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**RESEARCH ARTICLE**

# A Novel Approach to E-transporting Mobile Interfaces to Individuals with Visual Impairments

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**ABSTRACT**

The objective of this study is to estimate the effect of visual design, navigation design, and website information design on the competitive advantage of smart transportation companies in Jordan. 357 customer of transportation companies in Jordan were surveyed. The findings showed the significant positive influence of visual design, navigation design, and website information design on the competitive advantage of smart transportation companies. Competitive advantage of smart transportation companies was significantly moderated by visual design, navigation design, and information design. According to the results reached, this study recommends the necessity of designing special applications for the visually impaired in the field of electronic transportation that meet their needs and are easy to use to improve their quality of life and increase their productivity by paying attention to the good design of user interface components and also designing applications that rely on voice commands because the visually impaired depend on The sense of hearing is more important to compensate for the sight.

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## INTRODUCTION

Assistive technology is an umbrella phrase that encompasses all of the different types of systems, services, gadgets, and appliances that handicapped people utilize to support them in their day-to-day life, make their activities easier, and offer safe mobility (Moraiti, IFotoglou, Dona, Katsimperi, Tsionakas, Karampatzaki & Drigas, 2022; Alqaraleh, Almari, Ali, Oudat, 2022). Assistive technology was first developed in the 1960s as a means of resolving day-to-day issues associated with information transmission (such as personal care), as well as navigating and orienting aids that are associated with the provision of mobility support (Thuneibat, Ali, Alqaraleh, & Thneibat, 2022; Masal, Bhatlawande & Shingade, 2024).

Visually assistive technology can be broken down into three distinct categories: technologies that enhance vision, technologies that substitute for vision, and technologies that replace vision (Manjari, Verma & Singal, 2020). This form of assistive technology was made available to persons who are blind by means of electronic devices that enable users' detection and localization of objects in order to

provide those individuals with a sense of the external environment using the functions of sensors (Messaoudi, Menelas & Mcheick, 2022; Ahmad et al., 2023). Because they can determine the size, distance, and height of the objects around them, the sensors can also assist the user in performing mobility-related tasks (Meliones, & Sampson, 2018).

The user is able to control the operation of electronic devices stored at home using their mobile device, thanks to technological advancements (Liang, Zhao, Yuan, Chen, Zhang, Huang & Zhang, 2019). The majority of blind persons in today's world walk with the aid of a white cane, which helps them navigate their environment, navigate around obstacles, and be guided by friends, family, or trained canines (Chaudary, 2022). Because to advancements in technology, blind people now have access to a wide variety of different kinds of aids that can assist them in navigating. People who are blind or visually impaired will be able to use public transit independently with the assistance of the proposed technology. Portability, ease of use, and cost effectiveness are three aspects of the technology that stand out as very useful features (Choudhary, Bhatia & Ramkumar, 2020).

Hence, it essential to pinpoint that with the increasing number of blind and visually impaired people, developers and researchers came up with new technologies that tried to meet their needs and assist them in daily activities (Masal et al., 2024). The purpose of (Electronic Instruments of Navigation) is to provide guidance and wayfinding information to people affected by vision impairment (Prandi, Barricelli, Mirri & Fogli, 2023).

In the mobile user interface environment, competitive advantage is one of the most important basic goals that companies seek to achieve (Arslan, 2020). The completive advantages mean "The organization’s ability to attract customers and build prestige for the organization and increase perceived value by customers and achieve satisfaction (Sáez, Muñoz, Canto, García & Montes, 2019).

More deeply, the current study aims to fill the gap in the field of research. This kind of gap will contribute to the body of the knowledge. According to Creswell (2014) “research-based research problems are problems that need further research because a gap in the research exists or because the research needs to be extended into other areas”.

When it comes to the practical gap, it appears that this study is the first one of its kind to be conducted in Jordan and among the group that is being targeted. It has not been researched among the companies that were mentioned using the same research objectives and queries. The fact that past studies have made recommendations in which they declare that more research is required is one way in which this kind of gap could be demonstrated. In addition to that, there is a problem that calls for an investigation to be conducted. Not only was the researcher of this study motivated to carry out the study because there was a practical gap, but there was also a deficit in the field overall.

