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Onboarding strategies for mobile applications

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Abstract

With the profound increase in user acceptance of mobile device usage, the transfer of Web applications to mobile devices has become of paramount importance. There are currently three approaches, which could be followed to this end, namely; native mobile, hybrid and Web applications methods. Whichever method is adopted, the user interface must be adjusted to accommodate specific features of mobile devices, as well as the different interaction styles. The essence is the smooth transition from the Web to the mobile environment, through an effective learning process.

The research problem is that users do not automatically adjust from using Web interfaces to successful interaction with those same applications on a mobile platform. The process of onboarding is a potential solution, since it can help them to get started with the application, converting them form first-time visitors to returning customers during the first interaction with the product. A number of strategies exist to this end, but sometimes with contradictory details.

The objective of this research was to identify current strategies and analyse their strengths and weaknesses. An empirical study was conducted to investigate these strategies, categorize them, and finally, evaluate them.

The results include a categorization of currently used onboarding strategies. Each category is discussed with its advantages and disadvantages, and guidelines on the applications are provided. It is expected that these results will play a positive role in supporting the strong trend towards mobile rather than desk-bound computer and application usage.

Keywords: Learnability, learning process, mobile application, onboarding, touch-screen user interface.

1.   Introduction

With the expansion of the mobile industry, the transfer of Web applications to mobile devices has become particularly important. One of the common problems from design and development perspective is that the user interfaces of mobile applications must be adjusted to

accommodate specific features of mobile devices and fundamentally different interaction styles. It presents a number of technical challenges, but it also has an impact on users, because the transition significantly increases the cognitive load.

This paper addresses the initial phase of a users' transition from Web interfaces to interacting with those same applications on mobile platforms. Due to the specific characteristics of mobile user interfaces, the user adjustment cannot be taken for granted. On the contrary, it requires careful design of communication and instructions. In user experience design, the process of helping people to get started with an application is referred to as onboarding.

A number of strategies exist to this end. The problem is that these strategies are rarely based on solid user research and understanding of the learning process. More often than not, they are based solely on trials and errors. The objective of this research is to identify current mobile onboarding strategies, and evaluate their strengths and weaknesses.

2.   Background

From the development perspective, there are currently three basic approaches for transferring Web applications to mobile devices. Each approach presents specific advantages and disadvantages.

- *Web applications for mobile devices* utilize standard Web technologies, such as HTML5, CSS, and JavaScript. It allows for a development of one version of the application, which runs on any device with a conventional Web browser. Yet, this method still requires at least minor front-end adjustments for different categories of devices and does not take full advantage of unique mobile features, such as multi-touch interactions, a camera, or mobile sensors.

- *Native applications* are developed separately for each supported platform, using development tools and a programming language specific for each given platform. With this approach, the performance of mobile applications, the user interface, and even the extent of functionality can be optimized for each platform and category of devices. However, the approach is more time-consuming, and subsequently it increases the development cost.

- *Hybrid applications* are in theory supposed to combine the advantages of both previous methods by embedding Web applications inside native containers that provide access to the features of a native platform. In reality, due to the lack of standards and evolving nature of conventions in mobile industry, this approach still demands adjustments and optimization of applications for various end user devices.

Whichever approach is to be adopted, it is apparent that the transition from Web to mobile platforms is not straightforward and requires careful planning on many levels, including the user experience design. In fact, the thoughtful design of user experience is of paramount importance since in comparison to desktop and Web applications, user interfaces of mobile applications introduce some specific challenges.

First of all, touch-screen interactions are generally intuitive only with simple tasks. The concept of direct manipulation allows users to learn basic interactions (e.g. tap to open, or swipe to scroll) easily by reducing the cognitive load associated with hardware controls and peripheral devices. Nonetheless, touch-screen interactions are less obvious when it comes to complex operations. The range of possible interactions and the precise dynamics of execution are difficult to discover, and subsequently to recall (Norman, 2010:8). Furthermore, the touch-screen interaction design conventions are still evolving, so it can hardly be taken for granted that users will be familiar with advanced interactions. For now, advanced interactions (such as pull to refresh, squeeze to close an application, or swipe to delete an item) are used mainly as alternatives or shortcuts for more experienced users.

Secondly, the discoverability of advanced features on mobile devices is considerably reduced (Norman, 2010:10). Due to the limited size of mobile screens, the features and content of applications must be prioritized. Users are often provided only with basic functionality, while advanced features remain hidden. Although this approach effectively reduces information overload, it makes the communication of purpose and value of the application challenging.

