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# An empirical investigation of the consumer demand for digital television application services

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In the era of convergence of digital television (DTV) broadcasting and internet, DTV application services will be the key to success. Through theoretical and empirical analysis, this study showed that the integrated model which includes basic products/services, value-added services, interactive services, and behavioural intention is applicable to explain consumer's demands of DTV application services. Results indicated that value-added services is the most important factor affecting the behavioural intention to adopt DTV application services, while interactive services is the best way to create consumer's emotional value. In addition, this study also provided some impetus for both researchers and practitioners.

**Keywords:** experience economy; Kano model; innovation diffusion theory; DTV

## 1. Introduction

The advent of digital era has advanced the development of digital television (DTV) worldwide and leads to two emerging trends. The first is digital switchover. Driven by the wave of digitalisation of broadcasting signals, most developed countries have proactively established forward-looking policies for digitalisation. These countries have clearly outlined visions, goals, and directions of DTV development along with information and communication technology (ICT) policies. As DTV development has become an important policy among these countries, nations such as Sweden (2007), The Netherlands (2007), Germany (2008), and USA (2009) had already completed conversion from analogue signals to digital ones. The second is the rise of DTV interactive application services. The digital convergence of TV broadcasting and internet makes it possible to provide high quality media content and brings people brand new entertainment and communication experiences. On the other hand, the popularity of broadband network also changed the TV transmission from one-way broadcasting to two-way communications. The combination of TV broadcasting and internet creates a variety of services such as high definition (HD) content and personal video recorder (PVR), etc. In the near future, TV can also provide interactive services such as interactive gaming, education and voting.

Firms are constantly looking for new ways to differentiate their goods and services because of the increasing competition and ever changing economy. Since the economic value of experiences is higher than the value of goods and services (Pine and Gilmore 1999), firms devote to offer their customers unforgettable experiences through their goods and services (Pine and Gilmore 1998). On the verge of this new era, every firm should think ahead by pricing products or services at the value that provides unique experiences for their customers instead of pricing based on time and cost. Hence, some researchers (e.g. Desmet and Hekkert 2007, Hemmington 2007, Patricio *et al*. 2008) took advantage of experience-oriented consumption, in which the focus on experiences is gradually spread in both practice and theory.

In the future, TV broadcasters must carry, beyond TV programmes, with interactive technology, aesthetic design, cross-domain capability and marketing capability. This change not only brings brand new experience to the customer, but also creates new opportunities to the industry. Some of the previous researchers mostly explored the factors affecting the adoption intention of DTV by the perception of DTV's quality, characteristics, benefits and user demographic (e.g. LaRose and Atkin 1988, Jacobs 1995, Lin 1998, Dupagne 1999, Atkin *et al*. 2003, Chan-Olmsted and Chang 2006). Moreover, some researchers also explored the factors affecting consumer's adoption intention of internet protocol television (IPTV) by technology acceptance model (TAM) (e.g. Shih 2007, 2009), or the adoption intention of DTV by its features on innovation diffusion theory (e.g. Chan-Olmsted and Chang 2006). However, very few researchers have

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focused on the adoption intention of DTV application services. Hence, in order to investigate consumers' demands for DTV application services in empirical approach, we had combined both experience economy and innovation diffusion theory while briefly applying the concept of Kano model, and hoped it would make up the gap of DTV researches.

This study aimed to propose dimensions of DTV application services based on the concepts of the experience economy and empirical investigation, to categorise consumers' demands and adoption intentions for DTV application services, and then to suggest theoretical and practical implications for the industry. To sum up, the study has following objectives: (1) to propose and verify a hypothesised model based on the concepts of the experience economy and utilised in DTV application services, (2) to categorise consumers' demands and to identify the weights of service functions that determine consumers' adoption of DTV application services, and (3) to investigate demographics and technological diffusion adopters if it is associated with DTV application services demand and adoption behaviour.

## 2. Background and hypothesis

### 2.1. *Experience economy*

Pine and Gilmore (1998) were the first to bring the perspective about 'experience economy'. Pine and Gilmore (1999) then further promoted this idea by saying that experience economy has a higher value than commodities, goods, and services. Firms can gain pricing advantages through the experience economy's main idea/perspective to provide consumers with great, unique and profound experiences that allow firms to conduct massive differentiation and market segmentation. From the firms' stand point, the term experiences would mean using services as the stage and goods as the props to create memorable activities which consumers would want to reminisce about in the future.

Pine and Gilmore (1999) also believes that experiences are emotional, and emotions that the purchaser feels, would possess value as they are unforgettable. Hence, the one who experienced this emotion would treasure it, and when the activity is over, the value created by it would remain in his or her memories. Aside from this, firms must provide customised experiences which cater for different customers' needs, and should know the customers' desires better than the customers themselves.

In respect of consumer behaviour studies, many academics no longer consider consumers to be computer-like decision makers, but instead to emphasise the importance of hedonic or emotional variables that were constantly neglected in the past, and use the idea of experiences to measure consumer behaviour. It was also believed/identified that consumers would pursue extraordinary, pleasurable and enjoyment sensations apart from the benefits of tangible product functions.