## RESEARCH BACKGROUND

Previous studies have explored the impact of mobile user interface on trust and customer satisfaction, but specific features such as the progress indicator and purchase process hierarchy and their impact on trust have yet to be thoroughly investigated. The organizational structure and hierarchy utilized on a mobile use interface, as well as its visual design, including its visual appeal, innovativeness, aesthetics, and use of colors and shapes, are all aspects of user interface design (Dedeke, 2016). In online purchase, e-transportation application design is even more important than the service provided to clients in traditional businesses (Sáez et al., 2019).

Although some of previous researches focused on the impact of mobile user interfaces on the competitive advantage of e-business, they did not examine the following relationship between mobile user interfaces (visual design, navigation design, and website information design) on achieving competitive advantage (competition, delivery speed, quality, flexibility, costs) in e-transportation

companies in Jordan identifying the need of impaired people. In addition, they did not pay attention to moderating effect of TAM on such relationship. Thus, the researcher suggests.

Indeed, this research examining the relationship between the mobile user interfaces as independent variable with the following dimensions (visual design, navigation design, and website information design) on the competitive advantage of smart transportation companies in Jordan to serve the visually impaired, and examining this relationship by distributing a questionnaire and then, this study aims to design an appropriate user interface based on respondents feedbacks. The following hypotheses are therefore proposed:

H1. Visual Design positively influence Competitive Advantage

H2. Navigation Design positively influence Competitive Advantage

H3. Information Design positively influences Competitive Advantage

## THEORETICAL FRAMEWORK

The effects of visual design, navigation design, and information design on competitive advantage are illustrated in the theoretical framework (Figure 1).

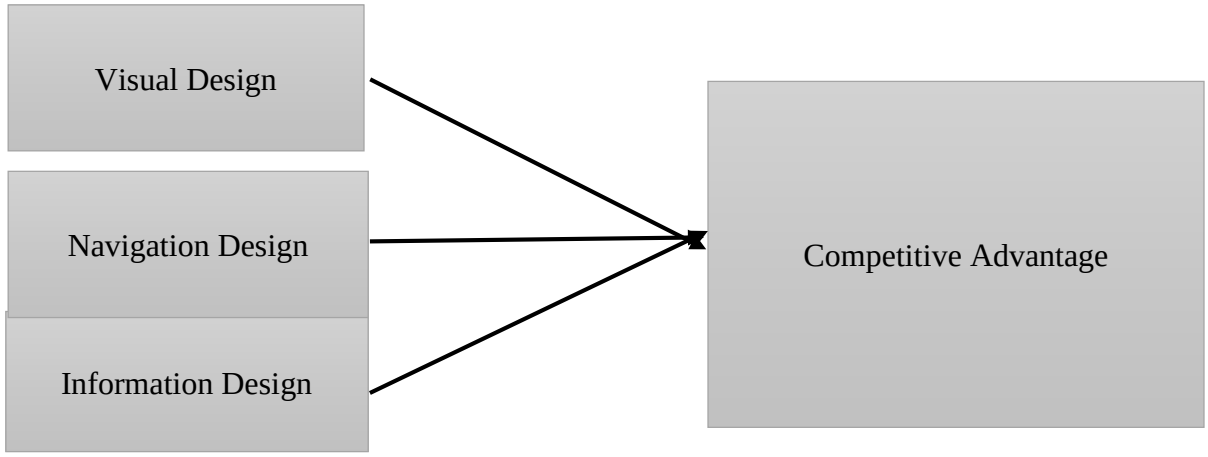


**Figure 1: Theoretical framework**

## METHODOLOGY

This part describes the research methodology used to conduct the research that contributed to the findings in this study. The Cronbach alpha is explained, including the One-way repeated measures SPSS (version 26). The interfaces are designed using a variety of design principles which are used stimuli of this study.

