

An application of the UTAUT2 model for understanding user intention adopting Google Chromecast in Taiwan

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Abstract

Online streaming has been progressively popular recently, and our research focuses on the people's intention of use of Google Chromecast by applying a modified extended unified theory of acceptance and use of technology (UTAUT2) theory based on 227 valid questionnaire samples. According to the path analysis, we find that performance expectancy, facilitating conditions, hedonic motivation, price value, habit and brand image have significant effect on the behavioral intention of using Chromecast, while effort expectancy and social influence do not. Another interesting finding is that none of the moderators (gender, age and experience) have significant moderating effect. Being the first research to combine UTAUT2 with construct brand image, this study presents academic and managerial implication to both academics and practitioners.

Keywords: Google Chromecast, path analysis, UTAUT2

1. Introduction

Online streaming is rapidly uprising since the development of the Internet and the devices such as *Google Chromecast*, *Amazon Fire TV* and *Apple TV* have been showing their popularity. In search of Chromecast study, most of them focuses on the technical part. Our research uses the extended unified theory of acceptance and use of technology (UTAUT2) model to explore the factors affecting the intention of using Chromecast. What influences the intention of use of Chromecast? According to the original theory UTAUT2, constructs including *performance expectancy* (PE), *effort expectancy* (EE), *social influence* (SI), *facilitating conditions* (FC), *hedonic motivation* (HM), *price value* (PV), and *habit* (HT) could have influences on the *behavioral intention* (BI) of use of Chromecast. In this paper, we modify the UTAUT2 model by introducing

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a new construct, *brand image*, to analyze the intention of use of Chromecast. Accordingly, we have concluded the objectives of this study as below:

1. To investigate the relationship between the determinant constructs (i.e., PE, EE, SI, FC, PV, HM and HT) and BI on the use of Chromecast.
2. For more knowledge of the relationship between the brand image (IM) and BI on the use of Chromecast.
3. To provide academic contribution on the UTAUT2 model and to give managerial suggestion about Chromecast marketing.

2. Literature review

2.1 Chromecast

Chromecast is defined as a line of digital media players launched by Google (Wikipedia, 2020). It is a small dongle that connects to TV with USB/HDMI port and streams information like YouTube or Netflix through Wi-Fi from the user's mobile device (Heredia, 2015). The first generation of Chromecast is released in 2013 and the second generation with Chromecast Audio in 2015. The differences between first generation and second generation of Chromecast are that the first generation is stick-shaped while the second generation is disc-shaped with improved Wi-Fi performance and better connection to home router (Wikipedia, 2020).

Chromecast Audio, which is by-product of Chromecast, streams only audio information. Chromecast Audio streams over Wi-Fi from the devices to the plugged speaker (Google, 2020). Chromecast Ultra released in 2016, similar to the second generation products, is also disc-shaped, and displays higher quality than previous versions do. Chromecast Ultra can stream 4K resolution content and offer better processing power (Wikipedia, 2020).

2.2 UTAUT2

The classical “the Unified Theory of Acceptance and Use of Technology (UTAUT)” model about information technology (IT) acceptance research was proposed by Venkatesh et al. (2003). The UTAUT model combines eight models including the theory of reasoned action (TRA), the technology acceptance model (TAM), the motivational model (MM), the model of PC utilization (MPCU), the innovation diffusion theory (IDT), the social cognitive theory (SCT), the theory of planned behavior (TPB) and combined-TAM–TPB. After a series of empirical validations, Venkatesh et al. (2003) theorize that three constructs (performance expectancy, effort expectancy and social influence) are significant as direct determinants of the behavioral intention and two constructs (facilitating conditions and behavioral intention) are significant as direct determinants of the construct *use behavior*.

In Venkatesh et al. (2003), performance expectancy is defined as “the degree to which an individual believes that using the system will help him or her to attain gains in job performance”; effort expectancy as “the degree of ease associated with the use of the system”; social influence as “the degree to which an individual perceives that important others believe he or she should use the new system”; facilitating conditions as “the degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system.” The construct behavioral intention means the user's intention to adopt the technology while the construct use behavior means the actual usage of the technology the user does.

Venkatesh et al. (2003) also include four moderators: *gender*, *age*, *experience* and *voluntariness of use*. Gender moderates the effect of performance expectancy on behavioral intention, effort expectancy on

behavioral intention, and social influence on behavioral intention; age moderates the effect of performance expectancy on behavioral intention, effort expectancy on behavioral intention, social influence on behavioral intention, and facilitating conditions on use behavior; experience moderates the effect of effort expectancy on behavioral intention, social influence on behavioral intention, and facilitating conditions on use behavior; voluntariness of use moderates the effect of social influence on behavioral intention.

Since Venkatesh et al. (2003) is mostly applied in organizational contexts, there is potential to explore this model in the consumer technology use context (Venkatesh et al., 2012). In 2012, Venkatesh et al. (2012) propose the extended UTAUT theory (also known as UTAUT2). The UTAUT2 theory adds three new constructs (*hedonic motivation, price value and habit*) as direct determinants of behavioral intention and habit is also a direct determinant of use behavior. Venkatesh et al. (2012) also argue that facilitating conditions as a direct determinant on behavioral intention.

