UPSIDE LEARNING

MULTI-DEVICE TESTING 101

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UPSIDE LEARNING

1.0 A MULTI-DEVICE WORLD

1.1 Where It All Started

Today, the world of connected devices has grown exponentially. Individuals own multiple devices and the primary device that connects them to the electronic world is likely to be anything from a smartphone or phablet to a PC or tablet.

It all started when Google released a comprehensive report on the emerging use of multiple devices in 2012. According to this report, 90% of our daily media interactions are screen based, with our time online primarily spread between four devices—televisions, desktop PCs/laptops, tablets and smartphones.

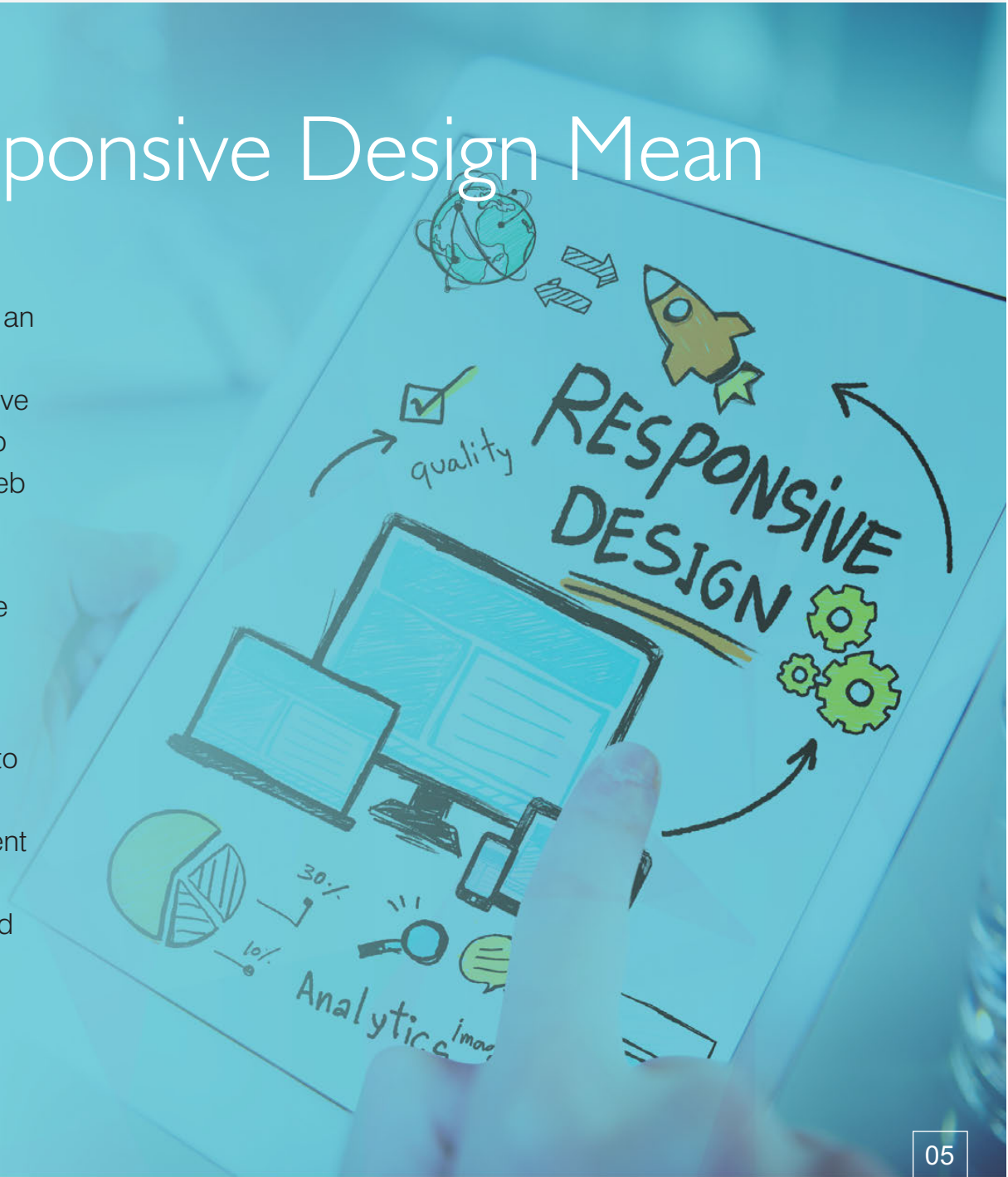
Computing trends are changing at a breakneck speed. A report from mobile manufacturer Ericsson states that by 2015, 80% of the populace will be accessing the Internet from mobile devices.

What this means for those who create and deliver online eLearning services is to not only develop a solution that works across devices but also to test it to ensure it works uniformly well on every device.

1.2 What Does Responsive Design Mean

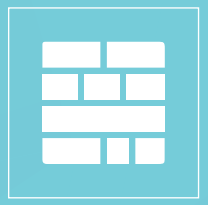
The term 'responsive web design' (RWD) was coined by Ethan Marcotte, a web designer, in an article in A List Apart in May 2010. He further described the theory and practice of responsive web design in his book titled Responsive Web Design. According to Marcotte, responsive web design means designing for optimal viewing experiences on different devices by using technology to make designs flexible and more adaptive to the media that renders them.

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.



1.2 What Does Responsive Design Mean

According to Marcotte, if web design is 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.

These three key features become the ground rules not only for the design and development of responsive eLearning design but also for testing responsive eLearning courseware.

2.0 A PEEK AT RESPONSIVE eLEARNING DESIGN

2.1 How Responsive eLearning Design Emerged

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

Device Availability

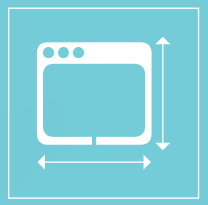
Multiple devices has multiplied learners' expectations. The mobile masses demand both flexibility and convenience and expect content to be available at the point-of-need, and time-of-interest.

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 centres 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.

2.1 How Responsive eLearning Design Emerged

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



Device Orientation

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

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 plays a vital role in the selection and use of a specific device—considering this, the instructional goals we set out to achieve must also align to the needs and purposes associated with learners' device use.

2.2 The Need for Multi-device Testing

The need for multi-device testing emerges directly from the increasing need and demand for multi-device learning solutions. There are several contributing factors to this.

1

Change in Computing Paradigms.

