

“Self-Cognition” in the Construction of Digital Museums—A Study Based on the “Collection of Famous Paintings in the Palace Museum”

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Abstract

This case study of the “Collection of Famous Paintings in the Palace Museum” examines digital museum visiting from a classic Technology Acceptance Model perspective. The impact of college students’ self-cognition on their use of the collection was investigated to study the acceptance behavior of digital museum users, thus providing a useful reference for the construction of “user-oriented” digital museums in the future. The individual innovativeness results show that: 1) the basic variables relating to “self-cognition” have a positive impact on the visitors’ perceived ease of use; 2) the perceived ease of use has a significant positive impact on usage intention; and 3) self-efficacy and individual innovativeness can indirectly impact the intended use of digital collections such as the “Collection of Famous Paintings in the Palace Museum” by college students through their positive impact on the perceived ease of use.

Keywords

Digital Museums, Technology Acceptance Model, Self-Cognition

1. Introduction

Digital museums first appeared in the 1990s in America. Drawing upon the affordances of modern technology, they provide an effective way of both protecting and exhibiting precious aspects of our cultural heritage. The Digital Museum is a website that provides digital services for both physical and intangible heritage. A complete digital museum consists of at least a digital collection, a storage platform, a processing platform, and an interactive display platform. Digital museums not only remove the temporal and spatial constraints involved in si-

multaneously preserving and exhibiting collections that confront physical museums, they can also open up access to more diverse audiences and provide those audiences with distinctive immersive experiences through the use of interactive digital media. This opens up the prospect of enabling visitors to get a more intuitive understanding of the abstract cultural knowledge indexed by cultural artefacts [1].

Since the beginning of the 21st century, large museums around the world have established their own digital museums, such as the Louvre, the British Museum, etc. Both theoretical and practical research about digital museums has been flourishing ever since. As a part of its “Digital Palace Museum”, the Palace Museum in Beijing began to construct in 2015 a digital exhibition entitled “Collection of Famous Paintings in the Palace Museum”. This has become an outstanding example of the use of digital museums in China because of the scale and quality of its content and the diverse ways in which its digital exhibits are presented [2].

The primary function of digital museums is to promote education regarding relics and museology and to make available the historical and cultural inheritance housed in their collections. In essence, a digital museum is a place where human and objects can interact [3]. The value of digital museums is reflected by the extent to which they succeed in their transmission of traditional culture. In other words, beyond just showcasing the application of emerging digital information processing technology, public awareness and the acceptance of digital museums is an important aspect of validating the transfer of information between the collections in museums and the public [4].

By investigating how college students have sought to use the “Collection of Famous Paintings in the Palace Museum”, this study analyzes the effects of different self-cognition variables on the public’s voluntary use of digital museums from an “individual self-cognition” perspective [5]. It aims to provide useful guidance for the ongoing construction of “user-oriented” digital museums [6].

2. Methodology and Self-Cognition Variables

Since it was first proposed by Davis [7], the Technology Acceptance Model has been widely used in the field of information systems to explain and predict the extent of user acceptance of new information systems. In 2000, Davis and Venkatesh [8] modified the Technology Acceptance Model and pointed out that, beyond the decisive effect of the three core variables “perceived usefulness”, “perceived ease of use” and “usage intention” on actual usage behavior, there are also external variables such as “the subjective norm” and “voluntariness” that can have an impact on the core variables.

This study is based on the Technology Acceptance Model and two variables—“self-efficacy” (V1) and “individual innovativeness” (V2)—are introduced to add further insights regarding the acceptance of digital museums, especially in relation to the core variable of usage intention. The research was conducted among college students, since they grew up in the era of Internet, getting used to ob-

taining information by using digital technology. Thus, the college students are important users and their opinions should be taken into consideration during the construction of digital museums. The sample data was obtained through questionnaires. Statistical analysis was then conducted using SPSS to verify the effect of each variable upon the college students' usage intention in relation to the "Collection of Famous Paintings in the Palace Museum". Drawing upon the studies of Davis [7] and Shin-Yuan Hung [9], the variables and how their expression was obtained using a form of Likert Scale are listed in **Table 1**.

3. Effects of Self-Cognition on Behavioral Intention

3.1. Survey Data Reliability and Validity Test

Basic data was obtained via the online questionnaire for each specific variable. The measurement items for each variable are shown in **Table 1**. The consistency of the survey was ensured by circulating the questionnaire among the Wechat groups of college students. Results of the reliability and validity tests for the obtained survey data are listed in **Table 2**. The survey involved 213 college students in various disciplines such as humanities and social sciences, science and engineering, and art, including 99 boys and 114 girls.

