

# **Behind the Screen: Human Perception vs. Reality of Skeleton Screens and Progress Indicator User Experiences**

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## **Project Objective:**

In an era where advancements are often evaluated by speed, there is a prevalent belief that background processes have accelerated due to developer modifications. This proposal will investigate the variances between human perception of splash pages, favored perceived perception of skeleton screens, and progress indicators by understanding the thinking behavior of individuals.

## **Project Background:**

Since 2013, a significant loading speed technique emerged: skeleton screens. The introduction of skeleton screens transformed the perception of loading speed, particularly within mobile experiences and web experiences. Perceived perception is the behavioral reaction to something based on one's personal experience, which often does not equal reality. Together with traditional spinners, progress bars, and indicators, skeleton screens provide a tool to bridge the gap between user action and displayed content. As a side effect, many developers have strayed from using them, claiming that the average time a user spends on a site to download something, for example, is around 2 seconds before leaving. This development raises several questions that we plan to answer with our proposal. What factors motivated organizations to adopt skeleton screens, and when did this shift take place? Why do these screens and experiences feel to load and behave faster compared to splash pages? Furthermore, how do developers determine whether to implement skeleton screens or progress bars, and are these methods effective?

Traditionally, splash screens served as the initial point of interaction, whether at the beginning, throughout, or end of the experience. Their purpose was to engage users during background processes. These screens, common across applications and websites, prevented users from simply interacting with a blank page, which might be misinterpreted as an error. As technology advanced, hardware improvements also sought to enhance performance. However, these advancements were often insufficient to meet user expectations. Therefore, developers pursued refined solutions, essentially leading to the adoption of skeleton screens.

These screens can be deployed in two primary ways. They can supplement a splash screen or function independently, offering insight into the application's structure. Regardless of implementation, skeleton screens present the framework or "wireframe" of the content to be displayed. As stated in one peer-reviewed article, this is done by outlining the layout of elements, which creates the perception of active loading, reducing user frustration (Söderström et al.). This impression of progress is enhanced by progress indicators, bars, and spinners, for example, in file

explorer or downloading an app from the app store, which provide feedback within 2 - 10 seconds. The adoption of skeleton screens represents a strategic shift in user experience design, transitioning from passive waiting to active engagement. Understanding the underlying thought processes and behavioral attributes that make users believe the mobile apps and sites they use every day run faster or perform better through our research will allow a potential breakthrough in what developers should continue to do or rethink on how to improve the overall loading time.

### **Research Methods:**

Reviewing and following similar methods to Mejtoft et al. and Söderström et al., our proposal plans on creating 4 prototyped versions of a mobile app and 2 websites using JavaScript, HTML, and CSS to develop varied user-interfaces (UI), speeds, animation, load time, and design, all having the same features. Utilizing the Knight Hack's outreach team and posts through social media content and emailing, we will recruit at most 20 participants: 5 engineering majors, 5 fine arts majors, 5 nursing majors, and 5 business majors. All of whom spend extended periods of time using computers, making 5 groups of 4 from different backgrounds, with 1 person from each major of study in each test. Thus, to get results on which ways were preferred, unpreferred, or neither preferred nor unpreferred.

***Test 1 - Mobile Bank App with Default Speed:*** This version of the mobile app will have light colored theming, much to imitate a softer, flowy, and relaxed user experience and pace, where the user will be met with a splash page, followed by the log in screen, home page with navigation, settings, and account page. This test plan is to monitor the behavior users have towards applications with a lighter theme, and the ease of access to navigate and use the app.

***Test 2 - Mobile Bank App with Default Speed and Dark UI:*** Similarly to the first test, it will be a carbon copy of that app version, this time with darker UI elements and theme to cause a vast difference in preference and likability. This test is inspired by user interactions with dark mode on several apps that are used daily, such as messaging, mobile banking, and settings, but focusing on one of those important apps, mobile banking. The goal is to receive results supporting our proposal that different experiences and behaviors are caused by the use of splash pages versus skeleton screens.

***Test 3 - Mobile Bank App with Faster Speed:*** This version of the mobile experience will still replicate the light theme of the first test, but with a skeleton page and a cleaned and refreshed UI, still keeping only the same features and light theme. The goal for this round of user observation will be to see how users perceive the app now that it has faster animation times and an improved UI look, rather than the normal UI and faster animation test that is usually expected.

***Test 4 - Mobile Bank App with Faster Speed and Dark UI:*** This fourth and final mobile app observation will replicate that of the third test, but with a darker UI and skeleton page instead of

a splash page. The results of this app experience might be preferred depending on an individual's preference for app theme and layout.