In Venkatesh et al. (2012), the construct hedonic motivation is defined as “the fun or pleasure derived from using a technology, and it has been shown to play an important role in determining technology acceptance and use” (Brown and Venkatesh, 2005); price value as “consumers’ cognitive tradeoff between the perceived benefits of the applications and the monetary cost for using them (Dodds et al., 1991)”; habit as “the extent to which people tend to perform behaviors automatically because of learning” (Limayem et al., 2007).

As for moderators, Venkatesh et al. (2012) also make some revisions. For gender moderator, despite of the moderating effect of performance expectancy on behavioral intention, effort expectancy on behavioral intention, and social influence on behavioral intention (as original Venkatesh et al. (2003) model), Venkatesh et al. (2012) argue that gender also moderates the effect of facilitating conditions on behavioral intention, hedonic motivation on behavioral intention, price value on behavioral intention, habit on behavioral intention, and habit on use behavior; similarly, Venkatesh et al. (2012) also argue that age and experience moderator could have moderate effect for facilitating conditions on use behavior (as original Venkatesh et al. (2003) model). Venkatesh et al. (2012) drop the moderator voluntariness of use (as existing in original Venkatesh et al. (2003) model).

2.3 Brand image

According to Barich and Kotler (1991) and Keller (1993), *brand* is defined as “a name, term, sign, symbol, or design, or combination of them which is intended to identify the goods and services of one seller or group of sellers and to differentiate them from those of competitors.” Keller (1993) further urges that brand image is an important concept in marketing realm. In his study, brand image is under the category of *brand knowledge*. Brand knowledge consists of *brand awareness* and brand image, while brand image is defined as “perceptions about a brand as reflected by the brand associations held in consumer memory.” Brand image is made of four categories: *types of brand association, favorability of brand associations, strength of brand associations* and *uniqueness of brand associations* (Keller, 1993). In Keller (2009), brand image is defined as “consumer perceptions of and preferences for a brand, as reflected by the various types of brand associations held in consumers’ memory”.