Cronbach's α coefficient was used to inspect the internal consistency of the questionnaire for the reliability test. The results show that Cronbach's α for each variable is higher than 0.7, indicating a relatively high reliability for the survey data (see **Table 2**). The " α value after the item was deleted" for each variable's measurement item is smaller than the Cronbach's α value for the corresponding variable. This also suggests that the measurement items have strong explanatory power for each variable and that the expression of each measurement item is solidly reliable. In the validity test of the data, the KMO (Kaiser-Meyer-Olkin) values of the variables were calculated to be 0.746 (V1), 0.691 (V2), 0.775 (V3), and 0.835 (V4), indicating that the requirements for the further factor analysis have been satisfied. As shown in **Table 2**, the approximate significance probability associated with 2 (the p-value) for the Bartlett spherical test is less than 0.01, indicating that the measured data are correlated to each other and can be subjected to factor analysis. At the same time, the factor loadings for all of the variables' measurement items are higher than 0.5, which also indicates that they have a high correlation.

3.2. Impact of Self-Cognition on Usage Intention

Table 3 present the results of the analyzed correlation between usage intention (V4) and sense of self-efficacy (V1), personal innovation (V2), and perceived ease of use (V3). **Table 4** provides the regression analysis between usage intention and these variables, respectively. The data in **Table 3** indicates that significant 0.01 level (two-tailed) correlations exist between the variables V1~V3 and the variable V4. The results of the regression analysis between the variables in **Table 4** show that the variance is 0.785 after adjustment of the multiple regression

Table 1. Scale table for each variable used in the study.

Variable	Measurement item
Self-efficacy (V1)	V1.1: I am confident that I can master how to use the “Collection of Famous Paintings in the Palace Museum” without being told how to use it.
	V1.2: I am confident that I can master how to use the “Collection of Famous Paintings in the Palace Museum” without ever having had the experience of using any similar digital museums.
	V1.3: I am confident that I can master how to use the “Collection of Famous Paintings in the Palace Museum” if I am given enough time to try to use it.
	V1.4: I am confident that I can master how to use the “Collection of Famous Paintings in the Palace Museum” with the guidance of user manual.
Individual innovativeness (V2)	V2.1: If I heard of a new information technology system, I would like to try to use it.
	V2.2: If I heard of a new information technology system, I would like to use it as soon as possible.
	V2.3: If I heard of a new information technology system, I would tend to be the first one among my peers to use it.
Perceived ease of use (V3)	V3.1: I think it is easy to learn to use the “Collection of Famous Paintings in the Palace Museum”.
	V3.2: I think the “Collection of Famous Paintings in the Palace Museum” is easy to use.
	V3.3: I think it is easy to use the “Collection of Famous Paintings in the Palace Museum” to obtain the necessary information.
	V3.4: I think the interactive operation of the “Collection of Famous Paintings in the Palace Museum” is easy to understand.
Usage intention (V4)	V4.1: I am very interested in the “Collection of Famous Paintings in the Palace Museum”.
	V4.2: I like the digitalized exhibition of the paintings in the Palace Museum collection by the “Collection of Famous Paintings in the Palace Museum”.
	V4.3: I would like to use (or would like to use in the future) the “Collection of Famous Paintings in the Palace Museum”.
	V4.4: I intend to use the “Collection of Famous Paintings in the Palace Museum” when I want to know about the paintings in the Palace Museum collection.
	V4.5: I am looking forward to using the “Collection of Famous Paintings in the Palace Museum”.

coefficient. The capacity of the regression equation to explain variations in usage intention reaches 78.5%. This indicates that the regression equation has obtained a satisfying fit for the results.

The *t* value in the regression coefficient significance test for perceived ease of use is 2.519 ($p = 0.013 < 0.05$), with the regression coefficient reaching a significant level. The regression coefficient for perceived ease of use is 0.129, indicating that the perceived ease of use has a significant positive impact on usage intention. In other words, the easier the college students find it to use the “Collection of Famous Paintings in the Palace Museum”, the stronger their usage intention. Outside of this, for the data sample obtained in this test, the *t* values for self-efficacy and personal innovativeness in the regression coefficient significance

Table 2. Study variable reliability and validity tests.

Variable	Measurement item	α value after the item was deleted	Cronbach's α value	Factor loading	KMO value	p value
Self-efficacy (V1)	V1.1	0.706	0.750	0.729	0.746	0.000
	V1.2	0.686		0.775		
	V1.3	0.683		0.780		
	V1.4	0.692		0.753		
Individual innovativeness (V2)	V2.1	0.678	0.779	0.846	0.691	0.000
	V2.2	0.758		0.794		
	V2.3	0.660		0.857		
Perceived ease of use(V3)	V3.1	0.734	0.838	0.903	0.775	0.000
	V3.2	0.831		0.725		
	V3.3	0.748		0.889		
	V3.4	0.832		0.751		
Usage intention (V4)	V4.1	0.817	0.862	0.847	0.835	0.000
	V4.2	0.852		0.748		
	V4.3	0.812		0.862		
	V4.4	0.852		0.744		
	V4.5	0.829		0.819		

Table 3. Correlation between the variables.

		Usage intention (V4)						
(V1)	Pearson correlation	0.795	(V2)	Pearson correlation	0.724	(V3)	Pearson correlation	0.734
	Sig (two-tailed)	0.000		Sig (two-tailed)	0.000		Sig (two-tailed)	0.000

Table 4. Regression analysis of usage intention and the other variables.

