User Adoption Intention of the Tourism APP
Based on Experimental Method

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Abstract. This paper mainly analyzes the influence of tourism app design on user's adoption intention. In this paper, the information system success model is used as the basic theoretical model. Besides the satisfaction, perceived usefulness and perceived ease of use are also taken into consideration to enrich the whole model. Four tourism APPs were designed for experimental participants to experience. These APPs have four kinds of different information quality and system quality, using the Xixi National Wetland Park as the background. A questionnaire was asked to complete after one different person using one kind of APP. Two hundred valid questionnaires were collected. This is first time to researches the user adoption intention of tourism APP by experiment method. Results show that the information quality and system quality in the system design have significant positive effects on the individual's perceived usefulness, and satisfaction. But the positive effect on the perceived ease of use is not significant. Research shows that improving the information quality and system quality in tourism APPs will indirectly affect the user's willingness to use.

Introduction

Mobile tourism APP can fully meet the tourists' diversification of tourism needs before the tour, in the tour and after the tour, providing tourists a richer, better and excellent travel experience than traditional desktop. The major tour operators have been involved in the APP field to grab market share. But the high APP development cost and operating costs also made those operators struggle. To dig out the real impact factors on user adoption of mobile tourism APP become a very important issue. Most of the current research is from the perspective of tourists to study the adoption intention, but rarely from what kind of APPs system designing would impact tourist adoption. In addition, most of the research methods are questionnaires, and less use of experimental methods. In the aspect of system design, this paper takes the information system success model as the research basis, and the system design of mobile tourism APP is evaluated from the two dimensions of information quality and system quality. At the same time, besides the user satisfaction, perceived usefulness and perceived ease of use, these three variables are added to enrich the overall model. And by experimental method with designing of different APPs, the feasibility of the model is tested.

Literature Review and Research Hypothesis

Individual Perception: Perceived Usefulness, Perceived Ease of Use, Satisfaction

In this study, the individual perception include perceived usefulness, perceived ease of use and satisfaction three variables.

Perceived usefulness refers to the degree to which performance is improved when an individual uses a technology. Perceived ease of use refers to the degree to which an individual learns about the ease of mastering a particular information technology or the effort he needs to pay. Satisfaction is a generalized state of mind, which refers to the expectations of consumers before they are used, and the
degree of confirmation of such expectations after use. The research of information systems incorporates satisfaction into the model of adoption intention.

**APP Design: System Quality and Information Quality**

This research uses the information system success model as the main theoretical framework of the system design. The information system success model was proposed by DeLone and McLean in 1992\[1\]. They found out that the main factors that affect the success of information system are the information quality and the system quality. The information quality means that the system can ensure that all the information can be in accordance with its original intention in the transmission process. The system quality refers to the system can be accurate and effective production information. In terms of the specific measurement of these dimensions, such as the information quality, including the accuracy, timeliness, completeness, relevance and persistence of the information provided by the system, are measured. The specific indicators of the system quality, include functionality and reliability, flexibility, integration, importance and etc.. These two dimensions affect the user's usage and satisfaction. With the popularity of smart phones and mobile Internet, scholars have begun to use the information system success model to analyze the user's adoption intention for mobile applications \[2-5\]. For tourists, mobile tourism APP must be fully interactive with them to complete the corresponding transactions and services. Then the individual perception of the tourists will inevitably be affected by the objective design of the mobile tourism APP. For example, the high quality of the system will fully meet the diversified functional requirements of tourists, while high information quality will provide tourists with adequate and accurate travel information, and timely notification. This objective factor based on the design of the mobile tourism APP obviously affects the individual perception, including the perceived usefulness, perceived ease of use and satisfaction.