Computing trends have changed; from huge mainframes to small personal desktop computers and mobile devices, from personal networking to the Internet and cloud computing. Learning solutions today need to keep up with the latest technologies and be served up on the latest devices.

2

BYOD Policies Are Gaining Acceptance.

Gartner predicts that by 2017, half of the employers will require their employees to supply their own device for work purposes. Towards Maturity's In-Focus - Mobile Learning at Work (2014) report states that 66% of top learning companies have a BYOD policy. However, it also states that 60% of top learning companies provide learners with smartphones and 48% provide them with tablets.

2.2 The Need for Multi-device Testing

3

An Increasing Number of Millennials Entering the Workforce.

According to the Business and Professional Women's Foundation (BPW Foundation) and the Deloitte Millennial (Generation Y) Survey, millennials will make up 75% of the global workforce by 2025. And these millennials like to learn by looking up, searching and discussing knowledge as and when they need it. They want information when they want it. They're used to technology and more specifically, to changing technology. They're often using more than one device simultaneously.

From a learning solutions viewpoint, this can mean searchable repositories, checklists, job aids, how to simulations, specific information in small doses—all this available on demand, with continuity, wherever they may be and whatever device they may be using at the time.

2.2 The Need for Multi-device Testing

4

Changing Work Trends.

While part-time and temporary jobs have been around for a while, the concept of full-time 9 to 5 work seems to be slowly petering out—for some types of jobs. Increasingly, it's about flexible work practices—a trend that the Emerging Technologies Outlook Program predicted way back in 2001. This includes flexible timings and schedules, telecommuting from home or other locations, contracting, and even flexi-tasking.

In his Top 10 Workplace Trends For 2014, Dan Schwabel predicts that freelancing will become a normal way of life—to the extent that there will be more freelancers, contractors, and consultants than full time workers in six years. This will mean more people working from outside the office, and using their own devices.

This means training and performance support needs to be available to all these people, no matter where they are, when they choose to work, or what devices they use.

3.0 The Quirks of Multi-device Testing

3.1 Key Challenges and Considerations

During the course of our work with responsive solutions, we experienced what it takes to do effective multi-device testing—the challenges and considerations.

Device-browser-OS Combinations

One of the biggest challenges is the number of possible device-browser-OS combinations. It is almost impossible to test each and every combination, for each and every test parameter—unless the target range is very specifically defined.

Which is why it is essential to first define the testing environment. This becomes easy if the target range is very specific and narrow. For a wider target range, an optimization approach is very helpful. This involves defining the testing environment based on device, browser, and OS popularity and usage statistics, including device specifications and browser, and OS versions. A couple of good data sources for this type of information are the Net Market Share and W3C Schools sites. You can also look up device specifications like screen size on these sites.

Once the optimal sets of devices, OSs, and browsers have been defined, it is best to manually work out all the permutations and combinations to create a testing matrix. The lowest specifications form the parameters for minimum edge testing.

For the most part, we found that multiple browser versions needed to be tested only for Internet Explorer; the latest versions are usually considered for Firefox and Chrome. Additionally, test cases needed to be refined and extended to make sure that different devices were covered.

3.1 Key Challenges and Considerations

Availability of Devices

The next point of consideration is the availability of actual devices against those identified in the testing matrix. Ask yourself if all of these are needed or if tools and simulators can be used to cover the missing ones. While some tools and simulators are effective, actual devices and setups are very much required for accurate results.

Experience and Effort

In our experience, we realized it would be most efficient to first test on one desktop, one tablet in portrait view, and the smallest smartphone in portrait view. This will allow the content to be validated for all breakpoints as a first major stage of testing.

This testing on the initial three representative devices is done 100% manually, one device at a time. Another good practice is to fix and reverify the initial issues before expanding to test on other combinations.

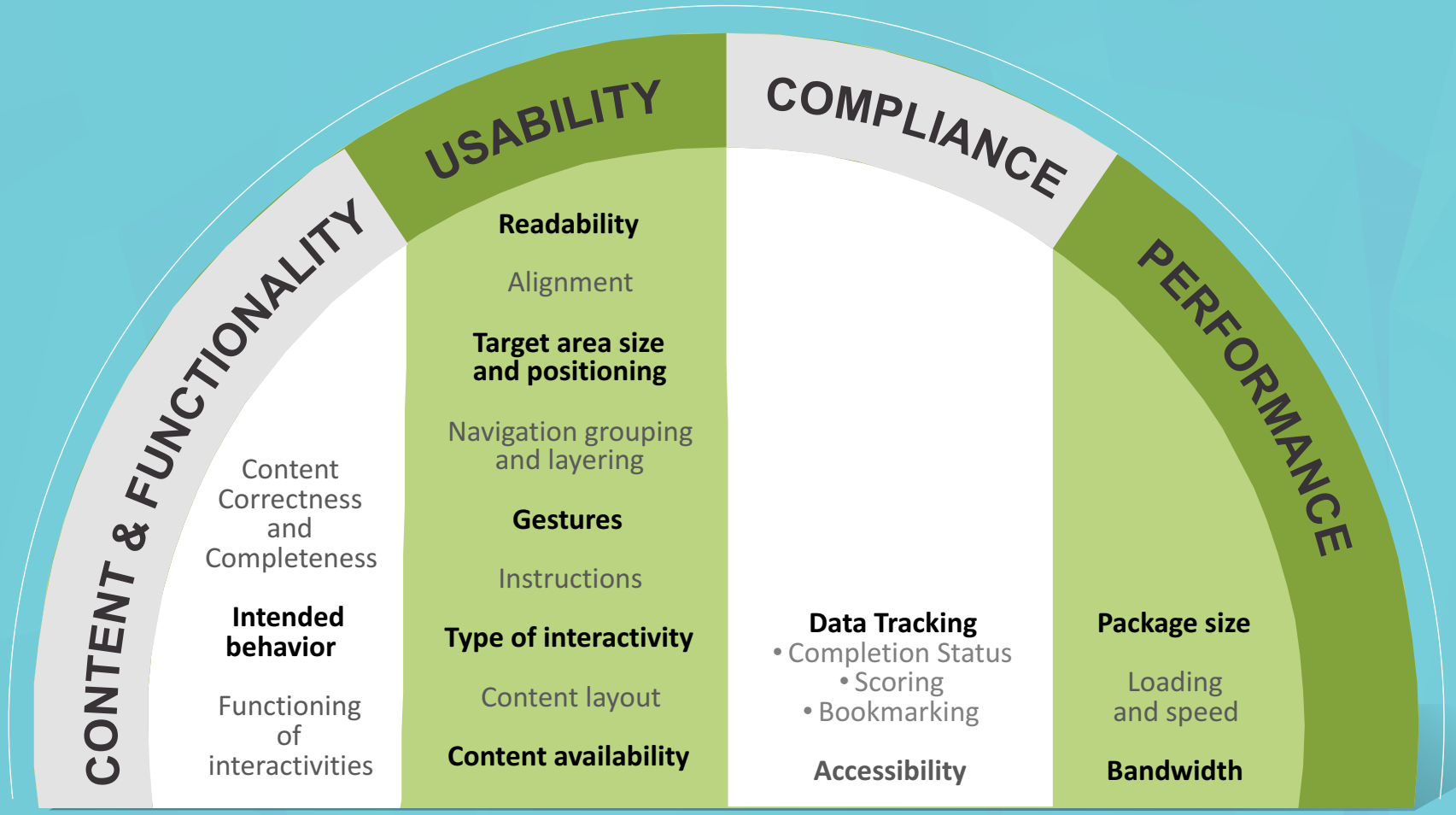
When testing the other combinations, it is more effective to test according to device-type first—this means to test on all tablets, covering all applicable browsers and OSs in succession before moving to the next tablet.

