e-Revista LOGO

# Creativity in mobile application design: the guideline issue

Criatividade no design de aplicativos mobile: a questão das diretrizes

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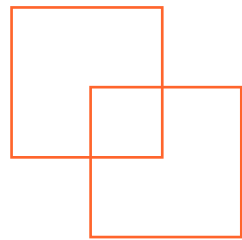
Abstract

Guidelines are common in design projects for mobile devices. There are different types of guidelines, from general recommendations to specific rules that must be followed. Although the guidelines are generally designed to help designers and developers create effective interfaces, they can also restrict their creativity. The purpose of this article is to discuss the influence of the guidelines on the creativity of mobile application design. In addition, it also describes the pros and cons of using guidelines in mobile application design. It uses as case studies the guidelines of the two major operating systems currently in use: Android and iOS. Finally, it provides some suggestions on how to design creative mobile apps using design guidelines (or not).
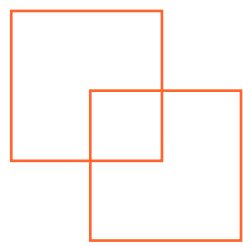
Keywords

Design creativity; Design guidelines; Mobile applications.

Resumo

Diretrizes são comuns em projetos de design de aplicativos para dispositivos móveis. Existem diferentes tipos de diretrizes, desde recomendações gerais até regras específicas que devem ser seguidas. Embora as diretrizes geralmente sejam projetadas para ajudar designers e desenvolvedores a criar interfaces eficazes, elas também podem restringir sua criatividade. O objetivo deste artigo é discutir a influência das diretrizes na criatividade do design de aplicativos para dispositivos Além disso, também descreve os prós e contras do uso de diretrizes no design de aplicativos para dispositivos móveis. Ele usa como estudos de caso as diretrizes dos dois principais sistemas operacionais atualmente em uso: Android e iOS. Por fim, ele fornece algumas sugestões sobre como projetar aplicativos móveis criativos usando diretrizes de design (ou não).

Palavras-chave

Criatividade em design; diretrizes em design; aplicativos para dispositivos móveis.
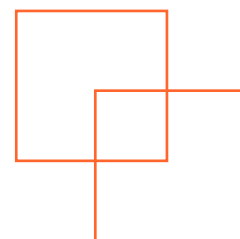
1 Introduction

Guidelines are used in different contexts (e.g. practice code, exams) and areas (e.g. medicine, government). The Human-Computer Interaction (HCI) guidelines, also known as the Human Interface Guidelines, are generally a set of software and/or application recommendations that aim to help designers and developers create effective interfaces and thus improve the user experience. Guidelines also help designers to implement a principle (Interaction Design Foundation, 2018), but guidelines are a "context-dependent policy", while design principles are a "fundamental rule or law" (Fu et al., 2016).

Guidelines also serve to create consistency within the application and the platform for which it is designed. Consistency is considered one of the key principles in interface design (Nielsen, 1994; Norman, 1988; Shneiderman, 2016). For example, Shneiderman (2016) argues that consistent color, layout, fonts, and so forth must be employed everywhere. He claims consistency can help users familiarize themselves with the interface and thus reach their goals more easily.

However, guidelines can also restrict the creativity of designers and, as a consequence, create applications that look the same, similar to one other rather than being originals. Creativity requires originality and effectiveness (Howard, Culley, Dekoninck, 2008; Runco and Jaeger, 2012) and is considered a key factor for the knowledge society (Lindberg, Danilda, Torstensson, 2012). In application design, creativity can be the success factor of the application. There are many applications that have the same functions and provide the same elements, so what is it that can make the difference? The innovative and creative design may be the answer. Providing users with what they need in an easy-to--use, effective and attractive interface can be the key to the prosperity of the application.