Model	Standardized coefficient β	t	Significance p	Adjusted variance
Constant		-0.977	0.330	
Self-efficacy (V1)	0.111	1.116	0.266	0.785
Individual innovativeness (V2)	0.071	1.377	0.170	
Perceived ease of use (V3)	0.129	2.519	0.013	

test are 1.116 ($p = 0.266 > 0.05$) and 1.377 ($p = 0.170 > 0.05$), respectively. In this case, the regression coefficients failed to reach a significant level, indicating that the impact of these variables on college students' usage intention is not well reflected within the sample.

3.3. Impact of Self-Cognition on Perceived Ease of Use

It can be seen from the results of the above analysis that perceived ease of use (V3) has a dramatic impact on usage intention (V4). However, in terms of the

scope of the data sample obtained for this study, variables V1 and V2 do not appear to have a direct impact on usage intention (V4). In this section, we examine the effects of V1 and V2 on perceived ease of use (V3). The results are shown in **Table 5** and **Table 6**.

It can be seen from the data in **Table 5** that there is a significant correlation between self-efficacy and perceived ease of use. There is also a significant 0.01 level (two-tailed) correlation between personal innovation and perceived ease of use. **Table 6** puts the variance after adjustment of the multiple regression coefficient at 0.555, with that the regression equation's capacity to explain variation in the perceived usefulness reaching 55.5%. The t values in the regression coefficient significance test for the two independent variables (V1, V2) are 7.492 ($p = 0.000 < 0.05$) and 4.379 ($p = 0.000 < 0.05$), respectively. These regression coefficients are both at a significant level and the overall results are within an acceptable range so, a satisfying fit for the results has been achieved. The regression coefficient for self-efficacy (V1) is 0.505, indicating that self-efficacy has a significant positive impact on perceived ease of use. The regression coefficient for personal innovativeness (V2) is 0.295. This implies that individual innovativeness also has a significant positive impact on perceived ease of use. Looking at the regression coefficients for self-efficacy and personal innovativeness, it can be concluded that both of these variables have a significant positive impact on perceived ease of use, with self-efficacy having a greater impact than individual innovativeness.

4. Conclusions and Suggestions

This study took the digital exhibition "Collection of Famous Paintings in the Palace Museum" as its research subject. The Technology Acceptance Model was used to explore the impact of college students' self-cognition on their usage intention. By looking at users' acceptance behavior for the digital museum we arrived at the following results (see also **Figure 1**): 1) Self-efficacy (V1) and personal innovation (V2) positively affect the perceived ease of use (V3) of the "Collection of Famous Paintings in the Palace Museum", with the perceived ease of use (V3) having a significant positive impact on usage intention (V4); 2) Self-efficacy (V1) and personal innovation (V2) do not have a direct impact on usage intention (V4), but these two variables still have an indirect impact on the usage intention of college students for the "Collection of Famous Paintings in the Palace Museum" through their positive impact on perceived ease of use (V3).

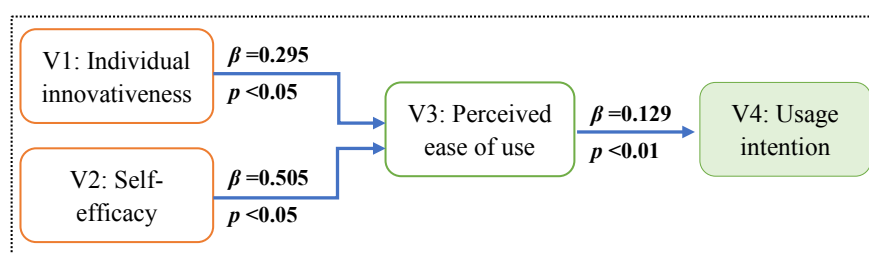
With digital museums undergoing a constant process of development, college students stand as a particularly important target audience. This cohort of users was born in an era when the Internet was developing rapidly. For them, the Internet is considered to be a more accessible resource for obtaining the information they need than traditional methods such as books and documentaries. So, digital museums have become an important way for these users to acquire an understanding of traditional painting and for them to receive cultural and

Table 5. Correlations between the variables.

		Perceived ease of use (V3)			
Self-efficacy (V1)	Pearson correlation	0.721	Individual innovativeness (V2)	Pearson correlation	0.665
	Sig (two-tailed)	0.000		Sig (two-tailed)	0.000

Table 6. Correlations between the variables.

Model	Standardized coefficient β	t	Significance p	Adjusted variance
Constant	/	2.524	0.012	
Self-efficacy (V1)	0.505	7.492	0.000	0.555
Individual innovativeness (V2)	0.295	4.379	0.000	

**Figure 1.** User acceptance behavior.

museological education more broadly. Taking the positive impact of self-cognitive factors on usage intention into consideration, for the future construction of digital museums, on the one hand, enhancing the immersive experience to moderately integrate into the game elements, on the other hand, optimizing the content and information structure to enhance usefulness, these measures will undoubtedly improve the overall impact of digital museums upon the process of cultural communication.

This paper mainly focuses on the research of college students, and does not conduct in-depth longitudinal tracking research on the specific behaviors of users. In the future, it is expected that the scope of the sample will be further expanded and a more general interpretation will be drawn.

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Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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