### 2.2. *The basic Kano model*

The Kano model (Kano *et al.* 1984) brings a different perspective for the analysis of improvement opportunities in products and services and classifies customer's need for product/service functions into three categories:

(1) Must-be demand attributes: the must-be attributes are basic criteria of a product/service. If these attribute are not fulfilled, the customer will be extremely dissatisfied. On the other hand, because the customer takes these attributes for granted, thus the fulfilment will not increase customer's satisfaction.
(2) One-dimensional demand attributes: With regard to these demand attributes, customer satisfaction is proportional to the level of fulfilment – the higher the level of fulfilment, the higher the customer's satisfaction, and vice versa. One-dimensional attributes are usually explicitly demanded by the customer.
(3) Attractive demand attributes: These attributes are the product/service criteria which have the greatest influence on how satisfied a customer will be with a given product/service. Attractive attribute are neither explicitly expressed nor expected by the customer. Fulfilling these attributes lead to more than proportional satisfaction. If they are not met, however, there is no feeling of dissatisfaction.

Generally, the hierarchy of importance for these different types of demand attributes is as follows: must-be need (M) > one-dimensional (O) > attractive (A) > indifferent (I) (Berger *et al.* 1993, Sauerwein *et al.* 1996, Xie *et al.* 2010). Existing literatures claimed that successful quality attributes follow a life cycle as: I→A→O→M. For example, Kano (2001) demonstrated that a remote control was an attractive attribute in 1983, a one-dimensional attribute in 1989 and a must-be attribute in 1998.

### 2.3. *Consumer's intention to adopt DTV application services*

In the view of DTV development trend, the application services include three dimensions, namely basic

products/services, value-added services, and interactive services. Basic products/services involve flat screen TV, 3D TV, set-top box, connected multimedia player, and so on. Value-added services include high quality audio-visual effect, personal video recorder, electronic programme guide, VOD (video on demand), t-commerce, videophone on TV, home surveillance management, telehealth, datacasting, internet on TV and 3D services. And interactive services include interactive shopping, gaming, karaoke, education, drama and real-time voting, or the like.

In terms of the functional specifications of DTV application services, consumers must acquire basic products/services functions in order for operators to provide value-added services functions and interactive services functions. These three functions are just similar to the three levels of experience economy: goods, services and experiences.

Additionally, in consideration of current situation of DTV application services that operators have provided, we regarded the basic products/services functions as 'must-be requirement attribute' to DTV, the value-added services functions as 'one-dimensional requirement attribute', and the interactive services functions as 'attractive requirement attribute'.

In accordance with current trends of DTV and the purpose of this study which is based on the concept of experience economy, the operational definitions of basic products/services, value-added services, and interactive services are as followings:

(1) Basic products/services: Basic and necessary products/services functions that may cater to DTV viewer's needs in terms of audio-visual effect and operational functions of DTV. These functions are classified as 'must-be attributes' in the Kano's quality model. Without these basic goods/services function, customers will be extremely dissatisfied.
(2) Value-added services: Digital multi-channel combination and displays that may enhance DTV viewers' general value-added service functions on the basis of necessary functions. These functions are classified as 'one-dimensional attributes', in the Kano's quality model. Customers' satisfaction is proportional to the degree of their fulfilment.
(3) Interactive services: Processes that may enhance DTV viewers' participation and emotions by means of increasing interactivity on the basis of both necessary products/services function and general value-added services function, and thus bring viewers impressive memories. These functions are classified as 'attractive attributes' in the Kano's quality model and will definitely increase customers' satisfaction if they are truly fulfilled.

Based on the above discussions and the operational definitions of DTV application services, the following hypotheses were identified:

H1a: High levels of perceived demand on basic products/services functions of DTV will positively affect perceived demand on value-added services functions of DTV.

H1b: High levels of perceived demand on basic products/services functions of DTV will positively affect perceived demand on interactive services functions of DTV.

H1c: High levels of perceived demand on basicproducts/services functions of DTV will positively affect behavioural intention to adopt DTV application services.

H2a: High levels of perceived demand on value-added services functions of DTV will positively affect perceived demand on interactive services functions of DTV.

H2b: High levels of perceived demand on value-added services functions of DTV will positively affect behavioural intention to adopt DTV application services.

H3a: High levels of perceived demand on interactive services functions of DTV will positively affect behavioural intention to adopt DTV application services.

### *2.4. Demographics*

Demographic variables continue to be important in the adoption of media or technologies such as videotext (Ettema 1984), computer bulletin boards (Garramone *et al*. 1986, Rafaeli 1986, James *et al*. 1995), call-in polls (Atkin and LaRose 1994) and the internet (Atkin *et al*. 1998). The empirical findings that adopters are better educated and have the higher income than non-adopters typically support Rogers' (1995) socio-economic generalisations about early adopters.

Regarding specific demographic variables, O'Reilly and Associates (1995) noted a gender gap among the early users of online services exists. And many studies of communication technology adoption (Ettema 1984, Reagan *et al*. 1985, Reagan 1987, Reese 1988, Scherer 1989, Litman *et al*. 1991, Lin 1998, Kang 2002) found that age is negatively related to adoption. Several studies (Dickerson and Gentry 1983, Ettema 1984, Reagan 1987, Reese 1988, Scherer 1989, LaRose and Atkin 1992, Lin 1998) also reported a positive relationship between education or income and adoption.