The purpose of this article is to discuss the influence of the guidelines on the creativity of mobile application design. First, it provides a description of the pros and cons of using guidelines in mobile application design. Next, the relationship between creativity in design and design guidelines is discussed. This is followed by case studies of design guidelines from two operating systems. Finally, it concludes with some suggestions on how to design creative mobile apps using design guidelines (or not).
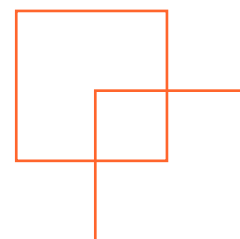
2 Design guidelines for mobile applications

Guidelines are used in different contexts (e.g. practice code, exams) and areas (e.g. medicine, government). The Human-Computer Interaction (HCI) guidelines, also known as the Human Interface Guidelines, are generally a set of software and/or application recommendations that aim to help designers and developers create effective interfaces and thus improve the user experience. Guidelines also help designers to implement a principle (Interaction Design Foundation, 2018), but guidelines are a "context-dependent policy", while design principles are a "fundamental rule or law" (Fu et al., 2016).

Guidelines also serve to create consistency within the application and the platform for which it is As mentioned in the introduction, guidelines are generally a set of recommendations designed to help designers and developers create more effective interfaces. There are several guidelines for mobile applications for a specific type of application, such as health (Ruzic et al., 2016) or accessibility problems (W3C, 2018); others focus on users' characteristics such as age (Zaphiris, Kurniawan, Ghiawadwala, 2007), and still others are for a specific operating system (Apple, 2018, Google, 2018, Microsoft, 2018). While it seems relevant to have specific guidelines for different contexts and purposes, their very specificity can make it difficult for designers and developers to choose, understand, and apply them.

Several authors have discussed the pros and cons of using design guidelines. Among the advantages of using the guidelines are the fact that they can help designers and developers create a more consistent interface, a more accessible interface, and an interface with fewer usability issues. Henninger, Haynes, and Reith (1995) point out that guidelines can shorten the number of iterations involved in the development process (design-evaluate-redesign). In addition, Kim (2010) states that guidelines can reduce designers' mental stress, increase productivity, improve interoperability between applications, product quality, and aesthetics.

On the other hand, it is recommended that designers be cautious in the use of guidelines, since it may be difficult to interpret and apply them (De Souza and Bevan, 1990, Kim, 2010). Moreover, they are sometimes considered "too wordy", "too general" and "too hard to understand" (Campbell, 1996). Souto (2009, 2017) states that there are contradictory guidelines, some that are applied to one type of medium and may not be appropriate for use in another type, and others that have not been tested and are based only on professional experience and, therefore,
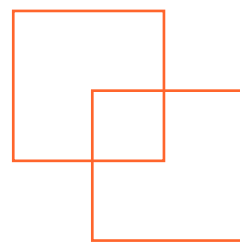
may not be reliable. In addition, guidelines may be inappropriate for a specific project context, may make the interface look similar to others, and may inhibit creativity.

As with any other type of media, the guidelines for mobile applications should take into account the specifics of the device, the usage context, and so on. Therefore, it is important to understand the key features of mobile applications. Muccini, Francesco and Esposito (2012) point out 10 peculiarities of mobile applications: (1) mobile connectivity, (2) limited resources, (3) autonomy, (4) user interface [UI], (5) context awareness, (6) adaptation, (7) new programming languages, (8) new O.S.s, (9) diversity of phones and O.S.s, and (10) touch screens.

They also propose a classification of mobile applications into two different categories: traditional applications rewritten to run on mobile devices (e.g. web search, social networking applications), and mobile applications that use contextual information to generate context-based outputs and rely on data (e.g. noise, motion, GPS, Wi-Fi). Regarding the guidelines, they argue that user interface guidelines are "a first-class testing need in mobile applications". They explain that mobile applications may look different depending on the resolution and dimension of the mobile device and also that different mobile devices may react differently to the same application code.