**Tests 5 & 6 - Online, Web-based banking:** These tests will be conducted the same as the previous tests, comparing the feel of using improved UI, simple animation, and light theme to its counterpart with faster animation, skeleton pages, and darker theme. The need to test using barebone UI or HTML is highly likely to return a 100% unpreferred interest in using, but using today's standard UI or light or dark mode would prove to be more revealing.

### **Expected Outcome:**

As the results are concluded and finalized, it is expected to find the commonalities and differences between the mobile app experience and the online, web-based experience from users. It is also highly likely that the mobile app performance numbers will be widely used and provide developers with a new set of data and analytics as to how their future apps and designs should flow, operate, and cater to their users. As proposed, the results will also show that there is a noticeable suggestion for why users would prefer to use and interact with skeleton pages and progress bars rather than not be given anything to interact with at all and risk wasting their time. Benefitting from the form of infographic potent deliverables will be better at helping people to understand the impact that skeleton screens have versus using splash pages.

At the University of Central Florida (UCF), particularly, loading the Canvas Student mobile app, you're presented with the Canvas logo, which further acts as a circular loading indicator and anxiety inducer for whether or not the app may load, depending on your device's cellular connection on campus. The same scenario happens when loading Microsoft Outlook or viewing MyUCF on any type of mobile device. The design, animations, and interactivity of the webpage or app all play an important role alongside the use of a skeleton page and determine whether or not the overall experience will prove to be worth it or not. The MyUCF webpage is a prime example of an overwhelming amount of information, without a splash or skeleton page to easily grasp the information loading, that lacks a user-friendly design and varied user interest.

These expected results, as proposed, will provide UCF with a more in-depth user response to their platform that in the future will prevent chaos and or added stress and frustration from users when visiting their site or using their mobile app services, the same way it will for other developers.

### **Preliminary Work and Experience:**

In one year of attending UCF, we've obtained a new set of skills and knowledge in creating mobile apps and websites that are both efficient for the users and the developers to maintain. We've participated in extracurricular clubs and activities such as Knight Hacks, in a group, a semester-long project creating a pantry food storage app that tracks your recipes, and receipts

with photo vision using artificial intelligence (AI). My primary focus was researching similar apps on the market, which resulted in designing a highly praised UI for our app. In that time, my skills in graphically designing and researching have greatly improved from attending career development workshops for front-end development. My passion and experience for this line of work and career remain without notice and acknowledgment from individuals and peers pursuing similar paths.

### **IRB Statement:**

Given our intended experimentation and analysis, an IRB approval will be needed for us to survey, interview, and observe individuals while they volunteer to participate in our proposed research. As mentioned earlier, we will need at most 20 student participants, all ranging from 5 different majors, engineering, nursing, business, and fine arts, with one participant from each field in each task to have a uniquely diversified set of results. We will be able to get participants by using available resources and outreach from Knight Hacks as well as from the Student Government by sending emails.

### **Budget:**

The budget for this proposal is understood to not exceed \$1,500, but it can easily be done for as little as \$0, given the appropriate use of free products and services. However, with our timeline of 2 months, wanting to get individuals to participate and the effort it will take to build these experiences, the realistic price will not be \$0.

To start, we anticipate beginning development after we research user experience perceptions that should account for no more than 2-3 days, spending no more than 8 hours per day, and no more than 1 week per mobile app or experience.

**Week 1 - Mobile App Experience 1 Development:** Week of June 1st to June 7th

**Week 2 - Mobile App Experience 2 Development:** Week of June 8th to June 14th

**Week 3 - Mobile App Experience 3 Development:** Week of June 15th - 21st

**Week 4 - Mobile App Experience 4 Development:** Week of June 22nd - 28th

**Week 5 - Online, Web-based Experience 1 Development:** Week of June 29th - July 4th

**Week 6 - Online, Web-based Experience 2 Development:** Week of July 5th - July 11th

**Week 7 - Surveying and Interviewing Participants:** Week of July 12th - 18th

**Final Week - Conclusions, Preparations for Result Presentations:** Week of July 19th - July 25th

Of our \$1,500, \$200 of which will be allotted for the participant prizes, \$10 for each participant for up to 20 participants. Leaving us with \$1,300 that will be used for any additional products or digital services that require a subscription to access or use, including but not limited to research paper documents on subscription websites like Figma Pro or Canva Pro, traveling to designated meeting places, digital software, or materials.

With all costs considered,

- Budget: \$1,500
- ( - ) Participant prizes: \$10/participant for 12 participants = **\$120**
- ( - ) Canva Pro (Individual): \$15/month for 2 months = **\$30**
- ( - ) Figma Pro: \$20/month for 2 months = **\$40**

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**Total Cost: \$190.00    Total Remaining: \$1,310.00**

The total cost of the research will be \$190, with \$1,310 remaining.

## References Cited

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