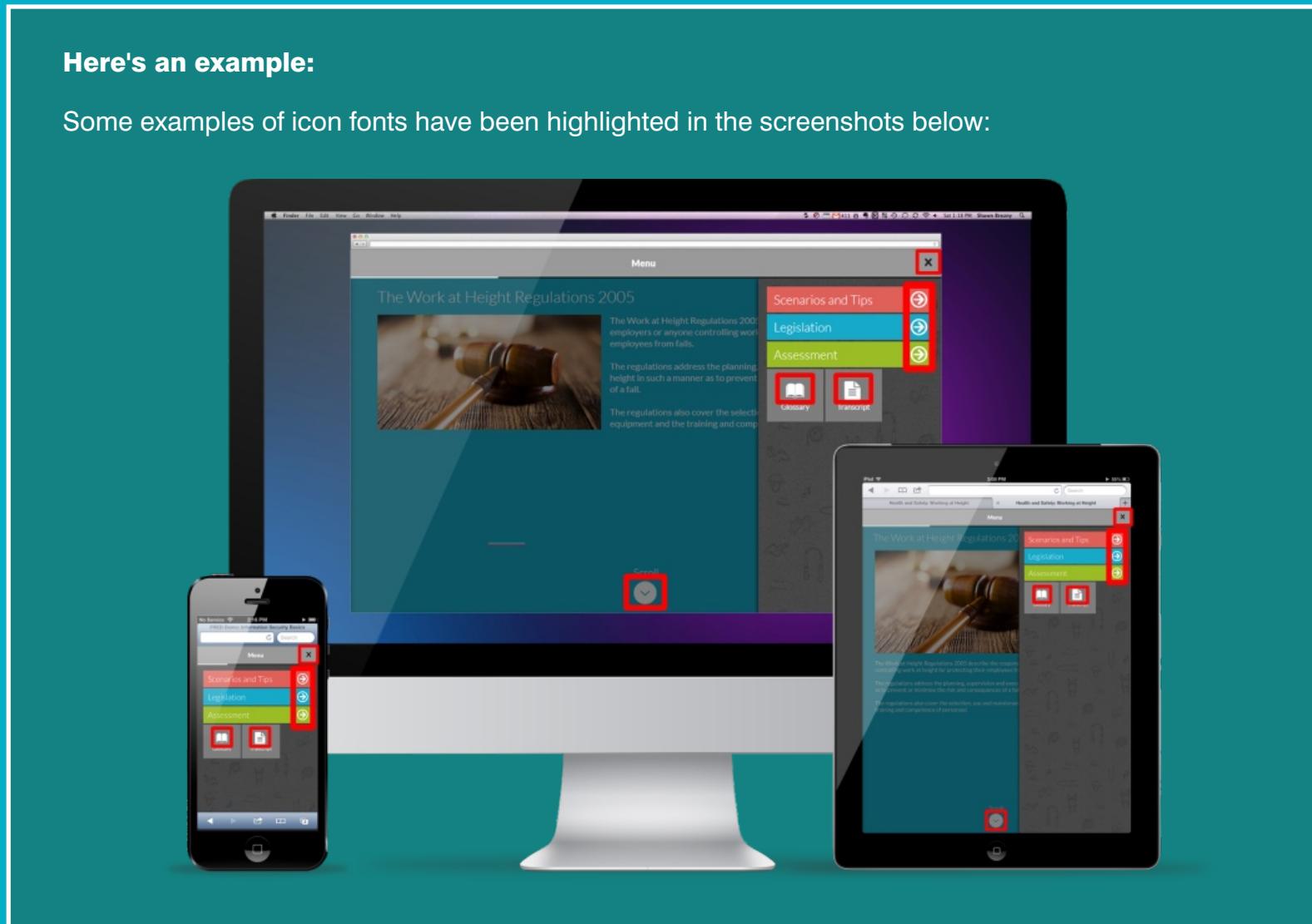
Determining A Responsive eLearning Design Strategy

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3.3.1: Design

Here's an example:

Some examples of icon fonts have been highlighted in the screenshots below:



Determining A Responsive eLearning Design Strategy

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3.3.1: Design

d

Sprite Sheets: Using CSS sprite sheets is recommended if a responsive design contains a lot of small, short, looped or reused animations.