With respect to the specific demographic factors influencing the awareness or adoption of DTV, the

General Accounting Office survey found that male, white collar educated households tended to be more familiar with the transition of DTV. Besides, age, ethnicity and urbanicity did not have any effect on familiarity with DTV transition. Furthermore, a recent DTV study also found that adoption intention for DTV was related somewhat to age and gender (Atkin *et al*. 2003).

Based on the discussions about relationship between individual demographics and adoption intention of DTV, the following hypotheses are postulated:

H4: Gender influences behavioural intention to adopt DTV application services.

H5: Age influences behavioural intention to adopt DTV application services.

H6: Occupation influences behavioural intention to adopt DTV application services.

H7: Marital status influences behavioural intention to adopt DTV application services.

H8: Income influences behavioural intention to adopt DTV application services.

### 2.5. Innovation diffusion theory and assigning adopter groups

According to innovation diffusion theory (IDT), five different groups of adopters (innovators, early adopters, early majority, late majority and laggards) spread over innovation diffusion stages. However, it is usual to downsize IDT model to two-group (innovators and non-innovators) model or three-group (early adopters, majority adopters and late adopters) model (Fell *et al*. 2003, Wonglimpiyarata and Yuberk 2005, Hsu *et al*. 2007) in industrial marketing studies. According to Tzou and Lu (2009), there are gulfs not only between early adopters and majority adopters but also between majority adopters and late adopters. Therefore, this study grouped DTV application services adopters into three categories: early adopters, majority adopters and late adopters.

Diffusion theory holds that earlier adopters will use mass media more frequently than later adopters (Rogers 1995). But in fact this generalisation is rarely supported in the literature. The amount of time watching television was significant but mostly treated as a negative media-use predictor which was commonly used by several adoption studies (Reagan 1987, Scherer 1989). This study provides an opportunity to investigate the existence of such a relation: the connection between different adopter groups and perceived demand and adoption intention for DTV application services.

H9: Technological innovation adopters' behavioural intentions to adopt DTV application services are not consistent within different groups.

## 3. Research method

### 3.1. Questionnaire design

The functions based on the previous strategic concept of experience economy, the trends, and the operational definition in the setting of DTV application services were developed by related literatures (e.g. Pine and Gilmore 1998, Ko *et al*. 2011), an expert panel discussion and customer interviews. The nominal group technique was used in the panel discussion, which included experts from the industry, government and academics with a total of eight members. In addition, as many researchers suggested (Griffin and Hauser 1993, Buchenau and Suri 2000, Yang and Hsiao 2009), 20 key customers including end users were interviewed in the initial stage of development of innovative services. As a result, 21 functions for DTV application services and dimensions of basic products/services, value-added services, and interactive services were identified in this study. The adjusted functions for DTV application services are shown in Table 1.

The questionnaire consists of four parts. The first part recorded the demographic information including gender, age, area of residence, marital status and

Table 1. The proposed dimensions and functions for DTV application services.

| Dimensions | Functions ID | Content |
|---|---|---|
| *Basic products/services* | G1 | Flat screen TV |
| | G2 | 3D TV |
| | G3 | Set-top box |
| | G4 | Connected multimedia player |
| *Value-added services* | S1 | High definition TV services |
| | S2 | Personal video recorder |
| | S3 | Electronic programme guide |
| | S4 | t-Commerce |
| | S5 | Video on demand |
| | S6 | Videophone on TV |
| | S7 | Home surveillance management |
| | S8 | Telehealth |
| | S9 | Datacasting |
| | S10 | Internet on TV |
| | S11 | 3D services |
| *Interactive services* | E1 | Interactive shopping |
| | E2 | Interactive gaming |
| | E3 | Interactive karaoke |
| | E4 | Interactive education |
| | E5 | Interactive drama |
| | E6 | Interactive real-time voting |

monthly household income. The second part was designed on the basis of the 21 functions for DTV application services (see Table 1). The third part was based on some literature reviews, and we found that consumers' behavioural intentions can be tested under four categories: consumers' willingness to repurchase (Cronin *et al.* 2000), considering that others should also use it, (Hsu *et al.* 2007, Lo'pez-Nicola's *et al.* 2008) willingness to pay premium prices and recommendation to others (Zeithaml *et al.* 1996). Thus, we set those as the main questionnaire items of behavioural intention. The second part and third part adopted Likert scale, in which each item was measured on a seven-point, ranging from 'Strongly Disagree' (1) to 'Strongly Agree' (7). It requested each subject to give an assessment on his or her degree of acceptance with each questionnaire item. The fourth part, based on the theory of innovation diffusion proposed by Rogers (1995), grouped DTV application services adopters into three categories: early adopters, majority adopters and late adopters according to their self-reported behaviours or intended behaviours.

During the questionnaire design process, a team of interviewers had conducted one-on-one interviews with seven DTV industry experts (three industry experts, two scholar and two government officials). Additionally, in an attempt to confirm the appropriateness of the questionnaire before further investigation, a pilot test was given to 30 experienced users who were familiar with the DTV application services. Some adjustments were made based on the feedbacks from the pilot test to improve the accuracy and readability of the questionnaire.