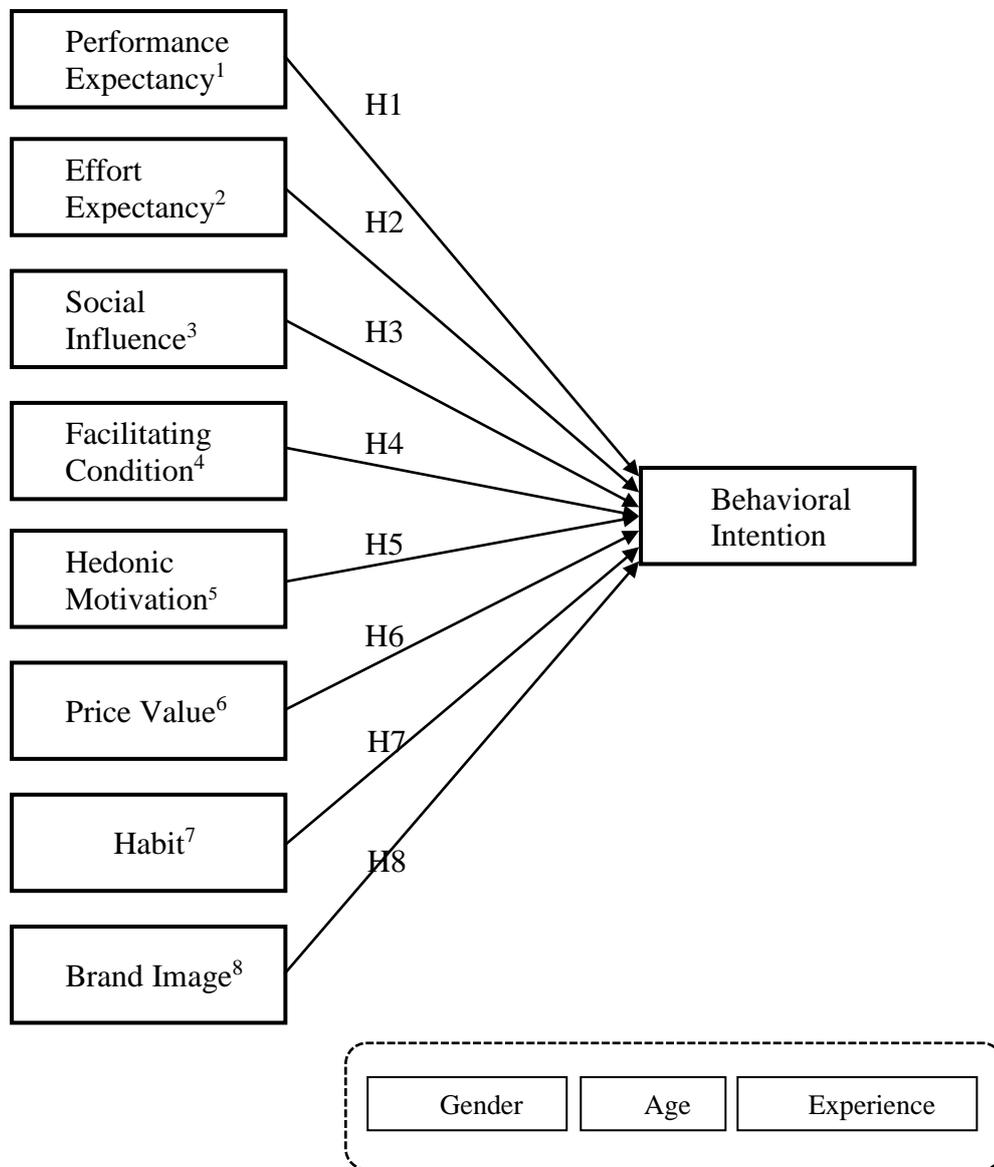
3. Research methods

3.1 Research framework

Venkatesh et al. (2003) defined the construct “performance expectancy” as “the degree to which an individual believes that using the system will help him or her to attain gains in job performance.” In this

study, we define performance expectancy as the degree to which a respondent believes that using Google Chrome will help the user to attain gains in job performance. Based on past studies that conclude that performance expectancy has positive influences on the behavioral intention in the contexts of social networks sites (Herrero and San Martín, 2017), information and communication technologies (Macedo, 2017), internet banking (Alalwan et al., 2018), mobile banking (Alalwan et al., 2017) and employment websites (Huang and Chuang, 2017), we have the following hypothesis below (See Figure 1).

Figure 1. The research hypothesis model



Notes:

1. Moderated by gender and age.
2. Moderated by gender, age and experience.
3. Moderated by gender, age and experience.
4. Moderated by gender, age and experience.
5. Moderated by gender, age and experience.
6. Moderated by gender and age.
7. Moderated by gender, age and experience.
8. Moderated by gender, age and experience.

Hypothesis 1. The performance expectancy (PE) in the use of Google Chromecast has a positive influence on behavioral intention (BI).

Venkatesh et al. (2003) defined effort expectancy as “the degree of ease associated with the use of the system.” In Davis et al. (1989), the construct “perceived ease of use” is one of the root constructs of effort expectancy. Davis et al. (1989) define perceived ease of use as the degree to which a user believes that using a system would be free of effort. Therefore, in this study, we define effort expectancy as the degree to which a person believes that using Google Chrome would be free of effort. Previous studies conclude that effort expectancy has positive influences on the behavioral intention in the context of internet banking (Alalwan et al., 2018), mobile banking (Alalwan et al., 2017), social recommender systems (Oechslein et al., 2014), and computer supported collaborative classrooms (Ali, Zhou et al., 2016). Therefore, we have the following hypothesis below:

Hypothesis 2. The effort expectancy (EE) in the use of Google Chromecast has a positive influence on behavioral intention (BI).

Venkatesh et al. (2003) define the construct “social influence” as “the degree to which an individual perceives that important others believe he or she should use the new system.” This study investigates whether surrounding people (friends, parents, relatives, etc.) could have influences on the users for using Google Chromecast. Therefore, in this study, we define social influence as the degree to which an user perceives that important others believe he or she should use Google Chromecast. Previous studies conclude that social influence has positive influences on the behavioral intention in the contexts of computer supported collaborative classrooms (Ali, Nair and Hussain, 2016), cloud based e-invoice service (Lian, 2015), and electronic health record (EHR) portal (Tavares and Oliveira, 2017). Therefore, we have the following hypothesis below:

Hypothesis 3. The social influence (SI) regarding the use of Google Chromecast has a positive influence on behavioral intention (BI).

Venkatesh et al. (2003) define the construct “facilitating conditions” as “the degree to which an individual believes that an organization and technical infrastructure exists to support use of the system.” If there is no environment for the users to use Chromecast, this environment is not suitable for the users to use the technology. Therefore, we wish to study whether the technology supported environment has enough influences on the behavioral intention. In this study, we define facilitating conditions as the degree to which a user believes that an organization and technical infrastructure exist to support use of Google Chromecast. In previous studies related to mobile social network games (Baabdullah, 2018), e-Government services (Lallmahomed et al., 2017), information and communication technologies (Macedo, 2017), and employment

websites (Huang and Chuang, 2017) all the results suggest that facilitating conditions have positive influences on behavioral intention. Therefore, we have the following hypothesis below:

Hypothesis 4. The facilitating conditions (FC) perceived in the use of Google Chromecast have a positive influence on behavioral intention (BI).

