

# DESIGNING FOR MULTIPLE DEVICES: NEW CHALLENGES IN VISUAL COMMUNICATION

**Chrysoula Gatsou**

Technological Institute of Athens, Athens, Greece

Email:cgatsou@teiath.gr

## Abstract

Nowadays, digital technologies are being integrated in everyday environments. Modern devices such as smartphones, laptops and tablets allow users to access and interact with digital information via the internet virtually anywhere, anytime. This access to digital information is achieved through the visual communication of the interface. Therefore keeping the visual design consistent across the different devices is a concern that is so far not handled sufficiently. In this paper we present design practices as responsive, adaptive and mobile first design and recommend four factors for successful multiple device interaction.

**Keywords:** multiple devices, visual communication, user experience

## 1 Introduction

Interface of mobile devices plays an important role in user performance. In semiotic terms interface acts as a code which transmits cultural messages in a variety of media. It can also be described as a cultural artifact that functions as a medium for communication, directly as well as indirectly. According to a recent study by Google our time online is spread across four device types (PC/laptops, TVs, tablets, smartphones). Managing information across such devices is one challenging aspect of using multiple devices. Using mobile devices for accessing information enforces various challenges on both designers and users, since mobile devices have limitations due to different size of display. This noticeably reduces the amount of information, which can be presented (Chittaro, 2006). Users will not want to keep in mind three or four completely different interface paradigms in order to operate their devices in different environments. There will need to be a connection between the metaphor and the look and feel even though the devices may be operating in the office, or in a noisy street, as mobile user's attention is not fully focused on the screen, but divided among a primary activity and other factors besides interacting with the interface. The main purpose of interface should be to provide a better overall user experience (Gatsou et al., 2012). A consistent approach to multi device design in which users have the same essential experience with the same content and features poses new challenges to designers in the field of visual communication and user experience. By reflecting on these issues, we will be able to better understand the role of visual communication and artifact use in different mobile devices and identify the opportunities for the development of appropriate interface solutions to support users.

This paper is organized as follows. We begin by presenting the theoretical background for this work. Then it presents design practices for multiple devices as responsive, adaptive and mobile approaches and proposes four principles for successful multiple device interaction. Finally, we present our conclusions.

## 2 Background

### 2.1 Multi device World

We live in Multi-device world where people own multiple devices and use them interchangeably. Digital technologies are being integrated in everyday environments. From laptops and desktops to smartphones and tablets, 90% of all media interactions today are screen-based, and allow us to access and interact with digital information via the internet virtually anywhere, anytime. People are shifting from device to device and expect products and services to move with them. Designing for multiple devices requires versatility and rationale in addition, it involves even more than simply resizing content to display on

different screens (Lavin, 2014). Figure 1 displays different devices and different screen sizes.

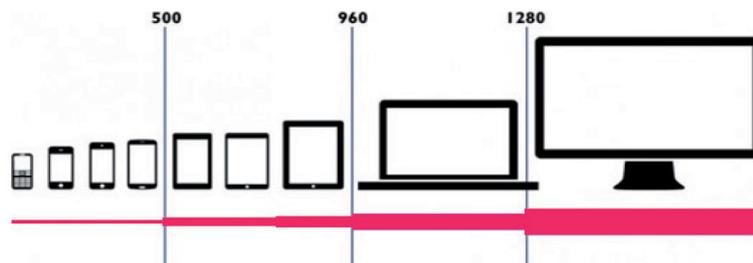


Fig.1. Different screen sizes – different devices

## 2.2 From a semiotic point of view

Nadin (1988) points out that “Design principles are semiotic by nature. To design means to structure systems of signs in such a way as to make possible the achievement of human goals: communication ...” It is clear that the interface plays an important role in enabling people to engage with multi device word. In *Interface Cul-ture*, Johnson (1997) argues that the interface is the most important cultural form of our time, comparing it to postmodern cultural and aesthetic forms. Visual interface design can complement or distract from the main message in an unlimited number of ways.

In semiotic terms interface acts as a code which transmits cultural messages in a variety of media. It can also be described as a cultural artifact that functions as a medium for communication, directly as well as indirectly. The concern of both cognition and culture are central to semiotic analysis with the interface being seen as a message sent from designer to user (de Souza et al., 2001).

## 2.3 Cross platform interaction

When users interact with mobile devices they form a communication system with two parts and a communication channel between them. Screen size limits the capacity of the communication channel. Managing information across multiple devices is a challenging aspect for effective visual communication. The limited size requires more careful consideration of what information is most important to show, compared to design for desktop web. The majority of online users are now cross-platform. They are spending more time with digital content across multiple devices. Engagement with content varies by time of day. The design of multi device interface is more complicated. Different approaches to mobile interface design attempt to solve the problem in different ways but they all need to be aware of the limited channel communication capacity. The aim is usually to make the different interfaces feel like a family, rather than on how devices work together as a system.