A sprite sheet is a single PNG image that contains a sequential array of smaller, distinct images or graphics that make up an animation. These smaller images/graphics (frames) get displayed in quick succession, so it seems like an animation.

Sprite sheets offer several benefits:

- They tend to have a smaller file size (as opposed to if each image were saved as a separate file).
- They consume less memory and resources as compared to video animations.
- They load quickly as only one file needs to be picked up.
- The viewport can be easily adjusted to view one or more frames at a time.

However, keep in mind that sprite sheets can have certain dimension and file size limitations depending on the resolution and the RAM size of the device on which they are displayed.

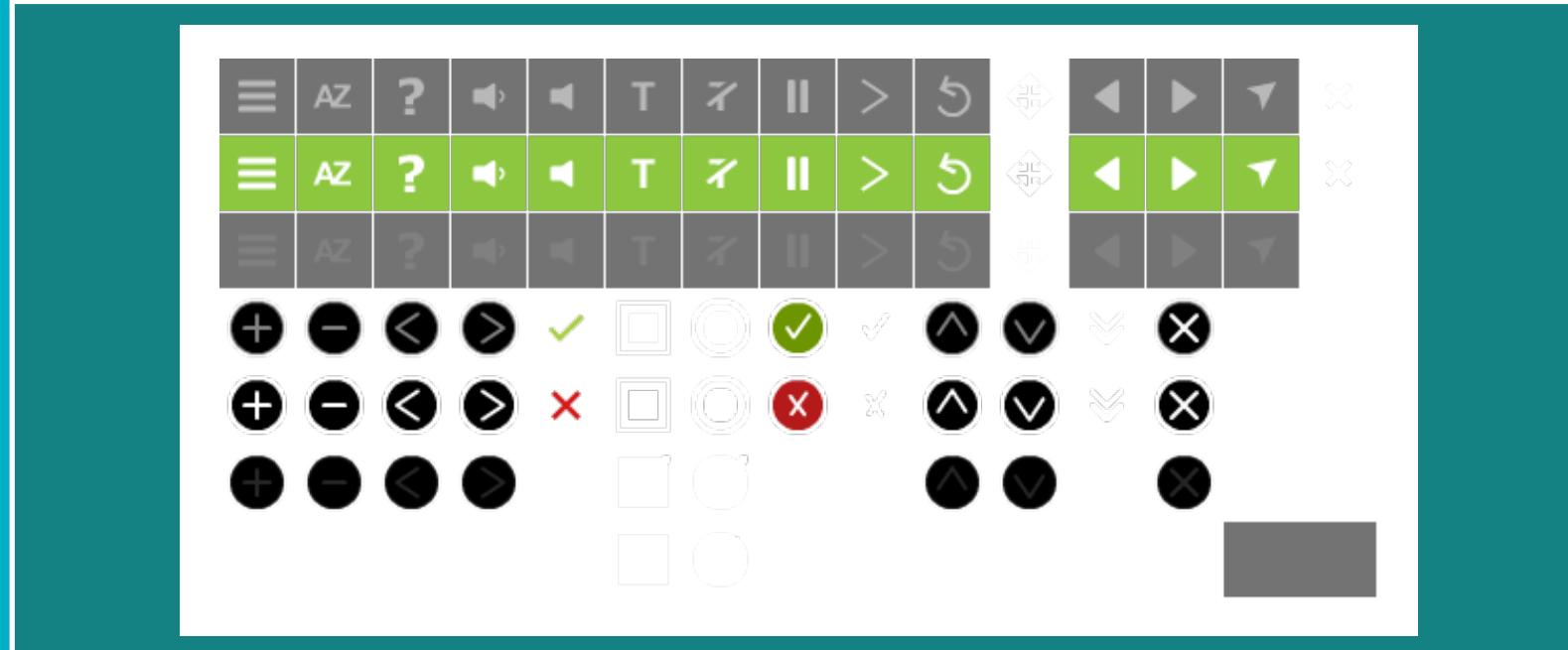
Determining A Responsive eLearning Design Strategy

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3.3.1: Design

Here's an example:

Here is a sample sprite sheet for navigation buttons. There are three images for each button: the top one shows the active state; the middle one the mouse-over state; and the bottom one the disabled state. (The ticks and crosses are indicators, not buttons, and therefore don't have states.)