In Venkatesh et al. (2012), the construct “hedonic motivation” was defined as “the fun or pleasure derived from using a technology.” In this study, we define hedonic motivation as the fun or pleasure derived from using Google Chromecast. In previous studies about mobile TV (Wong et al., 2014), social networks sites (Herrero and San Martín, 2017), information and communication technologies (Macedo, 2017), internet banking (Alalwan et al., 2017), and mobile banking (Alalwan et al., 2017) all suggest that hedonic motivation has positive influences on the behavioral intention. Therefore, we have the following hypothesis below:

Hypothesis 5. The hedonic motivation (HM) in the use of Google Chromecast has a positive influence on behavioral intention (BI).

In Venkatesh et al. (2012), the construct “price value” was defined as “consumers' cognitive tradeoff between the perceived benefits of the applications and the monetary cost for using them.” From the Google store website, Chromecast Ultra is priced at 69 US dollars, Google Chromecast and Chromecast Audio are priced at 35 US dollars. Since they are not free technology gadgets, the effect on the behavioral intention from price value is needed to be considered. In this study, we define price value as respondents' cognitive tradeoff between the perceived benefits of the applications and the monetary cost for using Chromecast. In previous studies about mobile banking (Alalwan et al., 2017), medical laboratory portals (Ravangard et al., 2017), mobile social network games (Baabdullah, 2018), internet banking (Alalwan et al., 2017), and mobile applications (Vinnik, 2017), all the results suggest that price value has positive influences on the behavioral intention. Therefore, we have the following hypothesis below:

Hypothesis 6. The price value (PV) perceived in the use of Google Chromecast has a positive influence on behavioral intention (BI).

In Limayem et al. (2007), the construct “habit” was defined as “the extent to which people tend to perform behaviors (use IS) automatically because of learning”. In this study, we define habit as the extent to which people tend to use Chromecast automatically because of learning. In the past research about social networks sites (Herrero et al., 2017), information and communication technologies (Macedo, 2017), employment websites (Huang et al., 2017), mobile banking (Baptista and Oliveira, 2015), all suggest that habit has positive influences on the behavioral intention. Therefore, we have the following hypothesis below:

Hypothesis 7. The habit (HT) of using Google Chromecast has a positive influence on behavioral intention (BI).

For UTAUT2 model, “brand image” is a new construct. Since Google is a famous brand, we think that the fame of Google has a positive effect on the behavioral intention for using Chromecast. According to Keller (2009), brand image is defined as “consumer perceptions of and preferences for a brand, as reflected by the various types of brand associations held in consumers' memory”. In this study, we define brand image as consumer perceptions of and preferences for Google, as reflected by the various types of brand associations held in respondents' memory. Here, we have the following hypothesis below:

Hypothesis 8. The brand image (IM) perceived in the use of Google Chromecast has a positive influence on behavioral intention (BI).

In addition, we explore the moderate effect of gender, age, and experience on the model.

3.2 Questionnaire design

The research questionnaire mainly adopts Venkatesh et al. (2012), and part of Keller (1993), Carlsson et al. (2006), Chang et al. (2011), Verplanken and Orbell (2003) and Woisetschläger and Michaelis (2012) as measurement scales shown in Table 1, and has been modified for this study. After short introduction, we briefly introduce Chromecast in order that the respondents have the knowledge about it. This questionnaire has two main parts: one is the main research questions and the other is demographic information. The questionnaire uses Likert 7 scales, measuring the items from “strongly disagree”, “disagree”, “slightly disagree”, “neutral”, “slightly agree”, “agree” to “strongly agree”. The higher the score is, the higher the agreement values. We also ask the respondents’ gender, age, using experience, education level, occupation and income by multiple choice questions. The three questions (gender, age and using experience) are compulsory while the other three questions (education level, occupation and income) are optional.

Table 1. The contents of the questionnaire

Construct	Item	Statement	Source
Performance Expectancy	PE1	I find Google Chromecast useful in my daily life.	Venkatesh et al. (2012)
	PE2	Using Chromecast helps me accomplish things more quickly.	Venkatesh et al. (2012)
	PE3	Chromecast makes time fly, when there is nothing else to do.	Carlsson et al. (2006)
	PE4	Using Chromecast increases my productivity.	Venkatesh et al. (2012)
Effort Expectancy	EE1	Learning how to use Chromecast is easy for me.	Venkatesh et al. (2012)
	EE2	My interaction with Chromecast is clear and understandable.	Venkatesh et al. (2012)
	EE3	I find Chromecast easy to use.	Venkatesh et al. (2012)
	EE4	It is easy for me to become skillful at using Chromecast.	Venkatesh et al. (2012)
	EE5	In my opinion, using Chromecast is handy.	Carlsson et al. (2006)
Social Influence	SI1	People who are important to me think that I should use Chromecast.	Venkatesh et al. (2012)
	SI2	People who influence my behaviour think that I should use Chromecast.	Venkatesh et al. (2012)