### Research design

This study adopted a quantitative research design. In order to reach a large number of respondents, this study used quantitative approaches, including a questionnaire (Mohajan, 2020). According to Ngenye and Kreps (2020), the objective of the quantitative method is to explain, control, and forecast social phenomena. Furthermore, Sekaran and Bougie (2016) stated that a quantitative approach aims to explain as well as solve difficult issues. Furthermore, a quantitative method can satisfy the study's aims by adopting empirical valuations such as numerical measurements and analysis (Zikmund, Babin, Carr & Griffin, 2013). They also stated that the common objective of quantitative research is to test specific research questions or hypotheses.

### Sampling method

The target population in the current study is the customers who are familiar to the selected application which are UBER, Careem, Petra Ride, and Jeeny. The entire population is to be huge as these two applications are used in Jordan in four main cities (Amman, Alzarqa, Irbid, and Alaqaba). Once the population is accurately defined, a simple random sampling technique has been used among the target the population. The sample size of this study is to be 377 based on the table of (Sekaran & Bougie, 2016). The simple random sampling technique is implemented as follows: firstly, the sample size is determined through the companies themselves. Secondly, the sample is randomly selected getting the sample through such process ensuring that the selected sample is totally random with nor bias or prejudice.

**Sampling frame**

After the type of respondent was decided, the task of getting the number of Jordanian blind people is based on statistics in Jordan (General Statistics Department in Jordan). These statistics allow the researcher to reach all blind people in Jordan in all main cities.

**Sample size**

A questionnaire is used as the quantitative approach instrument. The study population consists of the UBER, Careem, Petra Ride, and Jeeny users of blind people. Based on the above discussion, 384 samples out of 479491 based on General statistic department in Jordan (2022) are targeted to be technically acceptable, completed, and returned as recommended by (Sekaran & Bougie, 2016). Moreover, the results that are derived from a large sample could be generalized to the whole population (Turner, 2020).

**Questionnaire design**

As mentioned previously, a questionnaire is used in this research for collecting quantitative data. This questionnaire is adapted from several studies (see table 1). Before moving forward, the researcher should address some issues that might happen during data collection. These issues that could occur associated with suspicious response patterns such as: straight lining, inconsistent answers, missing data, data distribution and outliers.

**Variables measurement**

The survey measures two section demographic information and variables' sections:

**Table 1: Summarizes the instrument used for all variables and its source**

| Variable name | STATEMENTS | Source |
|---|---|---|
| **Visual Design** | The mobile user interface of my online store looks professionally designed and well presented<br>The screen design on the mobile user interface (i.e., colours, boxes, menus, navigation tools etc.) of my online store is harmonious and well presented<br>Background colour, contrast and font are clearly presented | Karimov, et al., (2011); Ganguly, et al., (2010). |
| **Navigation Design** | I can easily navigate the mobile user interface of my online store<br>I find the mobile user interface of my online store easy to use<br>The site of my online store provides good navigation facilities to search the information content<br>Navigation design is simple and consistent navigation | Karimov, et al., (2011); Ganguly, et al., (2010). |

| | | |
|---|---|---|
| | Navigation reinforcements include guides, tutorials and instructions | |
| **Website information Design** | I find the information to be logically presented<br>I find the information on this site to be well organized<br>Information is simply designed<br>Getting information effortless | Karimov, et al., (2011); Ganguly, et al., (2010). |

## RESULTS AND DISCUSSIONS

In order to process the data that was acquired, the information was processed using the SPSS (version 26) statistics tool for package social sciences for Windows. Additionally, it was applied for the purpose of evaluating the descriptive statistics, in addition to the structural equation modeling software that was developed by Amos. The research hypothesis was the primary focus of Amos, which was designed to test it.

### Data entry and screening

Over the course of the time period described above, a total of 384 questionnaires were filled out using the Google form that was made available. Twenty-two of the individuals who took part in these questionnaires filled out the questionnaires with precise replies. As a consequence of this, a total of 357 valid questionnaires were accepted, which is equivalent to 92.9% of the sample that was intended for the study. The researcher started with this sample size for the purpose of providing support for the suggested measurement model using SPSS and Amos, a CFA was carried out in order to achieve this objective.