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3.3: Challenges and Solutions

3.3.1: Design

e

Interactive and Navigation Elements: Interactivities and navigational elements form an important part of an eLearning course. Presenting elements like a multi-layer drop-down menu or an accordion interactivity on a desktop screen is no big deal. But on smaller devices, designers will always encounter the problem of limited screen space. And, this makes designing intuitive interactivities and navigational menus a challenge.

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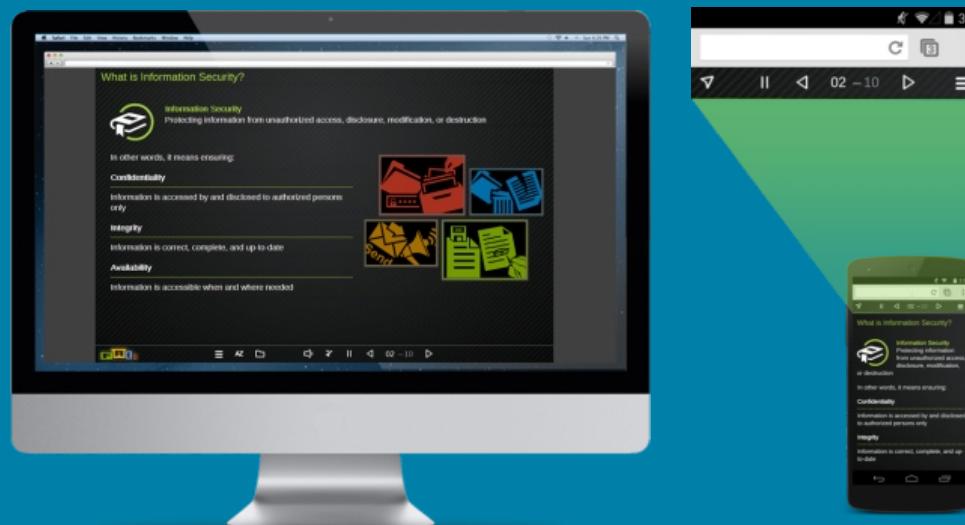
3.3: Challenges and Solutions

3.3.1: Design

Here are a few things to keep in mind to ensure a good experience on a variety of devices:

- Ensure that interactive elements like buttons, hotspots, links, etc. are large. As per [Fitt's Law](#), a larger, closer target is quicker and easier to select. However, if you do want smaller interactive elements from a design viewpoint, then you could consider increasing their hit area beyond their visible borders. [[Apple](#) recommends that touch targets should be at least 44 x 44 pixels; both [Android](#) and [Microsoft](#) recommend a touch target size of around 34-36 pixels.]

- Show more global navigation controls upfront on bigger devices. For smaller devices, grouping or layering them based on frequency of use is a good idea.



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3.3: Challenges and Solutions

3.3.1: Design

- Make sure interactive elements look distinctive. The users should be able to figure out just by looking at an element that it's clickable or touchable. This is all the more important on touch-based devices as these do not support hover effects.

Determining A Responsive eLearning Design Strategy

3.3: Challenges and Solutions

3.3.2: Development

Browser Challenges: A responsive design relies on HTML5 and HTML's performance can vary depending on browsers. Chrome, Firefox, Safari and Opera, Android Browser, Mobile Safari and Dolphin have eaten into Internet Explorer's market share. This has complicated matters further as an HTML5-compliant application may need to be coded differently to ensure that it delivers a similar if not identical behavior across different browsers.



Here's an example of similar - but not identical - behavior. In the screenshot on the right, the visuals are not angled; they are misaligned, and there is no rotating animation upon clicking/tapping.

Programmers can overcome these challenges if they avoid the use of features not supported by targeted browsers or provide alternatives for content presentation for those browsers.

IE 9
on Win 7



Safari 5.1.7
on Win 7



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3.3: Challenges and Solutions

3.3.2: Development

Here are just a few examples of how browsers differ:

Comparison of HTML5 Features					
Features	Chrome 35	Firefox 30	Opera 22	IE11	IE8
Drag and Drop	Full	Partial	Full	Partial	No
H.264 Support	Full	Partial	No	Full	No
Form Elements	Full	Partial	Full	Partial	Partial
Fields	Full	Partial	Full	Partial	No
Mp3 Support	Full	Full	No	Full	No
Location & Orientation	Full	Full	Full	Full	No

The Curious Case of IE: Internet Explorer is still used as a primary browser in many sectors; however, several HTML5 elements do not work or work only partially with IE versions 8 and lower. There can also be problems with external libraries/frameworks. Before using any external framework/libraries, remember to check their compatibility with different browsers and devices. The best practice to avoid issues is to use the latest release of the framework/library.