	SI3	People whose opinions I value prefer that I use Chromecast.	Venkatesh et al. (2012)
	SI4	I am trendy while using Chromecast.	Carlsson et al. (2006)
	SI5	My friends/family members value my choice of Chromecast.	Carlsson et al. (2006)
	SI6	My friends/family members guide me in the use of Chromecast.	Carlsson et al. (2006)
	SI7	My work community guides me in the use of Chromecast.	Carlsson et al. (2006)
Facilitating Conditions	FC1	I have the resources necessary to use Chromecast.	Venkatesh et al. (2012)
	FC2	I have the knowledge necessary to use Chromecast.	Venkatesh et al. (2012)
	FC3	Chromecast is compatible with other technologies I use.	Venkatesh et al. (2012)
	FC4	I can get help from others when I find difficulties in using Chromecast.	Venkatesh et al. (2012)
Hedonic Motivation	HM1	Using Chromecast is fun.	Venkatesh et al. (2012)
	HM2	Using Chromecast is enjoyable.	Venkatesh et al. (2012)
	HM3	Using Chromecast is entertaining.	Venkatesh et al. (2012)
	HM4	Using Chromecast is a way I like to spend my leisure time.	Chang et al. (2011)
	HM5	Using Chromecast is one of my favorite activities.	Chang et al. (2011)
Price Value	PV1	Chromecast is reasonably priced.	Venkatesh et al. (2012)
	PV2	Chromecast is good value for the money.	Venkatesh et al. (2012)
	PV3	At the current price, Chromecast provides good value.	Venkatesh et al. (2012)
	PV4	In my opinion, the initial costs do not inhibit the use of Chromecast.	Chang et al. (2011)
	PV5	In my opinion, the operating costs do not inhibit the use of Chromecast.	Chang et al. (2011)
Habit	HT1	The use of Chromecast has become a habit for me.	Venkatesh et al. (2012)
	HT2	I am addicted to using Chromecast.	Venkatesh et al. (2012)

	HT3	I must use Chromecast.	Venkatesh et al. (2012)
	HT4	I would find hard not to use Chromecast.	Verplanken et al. (2003)
	HT5	I use Chromecast frequently.	Verplanken and Orbell (2003)
Brand Image	IM1	I have good evaluations about Google.	Keller (1993)
	IM2	I have good belief in Google.	Keller (1993)
	IM3	Google is likeable.	Woisetschläger and Michaelis (2012)
	IM4	Google is attractive.	Woisetschläger and Michaelis (2012)
Behavioural Intention	BI1	I intend to use Chromecast in the future.	Venkatesh et al. (2012)
	BI2	I will always try to use Chromecast in my daily life.	Venkatesh et al. (2012)
	BI3	I plan to continue to use Chromecast frequently	Venkatesh et al. (2012)
	BI4	I aim to use Chromecast instead of the traditional ones.	Carlsson et al. (2006)

3.3 Data collection and samples

We conducted this questionnaire by using online survey website SurveyCake. We also distributed this questionnaire on the PTT bulletin board system, the most popular bulletin board system with over 1.6 million users, and boards covering a variety of topics of the latest technology including Chromecast. Moreover, data are also gathered via the social networking site, facebook.com in order to collect more samples. We also gave some rewards in order to collect samples more quickly. We worked from April 3rd, 2018 to May 11th, 2018, total 39 days. Finally, there are 233 questionnaire samples, and 227 of them are valid questionnaire samples.

3.4 Data analysis method

We analyze our research model by using the software, IBM SPSS Statistics 20 to do the demographic analysis and reliability analysis, followed by IBM SPSS Amos 25 to estimate factor loadings, composite reliability (CR) and average variance extracted (AVE) for convergent validity analysis. We also use IBM SPSS Statistics 20 again to do the discriminant validity analysis. Finally, we do the path analysis by software IBM SPSS Statistics 20, examining path coefficient of determinants and the effect of moderators.

4. Results

4.1 Demographic characteristics

In our valid samples (N=227), there are 112 males (49.3%) and 115 females (50.7%). The respondents' ages are mainly between 21 and 40 years old (78.8%); 69.2% of the samples have used Chromecast before. Most respondents' education level is either Bachelor (50.7%) or Master (29.5%), and 10 respondents did not answer to this question. As for occupation, most respondents serve in service industry (29.5%); the least respondents serve in agriculture, forestry or fishery (0.9%); the others are quite evenly distributed; but there are 13 samples of respondents who left the question unanswered. Table 2 shows the detailed results of the samples' demographic profiles.

Table 3 shows the mean and standard deviation (SD) of each construct. All of the items are measured in 7-point Likert scales where 1 represents "strongly disagree" and 7 represents "strongly agree." Among all constructs, booking channel has the highest mean and the second lowest standard deviation. According to the result, most mean values of the constructs are probably 5 and standard deviation values are between 1.0 and 1.7, which may imply that most of the respondents neither agree nor disagree the questions asked.

4.2 Reliability analysis

If Cronbach's α of a variable is more than 0.7, then it can demonstrate that the variable's reliability is acceptable. In Table 4, we can find that Cronbach's α of every construct variable is more than 0.7; therefore, our testing result of each construct has high reliability.