It is also important to log the issues in a more efficient manner, so as to reduce duplication. One thing that can help achieve this is the smart use of keywords (e.g., device/brand/OS/version/browser), either as a separate field or within the issue description. If you're using a testing tool, keyword tagging may be mandatory and may be used by the tool to automatically cross link and associate issues.

Additionally, as a best practice, after issues are fixed, all combinations need to be retested to ensure the fix hasn't affected any other combination.

3.2 Testing Parameters

We have identified some parameters for multi-device testing, and these include testing for content and functionality, usability, compliance, and performance. Here is a look at the parameters for multi-device testing.

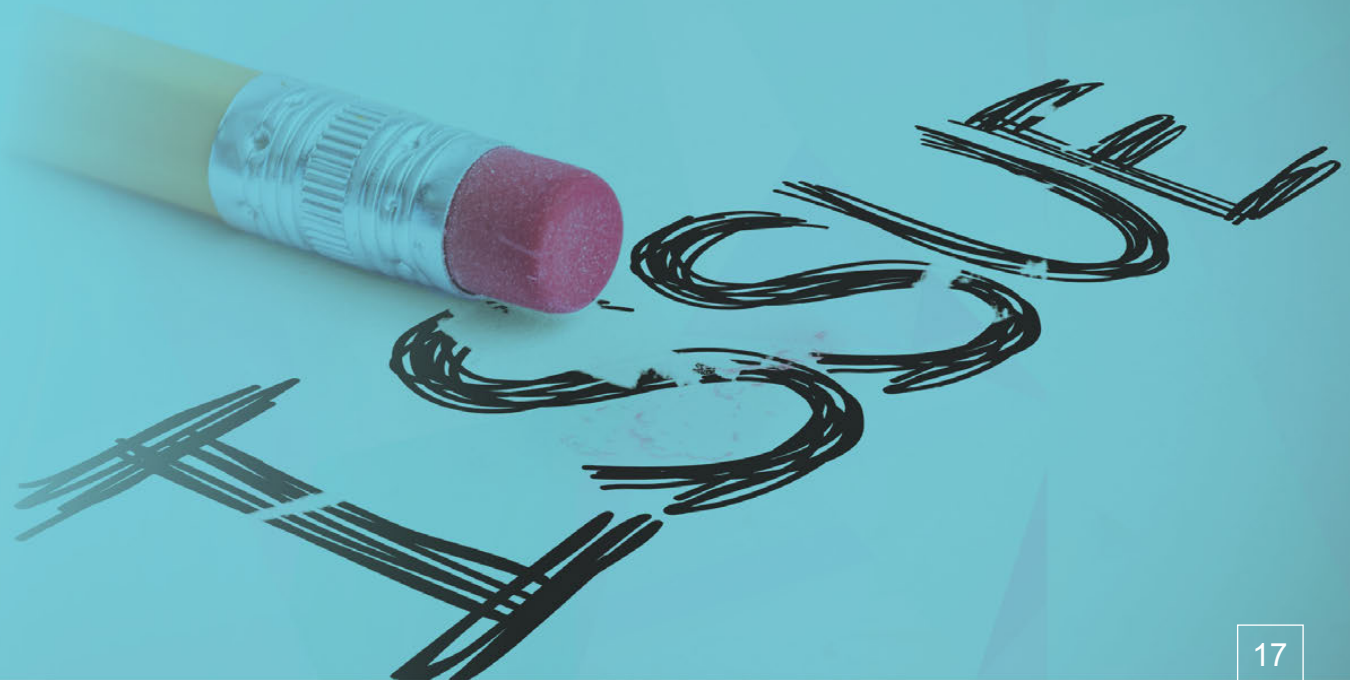


3.3 Some Common Issues

Multi-device testing is a time consuming and complex task. And if not carried out meticulously and comprehensively, learners may face a wide a variety of problems. Here are some common issues of multi-device testing to keep in mind.

Browser Differences

Every browser has its own HTML rendering engine and interprets JavaScript differently, which causes inconsistencies across browsers. These could be content, functionality, or usability issues.