Determining A Responsive eLearning Design Strategy

3.3: Challenges and Solutions

3.3.2: Development

The Tale of User Agents: All software applications, including browsers, contain user agents that send information to the network about themselves as well as the device they run on. This information is provided in the form of a unique user-agent string specifying the software application type, name, revision and the operating system.

If you take close look at these strings, you'll see that the browser name is different for different devices —the Chrome user agent for the desktop returns "Chrome" as the browser name whereas the user agent for the iPhone returns "CriOS" ("Cr" for Chrome and "iOS" for the OS). Similarly, there can be other parameter values within user-agent strings that differ based on device-software application combinations.

Sample user-agent string for Google Chrome 32 on a Windows 7 Desktop PC

```
1 Mozilla/5.0 (Windows NT 6.1; WOW64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/32.0.1700.107 Safari/537.36
```

Sample user-agent string for Google Chrome 31 on an iPhone running iOS 6

```
1 Mozilla/5.0 (iPhone; CPU iPhone OS 6_0_2 like Mac OS X) AppleWebKit/536.26 (KHTML, like Gecko) CriOS/31.0.1650.18 Mobile/10A551 Safari/8536.25(B0600651-5072-4F26-B5D9-7A3F057A65D8)
```

Sample user-agent string for Google Chrome running on a Nexus 5 is

```
1 Mozilla/5.0 (Linux; Android 4.4.2; Nexus 5 Build/KOT49H) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/30.0.1599.105 Mobile Safari/537.36
```

Sample user-agent string for Firefox running on the same Nexus 5 is

```
1 Mozilla/5.0 (Android; Mobile; rv:27.0) Gecko/27.0 Firefox/27.0
```

Here, you can see that unlike for Chrome, the user-agent string for Firefox does not specify the Android version.

Determining A Responsive eLearning Design Strategy

3.3: Challenges and Solutions

3.3.2: Development

When developing responsive eLearning design in HTML, developers need to be aware of the different user-agent strings for each targeted device-browser-platform combination. They need to code accordingly to develop eLearning which is compatible across all user agents, so that information or content can be displayed accordingly.

Media Issues (Audio/Video): Browsers use HTML5 `<video>` and `<audio>` tags to play media, and most of them support different video (e.g., MP4, OGV and WebM) and audio (e.g., MP3, OGG and WAV) formats. The hiccup here is you'll need to include audio/video files in ALL these formats to cover a wide range of devices. Also, if you want the video quality to adapt to the users' connection speed (useful when targeting mobile devices), you will have to create multiple versions of the same video or consider using a media server to stream videos; however, that comes with certain limitations as well. Note that having multiple versions of the same video/audio file will also have an effect on the size of the eLearning package which could be problematic depending on the LMS's upload limits.

Determining A Responsive eLearning Design Strategy

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3.3.2: Development

Animation Capability: Animations are an important element used in eLearning for visual explanations and engagement value. With HTML5, the first challenge is creating animation in sync with audio, which is a time-consuming and complicated task to achieve with the tools that are currently available.

That said, there are several ways in which animations can be created, using HTML5 elements (e.g., Canvas, SVG), CSS3, or Sprite Sheets. Custom development with these elements requires significantly higher effort. Tools such as Toolkit for CreateJS provide a workaround. They can help users to work in Flash and export HTML5 content. Another option is Edge Animate, which helps create animated and interactive content. These tools export HTML5 content, which will NOT be supported on older IE versions. Also, if these animations are going to be part of a course, — integration, data communication and control of these animations may be tricky. An alternative is to use Flash to create animations and then convert those into videos (MP4 format); however, while that works well for continuous animations, it may not be so effective for animations interspersed with interactivities.

Audio Syncing: Audio syncing in HTML5 can be achieved through the use of 'cue points', but it is a time-consuming task. There are currently very few tools (like Adobe Edge) available that can make syncing easier — and even those are still evolving.