## 2.4 User experience

Buxton (2007) considers the user experience to be made up from a combination of visual and experiential aesthetics and usability and he points out that “the purpose of physical objects is to “engage us in an experience – an experience that is largely shaped by affordances and character embedded in the product itself”. Latest mobile technology products, like personal computers, tablets and smartphones, are designed by teams with individuals from a variety of disciplines, but very few of them are trained in defining the overall user experience. Their knowledge of the influence of user experience and their ability to estimate ease of use is limited. User experience is a part of every interaction between user and system. When designing interactive systems it is important to understand what creates a particular experience. This will result in products being not merely utilitarian but enhancing the quality of experiences (Preece et al., 2007). A shift in the design activity that aimed to include the user in the design process prompted the need to understand the user through methods that allow access to the

user's experiential world (Wright & McCarthy, 2008). It is required to maximize the user experience for all devices thus users consider that the application was in fact designed for their devices instead of being just extended to fit the screen on their devices.

### 3 Design approaches

With the effusion and variety of mobile devices, designers need to provide variety of screen sizes. This is a challenge that every web and app designer currently faces. From the smart TV to the smartwatch, there are a huge number of ways that users can access information online in the present day. Designers trying to bridge the gap between devices have the following options for their designs.

#### 3.1 Responsive Design

Responsive design is a design that reconstructs its content to fit in different screen sizes. It is a term introduced by Ethan Marcotte and essentially means fluid grids, fluid images and media queries to achieve resolution independence. Responsive is based on HTML standard (CSS3).

Key characteristics

- Viewport changes:

Images resize automatically

Column widths resize automatically

- Breakpoints:

Multi-column layouts automatically switch to single column layouts

Navigation controls change position or presentation

Page elements change position or disappear altogether

A good responsive design will present the same flow of information on all devices, releasing authors to concentrate on the hierarchy of their content. If the hierarchy is maintained, the same content will make sense and feel correct, regardless of the device being used. Nevertheless, responsive design does not achieve full adaptivity. Responsive Design is not compatible with all browsers. Responsive design is considered to be a subset of adaptive design is limited to providing an optimal viewing experience in a cross-platform context (laptops, mobile devices, desktops). Figure 2 displays how a mobile application of a newspaper looks like in different devices through the use of responsive design.

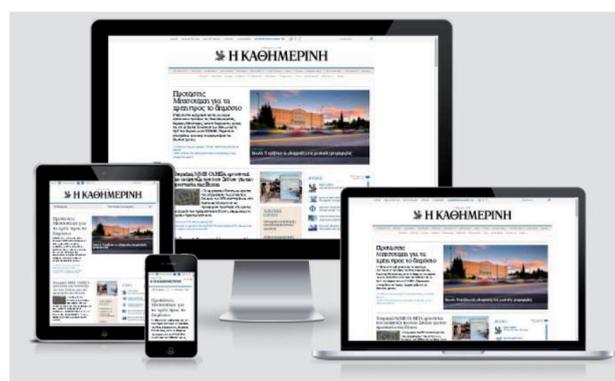


Fig.2. Responsive design (Greek daily newspaper)

#### 3.2 Adaptive Design

Adaptive Design was introduced in 2011 by web designer Aaron Gustafson in his book, Adaptive Web Design: Crafting Rich Experiences With Progressive Enhancement. It is also known as progressive

enhancement of a website. Both responsive and adaptive design attempt to optimize the user experience across different devices. Adaptive design is more like the modern definition of progressive enhancement. Instead of one flexible design, adaptive design detects the device and other features, and then provides the appropriate feature and layout based on a predefined set of viewport sizes and other characteristics. Adaptive design requires the creation of many different versions of each web page and also is useful for modifying an existing site in order to make it more mobile friendly. This lets you to control the design and develop specific, multiple viewports. Basically, you have three different versions of your site prepared.

- A desktop site.
- A tablet site.
- A mobile site.

### 3.3 Mobile First Approach

Firstly introduced in 2009 by Luke Wroblewski, the mobile-first concept purports that the mobile version of a website should be at the heart of the design strategy and take into account the constraints and user browsing behavior on mobile devices. Instead of being concerned with device breakpoints, the best practice is to design for your smallest viewport first. The Mobile First paradigm diverts our minds from thinking about the unnecessary ornaments at the beginning and helps us focus on the most important tasks that the user wants to accomplish.

The most important thing about this approach is that it forces you into a content hierarchy. The most important piece of content is on top, followed by the next. Unlike a desktop approach where you can put two pieces of content side by side for equal footing, a first mobile approach means one is above the other. The challenge is that designers' basic concept is to create an interface that works on multiple screen sizes, most commonly to work well on at least three different screen sizes — a small mobile screen, a tablet-sized screen, and a larger desktop computer monitor.