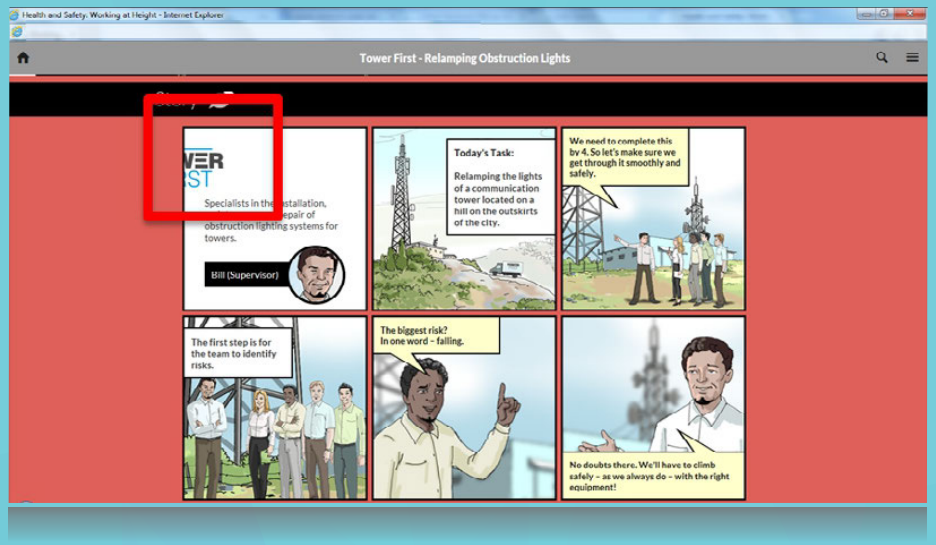


3.3 Some Common Issues

Content Misalignment

What looks fine on one browser can have issues on another browser. Here you can see the same screen on two different browsers, IE 10 and FF 32 and you can see that the logo is getting cut on IE 10 whereas on FF it looks correct.

Desktop - Win 7- IE10



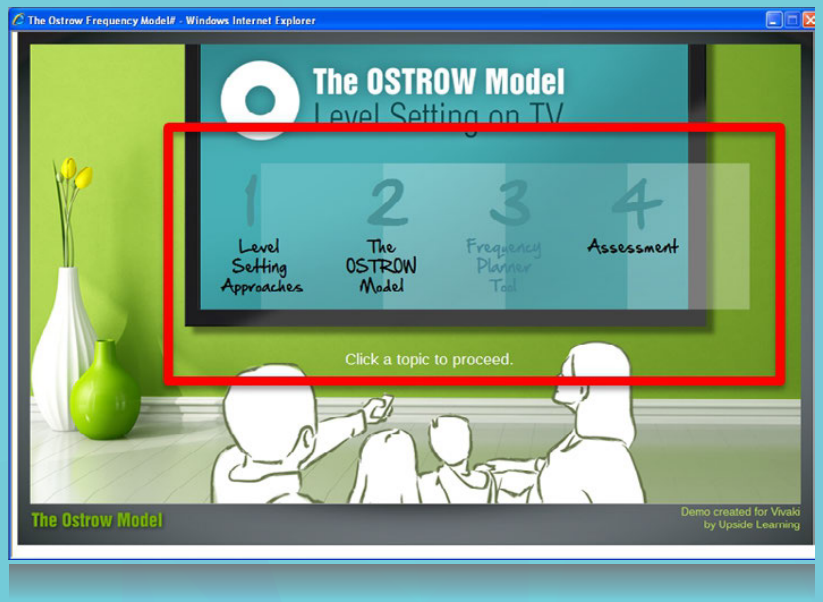
Desktop - Win 7- FF 32

3.3 Some Common Issues

Content Misalignment

Misalignment can cause functionality issues too. Here you can see how the transparent hotspots have shifted in IE 8, which interferes with their click functionality.

Desktop - Win XP- IE 8



Desktop - Win XP- FF32

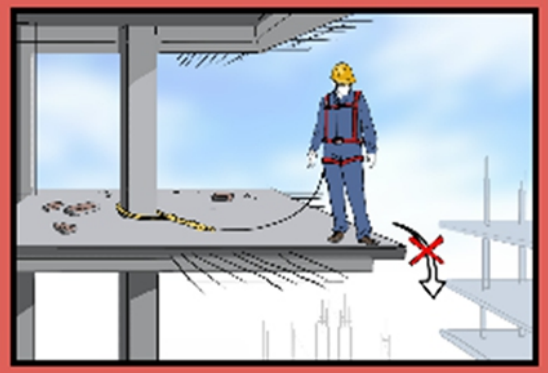
3.3 Some Common Issues

Image Quality

Image quality can differ from device to device, depending on size and resolution, or if scaled from browser to browser, which is why it is important to look out for blurry or distorted images. Here you can see that the graphic has blurry lines in chrome 37, but sharp lines in FF32 and Safari 8.

Desktop - Win 7- Chrome 37

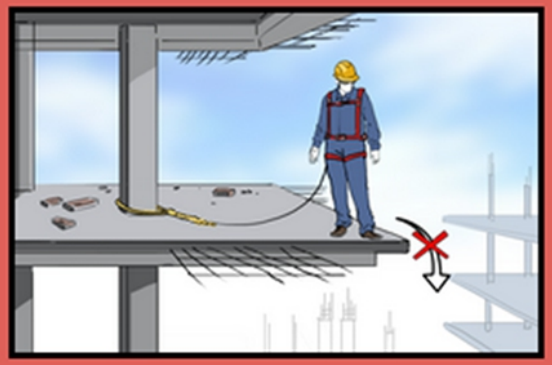
This includes working:



Above the ground or floor level

Desktop - Win 7- FF 32

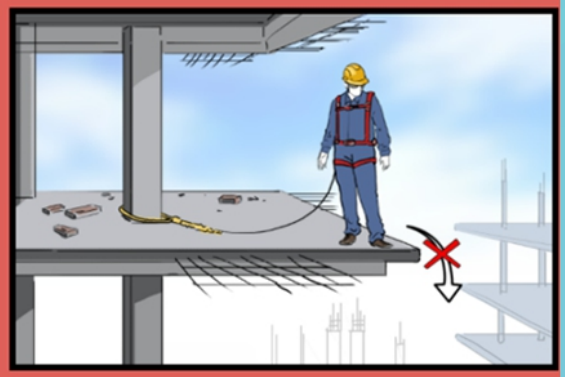
This includes working:



Above the ground or floor level

iPad - IOS 8 - Safari 8

This includes working:



Above the ground or floor level

3.3 Some Common Issues

Text Readability

Text size differs from device to device depending on resolution. The higher the resolution, the smaller the text appears. While inconsistencies in text size can't always be avoided, it's important to check readability on a range of devices in such a way that all target resolutions are covered.

These three devices have different resolutions, and we can see that the font size is not consistent on all the devices , and is just readable on the bigger tab.