With a different approach, Flora, Wang, and Chande (2014) differentiate "mobile application types" from "mobile application categories". According to them, there are four types of mobile applications: browser access applications (i.e. applications that are not installed on the device and can be accessed through the native browser), native applications (i.e. applications that are installed on the device and do not need to transfer data to the server), hybrid app Web (i.e. applications that are installed on the device and always require Internet connection) and hybrid app mixed (i.e. applications that are installed on the device and may or may not require Internet connection). Mobile application categories are divided into seven main groups: communications (e.g. e-mails, mobile/internet browsers), games, multimedia (e.g. audio and video players), productivity (e.g. calendars and calculators), travel (city guides and currency converters), utilities (address book and mobile search), and education (alphabet, numerical).

Based on a survey of key features and characteristics that differentiate mobile applications from conventional desktop applications, Flora, Wang, and Chande (2014) proposed a classification of 24 mobile application characteristics divided into three main categories: hardware, sof-

tware (application interaction, application development, and application security) and communication. Table 1 shows the main characteristics of mobile applications, as proposed by Flora, Wang, and Chande (2014).

Table 1. Characteristics of mobile application by Flora, Wang and Chande (2014).

Characteristics related to hardware		Less power, input mechanism, screen size and form factor, start-up time, physical parameters, device fragmentation
Characteristics related to software	Application interaction	User experience, user interface, interaction with information sources, integration with other apps, action feedback, error notification;
	Application development	Application focus, experienced resource, convenience, responsiveness, personalization, localization, reachability;
	Application security	Encryption, expire sessions, request validity period, prevent repeat request;
Characteristics related to communication		Network connectivity

Adapted from Flora, Wang and Chande (2014).

The authors argue that it is important for the mobile development community to understand the differences between desktop applications and mobile applications since the former are generally used in long sessions that provides an exploratory environment, while the latter provide a focus and experience to accomplish specific tasks in short sessions.
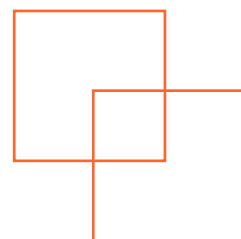
As it is possible to observe, the user interface is just one of many features of mobile applications. In addition, they are integrated with others and therefore should be considered as a whole. When considering design guidelines for mobile devices, designers and developers should keep in mind the various aspects related to the mobile application. Considering all these aspects and at the same time trying to comply with some guidelines is a challenge, especially when creating an application that not only innovates in function but also in visual appearance.

3 Creativity and guidelines in mobile design

Creativity in design is considered a key theme that addresses social problems and requires an appreciation for beauty and happiness (Nagai and Taura, 2015). For mobile applications, design creativity can be the main aspect that differentiates the application from its competitor and that leads to the success of the application.

To be creative, designers need to have some skills. Based on previous research, Kim, Shin, and Shin (2011) identified five elements of design creativity: fluency, flexibility, originality, elaboration, and sensitivity to the problem. Fluency is related to the ability to produce various ideas. This can help designers not to stick to an idea and escape from ready-made solutions, especially from some templates created to help designers, but which can induce them to create repetitive interfaces. Flexibility (i.e. the ability to change ideas from different sets) and originality (i.e., the ability to produce rare and new ideas) are two key skills that are essential for producing innovative applications. Elaboration (i.e. the ability to realize ideas in detail) and problem sensitivity (i.e. problem-solving skills) are skills that can lead to effective and efficient mobile applications, working on the details of the project and considering the problems of the project.

These skills are necessary for designers to successfully engage in the creative process and can be instrumental in creating innovative products. In mobile application development, they should be used in alignment with design guidelines. While it can be argued that design guidelines can dismiss creativity as they can impose a number of constraints on the design, it is also possible for designers to view them as allies and use the guidelines as a stimulus to break with outworn conventions and propose an innovative application approach.

Designers should consider that constraints are inherent to the vast majority (if not all) of the projects. Mobile application design projects can be limited by issues related to a problem, context, technology,
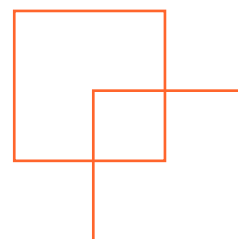
environment, user, content, financial constraints, designer knowledge, and so on. Therefore, the design guidelines for mobile devices are just another constraint to the project and should not restrict creators from being creative. For example, the minimum tappable area recommended by operating systems may limit the interface layout. However, the designer may see this as an opportunity to propose a pattern that is not common in mobile application design following this recommendation or even may not apply the minimum area if the designer has a good reason to do so. For example, in mobile games, some guidelines are not possible for game narrative and/or game functionality, and therefore some guidelines are not applied.

