

Comparing Icon-only and Text-and-Icon Navigation in Relation to Task Completion Speed

Maria Leth
male0333@student.umu.se
Umeå University
Sweden

Abstract

This study investigates whether icon-only or text-and-icon navigation leads to more efficient task completion interaction with a public transportation application. Total of six participants completed the study including two different prototypes, one with only icons and one with text-and-icon navigation, and doing three different tasks under both seated and walking conditions. Task completion time was measured in seconds and analyzed using paired t-tests. The results showed statistically significant difference in both conditions, with text-and-icon navigation producing faster completion times. The findings suggest that combining icons with text labels reduces cognitive load.

Keywords

icon-based navigation, text-and-icon navigation, task completion speed, mobile usability, cognitive load, walking versus seated

1 Introduction

Previous research indicates that the use of icons in digital interfaces has increased over the past decade [1]. Icons are widely adopted to support navigation and enhance user experience, as they can reduce cognitive load and promote faster recognition. However, some studies have shown that text-and-icon navigation may provide clearer meaning, especially for users who are unfamiliar with specific symbols [2]. Other research suggests that people often rely on additional cues, such as color or shape, to interpret icons accurately [3]. Another study make an analyze between how the text and icons in navigation affect the completion speed while walking versus being seated [5]. This study therefore focuses on navigation speed within a specific user interface and environment while doing two different tasks. The study is specific using redesigned prototypes based on the Ultra public transportation application used in Umeå. Participants will complete three different tasks using two distinct navigation approaches: one involving an icon-only prototype and the other a text and icon prototype. One task requires walking while navigating through the system, whereas the other is performed while seated, focusing solely on interaction with the user interface.

Despite the growing importance of icons in interface design, to the best of our knowledge, few previous studies have directly compared whether icon-only or text and icon interfaces lead to more efficient user interaction.

As digital products increasingly aim to combine aesthetic appeal with usability, understanding how various navigation styles influence task completion has become essential. By integrating perspectives from cognitive learning theory and information design,

this study seeks to provide new insights into how interface design choices affect user efficiency.

1.1 Research Objective

This report aims to evaluate the effect of icon-only versus text-and-icon navigation on task completion speed while users are either walking or seated.

2 Theory

2.1 Cognitive Load and User Interaction

Cognitive Load Theory explains how the human cognitive system processes information during learning and interaction. According to this theory, interfaces that present information in a clear and structured way can reduce mental effort when performing a task [9]. By carefully design and support efficient interaction allows the users to locate the information they need quickly. By using icons and text correctly in a digital interface makes the user more calm and easily can navigate throughout the design. Research has also shown that interactive interfaces can support deeper understanding when information is presented in a way that reduces unnecessary cognitive load [7]. A good design make the user want to interact and therefore understand the interface even more.

2.2 Navigation Design in Mobile Applications

Effective navigation design is an important factor in mobile usability. Mobile interfaces must support quick decision-making while users are often interacting with the device in dynamic environments. Such as quickly buying the correct ticket in a public transportation mobile application. Poorly designed navigation structures can increase task completion time and lead to user frustration [8]. Information design principles emphasize the importance of presenting information in a structured and accessible way in order to support user decision-making and interaction [10].

2.3 Icon-Based Navigation in Digital Interfaces

Icons are widely used in digital interfaces to support navigation and improve usability. They allow users to quickly recognize functions without reading longer text labels, which can reduce cognitive effort and speed up interaction [12]. Research has shown that icons can be effective for experienced users who are familiar with common visual metaphors [4]. However, icons can also be confusing if users are unfamiliar with their meaning, which may lead to slower navigation. Recent research has also explored methods for designing icons that improve usability and recognizability in digital interfaces [6].

2.4 Combining Icons and Text Labels

Combining icons with text in a design can reduce ambiguity. This approach can help the user to understand better and navigate quickly through the interface. Icons alone may be unclear or unfamiliar to the user. Text labels provide additional context that helps users understand visual symbols, especially for less experienced users [14].

3 Method

3.1 Participants

A total of 6 participants took part in the study. The participants were different people with different experiences with icons and general design knowledge. There were no specific method to choose the participants. The participants were from ages between 25-68 years and both females and males.

3.2 Prototypes

Two mobile prototypes were designed in the design tool Figma [15]. Several navigation features such as making a personal route and viewing departures were designed. The two different prototype flows have identical layouts and content apart from the navigation style (icon-only and text-and-icon navigation).

