An Investigation of Viewer's Perception and Acceptance of Digital Signage

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Abstract

Digital signage is considered as an innovative service technology in marketing and advertising industry recently. Digital content can be displayed and updated in one or more targeted locations simultaneously and quickly. As digital signage is still in its infancy, commercial marketing via digital signage still suffers from low acceptance rate. The main focus of this study is to investigate the viewer's needs in deploying digital signage in public locations. A digital signage acceptance model is proposed to examine the adoption attitude and willingness of viewer's acceptance of digital signage. The finding demonstrates that digital signage can be provided added-value and increase the quality of the viewer's living experience. Practical implications and suggestions for marketers also are provided.

Keywords: Digital signage, technology acceptance, perceived ease of use, perceived usefulness, display environment, presentation type

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Introduction

When walking in a department store, supermarket, fast food restaurant, airport or train station, LCD boards have been replaced the traditional marquee or scrolling text marquee. This new type of presentation technology – digital signage, enables the viewers to receive dynamic and vibrant product/service information. Digital signage, electronic billboards or LCD utilise digital display as a medium and integrates dynamic and statistic contents to communicate with potential customers (viewers) in a targeted time and location. Through this digital platform, the product or service information is disseminated in an animated form directly to targeted customer domains and triggers the customer's buying aspiration.

As digital signage is still in its infancy, commercial marketing via digital signage still suffers from low acceptance rate (Lee and Chang, 2009). The main focus of this study is to investigate the viewer's needs in deploying digital signage in public locations. A digital signage acceptance model (DSAM) based on Technology Acceptance Model (TAM) is proposed to investigate the viewer's attitude and willingness of adopting the new technology of digital signage. Two control variables such as the content presentation types and the display environment are incorporated in the research to examine the factors relating to technology acceptance. The paper concludes with suggestions to help digital signage providers in future marketing and promotion activity.

Literature and Research Framework

Digital signage is the new digital marketing application using digital display-media for static or animated contents presentation (Wertime and Fenwick, 2008). Digital signage in conjunction with digital technology provides more vivid indoor and outdoor advertising functionality. The distinct characteristics include: (1) audio and video presentation: through the use of digital displays, product or service information can be presented in high-quality forms (Tullamn, 2004) and in targeted locations and specific time slots on the digital signage platform; (2) ubiquitous: through the centralised system, providers can distribute the update-to-date digital contents remotely via the Internet platform (Raymond, 2005); (3) location: digital signage can be placed near the consumer areas to provide information to meet the consumer's needs. The dynamic multimedia presentation will attract viewer's eyes and trigger the purchasing desire, which in turn stimulates shopper's impulse for instant purchase effect; (4) dynamicism: digital signage offers diversity and variability features, the contents can be changed or reset any time without complicated processes (Wilson, 2004); and (5) individualism: for specific group of viewers and deployed in specific sites, real-time, and interactive marketing communication tool.

Technology acceptance model

The Technology Acceptance Model (TAM) has been used for user acceptance of new technology in many empirical studies. TAM was proposed by Davis (1989) under the foundation of Theory of Reasoned Action (TRA) developed by Fishbein and Ajzen (1975), and is one of the well-known theories for the study of user's behaviour towards new technology acceptance. The purpose of TAM is to explicate the use of computer technology and the user's behaviour.

The fundamental concept of TRA derives from social psychology. The model was developed from the user's behaviour in relation to the information technology. The intention is to explore the relationship between the user and usage of information technology through the user's psychological, behavioural characteristics, and in turn to explain or predict the behaviour elicited by the use of information technology.

To further improve TRA model, Ajzen modified the model with additional factor – "perceived behaviour control", and proposed the Theory of Planned Behaviour (TPB) in 1985. TPB shows that an individual can control behavioural beliefs and the resources such as money and time owned by that individual to control behavioural beliefs. Ajzen combined these two factors and created the term "perceived behavioural control". Taylor and Todd (1995) combined these factors and their respective beliefs in a simplified beliefs structure model. In past studies, there were a number of arguments regarding the relationships between Perceived Usefulness, attitude towards using, and behavioural intention. Adams et. al (1992) and Straub et. al. (1997) proposed a revised TAM with the removal of behavioural intention from the model. Igbaria (1997) has also applied the revised TAM to the technology acceptance related issues in SMEs (Small and Medium-sized Enterprises).

Due to the popularity and simplicity of the TAM, a proposed digital signage acceptance model (DSAM) is based on TAM to investigate the viewer's attitude and willingness of adopting the new technology of digital signage.

Research Model and Hypotheses

Figure 1 shows the DSAM to investigate the impact of technology acceptance on the adoption attitude (AA) and willingness to adopt (AW) of digital signage. The model embraces two control variables, which are also moderating variables – type of presentation and the display environment, to demonstrate the effect of AA and AW. The remaining section explores the rationale for the hypotheses development.