It is also relevant to draw attention to the fact that some guidelines are abstract and allow the interpretation of designers. For example, the "use of touch gestures to create fluidity" guideline (Apple, 2018) can make designers think of touch gestures and create ideas by proposing solutions that include new approaches to touch gestures.

4 Case study: Android and iOS guidelines

The most commonly used mobile operating systems are Android, developed by Google (71.6%) and iOS, developed by Apple (19.5%) (Statcounter, 2017). In order to discuss the influence of the guidelines on the creativity of mobile application design, the most commonly used mobile operating system guidelines will be reviewed. Initially, each will be briefly described, followed by a discussion.

4.1. Guidelines for Android: Google Material Design

Android is a mobile operating system developed by Google, and it is about 10 years old. Design guidelines for the Android system have been updated, and since 2014 they have been using design guidelines called Material Design. Material Design is "an adaptable system of guidelines, components, and tools that support the best practices of user interface design" (Android, 2018), and has also undergone continuous updates (the latest is May 2018). The guidelines state that designers and developers must follow "material design guidelines" for visual and navigation standards and "quality guidelines" for compatibility, performance, security, and so on.
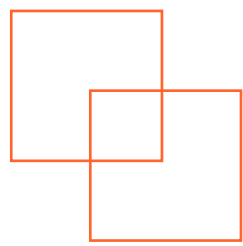
Material Design has three main goals: create, unify and customize; and five main principles: material is the metaphor; bold, graphic, intentional; motion provides meaning; flexible foundation; and cross-platform. Tables 2 and 3 show the description of each goal and principle of Material Design.

Table 2. Goals of Material Design by Google. https://material.io/design/introduction

Goals	Description
Create	"create a visual language that synthesizes the classic principles of good design with the innovation and possibility of technology and science".
Unify	"develop a single underlying system that unifies the user experience across platforms, devices, and input methods".
Customize	"expand Material's visual language and provide a flexible foundation for innovation and brand expression".

Table 3. Principles of Material Design by Google. https://material.io/design/introduction

Principles	Description
Material is the metaphor	"Material Design is inspired by the physical world and its textures, including how they reflect light and cast shadows".
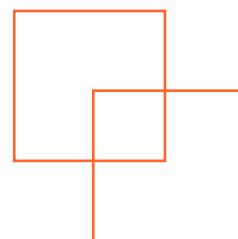
Bold, graphic, intentional	"Material Design is guided by print design methods — typography, grids, space, scale, color, and imagery — to create hierarchy, meaning, and focus that immerse viewers in the experience".
Motion provides meaning	"Motion focuses attention and maintains continuity, through subtle feedback and coherent transitions".
Flexible foundation	"The Material Design system is designed to enable brand expression. It's integrated with a custom code base that allows the seamless implementation of components, plug-ins, and design elements".
Cross-platform	"Material Design maintains the same UI across platforms, using shared components across Android, iOS, Flutter, and the web".

The new version of the material design is divided into three main sections: design, develop, and tools. The Design section is divided into the material system, material foundation, and material guidelines. The material system presents the goals, principles and material studies (i.e. studies that "explore real-world design and product limitations through the examination of a set of fictional apps"). Material foundations present the foundations "that address design from both a broad and detailed perspective", and they include environment, layout, navigation, color, typography, iconography, shape, motion, interaction and communication. Material guidelines also include Material Theming (i.e. tools to customize Material Design) and Material Studies. Table 4 shows the main topics and subtopics of the materials system, materials foundation, and material guidelines.
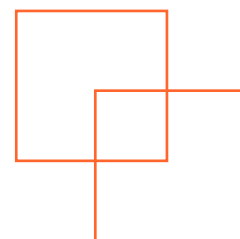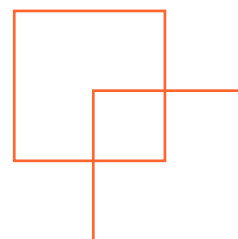
Table 4. Material system, material foundation, and material guidelines: main topics and subtopics