3.3 Some Common Issues

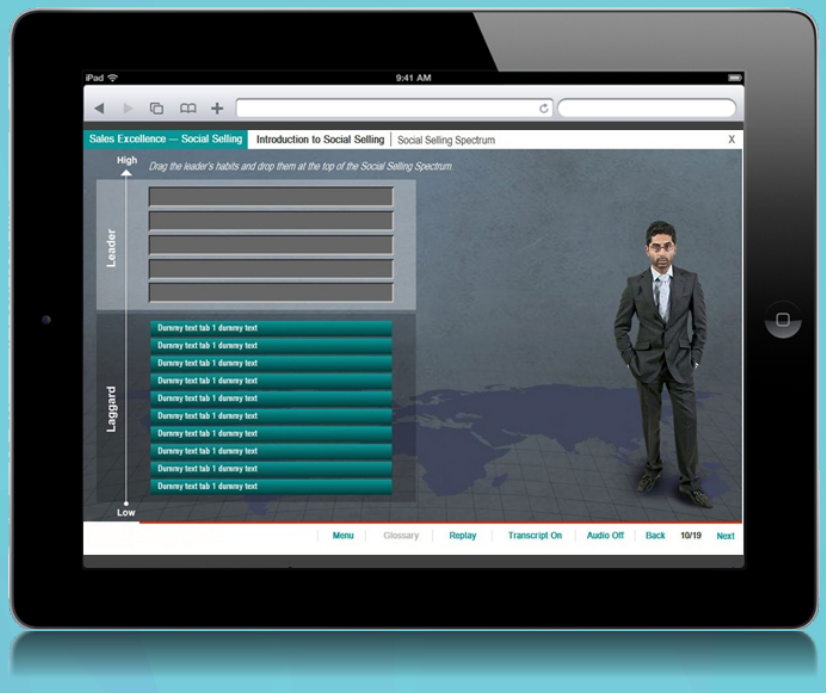
Content Meaning and Interrelationships

Changes to layout for different dimensions could cause a change in the meaning or relationship between two pieces of content. Here you can see that the speech bubble arrow is pointing to the lady's hand instead of towards her face.

3.3 Some Common Issues

Target Touch Areas

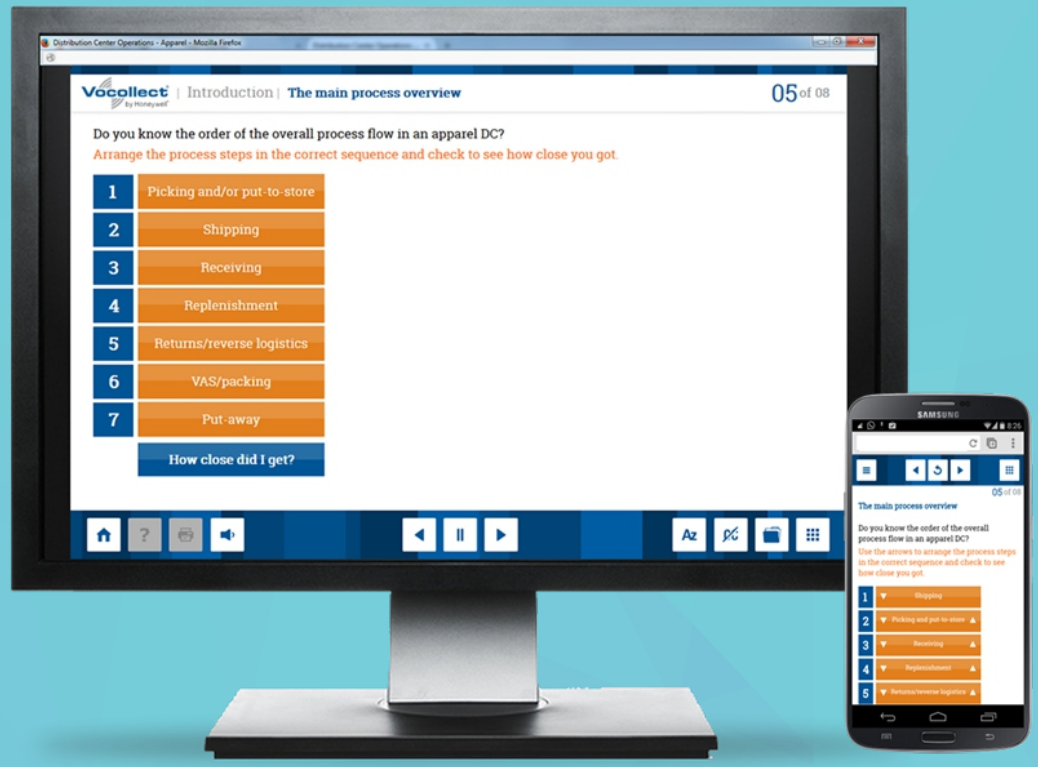
This focuses more around usability. Having small touch areas will lead to the user clicking the wrong buttons. Here, in the screenshot on the left, we can see that the draggable options are very close to each other, making it difficult for the user to attempt the interactivity comfortably. When the options are more spaced out, as shown on the right, it is more user-friendly.



3.3 Some Common Issues

Nature of Interactivities

An important aspect to consider while testing is the nature of the interactivities and whether they are well suited to different devices. Here on a desktop you can see all the options together and can drag to reposition them. On a smartphone, you have to scroll to see all options, and you'd have to drag beyond the visible areas to reposition, which is not so convenient. So the nature of the interactivity has changed to touching the up/down arrows to rearrange one level at a time.