### 3.2. Subjects

The penetration rate of DTV in Taiwan is still lower than 30% of the population, and most of the public is still not knowledgeable or aware of DTV enough. In order to select the individuals that best meet the criteria of the study, each subject was filtered carefully before the official survey. The sampling frame was based on a panel provided by Eastern Online Co. Ltd (EOL)[1]. EOL maintains an 80,000-member panel database which is sufficiently diverse in demographics to be representative of the Taiwanese population. In order to fully explore users' needs and preferences towards DTV application services, this study specifically chose users aged 18 or above as the target research subject. As a result, a total of 754 questionnaires were distributed through on-line survey system with approximately equally divided among sub-groups of age, gender and living area. After eliminating invalid questionnaires (due to missing and invalid answers, uncompleted and left blank), 600 valid responses were collected, with a valid response rate of 79.58%.

## 4. Data analysis, testing and results

### 4.1. Descriptive statistics

Among the 600 total valid responses, 298 of them were male (49.67%) and 302 were female (50.33%). Six hundred respondents were equally spread in the Greater Taipei area, Greater Tai-Chung area and Greater Kaohsiung area (200 respondents for each area, 33.33%). The numbers above indicated that the study took account of balances between genders and different living areas. Seventy per cent of the respondents were at age 40 or younger and 56% had a monthly income greater than NT$60,000, indicating that the respondents were primarily young, and could afford DTV application services. One hundred seventy-one subjects, or 7.86% of the 600 total, were self-reported to be early adopters.

### 4.2. Reliability and validity

Our data analysis was conducted using SPSS 13.0 and LISREL 8.72. First, item-to-total correlations were used to eliminate certain items. The result showed that the item-to-total correlation is between 0.519 and 0.699, all above 0.5, meaning the discriminatory power of all items is high (Churchill 1979, Doll and Torkzadeh 1988, Palvia 1996). Therefore, we kept these items for the following measurement and analysis. Following the recommendations of Churchill (1979), a reliability test was suggested for screening the data. We calculated the reliability coefficients of the scales using the Cronbach (1951) alpha. Here, it seemed appropriate to assume that DTV application services is a simple construct before using exploratory factor analysis to identify its underlying dimensions. We found that all the 21 items had a reliability of 0.933, showing a high degree of reliability.

Exploratory factor analysis was then conducted to purify the instrument by cutting items that did not load on an appropriate high-level construct (Churchill 1979, Ives *et al.* 1983, Doll and Torkzadeh 1988, Straub 1989, Palvia 1996). Factor analysis was used to identify the underlying factors or the dimensional composition of the DTV application services instrument. Impure items were eliminated to improve the factorial purity and enable greater specificity of hypotheses (Weiss 1970). A principal components factor analysis with orthogonal rotation by varimax method was then conducted. Firstly, any item with commonality less than 0.3 were removed (Hair *et al.* 1998). Secondly, the absolute value of rotated factor loading which was greater than 0.4 was retained only (Jöreskog and

Sörbom 1984). Then, factors with eigenvalues larger than one were extracted, resulting in three factors and 21 items. The results confirmed the existence of three factors with eigenvalues greater than 1 that cumulatively accounted for 56.616% of the total variance. These three factors were labelled basic products/services, value-added services and interactive services based on the concept of experience economy, operational definition of DTV application services, and the meanings of the items. Table 2 presents the factor structure of the principal components analysis for DTV application services.

Internal consistency reliability reflects the stability of individual measurement items across replications from the same source of information; it was assessed by computing Cronbach's alpha whose coefficients for the three constructs were above 0.6 (see Table 3), indicating a reasonable level of internal consistency among the items making it up (Hair *et al*. 1998).

The measurement model was tested using confirmatory factor analysis (CFA). The measures chosen to estimate the model fit are chi-square/degree of freedom ($\chi^2$/df), the goodness-of-fit index (GFI), the AGFI (adjusted GFI), the root mean square error of approximation (RMSEA), the normed fit index (NFI), the non-normed fit index (NNFI) and the comparative fit index (CFI). The results are shown in Table 3. For all cases, the indices met their respective common acceptance levels suggested by previous literatures (Bentler and Bonett 1989, Kettinger and Lee 1994, Hair *et al*. 1998, Scott 1994, Seyal *et al*. 2002).

The reliability and convergent validity of the measurement scale were also tested. Results are shown in Table 3. For all constructs, the standardised factor loadings reached a significant level, and the composite reliability (CR) was above 0.6, which showed good reliability on all measures (Bagozzi and Yi 1988, Hair *et al*. 1998). In addition, convergent validity was also observed for all constructs, the average variance extracted (AVE) were all above the recommended value of 0.5 (Fornell and Larcker 1981).

Finally, for discriminate validity, a test of correlation among the factors was performed to test for reciprocal relationship among them. Simple linear correlation (Pearson *r*) was used to determine the extent to which values of the variables are proportional to each other. Table 4 presents a correlation matrix of the variables. The generally modest inter-correlations among the variables indicated no significant multicollinearity problem.