Material system	Introduction	
	Material studies	About our Material studies. Basil, Crane, Fortnightly, Owl, Rally, Reply, Shrine
Material foundation	Foundation overview	
	Environment	Surfaces, Elevation, Light and shadows
	Layout	Understanding layout, Responsive layout grid, Spacing methods, Component behavior, Density
	Navigation	Understanding navigation, Navigation transitions, Search, Color
	Color	The color system, Applying color to UI, Color usage, Text legibility
	Typography	The type system, Understanding typography, Language support
	Iconography	Product icons, System icons, Animated icons
	Shape	About shape, Shape and hierarchy, Shape as expression, Shape and motion
	Motion	Understanding motion, Speed, Choreography, Customization
	Interaction	Gestures, Selection, States
	Communication	Confirmation & acknowledgement, Data formats, Empty states, Help & feedback, Imagery, Launch screen, Onboarding, Writing, Offline states
Material Guidelines	Guidelines overview	
	Material Theming	Overview, Implementing your theme
	Components	App bars: bottom, App bars: top, Backdrop, Banners, Bottom navigation, Buttons, Buttons: floating action button, Cards, Chips, Data tables, Dialogs, Dividers, Image lists, Lists, Menus, Navigation drawer, Progress indicators, Selection controls, Sheets: bottom, Sheets: side, Sliders, Snackbars, Tabs, Text fields, Tooltips
	Usability	Accessibility, Bidirectionality
	Platform guidance	Android bars, Android fingerprint, Android haptics, Android icons, Android navigating between apps, Android notifications, Android permissions, Android settings, Android split-screen, Android swipe to refresh, Android text selection toolbar, Android widget, Cross-platform adaptation

(Google, 2018). https://material.io/design/

Material system

Design material seems to be quite complex, with many topics and subtopics. It looks like a system manual with some guidelines. For example, in the topic "material guidelines", first the guideline overview is presented, then the material theme, followed by the components, then a topic called usability, and finally platform guidance. Each one of these topics has many subtopics. Inside the topic components, for example, there are 24 second-level subtopics and many third-level topics. In the component called the Apps bar: bottom, there are 6 third level topics: Usage, Anatomy, Behavior, Theming, Specs, and Implementation. These subtopics are common in many of the components. With the Usage

topic there is information on what the bottom app bar is, its principles when to use it, and an example of Do and Don't:

- Do. Use a bottom app bar to provide convenient access to actions
- Don't. Don't use a bottom app bar on screens with one or no actions (other than a FAB).

Table 5 shows examples of Material Design guidelines.

Type of material	Topic level 1	Subtopic level 1	Subtopic level 2	Title of the subsection 1	Title of the subsection 2	Guideline
Material Foundation	Typography	Type scale	Applying the type scale	Button		"Don't use expressive fonts for body text".
Material Guidelines	Components	Banner	Anatomy	Banner container		"Only one banner should be shown at a time".
Material Guidelines	Usability	Accessibility	Layout and Typography	Touch target spacing		"In most cases, touch targets should be separated by 8dp of space or more to ensure balanced information density and usability".
Material Guidelines	Components	Sheets bottom	Behavior	Visibility	Full-screen	"Do. Partially visible bottom sheets can be dragged to full-screen view and scroll internally".