## 4 Factors affecting visual communication and multiple devices

Based on this study and drawing from visual communication theory, interaction design, user experience and practice, we recommend the following factors that affect user's interaction with multiple devices. The following factors are shaped to serve as a guide in creating familiar user experiences for a multi device connected world. In Figure 3 there is an illustration of these factors.

### 4.1 Consistency

According to Jacob Nielsen, (1999) "Users should not have to wonder whether different words, situations, or actions mean the same thing. Follow platform conventions". Appropriate consistency across interfaces and interactions. A consistent visual and aesthetic style across all devices reinforces the perception of a coherent service. Words, data, and actions that are the same across devices should be understood to be the same. Where visual elements also convey meaning it is vital that they are used in the same way. This is semantic consistency. With multi-device consistency, Denis & Karsenty (2004) refer to perceptual, lexical, syntactical and semantic consistency.

- Perceptual consistency refers to appearance and structure of information, graphics and the order in which information is presented.
- Lexical consistency addresses labels and user interface objects.
- Syntactical consistency refers to the availability of the same operations on each device to attain a given goal. Semantic consistency covers partition of data and functionality.

The 'look and feel', terminology and symbols as well as interaction logic (navigation and the way certain operations are performed) should be as consistent as possible across devices and platforms. The same navigation structure and organization can remain consistent across all devices, keeping the interface adjustments between devices mostly visual.

## 4.2 Continuity

Continuity refers to the systems' ability to support carrying out transitions between platforms (Rowland et al., 2015). Continuity is supported by consistency in that it helps users transfer their skills from one use situation to another (Nielsen, 1989).

In multi device interaction design, continuity refers to the flow of data and interactions in a coherent sequence across devices. The user should feel as if they are interacting with the service through the devices, not with a bunch of separate devices.

## 4.3 Content hierarchy

If the website is not designed correctly, some of the most important content can end up at the bottom of the page, requiring a long or too long scroll to reach. Assigning priority levels to content creates a structure that assures the most important content rises to the top. The distribution of visual weight should be balanced to make a design feel stable.

- Visually dominant images get noticed most
- Focal point, center of interest

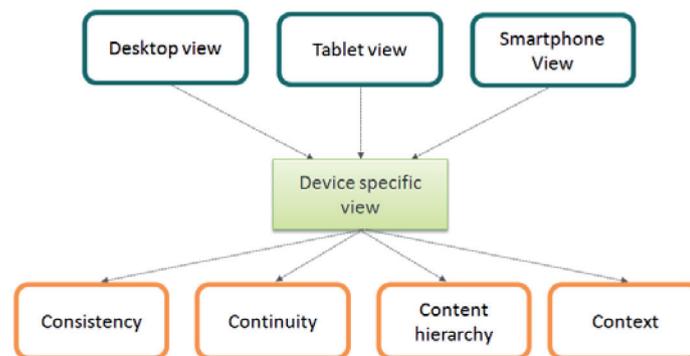


Fig.3. Factors affecting visual communication and multiple devices

## 4.4 Context

The dynamics of cognitive processes involves the vast number of contexts in which the meanings are constructed. Therefore what something means to an individual depends very much on the context of the interaction. In regard to how users and designers perceive the meaning of products, Krippendorf (2000) suggested that "objects are always seen in a context (of other things, situations and users, including the observing self)". Context can influence user interaction at different levels. For example, it can contribute very strongly to whether an experience is positive or negative or to how far users accept the service in question. As Macdonald (1998) stresses, visual symbolism is not universal. Perception, recognition and acceptance of an object is determined by the context in which it is used and by the nature and cultural conditioning of the user. Multiple contexts can interact with each other in ways that are not fixed. Preece et al., (2007) define context of use as "the circumstances in which the interactive product is expected to operate", and include the social, technological, organizational and physical environment. Buxton (2007) argues that technologies do not exist in a vacuum. In any meaningful sense, they only have meaning, or relevance, in a social and physical context.

## 5 Conclusions

It's obvious that we're moving towards an interconnected world populated by a numerous of devices such as desktops, laptops, smartphones, tablets and other personal devices. Having multiple devices and

access enables us to interact and experience information in ways that fit who we are.

In this paper we have presented design approaches and factors which affect cross-platform environments and may influence user experience. The better our understanding of users and their needs, as well as possible interaction models, the better our design solutions. Even though a lot of design principles could be the same, they get applied differently on different devices. The design approach should take into consideration the capacity of the communication channel between the user and the device and offers a start point for designing multi device user interfaces. To manage cross platform interaction design I consider that the factors of consistency, continuity, context hierarchy and context might be useful to the mobile design community, especially in regard to the design and display of multi screens.

We believe that designing and developing applications for cross platform interaction is an exciting and promising area of future research for a multi device world.

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