### Reliability

This investigation tested the reliability. This kind meets Cronbach's alpha with the use of SPSS. The instrument's reliability was determined to be over 0.70, which is satisfactory (Sürücü & Maslakçi, 2020). The results of the indicators of the study constructs' Cronbach Alpha (CA) and composite (CR) reliabilities are displayed in Table 2. The dependability magnitudes of the constructs used in this investigation are also displayed in the table. According to Cronbach alpha values, the lowest value was 0.811, indicating strong dependability levels.

**Table 2: The Cronbach and composite reliability for the items of the study constructs**

| Constructs | Items' Codes | Cronback Alpha | Composite Reliability |
|---|---|---|---|
| Visual Design | Visual_Design1 | .925 | .768 |
| | Visual_Design2 | | |
| | Visual_Design3 | | |
| Navigation Design | Navigation_Design1 | .811 | .748 |
| | Navigation_Design2 | | |
| | Navigation_Design3 | | |
| | Navigation_Design4 | | |

| | | | |
|---|---|---|---|
| Information Design | information_Design1 | .859 | .756 |
| | information_Design2 | | |
| | information_Design3 | | |
| | information_Design4 | | |

Table .2 shows that Visual Design has a Cronbach Alpha (Internal Consistency) as high at .925, indicating strong internal consistency among the items related to visual design. Also, Composite Reliability as high at .768, suggesting good reliability for the construct in the context of structural equation modeling. Additionally, Navigation Design respectable at .811, for Cronbach Alpha indicating acceptable internal consistency. The Composite Reliability Decent at .748, suggesting moderate reliability for the navigation design construct. The Information Design's Cronbach Alpha was Good at .859, indicating strong internal consistency. As for Composite Reliability was High at .756, suggesting good reliability for information design.

**Normality**

One of the fundamental principles of data analysis is normalcy (Alsaigh & Coyne, 2021). A "normality test" establishes the type of distribution or if the data have been regularly distributed. Every variable must have a normal distribution in order for there to be normalcy. when there shouldn't be a discernible departure from the norm in the data. Large variances have an impact on the validity of statistical tests (Pokki-Riikonen, 2023). In order to test for normality, two crucial numerical indicators that may be utilized to demonstrate how similar the variable data are to the data on the normal curve are skewness and kurtosis. Kurtosis, whether it is sharp or flat, shows where the data distribution's peak is. Based on the raw data, it can be concluded that the values of this indicator should not exceed an absolute value of (-3 to +3). The skewness of the tail determines whether the distribution is skewed to the left or right. The distribution of the data was roughly and substantially similar to the normal distribution, as demonstrated by examining the values of these two indicators.

**Table 3: Normality test of the study variables employing all of Skewness and Kortousis**

| | Skewness | | Kurtosis | |
|---|---|---|---|---|
| | Statistic | Std. Error | Statistic | Std. Error |
| Visual Design | -.015- | .129 | -1.725- | .257 |
| Navigation Design | -.129- | .129 | -1.477- | .257 |
| Information Design | .192 | .129 | -1.437- | .257 |

As it is seen in Table 3, all scores fall between (+3 and -3) The perceived usefulness representing a normal data distribution registered the highest value of the skewness indicator, which was (-.283-). The highest value was (-1.760), as indicated by this indicator (skewness) in relation to (kurtosis). The perceived usefulness variable was given this value. It is evident that the current value, which represents a normal distribution of data, was below the threshold. As a result, when these indications are combined, they show that the research variables have a normal distribution.

## Validity

The researcher used the SPSS-Amos program to perform the required computations, test the study hypotheses, and look into the validity and composite reliability of the questionnaire constructs. A major issue and characteristic of research is validity. Convergent and discriminant validities are the two groups into which it is separated. Convergent validity was expressed through the use of standardized loadings. An item is deemed convergent if its standardized loading value is 0.50 or higher. Divergent validity was assessed using three distinct techniques. The initial measure was the heterotrait-monotrait, which confirms that the item construct has greater correlations than the other constructs while also requiring that the correlation values not exceed 0.85 (Yusoff, Peng, Abd Razak & Mustafa, 2020)). or, in certain cases, is limited to 0.90 (Henseler, Ringle & Sarstedt, 2015). Second, the Fornel-Larker approach—which compares the construct intercorrelation to the square root of average variance (AVE)—was used to assess the divergent validity. This method requires that the square root of the AVE be greater than the intercorrelations of the constructs. Third, with the condition that the loadings on the associated constructs be equal, the discriminant validity was assessed by comparing the indicator loadings for a particular construct with the loadings for that construct on other constructs. The results are shown in the tables below.