Table 2. Demographic profile of respondents

Attribute	Group	Number	%
Gender	Male	112	49.3
	Female	115	50.7
Age	Under 15	0	0
	16-20	3	1.3
	21-25	43	18.9
	26-30	40	17.6
	31-35	72	31.7
	36-40	24	10.6
	40-45	13	5.7
	46-50	5	2.2
	Over 50	27	11.7
Experience of using Chromecast	Never	70	30.8
	Using less than 4 times	51	22.5
	Using more than 5 times	106	46.7
Level of education	High school (or under)	21	9.3
	Bachelor	115	50.7
	Master	67	29.5

	PhD	14	6.2
	Student	28	12.3
	Serviceman, civil servant or teacher	21	9.3
	Agriculture, forestry or fishery	2	0.9
Occupation	Manufacturing	43	18.9
	Financial industry	14	6.2
	Service industry	67	29.5
	Freelancer	25	11.0
	Other	14	6.2
Monthly salary (NT\$)	20,000 or fewer	33	14.5
	20,001-50,000	136	59.9
	50,001-80,000	27	11.9
	80,001-100,000	5	2.2
	100,000 or more	1	.4

Table 3. Mean and standard deviation of the construct

Construct	Mean	S.D.
Performance Expectancy	5.1399	1.10058
Effort Expectancy	5.3815	1.11475
Social Influence	4.5916	1.30328
Facilitating Conditions	5.1784	1.19785
Hedonic Motivation	5.3912	1.04106
Price Value	4.5903	1.49302
Habit	4.2432	1.69395
Brand Image	5.5958	.99995
Behavioral Intention	4.9482	1.33404

Table 4. Cronbach's α of each construct

Construct	Cronbach's α value
PE	0.877
EE	0.932
SI	0.939
FC	0.897
HM	0.945
PV	0.958
HT	0.973
IM	0.951
BI	0.954

4.3 Validity analysis

In this study, we use “construct validity” for our validity analysis. Construct validity has two categories: convergent validity and discriminant validity. Convergent validity is the degree of correlation between items in every same construct. The higher the correlation represents the higher the convergent validity is. On the contrary, discriminant validity tests whether the constructs are unrelated or not. The more they are unrelated, the higher discriminant validity is. Confirmatory factor analysis (CFA) is used to test the construct validity.

4.3.1 Convergent validity

To validate convergent validity, three requirements must be satisfied: the first one is that all standardized factor loadings must exceed 0.5; the second requirement is that composite reliability (CR) of all constructs must be over 0.7; the last requirement is that average variance extracted (AVE) of every constructs must exceed 0.5. We use IBM SPSS Amos 25 to estimate our factor loadings, composite reliability and average variance extracted.

As shown in Table 5, all standardized factor loadings are above 0.5, even above 0.7; and every composite reliability value is over 0.7; AVE values of each construct are also over 0.5. Therefore, the convergent validity of our samples reaches satisfaction.

Table 5. Factor loading, composite reliability and AVE

Construct	Item	Factor Loading	CR	AVE
Performance Expectancy	PE1	.884	.880	.647
	PE2	.798		
	PE3	.768		
	PE4	.762		
Effort Expectancy	EE1	.858	.934	.740
	EE2	.822		
	EE3	.885		
	EE4	.878		
	EE5	.856		
Social Influence	SI1	.848	.941	.696
	SI2	.921		
	SI3	.911		
	SI4	.752		
	SI5	.740		
	SI6	.808		
	SI7	.841		
Facilitating Conditions	FC1	.781	.905	.705
	FC2	.884		
	FC3	.873		
	FC4	.817		
Hedonic Motivation	HM1	.916	.950	.792
	HM2	.927		
	HM3	.932		
	HM4	.823		
	HM5	.845		
Price Value	PV1	.939	.956	.819
	PV2	.947		
	PV3	.966		
	PV4	.831		
	PV5	.833		

Habit	HT1	.928		
	HT2	.948		
	HT3	.936	.974	.880
	HT4	.937		
	HT5	.942		
Brand Image	IM1	.882		
	IM2	.868		
	IM3	.957	.951	.830
	IM4	.935		
Behavioral Intention	BI1	.880		
	BI2	.934		
	BI3	.951	.954	.838
	BI4	.894		

4.3.2 Discriminant validity

We assess discriminant validity by using the IBM SPSS Statistics 20 software. By calculating Pearson correlations between each construct (PE, EE, SI, FC, HM, PV, HT, IM and BI), the results are shown in Table 6. Since every diagonal position has identical value, we show only the lower half part of the Pearson correlations of the constructs. If the square root of AVE of every construct is greater than the Pearson correlations of the construct between the other constructs, then we call the discriminant validity is confirmed.

Although the square root of AVE value of construct PE (.804) is slightly lower than the Pearson correlation between PE and HM (.811); and the square root of AVE of construct FC (.840) is slightly lower than the correlation between FC and EE (.843); all the other square root of AVE values are higher than the Pearson correlations of every two constructs. Thus, the discriminant validity of our samples are satisfied.