Table 2. Factor analysis results and Cronbach's alpha coefficient.

| Item code | Original functions ID | Factor 1 | Factor 2 | Factor 3 | Cronbach's alpha |
|---|---|---|---|---|---|
| *Basic products/services* | | | | | 0.868 |
| BS1 | G1 | 0.570 | | | |
| BS2 | G2 | 0.799 | | | |
| BS3 | G3 | 0.714 | | | |
| BS4 | G4 | 0.614 | | | |
| BS5 | *S4* | 0.641 | | | |
| BS6 | *S6* | 0.547 | | | |
| BS7 | *S11* | 0.641 | | | |
| *Value-added services* | | | | | 0.877 |
| VS1 | S1 | | 0.578 | | |
| VS2 | S2 | | 0.665 | | |
| VS3 | S3 | | 0.652 | | |
| VS4 | S5 | | 0.548 | | |
| VS5 | S7 | | 0.757 | | |
| VS6 | S8 | | 0.739 | | |
| VS7 | S9 | | 0.664 | | |
| VS8 | S10 | | 0.470 | | |
| *Interactive services* | | | | | 0.838 |
| IS1 | E1 | | | 0.623 | |
| IS2 | E2 | | | 0.712 | |
| IS3 | E3 | | | 0.735 | |
| IS4 | E4 | | | 0.558 | |
| IS5 | E5 | | | 0.736 | |
| IS6 | E6 | | | 0.677 | |
| Eigen value | | 9.096 | 1.531 | 1.262 | |
| Cumulative variance explained (%) | | 20.899 | 39.673 | 56.616 | |

Table 3. Standardised factor loadings, CR[a] and AVE[b].

| Construct[c] | Items | Factor loading | CR | AVE |
|---|---|---|---|---|
| BS | BS1, BS2, BS3, BS4, BS5, BS6, BS7 | 0.58, 0.67, 0.70, 0.76, 0.73, 0.73, 0.70 | 0.868 | 0.697 |
| VS | VS1, VS2, VS3, VS4, VS5, VS6, VS7 | 0.68, 0.71, 0.72, 0.70, 0.67, 0.66, 0.74, 0.65 | 0.880 | 0.691 |
| IS | IS1, IS2, IS3, IS4, IS5, IS6 | 0.71, 0.69, 0.66, 0.62, 0.75, 0.66 | 0.840 | 0.682 |
| BI | BI1, BI2, BI3, BI4 | 0.90, 0.92, 0.80, 0.93 | 0.938 | 0.889 |
| Model fit statistics | | $\chi^2 = 1209.95$, df = 269, GFI = 0.86, AGFI = 0.83, NFI = 0.96, NNFI = 0.97, CFI = 0.97, RMSEA = 0.076 | | |

Note: [a]CR = composite reliability; [b]AVE = average variance extracted; [c]BS = basic products/services; VS = value-added services; IS = interactive services; BI = behavioural intention.

Table 4. Correlation matrix among factors.

| Construct[a] | BS | VS | IS | BI |
|---|---|---|---|---|
| BS | 1 | 0.748** | 0.626** | 0.594** |
| VS | 0.748** | 1 | 0.624** | 0.599** |
| IS | 0.626** | 0.624** | 1 | 0.506** |
| BI | 0.594** | 0.599** | 0.506** | 1 |

Note: [a]BS = basic products/services; VS = value-added services; IS = interactive services; BI = behavioural intention. *$P < 0.05$; **$P < 0.01$.

### 4.3. *Hypotheses test*

#### 4.3.1. *Structural paths*

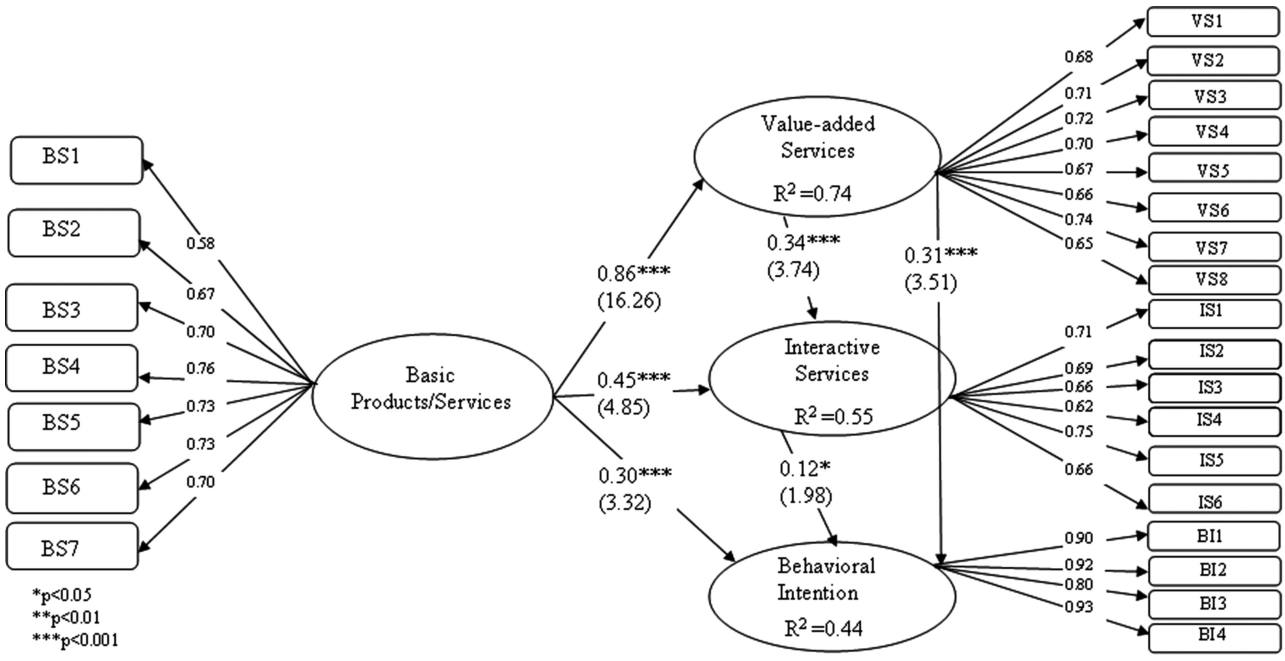
To test the structural relationships, the hypothesised causal paths were estimated; six hypotheses were supported (see Figure 1). The overall fit of the model is acceptable because the goodness-of-fix/fit statistics ($\chi^2$/df ratio close to 4.5, GFI = 0.86, AGFI = 0.83, NFI = 0.96, NNFI = 0.97, CFI = 0.97 and RMSEA = 0.076) met their respective common acceptance levels suggested by previous literatures (Bentler and Bonett 1989, Kettinger and Lee 1994, Scott 1994, Hair *et al*. 1998, Seyal *et al*. 2002).