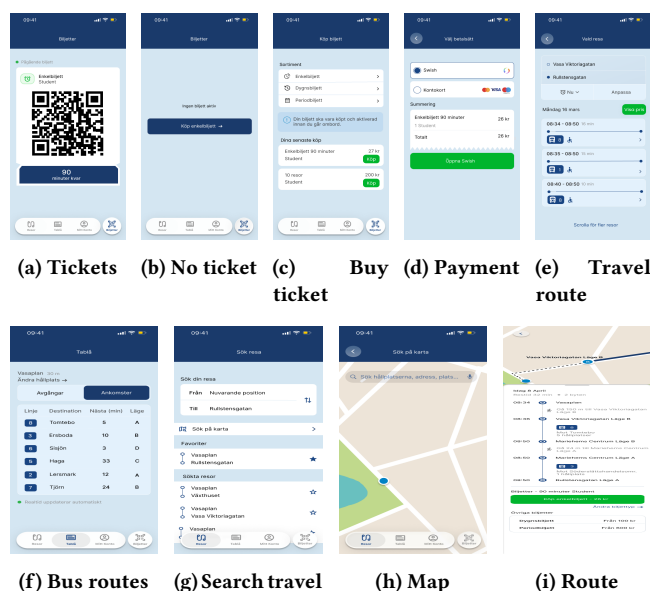


Figure 1: Screenshots from the text-and-icon navigation prototype.

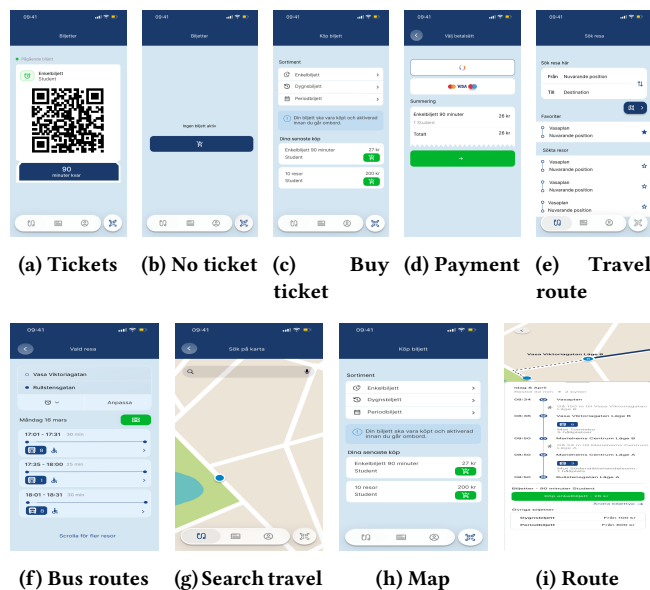


Figure 2: Screenshots from the icon-only navigation prototype.

3.3 Procedure

The study was conducted individually with each participant. First, all participants signed an informed consent form containing information about the study, their right to remain anonymous, that participation was voluntary, and their consent to participate in the study.

After providing informed consent, each participant completed tasks using the two different prototypes while both seated and walking. The completion time for each of the three tasks was measured in seconds in order to analyze task efficiency. Half of the participants started with the walking condition and the other half started with the seated condition.

The tasks consisted of three simple navigation flows: finding the next bus departure from the participant's current location to the city center, purchasing a ticket, and checking departure times for a specific bus route.

After completing the tasks, all participants were asked a set of interview questions.

- Which prototype did you prefer?
- What are your experiences with icons and symbols?
- Did the text labels improve navigation?
- Which tasks felt most difficult?

3.4 Tasks

The tasks the participants were asked to do included common interactions with the application. The tasks were tested for both prototypes while seated and while walking. The tasks included:

- (1) Finding the next bus departure from your current position to the city center.
- (2) Buying a ticket.
- (3) Checking departure times for a specific bus route.

3.5 Data Collection

The primary measure in this study was task completion time, which was recorded in seconds for each task. Before beginning the tasks, all participants were informed about the study and provided informed consent. After completing the tasks, participants answered a short questionnaire regarding their experience with the two navigation styles.

Data were collected from all completed tasks. The completion times for the three tasks were later summed for each participant, resulting in one total time for the seated condition and one total time for the walking condition for each prototype.

The summed task completion times were used to facilitate statistical analysis using paired t-tests.

4 Results

4.1 Statistical Analysis

A paired samples t-test was conducted to compare task completion time between the icon-only prototype and the text-and-icon prototype under both seated and walking conditions. The results showed statistically significant differences between the two navigation styles in both conditions. For the seated condition, participants completed the tasks significantly faster when using the text-and-icon prototype. The mean value in seconds for seated in the text-and-icon navigation was $M = 17.47$ s compared with the icon-only navigation which was $M = 20.60$ s. Also the standard deviation was $SD = 1.326$ for text-and-icon prototype and $SD = 1.406$ for the icon-only navigation prototype. The paired t-test was also significantly faster for using the text-and-icon only prototype with a p-value of .001113 and $t = -6.7107$.