Table 5. Examples of Material Design guidelines – including hierarchical levels
(Google, 2018). https://material.io/design/type of material

Designers should study each of the three main sections to create the interfaces. Material Design also provides Material Theming, Material Studies, and Tools. While these materials are very useful, helping designers with templates and instructions, they can inhibit designers' creativity by encouraging easy and ready-made solutions. The guidelines are mixed with informative text about the system, which makes it difficult for designers to apply them. There are many "do's" and "don'ts" that are explained by pictures, and therefore it is easy to understand the guidelines. However, they sound restrictive and can also inhibit designers' creativity.
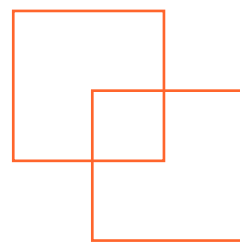
4.2 Guidelines for iOS: Apple's Human Interface Guidelines

Apple's Human Interface Guidelines (HIG) are detailed information and user interface resources for design applications that integrate with Apple platforms (Apple, 2018). Ginsburg (2011) states that creating applications that follow the Human Interface Guidelines will make users learn the application more easily. The iOS guidelines are divided into nine main topics, plus the iOS topic, which contains information on iOS Design Themes, iPhoneX, and interface essentials.

According to the guidelines, the three main themes that differentiate iOS from other platforms are clarity, deference, and depth. They also present six main principles to follow when designing iOS applications. They are aesthetic integrity, consistency, direct manipulation, feedback, metaphors and user control. Tables 6 and 7 show the explanations of themes and principles, respectively.

Table 6: iOS Design Themes and brief description

iOS Design Themes	Brief description (partial text)
Clarity	"Throughout the system, text is legible at every size, icons are precise and lucid, adornments are subtle and appropriate, and a sharpened focus on functionality motivates the design."
Deference	"Fluid motion and a crisp, beautiful interface help people understand and interact with content while never competing with it."
Depth	"Distinct visual layers and realistic motion convey hierarchy, impart vitality, and facilitate understanding."

(The description has been cut from the original posted on the Apple website. https://developer.apple.com/design/human-interface-guidelines/ios/overview/themes/ iOS Design Themes
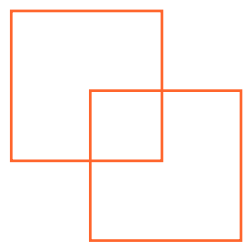
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Table 7. iOS Design Principles and brief description

| iOS Design Principles	Brief description (partial text)
Aesthetic Integrity	"represents how well an app's appearance and behavior integrate with its function".
Consistency	"A consistent app implements familiar standards and paradigms by using system-provided interface elements, well-known icons, standard text styles, and uniform terminology."
Direct Manipulation	"The direct manipulation of onscreen content engages people and facilitates understanding. Users experience direct manipulation when they rotate the device or use gestures to affect onscreen content."
Feedback	"Feedback acknowledges actions and shows results to keep people informed."
Metaphors	"People learn more quickly when an app's virtual objects and actions are metaphors for familiar experiences—whether rooted in the real or digital world".
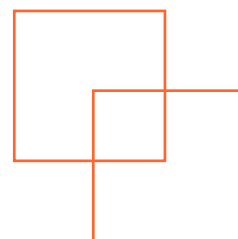
User Control	"Throughout iOS, people—not apps—are in control. An app can suggest a course of action or warn about dangerous consequences, but it's usually a mistake for the app to take over the decision-making".

(The description has been cut from the original posted on the Apple website. https://developer.apple.com/design/human-interface-guidelines/ios/overview/themes/

iOS Design Principles

The eight main topics are App Architecture, User Interaction, System Capabilities, Visual Design, Icons and Images, Bars, Views, Controls, and Extensions. Each of these topics contains from 5 to 13 subtopics, totaling 74 subtopics. Table 8 shows the main topics and subtopics of Human Interface Guidelines for iOS. In addition to these topics, it is also part of the Human Interface Guidelines content for macOS, tvOS, watchOS, technologies, Apple design features, and videos.