## Convergent validity

Convergent validity is the degree to which a measure correlates favorably with other measures of the same construct (Hair Jr, Sarstedt, Hopkins & Kuppelwieser, 2014). Average Variance Extracted (AVE), as supported by Hair et al. (2011), has become a standard method for verifying convergent validity at the variable level. Generally speaking, to guarantee enough convergent validity, each latent variable's AVE needs to be greater than 0.50 (Hair et al., 2014). This suggests that this latent variable accounts for at least half of the variance in its items (Hair et al., 2014). The current investigation's Table 4.5 shows that all AVE values fell within the range of 0.700 and 0.805, indicating a sufficient degree of convergent validity. Consequently, the convergent validity of this investigation was determined.

**Table 4: Convergent validity**

| | **Items** | | **Construct's / Factor's** |
|---|---|---|---|
| **Constructs** | **Codes** | **Construct's Loadings** | **AVE** |
| Visual Design | Visual_Design1 | 0.749 | 0.804 |
| | Visual_Design2 | 0.808 | |
| | Visual_Design3 | 0.855 | |
| Navigation Design | Navigation_Design1 | 0.831 | 0.831 |
| | Navigation_Design2 | 0.636 | |
| | Navigation_Design3 | 0.799 | |
| | Navigation_Design4 | 0.885 | |
| Information Design | information_Design1 | 0.906 | 0.791 |
| | information_Design2 | 0.869 | |
| | information_Design3 | 0.873 | |
| | information_Design4 | 0.594 | |

**The table presents the Average Variance Extracted (AVE) values for various constructs or factors in a research study. The AVE is a measure of the amount of variance captured by the construct's indicators relative to the measurement error. Here are the findings based on the table as follows: the visual design (AVE = 0.804). This construct demonstrates a high average variance extracted, indicating that approximately 80.4% of the variance in its indicators is due to true score variance rather than measurement error. The navigation design (AVE = 0.831). This navigation design also exhibits a high AVE of 0.831, suggesting a substantial amount of variance in its indicators is attributed to the underlying construct. As for the information design (AVE = 0.791), it shows a good AVE of 0.791, indicating a strong ability to capture variance in its indicators beyond measurement error.**

### Discriminant validity

Table 5 shows that the results of the Variance Extracted (VE) test for all the constructs are above the recommended value of .50 (Cheung, Cooper-Thomas, Lau & Wang, 2023).

**Table 5: Variance extracted for variables**

| Constructs | Variance Extracted |
|---|---|
| Visual Design | .590 |
| Navigation Design | .558 |
| Information Design | .572 |

According to previous research Hossain, Hasan, Begum and Sarker (2022), the variance extracted values in this study, which ranged from 0.558 to 0.590 and matched the condition that VE values should be at least 0.50 for each construct, all explained 50% or more of the variation. Accordingly, these findings suggest the proportion of variance captured by each latent construct in relation to its observed variables. Higher VE values indicate a better ability of the constructs to explain the observed variation in their respective indicators**.**

### Testing of hypotheses

- **Testing the H1 of the Visual Design positively influence Competitive Advantage**

**Table 6: Visual Design positively influence Competitive Advantage in Jordan**

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. | f | Results |
|---|---|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | | | |
| | (Constant) | .418 | .064 | | 6.501 | .000 | 847.431 | |
| $H_1$ | Visual Design | .345 | .051 | .437 | 6.798 | .000 | | Supported |
| a. Dependent Variable: Competitive Advantage | | | | | | | | |

The table provides coefficients for a model assessing the impact of Visual Design on Competitive Advantage. The first row represents the intercept (Constant) with an unstandardized coefficient (B) of 0.345 and a standard error of 0.051 The associated t-value is 6.798, leading to a highly significant p-value of 0.000. Overall, these results suggest a substantial and statistically significant positive relationship between Visual Design and Competitive Advantage, as indicated by the coefficients and associated statistical values accepting H1.