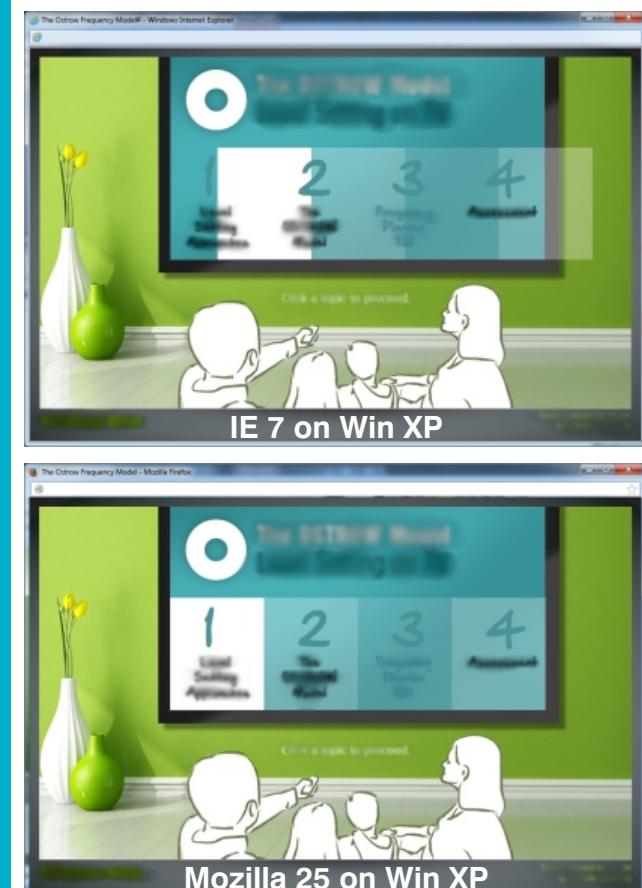
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3.3: Challenges and Solutions

3.3.3: Testing

Testing a responsive course means testing the content being presented, the layout and the functionality — on a wide variety of device-OS-browser combinations.

- **Text readability** - Text will appear bigger or smaller based on device resolution, so it's important to ensure that it is comfortable to read in all cases.
- **Content alignment** - Every browser has its own HTML rendering engine, which can display the same content with a slightly different page and text formatting, leading to differences in alignment. Similarly, because every browser interprets JavaScript differently, a course may not display similarly on all browsers. Testing on multiple browsers, devices and configurations is therefore crucial. Here's an example of content misalignment. In the screenshot on the left, the position of the white and translucent holders has shifted, so that they bifurcate the texts. And because these holders are hotspots, the interactivity does not work properly either.



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3.3: Challenges and Solutions

3.3.3: Testing

- **Target areas for touch interactions** - The smaller the device, the harder it can be to touch a precise spot. While testing, check that touch targets are large and wide apart enough to be comfortably used.
- **Navigation controls** - While there may be space on larger devices to display all navigation controls upfront, it is recommended that they be logically grouped and layered on smaller devices. When testing, check the location of the controls and how well they have been grouped and layered in terms of frequency of use.
- **Visual cues for new or specific gestures on touch devices** - If the eLearning course includes interactivities or navigation that require specific gestures, check whether there are clear and explicit visual cues right at the beginning and or the first time such gestures are required.
- **User instructions** - If device-specific instructions are being used (e.g. click/tap), then make sure the right instructions are displayed on the different types of test devices. If task-based instructions are being used (e.g. explore, find out, go through), then check to see whether they provide the required clarity in terms of what the learner is expected to do.

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3.3.3: Testing

- **Content meaning and interrelationships** - Since content layout changes based on display size, it is important to check that it retains its meaning at all times. An incorrectly placed label, or text aligned with the wrong visual, or a wrongly positioned arrow can change the interrelationships between content, and therefore their meaning.

Here's an example of how meaning can change - on the smartphone, the "Box File" and the "Password" labels are still horizontal and therefore pointing at nothing.