Table 8: Human Interface Guidelines for iOS: main topics and subtopics (Apple, 2018). https://developer.apple.com/design/human-interface-guidelines/ios/overview/themes/

Main topics	Subtopics
iOS	Themes, iPhone X, Interface Essentials
App Architecture	Accessibility, Loading, Modality, Navigation, Onboarding, Requesting Permission, Settings
User Interaction	3D Touch, Audio, Authentication, Data Entry, Drag and Drop, Feedback, File Handling, Gestures, Near Field Communication, Undo and Redo
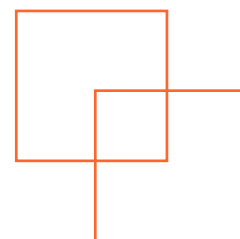
System Capabilities	Augmented Reality, Multitasking, Notifications, Printing, Quick Look, Ratings and Reviews, Screenshots, Siri, TV Providers
Visual Design	Adaptivity and Layout, Animation, Branding, Color, Terminology, Typography
Icons and Images	Image Size and Resolution, App Icon, Custom Icons, Launch Screen, System Icons
Bars	Navigation Bars, Search Bars, Status Bars, Tab Bars, Toolbars
Views	Action Sheets, Activity Views, Alerts, Collections, Image Views, Maps, Pages, Popovers, Scroll Views, Split Views, Tables, Text Views, Web Views
Controls	Buttons, Edit Menus, Labels, Page Controls, Pickers, Progress Indicators, Refresh Content Controls, Segmented Controls, Sliders, Steppers, Switches, Text Fields
Extensions	Custom Keyboards, Document Providers, Home Screen Actions, Messaging, Photo Editing, Sharing and Actions, Widgets

The complete guidelines are easily visualized since the subtopics are in an expanded menu that continues to expand, if the user presses the next topic. This is interesting because the user can view all 74 subtopics at once and therefore have an overview of the guidelines. Within each subtopic, a brief description of the topic is initially presented, followed by the guidelines and explanation of each topic. Examples of guidelines and their descriptions are shown in Table 9.
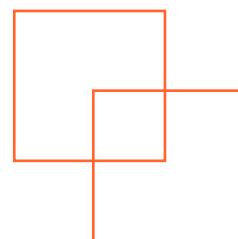
Table 9. Examples of HIG guidelines and their descriptions (Apple, 2018).

Subtopic	Guideline	Description
Animation	"Make animations optional".	"When the option to reduce motion is enabled in accessibility preferences, your app should minimize or eliminate application animations".
Image Size and Resolution	"Provide alternative text labels for images and icons".	"Alternative text labels aren't visible onscreen, but they let VoiceOver audibly describe what's onscreen, making navigation easier for people with visual impairments".
Toolbars	"Provide relevant toolbar buttons".	"A toolbar should contain frequently used commands that make sense in the current context".
Navigation Bars	"Consider showing the title of the current view in the navigation bar"	"In most cases, a title helps people understand what they're looking at. However, if titling a navigation bar seems redundant, you can leave the title empty".

https://developer.apple.com/design/human-interface-guidelines/ios/
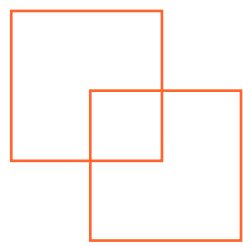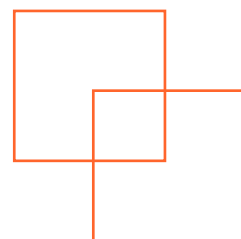
Subtopic

The guidelines are usually simple and easy to understand. Some of them are related to accessibility aspects, although they are not listed in the accessibility subtopics, such as the first two presented in Table 9. These, of course, are very important for consideration and application, unless there is a good reason not to apply them. There are also more "abstract" guidelines, such as the third in Table 9, as designers can interpret which toolbar buttons are relevant to the design. Other types of guidelines are those that are written "considering" something (example in Table 9). These clearly give an opportunity for the designer to reflect on the need to apply the guideline regarding their design needs.

4.3 Google's Material Design and iOS guidelines: influencing design creativity

By comparing the Material Design (Android guidelines) with the Human Interface Guidelines (iOs guidelines) it is possible to note that both include some restrictions for designing creativity. The Android guidelines have much more detail than the iOS guidelines. More details can mean more constraints and therefore less freedom to create a new design. However, the iOS guidelines also provide many recommendations that can affect user influence. For example: "Use a large headline when you need to give extra context emphasis". This guideline seems like an obvious piece of advice; however, raising the title is not the only option that works to emphasize the context. Following this guideline, designers may not think of other alternatives to emphasize context, and as a consequence, many applications may look similar.