**Research Model**

In this paper, how the design of mobile tourism APP affect users' adoption intention is studied by the model shown in Fig.1. Based on this, the following hypotheses are proposed:

**Hypothesis 1.** Perceived usefulness has a significant positive effect on the adoption intention.

**Hypothesis 2.** Perceived ease of use has a significant positive impact on the adoption intention.

**Hypothesis 3.** Satisfaction has a significant positive impact on the adoption intention.

**Hypothesis 4a.** Information quality has a significant positive effect on perceived usefulness.

**Hypothesis 4b.** Information quality has a significant positive impact on perceived ease of use.

**Hypothesis 4c.** Information quality has a significant positive effect on satisfaction.

**Hypothesis 5a.** System quality has a significant positive effect on perceived usefulness.

**Hypothesis 5b.** System quality has a significant positive impact on perceived ease of use.

**Hypothesis 5c.** System quality has a significant positive effect on satisfaction.

![Figure 1. Research model.](image-url)
Experimental Design and Experimental Process

Experimental Design

In order to be able to actually operate the different levels of information quality and system quality, four kinds of tourism APPs with different system interfaces are designed for experiment.

First, it needs to determine the scene as the APP's experimental background. The famous tourist attraction in Hangzhou, Xixi National Wetland Park, is selected as the background, because it is very suitable for developing a tourism APP.

Xixi National Wetland Park is located in the west of Hangzhou City, Zhejiang Province, 6 kilometers away from the center of the Hangzhou city, Wulinmen, only 5 kilometers away from the West Lake. The total area of the park is about 11.5 square kilometers, divided into the eastern wetland ecological protection area, the central wetland ecology Tourism recreation area and the western wetland ecological landscape enclosure area. The park is a national wetland park integrated with urban wetlands, farming wetlands and cultural wetlands. It was included in the list of international important wetlands at November 3, 2009 and was named the national AAAA-class tourist attractions at January 10, 2012. Its spatial layout can be summarized as "three areas, one gallery, and three zones.". It is also famous for the "three banks, ten scenes".

From the brief introduction of the Xixi National Wetland Park above, it is easy to know the Park contains a large range of space, and the scenic area has a lot of beautiful natural and cultural landscape. It is very suitable for developing a tourism APP related to the park.

Four different tourism APPs are developed, with Xixi National Wetland Park as the background. The four different function combinations of the design and interface content of the tourism APP, just corresponds to the level of information quality and system quality. Four different combinations are developed as high information quality with high system quality (HIHS), low information quality with high system quality (LIHS), high information quality with low system quality (HILS), low information quality with low system quality (LILS), as shown in Table 1. (If the APP screens are hoped to show the differences in terms of the system design and the content presentation, please connect authors to send by email.)

<table>
<thead>
<tr>
<th>APP Type</th>
<th>low information quality</th>
<th>high information quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>low system quality</td>
<td>LILS</td>
<td>HILS</td>
</tr>
<tr>
<td>High system quality</td>
<td>LIHS</td>
<td>HIHS</td>
</tr>
</tbody>
</table>

APP-LILS is firstly designed. As APP-LIHS is at the same level of low information quality as APP-LILS, so APP-LIHS in the dimension of information quality has not made a change from APP-LILS. APP-LIHS's change of system quality is described in detail. At the bottom of the main page, a new tool bar are added, including "Home", "Navigation", "Personal" buttons: 1) in the "home" page is the original main page of APP-LILS; 2) in the "navigation" page, some map elements are added. At the same time, a search bar is added in this page which tourists can search scenic spots of the park and travel information related to the positioning, making the system quality more reliable; 3) the "personal" page contains the personal account login information and account settings.

APP-LIHS represents the combination of low information quality and high system quality, so in terms of information quality dimensions, it still keep the display in APP-LILS, in respect of system quality dimensions, to show that the high level and low level of distinction, APP-LIHS add the "home", "navigation" and "personal" three interfaces, and those functions in interfaces can fully reflects the high level of the system quality of APP-LIHS.

APP-HILS is designed interface content for high information quality and low system quality levels. As this APP-HILS is at the same level of low system quality as the APP-LILS, so APP-HILS in the dimension of system quality has not made a change from APP-LILS. Next the improvement in information quality dimension of APP-HILS is described as follow. In order to reflect the APP-HILS's advantage in displaying information in the accuracy, timeliness, integrity and relevance,
the following changes based on APP-LILS are made. In addition to the top search bar in the home page, some of the scenic pictures and "Information of landscape" these three modules, the "Regional choice" and "Leisure place" modules are added: 1) First, "Regional choice" module include "Landscape", "Food" and "Accommodation", "Travel", "Shopping" and "More" six buttons, the experimenter can click any of the button to see the relevant information. 2) In the next "Leisure place" module, some recreational and leisure site are introduced, such as Starbucks, Xixuan Hotel, etc., by some specific icons and simple descriptions. 3) At the bottom of the first page, compared to APP-LILS, the "attractions evaluation" function is also added. This function's page mainly shows former visitors' evaluation to the Xixi National Wetland Park tour experience. These evaluations include text information and image information. Based on these, it is believed that the design can fully reflect the high level of information quality in APP-HILS.