Similarly, under the walking condition, participants were also significantly faster when using the text-and-icon prototype ($M = 22.35$, $SD = 1.007$) compared to the icon-only prototype ($M = 25.68$, $SD = 0.898$) and a p value of $p = .001089$ and $t = -6.742$.

These findings indicate that the text-and-icon navigation prototype supported more efficient task completion than the icon-only prototype across both experimental conditions.

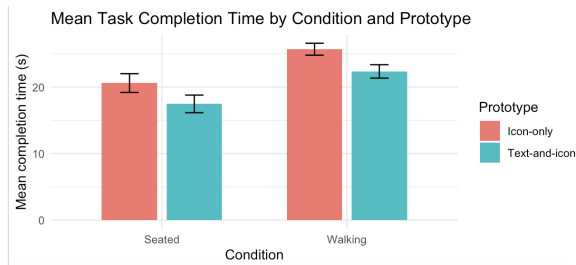


Figure 3: Mean Task Completion Time by Condition and Prototype

Table 1: Mean and standard deviation of task completion time (seconds)

	Seated		Walking	
	Mean (s)	SD	Mean (s)	SD
Text-and-icon	17.47	1.326	22.35	1.007
Icon-only	20.60	1.406	25.68	0.898

4.2 Questionnaire Results

Following the tasks, participants generally said that the text-and-icon navigation was easier to understand and navigate through. Overall, had the participants a wide knowledge about icons and symbols. They all said that they could easily navigate throughout the application, however when seeing the icons without a text-label made them think twice before making decisions. The decision-making took a bit longer with only icons, regardless that they had made the tasks with the text-and-icon procedure before.

Selected participant responses that:

"I had trouble finding with only icons. The text label makes it more clear exactly where I should navigate."

"I believe that my grandmother would not have understood the icons."

"It is important with good navigation when it's about payment. I want to be sure that my payment goes through in a secure and trustful way!"

"Good with a clean and simple navigation bar. Nice and clean design with only icons in the navigation bar."

5 Discussion

The findings from the study make clear that icons benefit significantly from accompanying text labels. Navigation design is a fundamental aspect of any application: it must be intuitive and accessible to a wide range of users. All from the people living and speaking the language of the location to internationals and tourists. Navigation should therefore be in somehow global and functional for a wide target group. This is particularly true for public transportation applications, which must serve all age groups. A clear and simple navigation structure is essential for an application to fulfil its core purpose.

Text-and-icon navigation appeared to support faster and more confident decision-making. Users could first recognize a function visually through the icon, and then confirm its meaning through the text label. The key limitation of icon-only navigation is that different target groups such as various ages social groups have varying levels of familiarity with icons. Younger users tend to be more accustomed to icon based interfaces, whereas older users may rely more heavily on text for orientation.

Above all, icon must communicate meaning clearly within a graphical user interface. An icon is, by definition, a visual representation of an object, action, or idea. If that meaning is not immediately apparent to the user, the icon becomes little more than visual noise which causes frustration, confusion, and ultimately hindering task completion. A user's understanding of an icon is based on prior experience. Due to the lack of standardized usage for most icons, text

label are necessary to communicate meaning and reduce ambiguity [12].

The benefits of icons in a graphical user interface include:

- **Targetability:** Icons are typically large enough to be easily tapped in finger-operated interfaces.
- **Space efficiency:** Icons are compact, allowing toolbars and palettes to display many functions within a limited area.
- **Speed of recognition:** Icons can be recognized at a glance, particularly when users have prior experience with them.
- **International accessibility:** Icons do not require translation, which is especially valuable in public transportation applications used by international visitors.
- **Aesthetic appeal:** Well-designed icons can enhance the visual quality of an interface.
- **Familiarity through consistency:** Reusing the same icons across an application helps users build familiarity over time.

However, truly universal icons are rare. Beyond a few widely recognized symbols, such as home or print, most icons remain ambiguous, as their meaning may vary across interfaces and contexts. This lack of standardization undermines user trust and slows adoption over time.

When designing with icons, it is important to gather research first: understand the target group and study the icons already used by competitors, so that users bring some prior familiarity to the experience. If a new icon is required, the design should be kept simple and schematic focusing on the essential characteristics of the object rather than realistic detail. A useful heuristic is the five-second rule [7]: if it takes more than five seconds to think of an appropriate icon for something, that concept is unlikely to be effectively communicated through an icon alone. Any new icons should also be tested with real users before deployment.