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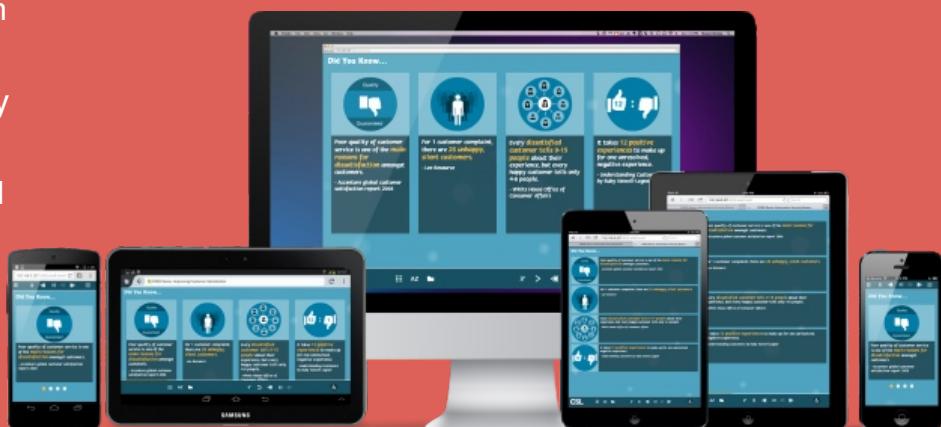
3.3: Challenges and Solutions

3.3.3: Testing

Testing responsive eLearning is a complex and intricate activity. Tools like Ghostlab or [Adobe Edge Inspect](#) can reduce testing time to a certain extent. [Ghostlab](#), for example, allows testers to wirelessly pair multiple iOS, Android, Windows, and BlackBerry devices to their computer and sync them. Changes can be simultaneously seen on all connected devices:

If you don't have sufficient physical devices, you can also use SDK simulators for different operating systems or web-based simulators like BrowserStack for testing. SDK simulators need to be installed on local machines. The target (OS) environment can be simulated and testers can see the simulated results of any changes. [BrowserStack](#) can be used to test how a course functions on different devices and operating platforms including iOS, Android and Windows.

While simulators can certainly help in initial testing and to check specific aspects, the results they provide may not always be 100% accurate. They also do not allow you to test physical aspects like touch- or gestural-navigation and interaction, or parameters dependent on device hardware and performance.

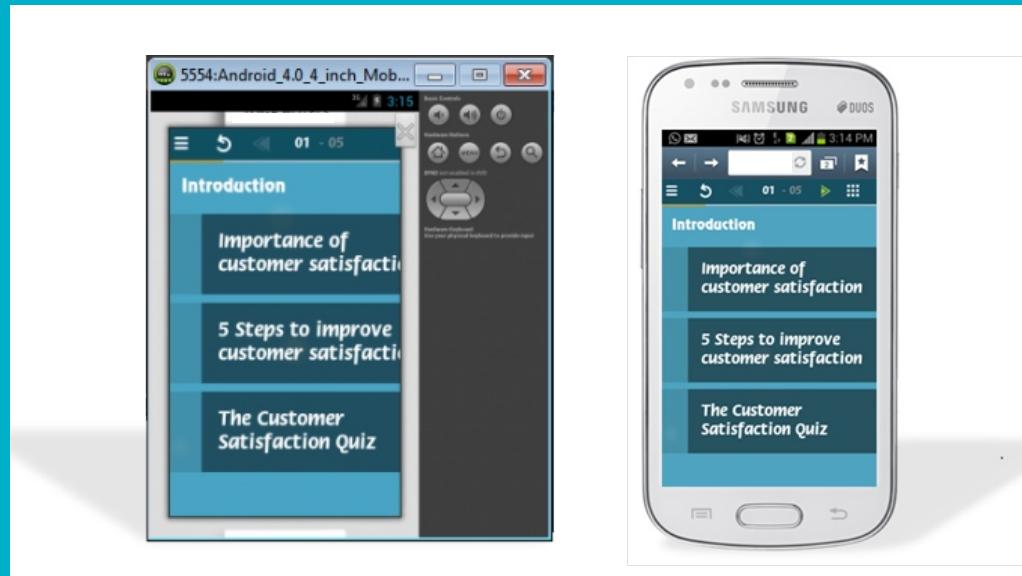


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3.3.3: Testing

In the screenshot on the left, the simulator shows text getting cut. On the actual device, however, the complete text is getting properly displayed.



Testing on physical devices is therefore recommended, at least for the primary target devices and configurations. Remember there is no substitute for running an application in the real environment on the appropriate hardware. This practice allows you to see and experience your application exactly as your users will.