The test results of the hypotheses were summarised in Table 5. The results are stated and discussed below:

(1) Perceived demand for basic products/services had a significant and positive effect on perceived demand for both value-added services ($\gamma = 0.86$; $t = 16.26$) and interactive services ($\gamma = 0.45$; $t = 4.85$), indicating support for both H1a and H1b. Perceived demand for basic products/services also had a significant and positive effect on behavioural intention to adopt DTV application services ($\gamma = 0.30$; $t = 3.32$), indicating support for H1c as well.
(2) Perceived demand for value-added services had a significant and positive effect on both perceived demand for interactive services ($\beta = 0.34$; $t = 3.74$) and behavioural intention to adopt DTV application services ($\beta = 0.31$; $t = 3.51$), indicating support for both H2a and H2b.
(3) Perceived demand for interactive services had a significant and positive effect on behavioural intention to adopt DTV application services ($\beta = 0.12$; $t = 1.98$), indicating support for H3a.

#### 4.3.2. *Multiple regressions*

The second section of the discussion investigates the effects of demographics and different adopter groups on behavioural intention to adopt DTV application




| Item code | Meaning | Item code | Meaning | Item code | Meaning |
|---|---|---|---|---|---|
| BS1 | Flat screen TV | VS1 | High Definition programme | IS2 | Interactive gaming |
| BS2 | 3D TV | VS2 | Personal video recorder | IS3 | Interactive karaoke |
| BS3 | Set-top box | VS3 | Electronic programme guide | IS4 | Interactive education |
| BS4 | Connected multimedia players | VS4 | Video on demand | IS5 | Interactive drama |
| | | VS5 | Home surveillance management | IS6 | Interactive real-time voting |
| BS5 | t-commerce | VS6 | Telehealth | BI1 | Intend to use |
| BS6 | Videophone on TV | VS7 | Datacasting | BI2 | Think others should use |
| BS7 | 3D services | VS8 | Internet on TV | BI3 | Worth to use |
| | | IS1 | Interactive shopping | BI4 | Recommend others to use |

Figure 1. The results of consumer demands for DTV application services.

Table 5. Results of hypotheses tests for structural model.

| Hypothesis | Effects[a] | Structural coefficient | t-value | Remarks |
|---|---|---|---|---|
| H1a | BS → VS | 0.86** | 16.26 | Support |
| H1b | BS → IS | 0.45** | 4.85 | Support |
| H1c | BS → BI | 0.30** | 3.32 | Support |
| H2a | VS → IS | 0.34** | 3.74 | Support |
| H2b | VS → BI | 0.31** | 3.51 | Support |
| H3a | IS → BI | 0.12* | 1.98 | Support |
| H4 | Gender → BI | | | Reject |
| H5 | Age → BI | | | Reject |
| H6 | Occupation → BI | | | Support |
| H7 | Married → BI | | | Support |
| H8 | Income → BI | | | Reject |
| H9 | Adopter → BI | | | Support |

Note: [a]BS = basic products/services; VS = value-added services; IS = interactive services; BI = behavioural intention. *$P < 0.05$; **$P < 0.01$; ***$P < 0.001$.

services (Table 6). In this study, the demographic variables had only weak influence on behavioural intention. Occupation ($\beta = -0.094$) was inversely related to behavioural intention to adopt DTV application services (H6). The marital status had a significant and positive effect on behavioural intention to adopt DTV application services (H7). The age and income had no effect. Additional, the different adopter groups had a significant negative influence on perceived demand and behavioural intention (H9).