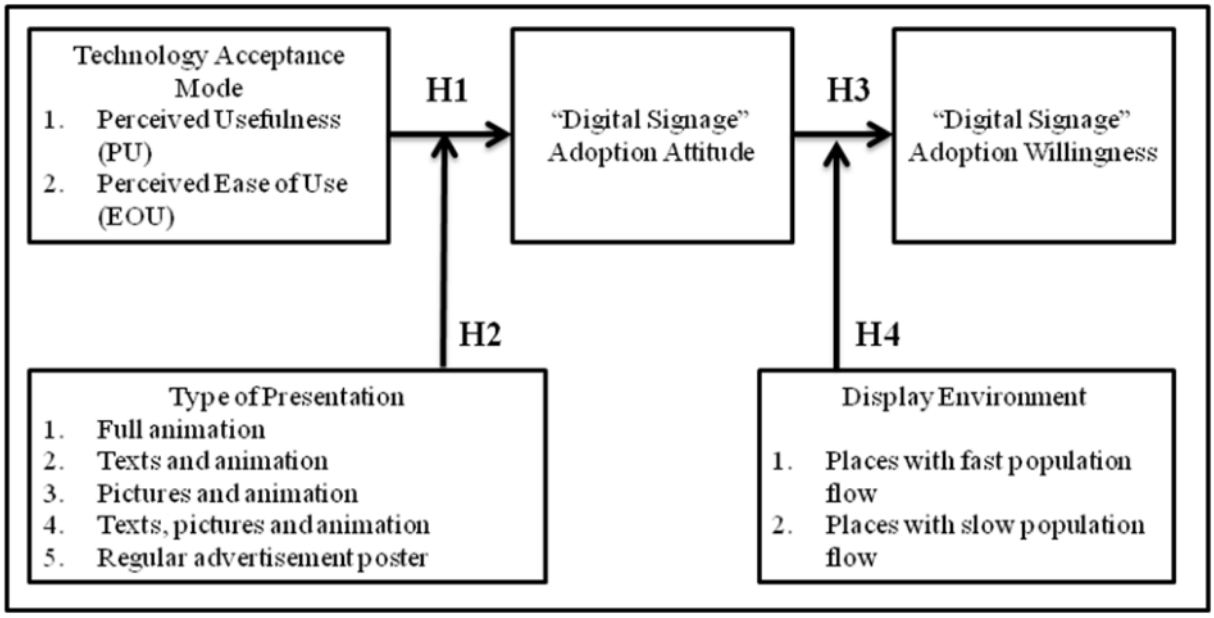

Figure 1. Digital Signage Acceptance Model (DSAM)

Hypotheses

The special characteristics of TAM entail the explanation of user behaviour in computer technology acceptance and an attempt to analyse the factors influencing user acceptance of new technologies. Davis (1986) stressed that in addition to the "Perceived Usefulness" and "Perceived Ease-of-Use" as the key factors in TAM, the adoption attitude will further affect the user's (viewer's in this study) adoption willingness.

Hence, it is hypothised that the viewer's perception of usefulness has a significant affect in the adoption attitude of digital signage (H1-1) and the viewer's perception of ease-of-use has a significant affect in the adoption attitude of digital signage (H1-2).

The high quality of animation, rendering of the image and text to enrich media and video effects has been widely used in digital signage presentation types for product/service information in the public places. Hence, it is proposed that TAM has a significant affect in the adoption attitude of digital signage moderated by the presentation type (H2-1, H2-2, H2-3, H2-4, and H2-5). Agarwal and Praad (1989) proposed that the human behaviour of adopting technology will be subject to the effects of the use of attitude. In other words, the more positive attitude of an individual towards the usage of technology, the stronger behavioural intention of using technology, and consequently a higher acceptance of new technology (H3). Lastly, two display environmental factors are considered as the moderating variables to test the effect of adoption willingness (H4-1 and H4-2).

Data collection and analysis

Data was collected using a survey disseminated in crowded public spaces such as a university campus. The respondents include students and nearby residents. The respondents were given an introduction and a demonstration of digital signage before distributing the survey. The sampling methods used was a non-probability sample (the size of the sample), which ensured that respondents had experienced by viewing the digital signage. The survey was conducted on 4^{th} -10^{th} March, 2010 for a week. A total of 164 responses were collected with 150 valid responses after the preliminary data analysis.

The valid respondents include 78 male and 72 female. The largest age group is in the age of 18-22, which represents 33.3% of respondents, the second age group is in the age of 23-25 (32%); in education level, 97 respondents (64.7%) hold an undergraduate degree and 47 (31.3%) a masters degree. There are 98 university students, representing 65.3% of the total respondents; 13.3% of respondents are in a service industry; 6% in business and trade; 4.7% are staff in education institutions, and 4% unemployed. In order to understand the viewer's perception of digital signage usage, various digital signage functions or purposes are included such as to provide product/service information (62.7%), to fill in time (18.7%), to relief stress (8%), to increase topics of chatting with friends (8%), and to be inspiring (4%).