There are several advantages to using these guidelines to create applications that will be used on one or both operating systems: they provide important information about the system, provide rules that must be followed, provide some general principles, and also provide information about the needs of users.

Helping to create a consistent interface can be one of the most important advantages of using design guidelines. As shown above (introduction section), rules or guidelines recommend using consistency so that users become familiar with the interfaces. It is important to distinguish consistency in the interface and consistency across different applications used on the same operating system. The first is related to using the same elements or layout (e.g. using the same icon style) within an application. The latter is related to the use of the same elements in diffe-

rent applications (e.g. using the icon with the same meaning and/or the same appearance as provided in the system model).

Interfaces consistent with the operating system create patterns and the same look and feel. In addition, consistency can provide an opportunity for designers to focus on other aspects that can innovate or think of a way to break consistency by creating a new type of configuration. For example, the convention is that three horizontal bars, called a triple bar or hamburger button, indicates a menu function. If designers decide to represent the menu with another symbol, this can cause confusion for users, and its consequences should be very well analyzed. However, there are many other elements for which designers may consider proposing a new visual approach with less "cost" for the user.

Another advantage of using guidelines for building applications is the time duration of product development. By using some system recommendations, designers can shorten the time to build the application, since guidelines provide information about how the system works, and about how some elements should be included for the application to work, among others.

Knowing the behavior of the user is also a type of information provided by the guidelines. This can be very useful in ensuring that the application design is not only innovative but also usable. For example, the Android guideline: "Typically, user interaction with a surface will stretch it in one direction. For example, tapping 'more details' can cause a card to grow vertically and display additional content". This guideline provides design information about the user interaction process.

5 Conclusions

Design guidelines are relevant for designers to create useful and effective applications. However, as discussed, they should be used with caution and knowledge, so they do not guide the designers to make the application look and feel like that of their competitors.

Design guidelines for applications may restrict designers' creativity, but there are ways to lessen that influence. First, designers should know the guidelines in depth. They should study the operating system design guidelines and also the other system's guidelines to understand the differences and new possibilities. Designers should try to distinguish between guidelines that are mandatory (i.e. those that should be used
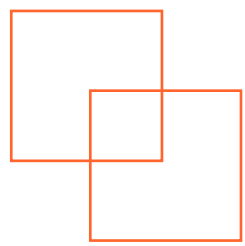
for the application to function) and those that would be reasonable to follow, but which can be broken for a good reason.

Designers should also question whether the guideline is appropriate for the context of their application. It may not be as relevant to this context or there may be other ways to achieve the same goal as that proposed by the guideline. Designers can use guidelines as a reference list and verify that all important aspects of the interface are considered. Designers can also use guidelines to learn about the system and users and thus feel confident to create and innovate.

Designers should understand the behavior, functions, and needs of users to create an effective application, and effective guidelines typically provide this information. Designers can use the guidelines as a tool, one of many they need to use during design. This can be a tool that provides general information about the system, users, and/or application-specific context. Designers should look for different alternatives and, instead of simply violating a guideline, they can replace it with a more suitable one. However, if designers feel confident that the best solution for creating an outstanding application is to break the guidelines, they should do so.

Acknowledgement

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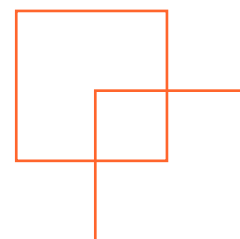
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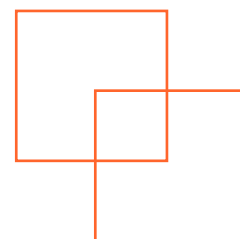
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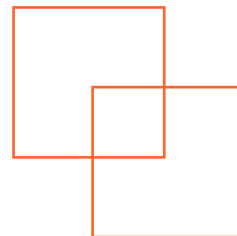
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