Table 6. Results of regression tests for demographics and adopters.

| Regression test | $\beta$ | Result |
|---|---|---|
| Behavioral intention to use DTV application services ($R = 0.390$, $R^2 = 0.152$, Durbin–Watson = 1.765) | | |
| Gender | −0.010 | H4 rejected |
| Age | −0.027 | H5 rejected |
| Occupation[a] | −0.090* | H6 supported |
| Married[b] | 0.131** | H7 supported |
| Income | −0.018 | H8 rejected |
| Adopter[c] | −0.345*** | H9 supported |

Note: $*P < 0.05$; $**P < 0.01$; $***P < 0.001$. [a]Occupation = 1 as High level manager; 2 as Official worker; 3 as Freelance specialist; 4 as Service worker; 5 as Student; 6 as Housewife; 7 as Retired; 8 as Others. − (significant negative effect) represents that the higher the position, the higher the willingness to adopt DTV application services. [b]Married = 1 as Unmarried; 2 as Married. + (significant positive effect) represents that one who married tends to have higher willingness to adopt DTV application services. [c]Adopter = 1 as Early adopters; 2 as Majority adopters; 3 as Late adopters. −(significant negative effect) represents that the higher the innovativeness, the higher the willingness to adopt DTV application services.

## 5. Conclusion

Based on the perspective of Pine and Gilmore's experience economy, experience is the key to satisfy consumers and the value of experience is higher than goods and services. We hope that findings of this research would enable further understandings of consumer demand and adoption intention for DTV application services so as to enhance the emotional value of consumer, and then to advance the development of DTV industry. Therefore, the purpose of this study is to propose dimensions of DTV application services based on the concept of the experience economy. Furthermore, an empirical investigation was conducted to categorise consumer demand and adoption intention for DTV application services.

This study revealed that the model with basic products/services dimension, value-added services dimension, interactive services dimension and behavioural intention dimension were applicable to explain the consumer demand and adoption intention for DTV application services. The empirical evidence of the research may provide some insights into the association between the perception nature of DTV application services and individual psychological cognitions. The following major findings and implications were observed. First, if we categorise the functions in basic products/services dimension as 'must-be demand attribute', the functions in value-added services dimension as 'one-dimensional demand attribute', and the functions in interactive services dimension as 'attractive demand attribute', the results showed that consumer demands of some functions (t-commerce, videophone on TV, 3D services) in value-added services dimension have shifted to basic products/services dimension (see Table 3). That implied the consumer demand attributes for DTV application services would shift gradually as time goes by. Secondly, the observed percentage of respondents for each user group in this study was 28.5% (171), 55.67% (334) and 15.83% (95) for early adopters, major adopters and late adopters, respectively. Compared with the classic Rogers model (Rogers 1995), which had the ratio of each group at statistical as approximately 2.5%, 13.5%, 34%, 34% and 16% for innovators, early adopters, early majority, late majority and laggards, respectively, the early adopters group in this study was 28.5% higher than that of Rogers' innovators and early adopters (sum of the both). This result indicated that consumers in Taiwan are more inclined to accept innovative services.

We also found that technological innovation adopters had a significant negative effect on behavioural intention to adopt DTV application services (see Table 6). This result also implies that application services providers should target consumers with innovative characteristics and apply differentiated marketing strategies in different adopter groups when promoting DTV application services.

Thirdly, perceived demand for basic products/services had a significant positive effect on perceived demand for value-added services and perceived demand for interactive services. Perceived demand for value-added services had a significant positive effect on perceived demand for interactive services (see Figure 1 and Table 5). The results indicated that the basic products/services are necessary elements for value-added services and interactive services, and the value-added services are necessary elements for interactive services. It is consistent with the concept of experience economy that suggested experiences would use services as the stage and goods as the props to surround the consumer and create a memorable activity (Pine and Gilmore 1999). These results also implied that although the interactive services could best create consumers' emotional value, operators must be well aware that DTV application services are hierarchical. First is to make consumers perceive the demand of basic products/services, followed by the demand of value-added services, and finally the demand of interactive services.

Fourthly, perceived demand for basic products/services, perceived demand for value-added services and perceived demand for interactive services all had significant positive influence on behavioural intention to adopt DTV application services. It also indicated that perceived demand for value-added services had the largest direct effect and perceived demand for interactive services had the smallest direct effect on consumers' behavioural intention to adopt DTV

application services (see Figure 1 and Table 5). Although interactive services create the greatest consumers' emotional value (Pine and Gilmore 1995), the user demand of interactive services is relatively low in accordance with the results of present investigation. This indicated interactive services still need to be enlightened or promoted. Therefore, application services' providers should not only meet consumers' demands of basic products/services and value-added services, but also strengthen marketing and promoting the value of interactive services, in order to create consumers' perceived demands of interactive services and then increase consumers' adoption intention for DTV application services.

Fifth, the two items with the highest loading value in basic products/services dimension are 'Connected multimedia players' (0.76), 't-commerce' (0.73) and 'Videophone on TV' (0.73). Thanks to the high penetration rate of broadband in most developed countries, many video contents (e.g. a variety of videos and video-based commerce like YouTube, Hulu, Netflix, etc.) are easily accessible through internet. Because most people still prefer leaning back and watching videos, a new relationship between internet and television is then developed. As most television sets are not internet connected yet, those internet connected multimedia players (the transitional products such as Wi-Fi built in Blu-ray player, mp5, OTT box, Movie box or the like) are at the greatest demand currently. It can thus be seen that both internet connected devices and video application services are consumers' basic demands.