Table 6. Pearson correlation matrix and AVE

Construct	1	2	3	4	5	6	7	8	9
PE	1.000								
EE	.782	1.000							
SI	.708	.638	1.000						
FC	.682	.843	.671	1.000					
HM	.811	.842	.681	.786	1.000				
PV	.651	.634	.608	.608	.663	1.000			
HT	.661	.674	.736	.700	.661	.755	1.000		
IM	.530	.571	.350	.492	.594	.448	.402	1.000	
BI	.759	.752	.684	.753	.792	.739	.820	.586	1.000
Square root of AVE	.804	.860	.834	.840	.890	.905	.938	.911	.915

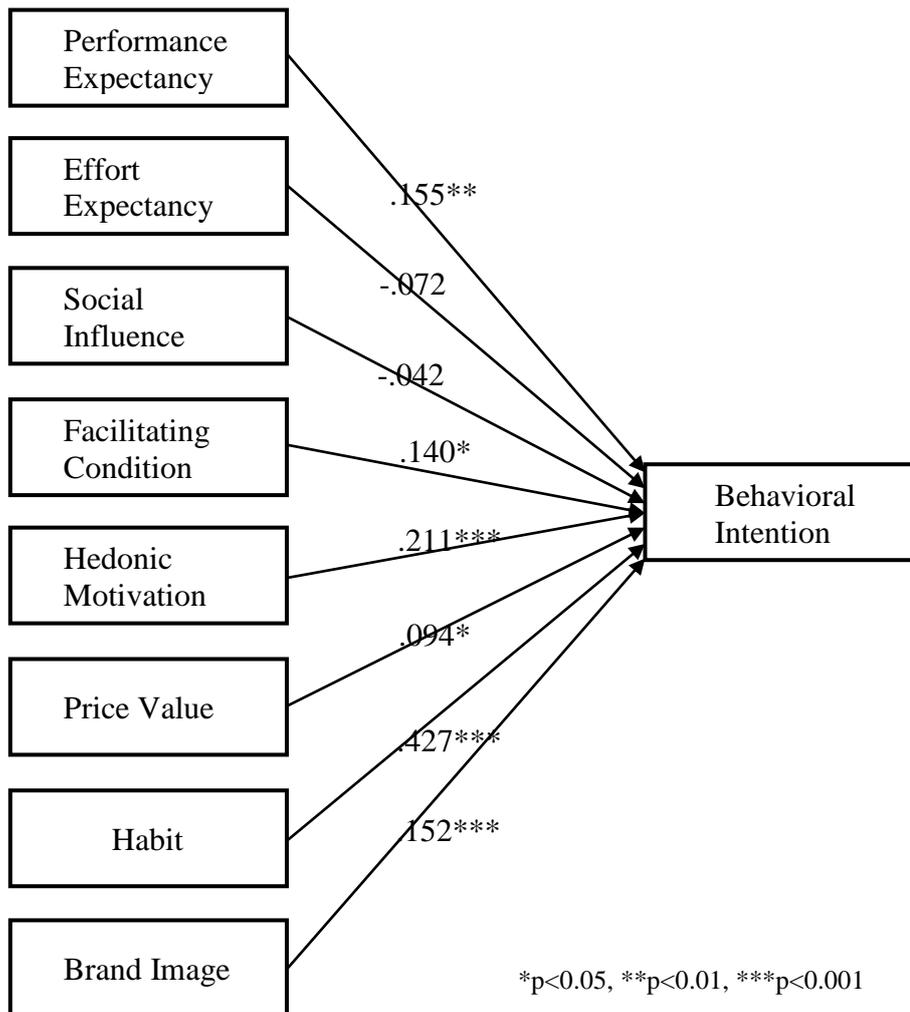
4.4 Path analysis

4.4.1 The effect of direct determinants

We use IBM SPSS Statistics 20 to test for path analysis, and the effect of direct determinants is shown in Figure 2. We find that EE and SI do not have significant effect on BI while PE, FC, HM, PV, HT and IM have significant effect on BI. The path coefficient of PE on BI is 0.155 ($\beta=0.155$, $p=0.007$), EE on BI is -0.072 ($\beta = -0.072$, $p=0.293$), SI on BI is -0.042 ($\beta = -0.042$, $p=0.400$), FC on BI is 0.140 ($\beta = 0.140$,

$p=0.021$), HM on BI is 0.211 ($\beta = 0.211$, $p=0.001$), PV on BI is 0.094 ($\beta = 0.094$, $p=0.049$), HT on BI is 0.427 ($\beta = 0.427$, $p=0.000$), and IM on BI is 0.152 ($\beta = 0.152$, $p=0.000$).

Figure 2. The effect of direct determinants



4.4.2 The effect of moderators

In the effect of moderators, neither does gender, age, nor experience has significant impact for any determinants (PE, EE, SI, FC, HM, PV, HT, and IM) on the behavioral intention (BI).