Another problem is the fragmented nature of interactions with mobile devices. Previous research demonstrated that sessions with mobile applications are short and occur under varying circumstances (Böhmer et al, 2011:50–54; Oulasvirta et al, 2005:919; Müller et al, 2012:3–8). In contrast with desktop and web applications, users' cognitive resources are not focused solely on the mobile user interface. Under these conditions, clarity and ease of task flows play a substantial role. On the other hand, it is important to find strategies to make users aware of more efficient flows, which may be less intuitive but more useful in the long run.

The research problem stems from the fact that users are familiar with standard Web interfaces via traditional keyboards, whether on a personal computer or smartphone. However, with the reduction of screen size on mobile devices, full-size keyboards have been replaced mostly by touch interfaces. As a result, users have to adjust to using a range of gestures and other actions associated with touch interfaces. The research problem is that user productivity and satisfaction are reduced, since users do not transfer between these two interfaces automatically. A learning phase is required for this transition to take place.

3.   Related research

Onboarding is a relatively new term with origins in the organizational psychology. It refers to the process of new employee orientation, through which newcomers learn the knowledge, skills, and behaviours they need to succeed in the new organization (Bauer & Erdogan, 2011:51). Depending on the role and responsibilities of the new employee, the process may include formal meetings, training, lectures, or self-study of organization-related materials. Yet, onboarding is not focused merely on teaching employees how to perform work-related activities. It is linked to a broader issue of socialization within the organization. As an outcome, effective onboarding should drive newcomer's productivity and engagement, leading to better performance, higher job satisfaction and organizational commitment (Bauer, et al, 2007:707).

During the last few years, the term onboarding has been adopted to the user experience design. In this context, onboarding refers to the process of helping people to get started with a

software application, converting them from first-time visitors to returning customers during the first interaction with the product (Crumlish & Malone, 2009:70). Similarly to the new employee orientation, onboarding of new users should aid in reducing uncertainty, and overcoming initial difficulties.

The design of onboarding became more important with the proliferation of social services. In this case, the onboarding of new users is particularly challenging because individuals enter a virtual environment with implied rules and expectations about their behaviour. To minimize the retention in the initial phase, it is crucial to increase users' understanding of the service. Therefore, it is important to demonstrate the value of the service and explain how to use it, while simultaneously keeping newcomers interested in the service (Crumlish & Malone, 2009:70). As a side effect, thoughtfully designed onboarding may also positively affect brand perception and decrease the load of customer support service.

3.1   The process of learning

Traditional theories on skill acquisition (Fitts and Posner, 1967; Anderson, 1982:369) identify three phases of learning. In the initial phase, beginners focus on understanding the activity and achieving immediate goals. They make perceptually salient errors and they often rely on assistance to help them overcome initial difficulties. In the middle phase, individuals gain experience – mistakes become less frequent and the activity can be performed with reduced concentration. Eventually, they achieve an acceptable level of performance. In the last phase of learning, performance becomes autonomous, which means it does not need to be actively controlled. Hence, most learners do not perceive an urge for further improvements and with the minimum amount of regular practice they are able to maintain the same level of accuracy for months, or even years.

3.2   Learning in human-computer interaction

Skill acquisition became the topic of interest in human-computer interaction (HCI) in the early 1980s. With the emergence of personal computers, interactive systems were no longer used only by technically oriented users. Yet, operating most programs required paper manuals and formal training. This situation motivated a number of studies on learning and led to several significant conclusions. First of all, exploratory learning has proven to be an effective and popular strategy among users. Compared to working through sequenced training materials, individuals seem to be more successful in guided task-oriented investigation (Carroll & Carrithers, 1984:802). Secondly, users' motivation for learning is focused on attaining practical goals. Software is perceived as a tool and learners are not interested in understanding the tool but rather in how it can help them fulfil their needs (Carroll & Rosson, 1987:80). Thirdly, users often generalize their prior knowledge about how a system works (Mack et al, 1983:260). The problem is that they use this interpretation even when it does not apply, and, as long as they reach their goals, they are reluctant to change their strategies in favour of more efficient procedures. Therefore, they often persist in using inefficient strategies and their performance stabilizes on relative mediocrity (Rosson, 1983:171). These findings have initiated further research on the learnability of interactive systems and training materials in HCI.