The two items with the highest loading value in value-added services dimension are 'Datacasting' (0.74) and 'Electronic program guide' (0.72). With the lack of DTV recognition, choices of DTV application services and willingness to pay additional fees, most consumers demand for the free and daily information application services through datacasting. Similarly, electronic programme guide is considered as the basic function of value-added services or the interface to control enhanced services. The two items with the highest loading value in interactive services dimension are 'Interactive drama' (0.75) and 'Interactive shopping' (0.71). Since drama is the main reason for most viewers to watch television, it increases consumers' demands if they can interact or change plot details. Additionally, shopping on TV has become one of the modern ways for consumers to shop. Thus, an interactive TV shopping service is certainly interesting and convenient for consumers. The two items with the highest loading value in behavioural intention dimension are 'Recommend others to use' (0.93) and 'Think others should use' (0.92). It can thus be seen that consumers consider that DTV application services is a necessary trend, but their willingness to adopt and pay for it remains low.

Finally, from the literature review given earlier, it would appear that demographic variables play an essentially important role in determining adoption of hardware-based communication technologies such as VCR, home satellite dish, and PC. However, in this study, most of the demographic variables only had weak (namely occupation) or even no influence (namely age and income) on behavioural intention to adopt DTV application services. One exception is that the marital status had a significant positive effect on behavioural intention to adopt DTV application services (see Table 6). This result indicated that DTV application services still have not gained enough traction in Taiwan. This result also implied that marital status had a stronger effect on behavioural intention to adopt DTV application services so services providers should target on married consumers when promoting DTV application services.

The limitations of this study are as follows: First, the results are based on a test performed within a single market and culture. Secondly, sampling all the practical users of DTV application services was not feasible because the services are still in its infant stage in Taiwan. Finally, because of time constraints, the survey was performed at a specific point of time and only cross-sectional data were adopted. Future studies could focus on acquiring more objective results by making in-depth investigations on users that had a higher level of involvement in DTV application services than the present study. In addition, this study found that technological innovation adopters had a significant negative effect on behavioural intention to adopt DTV application services. Thus, future studies could examine the effect between experienced and inexperienced users on behavioural intention to adopt DTV application services.

## Note

1. Eastern Online Co., Ltd (EOL). is a famous lifestyle and consumer market research consultant in Taiwan, which was co-founded by Eastern Advertising, Co., Ltd. and one of Taiwan's largest Internet media company, PCHome Group since 2000.The company President, Mr. Jan Hung Tze is a famous expert in trend analysis and CEO, Mr. Tsai Hung Shien also has profound experience in integrated marketing and brand management. Furthermore, EOL has stepped into Pan-Asia area by strategic alliance, C-News Asia Network (CAN) with outstanding partners, such as Sinomonitor International in Mainland China, Info-Plant in Japan and Embrain in Korea. Specifically, the biggest Internet survey company in Korea, Embrain can provide quick and accurate information using the nation's biggest number of panels, around 400,000, and maintains close relationship with panel members by ID verification. With this partnership,

EOL can release consumer and market research report periodically for Northeast Asian countries.

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**Appendix 1. Definition of application services (Ko, *et al.* 2011, 2012; this study)**

| Application services | Definition |
|---|---|
| *Basic products/services* | Basic TV set, device or television programmes |
| Flat screen TV | TV that is much thinner and lighter than traditional television, and are usually less than 100 mm (4 inches) thick |
| 3D TV | A television set that employs techniques of 3D presentation |
| Set-top box | A device that connects to a television and an external source of signal, turning the signal into content |
| Connected multimedia player | A networked device that transmit or stream multimedia content from a computer or Internet to a TV set |
| *Value-added services* | Extra applications or services in addition to basic TV set or programmes |
| High definition TV services | Video service that provide resolution substantially higher than that of traditional television systems |
| Personal video recorder | Application that records video in a digital format to a disk drive or other local or networked storage device |
| Electronic programme guide | A continuously updated menu displaying scheduling information for current and upcoming programming |
| t-Commerce | e-commerce undertaken using digital television |
| Video on demand | A system allowing user to select and watch video content on demand |
| Videophone on TV | A system for user to make video call on a Digital TV set |
| Home surveillance management | A system monitoring the behaviour or activities, or other changing information in home |
| Telehealth | The delivery of health-related services and information on TV |
| Datacasting | A service that delivers content in the form of text, data, voice or visual images to persons via the broadcasting services bands |
| Internet on TV | Watching online streaming video or using internet related services on TV |
| 3D services | A 3D presented channel or services |
| *Interactive services* | Services that involve with 2-way communications, interactive response or personalised services |
| Interactive shopping | Interactive TV shopping |
| Interactive gaming | Interactive online TV game |
| Interactive karaoke | Karaoke with latest songs which are automatically updated |
| Interactive education | Personalised or interactive education programme on TV |
| Interactive drama | Drama with different episodes for user to choose |
| Interactive real-time voting | To conduct a survey or opinion poll while watching TV |