4.5 Hypothesis testing results

4.5.1 Hypothesis testing results of direct determinants

The testing results as shown in Table 7 present that hypothesis 1, hypothesis 4, hypothesis 5, hypothesis 6, hypothesis 7 and hypothesis 8, are supported; hypothesis 2 and hypothesis 3 are not supported. Therefore, there are positive relationship between behavioral intention and performance expectancy, facilitating conditions, hedonic motivation, price value, habit, brand image. And the relationships between behavioral intention and effort expectancy, social influence are not significant.

According to this finding, we deduce that in-home Chromecast usage is not easily influenced by other people, social environment or public opinions since social influence do not play significant roles in determining the using intention of Chromecast. Also, the usability of Chromecast does not play significant roles in determining the using intention of Chromecast, either. Moreover, the results show Chromecast could be experienced tech users and the complexity of the device and the degree of efforts needed to use it are not problems for them.

Table 7. Testing results of hypotheses 1-8

	Results
Hypothesis 1	Supported
Hypothesis 2	Not supported
Hypothesis 3	Not supported
Hypothesis 4	Supported
Hypothesis 5	Supported
Hypothesis 6	Supported
Hypothesis 7	Supported
Hypothesis 8	Supported

For other determinants (PE, FC, HM, PV, HT, and IM), since performance expectancy has significantly positive effect on the behavioral intention of using Chromecast, it signifies that if the functionality matches the user's need, the intention of using Chromecast reasonably increases. Facilitating conditions of course are related to the behavioral intention of using Chromecast. Imagine an environment that people do not have a TV or iPhone, etc. Could they be able or want to use Chromecast? Hedonic motivation which has positive relationship with the behavioral intention of using Chromecast represents that if something is funny, the intention of using it do increase. Price value which has positive relationship with the behavioral intention of using Chromecast represents that if something is more valuable (high value but low price), then more people will reasonably have more intention to use it. Habit has the highest value of regression coefficient, which implies that what influences survey respondents' intention of using Chromecast the most are still their habits. That is, if one has been using Chromecast before, the rate of using Chromecast is reasonably higher than those who do not use Chromecast before. Brand image is one of the focus points, and brand image does have positive relationship with the intention of using Chromecast. The more famous a brand is, the more user intention is suggested.

5. Discussions

5.1 Conclusion

By using the questionnaire instrument, we have collected many Taiwanese respondents for their opinions about Chromecast. Because hypothesis 2 (the effort expectancy in the use of Google Chromecast has a positive influence on behavioral intention) and hypothesis 3 (the social influence in the use of Google Chromecast has a positive influence on behavioral intention) are not supported in our analysis, we can speculate that effort expectancy (EE) and social influence (SI) do not have positive effect for people on the intention of using Chromecast. However, the rest hypotheses are all supported. That is, performance expectancy (PE), facilitating conditions (FC), hedonic motivation (HM), price value (PV), habit (HT), and brand image (IM) do have significant effect on the behavioral intention (BI) of using Chromecast. The moderators (gender, age and experience) do not play significant roles in determining the intention of using Chromecast.

5.2 Academic and managerial implication

To the best of our knowledge, this paper is the first one to combine UTAUT2 with construct brand image as our questionnaire model, and apply it to explore the intention of using Chromecast of Taiwanese people. Since the moderators do not play significant roles in determining the intention of using Chromecast, it somehow explains why there are many research papers drop moderators out of their models.

This study gives some people's viewpoints of Chromecast. Although Chromecast looks simple and easy to use, this does not enhance the intention of using it. Therefore, we suggest that Chromecast providers or sellers can give more function to Chromecast and lower the price. Since facilitating conditions do have positive effect on the behavioral intention, Chromecast sells better in the developed countries or the regions where the e-infrastructure meets the requirements. Because habit has the highest coefficient value, old customers must be maintained and it's better to release new version periodically. If someone is accustomed to using Chromecast, they will keep eyes on the second generation, third generation of it. And the brand image itself is also important, thus it is unreasonable to reject establishing and insisting positive reputations among customers, for brand image does not only relate to just one product, but all products which belong to it.

5.3 Limitation and future research suggestion

This research survey is conducted through the Internet, so there may be some deviations owing to the Internet. For example, the survey data from the website SuveyCake shows that there are many respondents that may come from the same person. This kind of situation will lower the reliability of statistical results. Besides, we find some unrelated results that come from the same place, though we have no evidence that these results are from the same person. Maybe they are families, roommates, etc. Therefore, it is suggested that, in the future, online survey needs to use some identification method to prevent such problems, for more accuracy and reliability of the questionnaire research. Besides, since convenience sampling does not represent the population, future researchers can expand the scale of the sample size and re-examine this model.

The new question based on the findings is that, though the path coefficients of PE, FC, HM, PV, HT and IM of our samples are significant, why the path coefficients become insignificant as we divide the samples in groups? This could be an interesting question for further research.

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