APP-HIHS's system design and interface content, represents high information quality and high system quality levels. Here is no longer one by one specifically described.

To sum up, four different types of experimental tourism APPs' system design and interface are described above.

Experimental Process

Suitable experimenters were selected. A total of 200 experimenters from a college in Zhejiang are selected. According to four different APP experiments, each group has 50 experimenters.

Before the start of four experiments, a classroom that could accommodate 50 experimenters and with good campus WIFI signal was selected. And each experimenter is asked to connect to campus WIFI when 50 experimenters sat in the classroom. They would add into the QQ group to download and install the specific version of APP for them to experience. When experiment began, each experimenter had 15 minutes to use the APP selected for them. They could fully experience or end the experience ahead of time. At the end of the experience, the experimenter completed the questionnaires based on the results of the experience. Each experiment took 40 to 50 minutes to complete from the preparation phase to the end of the paperwork.

Experimental Results Analysis

Experimental Data Analysis

At the end of the experiments, the data were collected and counted. Before the statistical analysis, the participants of the gender, age, experience of mobile phone and APP are studied. In preliminary statistics, the number of males involved in this experiment was 97, and the number of females was 103, which was nearly equal. In the mobile phone APP experience, there are 8 people have less than 1 year experience, 46 people have more than one and less than 2 years-experience in using APPs, 146 people have more than 2 years-experience.

Using the method of variance analysis to verify the gender, age, demographic variables, or mobile phone APP experience in the four different groups are not significant differences, so these control factors will not have an impact on the experimental results of this article.

Further, research model of the experiment will be analyzed. The MANOVA, Multivariate Analysis of Variance were used to analyze the impact of the two experimental variables on system quality and information quality.

In this paper, the experimental research model is based on four different groups, namely high information quality with high system quality, low information quality with high system quality, high information quality with low system quality as well as low information quality with low system quality. We have different dependent variables, as observational variables: perceived usefulness, perceived ease of use, and satisfaction. So this article will analyze the whole model integrally through MANOVA. The analysis results are listed below.

As can be seen from the Table 2, in the dimension of system quality, it had a significant effect on perceived usability (p<0.001, ***), perceived ease of use (p <0.01, **) and satisfaction (p <0.01, **), and in the dimension of information quality, it also had a significant effect on them. In addition, the
effects of interaction between system quality and information quality on these three variables were examined. Perceived usefulness ($p<0.001$, ***) , perceived ease of use ($p<0.001$, *** ) and satisfaction ($p<0.05$, *) have a significant impact.

Table 2. Results of subject effect test.

<table>
<thead>
<tr>
<th>Source</th>
<th>Dependent variable</th>
<th>Type III squares</th>
<th>df</th>
<th>Mean square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>system quality</td>
<td>Perceived ease of use</td>
<td>4.470</td>
<td>1</td>
<td>4.470</td>
<td>8.324</td>
<td>.003</td>
</tr>
<tr>
<td></td>
<td>Perceived usefulness</td>
<td>11.545</td>
<td>1</td>
<td>11.545</td>
<td>22.958</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>satisfaction</td>
<td>5.565</td>
<td>1</td>
<td>5.565</td>
<td>11.601</td>
<td>.001</td>
</tr>
<tr>
<td>information quality</td>
<td>Perceived ease of use</td>
<td>5.012</td>
<td>1</td>
<td>5.012</td>
<td>9.504</td>
<td>.003</td>
</tr>
<tr>
<td></td>
<td>Perceived usefulness</td>
<td>12.504</td>
<td>1</td>
<td>12.550</td>
<td>24.887</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>satisfaction</td>
<td>5.102</td>
<td>1</td>
<td>5.102</td>
<td>10.619</td>
<td>.002</td>
</tr>
</tbody>
</table>

Based on the above analysis of the experimental data, the hypothesis could be summed up that H4a and 4c are supported by the data, hypothesis5a and 5c are also supported by the data. But hypothesis4b and 5b are not supported.