There is a significant relationship between the Visual Design competitive advantage of an e-transportation companies in Jordan?

- **Testing the H2 of Navigation Design positively influence Competitive Advantage**

**Table 7 Navigation Design positively influence Competitive Advantage in Jordan?**

| Model | | Unstandardized Coefficients | | Standardized Coefficients | T | Sig. | F | Results |
|---|---|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | | | |
| | (Constant) | .418 | .064 | | 6.501 | .000 | 847.431 | |
| $H_2$ | Navigation Design | .218 | .049 | .208 | 4.403 | .000 | | Supported |
| a. Dependent Variable: Competitive Advantage | | | | | | | | |

Navigation Design (H.2) showed a significant positive relationship with an unstandardized coefficient of 0.218, a standard error of 0.049, a beta of 0.208, and a t-value of 4.403 (p-value = 0.000).

Overall, these results suggest a substantial and statistically significant positive relationship between Visual Design and Competitive Advantage, as indicated by the coefficients and associated statistical values accepting H2.

There is a significant relationship between the Navigation Design on competitive advantage of an e-transportation companies in Jordan?

- **Testing the H3 of the Information Design positively influences Competitive Advantage**

**Table 8: Information Design positively influences Competitive Advantage in Jordan**

| Model | | Unstandardized Coefficients | | Standardized Coefficients | T | Sig. | F | Results | |
|---|---|---|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | | | | |
| | (Constant) | .418 | .064 | | 6.501 | .000 | 847.431 | | |
| $H_3$ | Information Design | .358 | .051 | .324 | 6.962 | .000 | | | Supported |
| a. Dependent Variable: Competitive Advantage | | | | | | | | | |

Information Design (H.3) also demonstrated a significant positive effect, with an unstandardized coefficient of 0.358, a standard error of 0.051, a beta of 0.324, and a t-value of 6.962 (p-value = 0.000).

The overall model fit, indicated by the F-statistic (f = 847.431), was highly significant, reinforcing the robustness of the relationships observed.

Overall, these results suggest a substantial and statistically significant positive relationship between Information Design and Competitive Advantage, as indicated by the coefficients and associated statistical values accepting H2.

There is a significant relationship between the Information Design competitive advantage of an e-transportation companies in Jordan?

## DISCUSSION

The results provide useful contributions to the competitive advantage of smart transportation companies. Visual design was found to be able to improve competitive advantage of smart transportation companies. In particular, there is a relationship between the visual design, navigation design and competitive advantage of smart transportation companies. This has important implications for transportation companies to improve their competitive advantage. The use of visual design, navigation design, and website information design could also help to improve the competitive advantage of smart transportation companies in Jordan. The visual design, navigation design, and website information design significantly impact the competitive advantage of smart transportation companies by influencing brand perception, enhancing user experience, improving information accessibility, facilitating differentiation, optimizing conversions, and fostering adaptability and innovation. By prioritizing these design elements, companies can effectively position themselves for success in the dynamic and competitive smart transportation industry.

More study is needed to examine the effect of visual design, navigation design, and website information design on the competitive advantage of smart transportation companies in Jordan. Nonetheless, this study has contributed important empirical evidence on the effect of visual design, navigation design, and website information design on the competitive advantage of smart transportation companies in Jordan. Companies that invest in effective design strategies can position themselves as leaders in the smart transportation industry and gain a competitive edge over their rivals.

## CONCLUSION AND RECOMMENDATION

This study has examined the effect of visual design, navigation design, and website information design on the competitive advantage of smart transportation companies in Jordan. 357 customer of transportation companies in Jordan were surveyed.

The findings showed the significant positive influence of visual design, navigation design, and website information design on the competitive advantage of smart transportation companies. Competitive advantage of smart transportation companies was significantly moderated by visual design, navigation design, and information design.

According to the results reached, this study recommends the necessity of designing special applications for the visually impaired in the field of electronic transportation that meet their needs and are easy to use to improve their quality of life and increase their productivity by paying attention to the good design of user interface components and also designing applications that rely on voice commands because the visually impaired depend on The sense of hearing is more important to compensate for the sight.

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