3.3 Some Common Issues

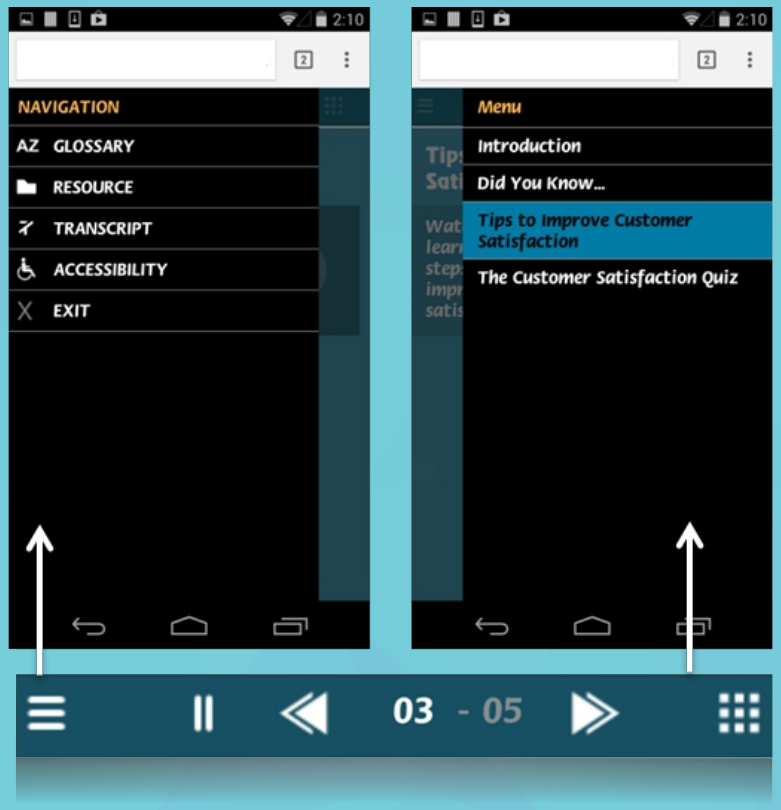
Visual Cues for Gestures

While testing, very simple, put yourself in the learner's shoes. Do you know what to do? Do you know how to interact with the content? Is it intuitive, or are there clear and device-appropriate instructions, and/or visual cues for new or specific gestures? This screenshot is an example from a tablet-based app which gives us a good idea of how to give gestural cues. On a desktop, this may change to a cue that tells you to click arrows or drag a slider to rotate the car, and click the hotspots.

3.3 Some Common Issues

Navigation

This is another big usability point. The navigation elements and structure should be conducive to the device type and size. For smaller devices like smartphones, we need to check whether the navigation controls are logically grouped and layered. More frequently used controls should be placed on the main screen, while less frequently used controls should be layered and placed at a second level.



3.3 Some Common Issues

Compliance

Compliance (SCORM, AICC, xAPI or Tin Can) will need to be checked on multiple devices.

This will include typical parameters like bookmarking, status, score, and so on.

And, there's an additional check you'll need to do if sequencing is implemented—that is, if there is continuity across devices. Sequencing will only happen if the same LMS is accessible from all devices and you are online from all devices and/or if there is an offline player compatible with the LMS through which you can view courses offline and synch later. Some LMSs also have their own offline players/modes.

3.3 Some Common Issues

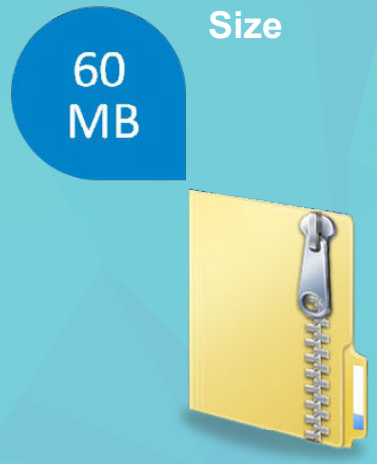
Performance

While testing always check how the eLearning is performing on different devices with different configurations, and how interruptions are handled. In case of poor performance, it may be worth checking on package size or even on the number of images in the package.

Interruptions

Connectivity

Size



eLearning Course

3.4 About Tools and Simulators

There's no doubt that testing multi-device eLearning, and especially responsive eLearning, is a complex activity. Here's a quick summary of some tools and simulators that we explored with a specific focus on their capability to test multi-device eLearning, and not websites or web applications.

GhostLab

This is a tool that allows testers to wirelessly pair multiple iOS, Android, Windows, and BlackBerry devices to their computer and carry out synchronous testing. Since GhostLab involves concurrent testing on actual physical devices and configurations, you can check real user experiences. Changes (e.g. changing a page or displaying content on clicking a button) can be simultaneously seen on all connected devices.

GhostLab is useful for checking visuals and content alignment; for joint reviews; and also for a quick final run-through or reverification prior to release. It could be a good tool for developers to immediately check the result of code changes, and may be quite helpful for testing text-based courses on multiple devices.

3.4 About Tools and Simulators

Adobe Edge Inspect

This is another tool that displays synchronized output on physical devices. It allows testing on iOS and Android mobile devices, as well as Kindle Fire. With Adobe Edge, you need to install the main application on a desktop computer, and launch the course through a Chrome browser. You can then access the synchronized course through the Edge Inspect app on connected devices.

Edge Inspect loads only HTML pages, and if you'd like to control course-level navigation synchronously through the main desktop, it requires a separate URL for each page. This means it can be efficient for testing Lectora- or other HTML-based courses that are structured so as to have a different URL for each page. Page-level interactivities can also be synchronously controlled through the main desktop if the content that appears on click is available on a separate URL.

BrowserStack

This is a cloud-based simulator that is useful for checking text alignment on a specific device-OS-browser combination. It can also be useful for catching visual aspects like crooked button edges.

SDK Simulators

These are local simulators, can also be helpful for testing some parameters. With the iOS and Windows simulators, we could check content, alignment, and layouts quite reliably. However, there are some inaccuracies with the Android emulator.

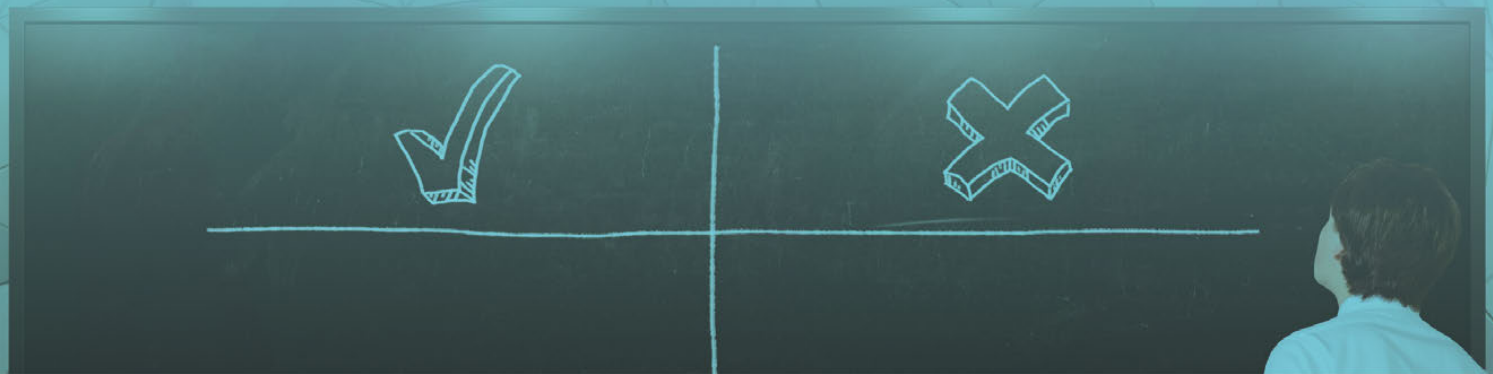
3.5 Benefits & Drawbacks of Tools & Simulators

While using simulators for testing eLearning, keep in mind that actual learner experience cannot be completely replicated and checked, as physical devices are not being used—so there can be inaccuracies and performance mismatches based on the configuration and resolution of the machine running the simulator.