Nowadays, learnability is widely considered to be one of the most important aspects of software usability. The term refers to the quality of the system empowering users to easily learn how to use it so that they "can rapidly start getting some work done with the system" (Nielsen, 1993:26).

3.3   Multi-device services

In HCI, the term multi-device service is commonly used to describe systems encompassing multiple platforms, devices, or applications (Wäljas, 2010:220). These services allow users to access data and functionality across a range of contexts in time and space, which often provides an added value to the service. However, designing the task flows between devices requires special attention, because the transitions significantly increase user's cognitive load (Denis & Karsenty, 2004:373).

Depending on the architecture of the service, three degrees of device redundancy can be determined, namely redundant, exclusive, and complementary devices (Denis & Karsenty, 2004:378). This distinction plays an important role, because each architecture encumbers the user in a specific way. Redundant devices provide access to the same data and functions, but due to technical differences and interaction styles, users might fail to understand the redundancy. Exclusive devices, offer access to distinct data and functions. It is a less commonly used architecture and the problem might be the interpretation of difference and cooperation between the service components on various devices. Complementary devices share some data and functions, while at least one of the devices offers access to data and functions unavailable on the other devices. This architecture is the most common one and it combines issues of the both previous approaches. (See Figure 1.)

Figure 1: Three degrees of device redundancy

| a) | b) | c) |

Redundant   **Exclusive**   **Complementary**

3.4   Inter-usability

To address the issues of transition between devices, Denis and Karsenty introduced the conceptual framework of inter-usability (Denis & Karsenty, 2004:374). Inter-usability refers to the ease with which individuals can reuse their knowledge and skills for a given functionality when switching to other devices. It is based on three design principles: inter-device consistency, transparency, and adaptability (Denis & Karsenty, 2004:380).

The principle of inter-device consistency is designated to maximize the coherence of service components on various devices, as long as it does not contradict technical constrains. Transparency allows users to build up an internal representation of the system, so that they can use the system efficiently. In the context of this paper, the principle of transparency is

particularly important. Due to the technical differences, transparency must often be approached with user help, and it is essential mainly in the initial phase of usage. As such, transparency is one of the properties that can be facilitated by appropriate onboarding. Last but not least, the principle of adaptability is closely related to transparency. Since transparency evolves in time and varies with the context of use, system adaptation based on usage data might help to promote transparency. This is sometimes considered in the long run by means of adaptive user interfaces, but it might be helpful in the initial phase of using a new device as well, since user guidance can be adapted based on the individual's knowledge from using service components on other devices.

3.5   Onboarding and mobile applications

Onboarding can be used to help users minimize the cognitive load required by the initial phase of learning. In the context of mobile applications, it means to facilitate the understanding of the application and its purpose, especially with respect to the particulars of the mobile user interfaces and the architecture of the service. The essence is to provide users with help, but at the same time reduce the amount of displayed information to the bare minimum necessary for each step of the familiarization. As a result, a user should be able to understand the purpose of the application, accomplish basic tasks and feel encouraged to proceed to the middle phase of learning, without being overwhelmed by the number of details or strict guidance.

4.   Methodology

This empirical research consisted of several steps. At first, a study of onboarding strategies was conducted. To reduce the scope of the investigation to a feasible size, only iPhone applications were studied. Smartphones were targeted, because in comparison to traditional desktop and Web user interfaces, they provide the most significant difference in terms of form factor and interaction style.

A total number of 117 examples were collected during a period of 12 months. Initial task flows were documented in the form of screenshots and notes. In each task flow, different types of introductory information were identified and labeled. To analyze and organize the data, affinity diagrams were used. The labels were recorded on index cards, and the items were iteratively sorted into groups based on the identified relationships. Afterwards, each group of index cards was labeled and the categorization was created.

Finally, the strengths and weaknesses of the categories were collated based on the literature review and the collection of existing solutions.

5.   Results and discussion

Individuals discover mobile applications through various sources – for example, personal recommendations, social networks, or Google search. To find out more about the application, they can visit the application website. However, to access the application, they have to search it on the application market. From there, they can download the application, and subsequently, launch it for the first time.

As this sequence of steps suggests, there are two main communication channels that can be used to introduce the application to new users – the application market, and the application itself. For most users, these two channels present integral parts of the onboarding experience.