Even when using tools like Ghostlab that do connect simultaneously to multiple physical devices, there will still be things you'll need to check through manual testing on individual devices - for example, certain types of interactivities, or audio synching. Also, if content treatment or layering is different on different device sizes, this too will need to be manually tested.

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3.3.3: Testing

Testing — or rather checking to see how the eLearning looks and works - comes into play from a programmer's viewpoint too — both during development itself and while fixing any issues logged during the testing stage.

With responsive eLearning, the most common causes for issues could be:

- The code is not HTML5 compliant.
- The code is not compliant with a specific browser.
- The code is neither HTML5 nor specific-browser compliant.

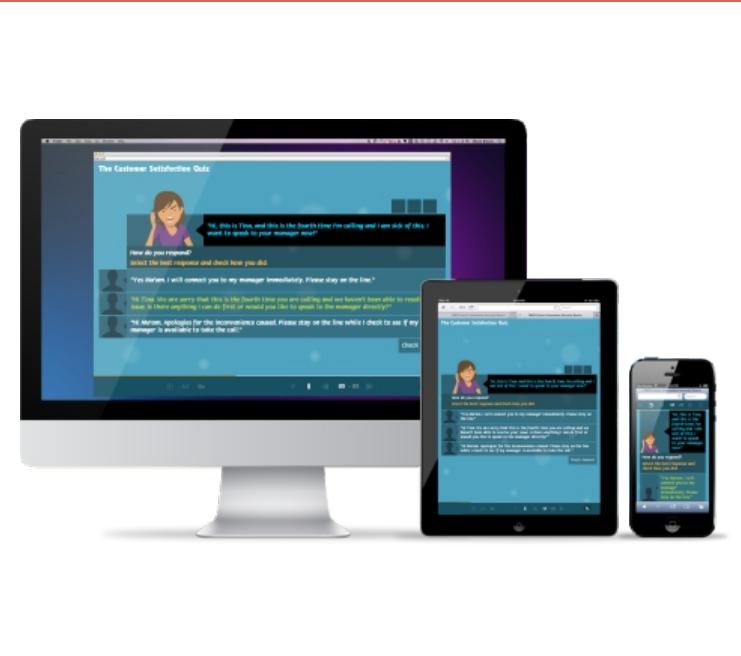
A programmer must check the code and logic to identify the correct cause and make the required fixes; and as browsers and the HTML5 standard continue to evolve, the process of identifying the causes of issues will also continue to evolve.

While checking, a programmer needs to load the page on every device and follow the same steps every time they make changes to the code. Programmers too can benefit to a certain extent from the use of tools and simulators; however, for them as well, there's no escaping checking on physical devices.

Conclusion

With the changing learning and computing paradigms, the need and demand for responsive design in eLearning is certainly on the rise.

Today's learners expect content to be available at the point-of-need or time-of-interest and increasingly mobile workforces require and demand flexibility and convenience. With the sheer variety of device choices out there, from different manufacturers and of different sizes and configurations, one size no longer fits all. The adoption of BYOD within organizations and educational systems has also increased the variety of devices that eLearning must support.



Conclusion

A single source through which content is displayed optimally on different devices is an efficient solution to meet these needs. We at Upside Learning recognize that responsive design is the next "big thing" in the world of eLearning. Like any other approach, it comes with its own set of planning, design, development and testing considerations and guidelines - and it forces those of us who create responsive eLearning to think beyond just one fixed display size and one uniform use context.

With responsive eLearning, organizations can extend the reach and availability of their learning while simultaneously shifting to mLearning. And they can do so in a future-friendly manner, as long as upcoming technology and browsers follow HTML 5 guidelines.



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AVP Learning Design

Leading the Instructional Design team at Upside Learning, Geera has over 13 years of professional experience. As an instructional designer, she has worked on 70+ projects of varying types, covering business and technical simulations, story-based learning, and CBT to WBT conversions. She is proficient in analyzing client requirements and content, defining instructional approaches and course structures, creating storyboards, and reviewing outputs.



Sonal Sheth
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Sonal boasts of over 13+ years of experience in the eLearning industry during which she has worked in different domains including Graphic Design, Instructional Design, and Project Management. This varied exposure enables her to take a more holistic view of eLearning projects. She has executed over 100 projects for clients located in the USA, the UK, Singapore, the Netherlands, Australia, and India.

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