5.1 Limitation

The study has limitations following the small sample size of participants. The results are therefore not fully reliable and the study is in need of future work.

5.2 Navigation in a mobile application

Recent mobile technology have changed how people access information and services in their everyday lives. Mobile applications are designed to meet the immediate needs of users, often in several environments that require users' attention. However, navigating through a mobile application is not always straightforward, and poorly structured navigation can lead to frustration and errors, particularly when users are on the move [8]. While walking or even running needs today's application to still be user friendly and straightforward. An example is from one of the conditions from this study: walking while buying a bus ticket. This situation adds additional demands on cognitive resources and highlights the importance of designing navigation that is simple, predictable, and immediately understandable.

This is directly relevant to the findings of the present study. The walking condition introduced an element of divided attention, which can reduce a user's available cognitive capacity. According to Cognitive Load Theory, when mental resources are stretched across multiple simultaneous tasks, the ability to process and interpret

interface elements, such as ambiguous icons, becomes more difficult [9]. The results of this study suggest that text-and-icon navigation may compensate for this increased load, as the text label provides an additional layer of clarity that icon-only navigation does not.

Effective mobile navigation should therefore be consistent, minimal, and self-explanatory. Reusing familiar patterns and combining visual and textual information can reduce the cognitive effort required to navigate, allowing users to focus on their actual goal rather than on confusing the interface. For a public transportation application in particular, where users must make fast decisions in unfamiliar or stressful situations.

Another important consideration is to make the application accessible to a broader target group, particularly individuals with disabilities who may benefit from additional support. This includes, for example, people who are blind or have other visual, cognitive, or physical impairments. From the Sketch and Build[16] conference earlier this year a lecture was about specific this subject: availability in websites and applications for blind and individuals with disabilities. From that lecture made the lecturer clear how important availability in text labels really are. Blind people navigate throughout websites and application throughout speech. A voice explains how to navigate by text labels. Without text labels it is nearly impossible for blind people to be able to navigate themselves.

5.3 Cognitive Load in Interface Interaction

Cognitive Load Theory provides a useful framework for interpreting the results of this study. According to the theory, the human cognitive system has a limited capacity for processing information at any given time [9]. When an interface requires users to interpret unfamiliar elements additional mental effort is needed, leaving fewer cognitive resources available for the actual task at hand.

This effect is likely to be more pronounced in the walking condition. When users navigate a mobile application while simultaneously walking, their cognitive resources are divided between the physical act of moving and the mental act of interacting with the interface. Under this condition, any added confusing navigation element compounds the overall cognitive load and can slow task completion speed. While using text labels with icons in navigation this appears to reduce this burden. The user confirms with the text label their understanding with less mental effort. This aligns with research suggesting that well-designed interfaces can support more efficient interaction by reducing unnecessary cognitive load [9].

The results of this study reflect this pattern. Participants completed tasks faster when using the text-and-icon prototype, and this difference was particularly evident in the walking condition. This suggests that the clarity provided by text labels is not only helpful, but becomes increasingly important as the demands of the user's environment grow.

6 Conclusions

This study set out to investigate whether icon-only or text-and-icon navigation leads to more efficient task completion while interacting with a mobile public transportation application. The results indicate that text-and-icon navigation supports faster and more confident interaction, both in seated and walking conditions.

A central finding is that icons alone are rarely sufficient for clear navigation. Almost all icons carry some degree of ambiguity, and without a text label to clarify their meaning in context, users risk misinterpreting or overlooking them entirely. According to this study text labels should therefore be visible at all times. Any additional interaction from the user is not required, as this forcing users to reveal labels which adds unnecessary steps and cognitive effort.

The value of combining icons with text extends beyond clarity alone. For international users who may not be fluent in the application's primary language, familiar icons paired with short text labels can significantly lower the barrier to use. Or elderly people in the society that's not familiar with so many icons needs to have some sort of text-label navigation to navigate successfully. In the context of a public transportation application which serves a diverse and often time-pressured user base this inclusivity is particularly important.

For navigation specifically, the stakes are high. Users need to move through an application quickly and with confidence, often while simultaneously managing other tasks such as walking or monitoring their surroundings. In these situations, any ambiguity in the navigation interface can result in errors, delays, or frustration. Clear and consistent text-and-icon navigation directly reduces this risk.

In conclusion, the findings of this study support the principle that effective icon design is not about decoration, but about communication. Icons should always serve the user's understanding, and where there is any risk of unclearness, a text label must be present.

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