The next part will focus on whether perceived usefulness, perceived ease of use and satisfaction have impact on user's adoption intention.

**Questionnaire Data Analysis**

Table 3 is the reliability analysis of the questionnaire data. The Cronbach's alpha value of the variable is greater than 0.7, indicating that the reliability requirement has been reached.

In order to further prove the validity of the data, it will be verified through the method of Confirmatory Factor Analysis (CFA) in software AMOS21.0. The value of AVE is greater than 0.5. The results show that the sample data have good aggregation validity and discriminant validity at the same time.

The result of the model was credible and effective, and the whole sample data passed through the test, suitable for the analysis of the hypothesis model.

In order to verify the above assumptions, the structural equation model analysis software AMOS 21.0 is used here, the final analysis results shown in Table 3.

Table 3. Model analysis results.

<table>
<thead>
<tr>
<th>Path</th>
<th>Corresponding hypotheses</th>
<th>Standardized regression coefficients</th>
<th>Critical ratio</th>
<th>P values</th>
<th>Inspection results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived usefulness * Adoption intention</td>
<td>H1</td>
<td>0.305</td>
<td>3.184</td>
<td>**</td>
<td>Support</td>
</tr>
<tr>
<td>Perceived ease of use * Adoption intention</td>
<td>H2</td>
<td>0.058</td>
<td>0.816</td>
<td>0.414</td>
<td>Not support</td>
</tr>
<tr>
<td>Satisfaction * Adoption intention</td>
<td>H3</td>
<td>0.234</td>
<td>2.362</td>
<td>*</td>
<td>Support</td>
</tr>
</tbody>
</table>

Note: $p<0.001$ for ***, $p<0.01$ for **, $p<0.05$ for *

As can be seen from Table 3, perceived usefulness and satisfaction have a significant positive effect on the adoption intention. The influence coefficient on the perceived usefulness of $\beta = 0.329$ is greater than the satisfaction of $\beta = 0.255$, that means perceived usefulness have greater effect on the adoption intention. It is also verified that the hypothesis H5 are supported by the sample data. The perceived ease of use is not significant for the adoption intention, that is, hypothesis H3 and H4 are not supported.

From Table 3, the values of the model are assumed to meet the requirements of academic research, where $X^2 / df$ is less than 3, GFI, AGFI, NFI, TLI, CFI are greater than 0.9 and RMSEA is less than 0.08, indicating that the results are credible, the model is constructed correctly and effectively.
Summary
This is first time to researches the user adoption intention of tourism APP by experiment method in this paper. Based on Xixi National Wetland Park, four different mobile tourism APPs are designed, which embodies the combination of information quality and system quality in two different levels, namely, APP-HIHS of high information quality with high system quality, APP-LIHS of low information quality with high system quality, APP-HILS of high information quality with low system quality, APP-LILS of low information quality with low system quality. In the course of the experiment, each APP was experienced by 50 experimenters for 15 minutes. After the experience, the questionnaire was filled immediately. As can be seen from the results, information quality has significant positive influence on the perceived usefulness, perceived enjoyment and satisfaction. System quality also has significant positive influence on the perceived usefulness, perceived enjoyment and satisfaction. But the effects of information quality and system quality on perceived ease of use are not significant.

In the theoretical model analysis, the structural equation model is used to verify hypotheses. The final results show that perceived usefulness and satisfaction has significant positive influence on users' adoption intention. Perceived usefulness has more influence than satisfaction does. But perceived ease of use and perceived enjoyment having effect on users' adoption intention may not be supported. It is concluded from the results that people pay more attention on APP's practicality when they use a tourism APP. Mobile tourism APP's main role is to help tourists solve some very practical problems. APP's operational simplicity and interesting usage do not have enough attraction to users.

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