The content provided on mobile application markets is standardized. It usually consists of basic description of the application and the key features, application screenshots, and customer reviews. Previous research has demonstrated that this content is perceived as important by many users and helps in the decision whether to download the application (Tokárová & Weideman, 2013:4). At this point, most of the investigated applications focused solely on highlighting the purpose of the application and the key features. However, there were also a few examples, which demonstrated how to use the application.

In comparison to the mobile application market, the amount and type of introductory content inside the mobile application is less limited. It means that the content and the interaction flow can be adjusted to fit the purpose of the application, enhance the learnability and overall, form the onboarding user experience. For this reason, the onboarding strategies used inside the applications were analysed, and are discussed in detail below.

5.1   Categorization of onboarding strategies

Based on the analysis of current onboarding strategies, two main categories of onboarding information were identified:

- Introductory content (to answer "What does the application do? What is the purpose of the application?")

- Tutorials (to answer "How does the application work? How to use the application?")

Each category has a different purpose and includes different types of information. However, various types of information are often combined to support users in different stages of learning and application usage. Table 1 provides the overview of the categorization.

Table 1: Categorization of onboarding strategies

Introductory content: What is the purpose of the application? What does the application do?	Presentation	Presentation of features	Short introductory presentation showing available features
		Presentation of use cases	Short introductory presentation showing examples of application usage
	Trial version	Sample content	Access to limited amount of content before registration, or buying the complete version of the application
		Sample features	Access to limited amount of functions before registration, or buying the complete version of the application

Tutorial: How does the application work? How to use the application?	Non-interactive tutorial	Introductory tutorial	Short introductory presentation explaining the structure of the application, basic gestures, or interactions
		Coach marks	Short descriptions of available gestures and control elements
	Interactive tutorial	Walkthrough	Short descriptions, which lead the user through the primary task
		Integrated help content	Utilization of the empty user interface to provide help content, which leads the user to explore the interactions and features

5.1.1 Introductory content

The purpose of the introductory content is to explain the purpose of the application and highlight the key features. It is often used to introduce the application to a new user, present the concept and the structure of the service, and motivate users to try the application. Yet, it is also important in case of users' transition to a mobile platform. Especially in complementary architecture, it is essential to enhance the service transparency and align the users' expectations by explaining the similarity and difference among applications on various devices.

There are two main approaches that can be used to introduce the application: presentations and trial versions.

Presentation is usually non-interactive and provides introductory information about the application. It can be presented before registration to emphasize the value of the application and to motivate new users to create an account. Or, it can be provided at the beginning of the first launch of the application. Presentations often utilize the combination of textual descriptions and images. In some cases, various methods are used to attract users' attention – for example, targeting emotional response by using humorous or surprising content, or storytelling. Presentations are usually finished with a call to action (e.g. "Sign up") or direction to the next step.

The main advantage is that presentations offer quick and concise overview of the application and help align the users' expectations. On the other hand, it is particularly difficult to find balance between the amount of necessary content and information overload. As previous research suggested, at this stage – after accessing the content on the application market, users are much less willing to read additional introductory information (Tokárová & Weideman, 2013:4–5). Therefore, the content should be very carefully selected to provide only the most relevant information and it should be designed to be easy to scan. Moreover, a user should have the option to skip the presentation and access it later.

Two types of presentations were identified:

- *Presentation of features* is often used to communicate the purpose of the application and available functions.

- *Presentation of use cases* is less common and provides examples of application usage. This strategy is very similar to the previous one – it is used to communicate the purpose of the application. The difference is subtle, but important because it shifts the focus from application to a potential user and explains how they can benefit from the application.

Trial version of the application is sometimes provided to communicate the value of the service, when a registration or payment is required. As opposed to presentations, trial versions are used to attract the users and explain the purpose of the application in more engaging, interactive way.

The advantage is that users are not overloaded with additional information about the application. Instead, they can access the application immediately and explore it on their own. Since the amount of features and content is limited, they are not overwhelmed by the complexity of the whole application from the very beginning. The typical insufficiency is that to communicate the full range of features, additional strategies are sometimes required. Furthermore, in some cases, the transparency of the service might be suppressed, because the application relies on users to build their own understanding of the service.

There are two types of trial versions:

- *Sample content* is used to attract the user before registration or buying the full version of the application. Provided content can help users to form expectations about the service and type of the information they can expect in the application.

- *Sample features* are also used to attract the potential user. Individuals are provided with a limited amount of key functionality and they explore the application on their own. Since the complexity of the application is reduced, the learnability is facilitated. This approach has similar characteristics as the training user interface (Carroll & Carrithers, 1984:800).