Checking real-time physical device aspects like battery life, charging, and actual bandwidth speed may also not be possible. Nor can you check content or functionality dependent on device features like camera, location, and accelerometer, or simulate interrupts.

Also, eLearning includes a lot of custom interactivities—on multiple devices, this brings in gestural navigation, which does require the actual tactile experience to be evaluated on the device.

Additionally, in the case of cloud-based simulators, content loading, as well as speed and smoothness of animations, can vary based on the connection, which may lead to inaccurate issues being logged. Remote simulators can also cause some difficulties when it comes to testing interactivities, as options can't be selected unless content is fully and properly loaded on the remote machine.

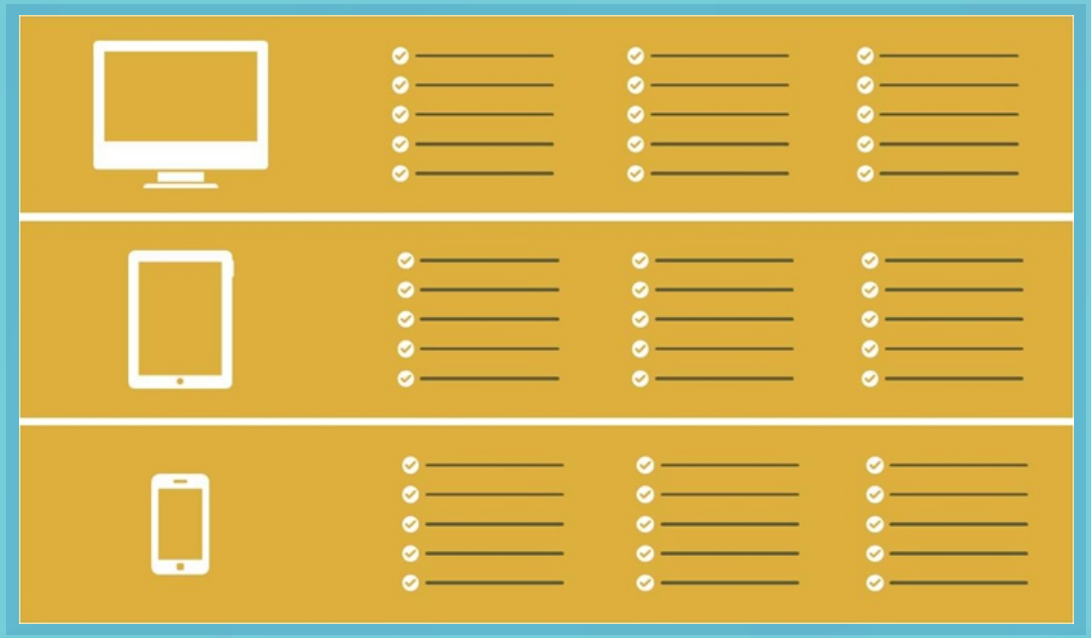


3.6 Multi Device Testing Best Practices

1

Define the Testing Target Environment and Approach

For a precise, limited specification, that is a very specific and narrow target range, defining a testing environment would be relatively easy. It might look as simple as this:



However, for a wider target range, an optimization approach would be helpful. This involves analyzing popularity, usage, and sales statistics for devices, browsers, and OSs to narrow down to a comprehensive, representative set.

3.6 Multi Device Testing Best Practices

2

Create a Testing Matrix

Once an optimal set of devices, OSs and browsers are identified, manually work out all the permutations and combinations to create a testing matrix. The lowest specifications will form the parameters for minimum edge testing.

		Browsers		
Device	**Platform**	**Browser 1, v.X**	**Browser 2, v.X**	**Browser N, v.X**
Device Type 1	OS 1, v.X			
	OS 2, v.X			
	OS 3, v.X			
Device Type 2	OS 1, v.X			
	OS 2, v.X			
	OS 3, v.X			
Device Type 3	OS 1, v.X			
	OS 2, v.X			
	OS 3, v.X			

Tip: Your test cases will need to be refined and extended to make sure that different devices are covered. For example, for the scenario page shown below, the test case for desktops would define clicking the next/back arrow buttons as well as the numbered buttons for moving from one to scene to the other.
For the same scenario page on a tablet, the test case may additionally define horizontal swiping to move between scenes.
Finally, for smartphones, the scenario presentation has changed to a non-interactive, more-text-based view that is better suited to smaller displays. The test case therefore needs to define only vertical swiping to scroll through the scenes.

3.6 Multi Device Testing Best Practices

3

Check the Availability of Physical Devices

Given the number of devices available in the market and client expectations, checking the availability of actual i.e. physica devices is necessary for effective testing. Although there cannot be a match for actual devices, in case any are not available, you can very well consider using tools or simulators instead.

***Tip**: For more accurate results, use actual devices and setups for testing, as far as possible, rather than relying on tools and simulators.*

4

Test, Test, and Re-Test

As far as the testing process goes, it may be more efficient to first test on one desktop, one tablet in portrait view, and the smallest smartphone in portrait view. This will allow you to validate content for all breakpoints as a first major stage of testing. It is advisable to perform this testing 100% manually on the initial three representative devices, one device at a time.

***Tip 1**: Wait till the initial issues are fixed and re-verified before expanding to test on other combinations.*

***Tip 2**: When testing the other combinations, it can be more effective to go device-type-wise - for example, first test on all tablets, covering all applicable browsers and OSs in succession on each tablet; then move on to smartphones.*

5

Issue Logging

Log the issues in an efficient manner, so as to make grouping easier and reduce duplication.

***Tip**: Make smart use of keywords while logging issues (e.g. device/brand/OS/version/browser), either as a separate field or within the issue description.*

3.7 Our Multi-Device Testing Lab

We understand that it may not be feasible for everyone to commit to or fulfil these requirements, especially if you're looking to test a single or just a few courses. Which is why we offer our Multi-Device Testing Lab as a service. As part of our service, we use our infrastructure, expertise and process to conduct systematic and thorough testing of your multi-device eLearning on the target devices and environments that you specify—or that we work out for you based on optimization.