Two dimensions are examined from the DSAM perspective – Perceived Usefulness (Crobach's $\alpha = 0.809$) and Perceived Ease-of-Use (Crobach's $\alpha = 0.431$). Each of these two dimensions is measured by multi-items on a five point Likert scale. The results indicated that the average of each dimension is above 3, demonstrating that the viewer's perception of technology acceptance in both dimensions lay between the ordinary and satisfaction level.

Regarding the preference of the physical size of digital signage, experience of viewing digital signage in places with fast or slow population flow the findings show that more than 50% of the respondents prefer viewing large size digital signage (37 inches and above); MRT – Mass Rail Transit (26%) and bus (26%) are the two main places with slow population flow the respondents have experience of viewing digital signage; and department store (38.67%) and shopping mall (32.67%) are the two main places with fast population flow the respondents have experience of viewing digital signage.

In digital signage contents rendering/presentation mode, respondents were allowed to select multiple answers. 52% of responses were "Text + Picture + Animation", which is the most favourite contents presentation type. Following by "Full animation" – 25.3%, "Picture + Animation" – 23%, "Text + Animation" – 22.67%, and "Regular TV commercial" – 22.67%. "Text + Picture" – 11.3%, "Text only" – 3.3%, and "Picture only" – 3.4% are considered lower acceptable modes by the respondents.

Regression analysis

Regression analysis was used with 95% of reliability to verify the affect of DSAM on Adoption Attitude. With 95% of reliability, the T value of Adoption Attitude in both Perceived Usefulness and Perceived Ease-of-Use has reached the significant level (6.754). Furthermore, F value is at the significant level of 16.318. Therefore, Perceived Usefulness and Perceived Ease-of-Use will definitely impact on Adoption Attitude and we conclude that both H1-1 and H1-2 are supported (Table 1).

In the test of the affect of digital signage contents presentation type on Adoption Attitude the investigation focuses on whether there is a significant affect of various types of digital signage contents presentation on Adoption Attitude. Through the regression analysis, the T values of these types of contents presentation have not reached the significant level (less than 1). There are not enough statistical significance to support hypotheses H2-1, H2-2, H2-3, H2-4, and H2-5.

Table 1. Regression analysis of DSAM on Adoption Attitude and Adoption Willingness

Dependent Variable		Standard β Value	T Value	Hypothesis Test
Adoption Attitude	TAM	0.507	6.754***	H1-1: Supported H1-2: Supported
F Value = 16.318 Adjusted R^2 = 0.252 Note: *** represents P<0.001				

Dependent Variable		Standard β Value	T Value	Hypothesis Test
Adoption Willingness	Adoption Attitude	0.704	12.044***	H3: Supported
F Value = 52.289 Adjusted R^2 = 0.525 Note: *** represents P<0.001				

A separate examination of the affect of digital signage Adoption Attitude on Adoption Willingness was carried out. The result shows that both a T value (12.044) and an F value (52.289) have reached the significant level therefore it is confident to draw conclusion that Adoption Attitude has significant impact on Adoption Willingness. The hypothesis H3 is strongly supported (Table 1).

The last regression analysis is to investigate whether the display environment has significant impact on Adoption Attitude. The result indicates that the T values (1.588 and -0.416) in both places with fast and slow population flow are not significant. Hence it is believed that there is no obvious inference of digital signage's display environment with Adoption Attitude. The hypotheses H4-1 and H4-2 are not supported.

Conclusions and recommendations

This study aimed at exploring the viewer's intention and perception of adoption digital signage. The proposed digital signage acceptance model (DSAM) is used to explore the relationships between Adoption Attitude and Adoption Willingness. Through the empirical data analysis, the hypotheses H1 and H3 are supported whereas H2 and H4 are not supported.

The findings have both theoretical and practical implications. In theoretical context, our study has contributed to the usage of digital signage literature by reconfirming the proofed correlations of three main constructs – Technology Acceptance Mode, Adoption Attitude and Adoption Willingness. We introduced two moderating variables – type of presentation and display environment to verify if the relationships will be changed between the main constructs. The results confirm that these two moderating variables do not have significant affect on the main constructs. From practical point of view, the findings demonstrate that successful implementation of digital signage will add value and increase the quality of the viewer's living and working experience. Furthermore, the authors outline the following suggestions, which might be helpful for digital signage providers in future marketing and promotion activity.

Although there are increasingly digital signage devices emerging in the public places, there are still great differences between the provider's expectation and the actual understanding and consumption of viewers. The main reason for such huge discrepancy is the lack of individualised or personalised contents, to attract and satisfy the viewer's needs. The future digital signage contents should be produced to meet different market needs and provide customer-oriented and customer-centric services.

The usage of digital signage is still in its infancy in Taiwan. The one-way distribution of product or news and information to viewers in the general public relates to the current digital signage contents. It is essential for the providers to invest in dynamic contents generation with two-way interaction to enable the viewers to engage with the system and provide feedback. To further investigate the factors influencing Adoption Attitude and Adoption Willingness, additional variables such as the viewer's satisfactory level and the experience of using the service might be included in the future study.

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