5.1.2 Tutorial

In general, tutorials in mobile applications should be used sparingly. For instance, Android user interface design guidelines states "the only reason for showing pure help content to new users unsolicited is to teach high value functionality that is only available through a gesture" (Android Developers, 2012). Similarly, iOS human interface guidelines advise on minimizing any onscreen help content (Apple, 2010). Nevertheless, the investigation of onboarding strategies has indicated that tutorials are provided fairly often.

The main purpose of tutorials is to demonstrate how the application works and teach users how it can be controlled. They are often used to explain the application to new users in cases, where mobile application provides the first contact between the user and the service. However, they can also foster the transition to mobile platforms. Due to the technical discrepancies, the consistency of service components on various platforms is suppressed, which has a negative influence on the application learnability. Tutorials can be used to

facilitate the initial learning of how to use the application on a new platform, and subsequently support the transparency of the service.

Two approaches can be used: non-interactive tutorials and interactive tutorials.

Non-interactive tutorials are delivered in form of static presentations. They are usually provided at the beginning of the first launch of the application and consist of the combination of text and images. The content can be designed in form of slides, separate from the user interface. Or, it can be displayed on the semi-transparent layer on top of the real user interface, to deliver the information together with the context.

On the positive side, non-interactive tutorials offer quick overview of the functionality. Users have an opportunity to learn basic concepts and acquire understanding of how to use the application. The main idea is that the control elements might be afterwards more easily recognizable. This approach has similar disadvantages as introductory presentations. At this point, users have accessed several layers of information about the application, but they have not tried it on their own. Additional information can be perceived as disruptive and users are likely to be unwilling to pay attention. Therefore it is essential to consider the amount of displayed information and provide the option to skip the content and return to it later.

Two types of non-interactive tutorials were identified:

- *Introductory tutorials* are short presentations explaining the structure of the application, basic gestures, or interactions.

- *Coach marks* are brief descriptions of control elements and available gestures. They are usually displayed when first time users access unfamiliar screens, which mean that the amount of information is less concentrated, and the learning is broken down into smaller context-related chunks.

Interactive tutorials are utilized to lead users through basic tasks. The objective is to engage users in the familiarization by applying learning-by-doing approach.

The main advantage of this approach is the user involvement. Instead of being observers, users try the application on their own. Since they are led through the actions necessary to accomplish the basic task, they are learning, while simultaneously using the application to pursue their goals. This can facilitate the learning and user engagement, and make the onboarding experience more natural. On the other hand, as the investigation of current strategies suggested, providing appropriate guidance is challenging. The amount of descriptions should not be overwhelming – it should provide the basic information, but it should not make users feel incompetent or restrict them in the individual exploration.

Two approaches were identified:

- *Walkthroughs* use short descriptions, similar to coach-marks, to lead users to accomplish basic tasks for the first time they use the application.

- *Integrated help content* utilizes the blank state of the application. It is used to fill the empty user interface after the first launch of the application. The help content is strategically designed to facilitate the understanding of the concept and leading users through basic tasks.

6. Conclusion

Onboarding is the process of helping users in the initial phase of using a new application, whether it is a completely new service, or a familiar service accessed on a new platform. The purpose of this research was to examine currently used onboarding strategies and evaluate their strengths and weaknesses. The study identified two main categories of onboarding strategies: the introductory content and tutorials. Each category has a different purpose – the introductory content is used to communicate the purpose of the application and highlight the features, while tutorials are focused on explaining how to use the application. Each category includes two subcategories and several strategies, which were discussed in detail, together with their advantages and disadvantages.

This categorization should serve two purposes. First of all, the categorization provides a systematic overview on currently used onboarding strategies. It can be used to facilitate design decisions and highlight their benefits, as well as shortcomings that need further consideration. Secondly, the categorization will be used in further research. To evaluate the supporting strategies, their effectiveness and popularity among users, a systematic approach was necessary. The categorization will provide an essential basis to build subsequent user studies.

Both of these objectives are currently highly relevant. With the considerable increase in user acceptance of mobile devices, the transfer of Web and desktop applications to mobile platforms has become one of the pre-conditions for service competitiveness. However, the number of technical issues often overshadows users' needs. To support the users' transition, it is essential to extend the understanding of user perspective and design support mechanisms that will facilitate the process through an effective learning. Therefore, it is expected that the present study will play a positive role in supporting the strong trend towards mobile rather than desk-bound application usage.

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