3.7 Our Multi-Device Testing Lab

Our testing lab includes a wide variety of devices running different operating systems and browsers—the result of our optimization exercises.

We have Windows PCs, Macs and laptops through which we cover testing for larger displays; iOS, Android and Windows tablets of different sizes and configurations; and iOS, Android, Windows, and BlackBerry smartphones to cover smaller displays. Through these, we're able to cover screen sizes between 3.5 and 10.6 inches for mobile devices, and resolutions between 320x480 and 1536x2048.

As new devices get introduced, and browsers and OSs continue to be updated, we will similarly continue to add to the set of devices available in our lab.

4.0 User Experience Testing

4.1 User Experience Testing Overview

One big part of multi-device eLearning is that it aims at providing a well-rounded user experience for every type of target device. What this means is that the course through its flexible design will adjust to the learners' devices—text will be rearranged, layouts will adjust, images will get cropped, target touch areas will change, etc. For multi-device eLearning courses to be successful, it is very important that courses not only be tested across platforms but also from the user's perspective.

This brings us to user experience testing. Often referred to as UX testing, usability testing or user testing, this term means exactly what it sounds like - it simply is the process of understanding the users' experience with the eLearning course. It includes everything your users see, hear and do; the rationale behind their actions; and their emotional reactions to the results.

Every multi-device eLearning course is designed in a very specific manner. For every learner action, there is a defined resulting behavior in the course. What user experience testing does is to try and understand the user's reaction when performing that action, either successfully or unsuccessfully. This is simply the instinctive response a user has to a new experience when they tap, click, swipe or read the content displayed and how it is displayed.

4.1 User Experience Testing Overview

But why is user experience testing so important? While it's very easy to go with what you think looks good, at the end of the day, you need to think of your learners and their overall learning experience and make sure they can easily navigate through the eLearning course. If your users can't find information easily or can't navigate quickly through the interface, they will be dissatisfied. Very simply, it can make the difference between performing a task accurately and completely or not, and enjoying the process or being frustrated.

As an organization, if you do have the access to it, user experience testing is highly recommended as it allows you to test your eLearning course from the point of view of a real user. It is about understanding what works and what doesn't as a user interacts with the interface, and then fixing it!

4.2 Tips for Conducting User Experience Testing

While we did not have access to external users, we did conduct a small user experience testing trial with internal employees on our own multi-device eLearning demo courses. We made sure to include team members from different domains of our company to get a more balanced feedback.

Based on our experience, here are some tips on how to conduct user experience testing.

Gather an adequate user sample

Make sure your sample size includes enough people to test your eLearning course so that you find common themes among the results or feedback. This ensures that you have more accurate information to base your decisions on.

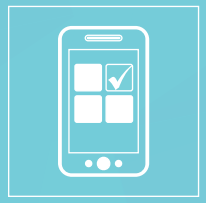
Provide users with background information

Brief your users and tell them why they are there and why they have been chosen to participate in the user testing exercise. This allows your users to see the big picture and provide useful feedback.

4.2 Tips for Conducting User Experience Testing

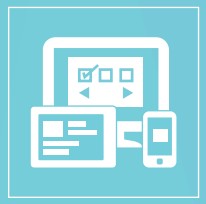
Give users clear instructions

Tell your users what they need to do and how they need to go about it. Giving them these instructions ensures that they are able to perform the task at hand without any hindrances.



Provide users with the correct course

Always give your users a course that is complete and has been through quality testing. If you give them a course with major bugs or issues, they will not be able to provide complete and thorough feedback.



Ensure your users have all the equipment they would need

If your users are going to be testing a course with audio, ensure that they have headphones. If your users are required to launch the course from the LMS, ensure that the LMS page is already loaded on the device.

Interact with your users

Ask your users if they are comfortable with the task they need to perform or if they have any questions or concerns. Interact with them to pick up on their actions as well as their emotional responses **while** they are performing the task rather than at the end of it.

4.2 Tips for Conducting User Experience Testing

Inform users how their feedback will be used

Tell your users what you intend to do with the findings or feedback you receive at the end of the user experience testing. This way your users know that the time they have invested towards the exercise is going to be used in a productive manner.

We found that user testing can bring out feedback on a variety of aspects, including but not limited to:

- How much and what type of information to provide, and at what point, to correctly set learner expectations
- Design aspects related to usability like affordance, visual cues, target touch areas, visibility of text entry boxes, indication of presence of content below the visible screen area on touch devices and even consistency of controls
- Sufficiency and clarity of learner instructions and interactive element labels
- Content presentation and layering, including with regards to clarity of visual representations and metaphors and ease of understanding and assimilation

5.0 CONCLUSION

To bring this to an end, no one can deny the growing demand for responsive design and with that no one can deny the importance of testing for responsive eLearning. Multi-device testing comes with its own set of considerations, issues and challenges. One of the biggest challenges is testing thoroughly on the wide range of devices, browsers, operating systems, connectivity modes and platforms. And, not only do you need to have the infrastructure, but also the experience and expertise along with a disciplined quality assurance process to ensure the package is considered 'good-to-go'.

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7.0 AUTHORS

With 8 years of experience in the testing field, Anushka heads a team of quality testers at Upside Learning. With a key responsibility of maintaining quality on all projects, she also supports QA team members on process-related tasks.

Anushka has worked on more than 65 projects with different technologies and tools, such as Flash, HTML, Articulate, Captivate, and Lectora, for multi-device platforms. She is responsible for defining the testing strategy for all new project types, conducting testing activities for new as well as internal projects, and is involved in R&D too.

Anushka holds a Bachelor's Degree in Computer Applications from Bhopal and Diploma in Software Testing from SEED Infotech, Pune.

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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.

Geera Bellare AVP Learning Design

8.0 ABOUT UPSIDE LEARNING

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We offer:

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- **Custom mLearning** - Tailor-made solutions for smartphones and tablets
- **FRED** - Framework for Responsive eLearning Development
- **Multi-device testing lab** – Testing services for responsive courseware

We have been consistently picking up awards and other recognition every year and today, boast of 30+ such awards and recognitions received from renowned bodies in eLearning and technology. These include Brandon Hall Research, Training Industry, Chief Learning Officer (CLO), Deloitte, Red Herring, APEX to name a few.

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