# THE RELATIONSHIP BETWEEN CUSTOMER EXPERIENCE VALUES AND CUSTOMER LOYALTY IN VIRTUAL BRAND COMMUNITY

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**By**

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# The Relationship between Customer Experience Values and Customer Loyalty in Virtual Brand Community

**The examining committee approved this dissertation submitted**

**In partial fulfillment of the requirements for the degree of**

**Doctor of Business Administration (D.B.A.) in marketing**

**On Friday 8th November 2019 by**

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## ABSTRACT

Title : The Relationship Between Customer Experience Values and Customer Loyalty in Virtual Brand Community

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This study aimed to explore: 1) the relationship between different customer experience values and community loyalty and brand loyalty in virtual brand community; 2) its implication on private universities of Thailand in constructing brand loyalty for Chinese students; and 3) to propose the Marketing Decision Support System (MDSS) for Private universities of Thailand in a virtual brand community. This was a quantitative research. The employed instrument was a questionnaire. The research sample consisted of 538 Chinese students from different private universities in Bangkok, obtained by multi-stage random sampling technique. Path analysis was employed as the hypothesis testing. Structural Equation Modeling (SEM) was used to test the brand loyalty model in a virtual community, and the SEM outputs generated were utilized as inputs for Analytic Hierarchy Process (AHP) to rank perspectives of the alternatives derived in brand loyalty in virtual brand community.

The result of the questionnaires showed: community loyalty positively impacted by practical value ($\beta$ = **0.111**) and social value ($\beta$= **0.519**), but negatively impacted by entertainment value ($\beta$= **−0.019**); brand loyalty positively impacted by practical value ($\beta$ = **0.155**), entertainment value ($\beta$ = **0.137**), and social value ($\beta$ = **0.098**), finally, brand loyalty was positively influenced by community loyalty

($\beta = 0.492$).

The results of this study raised the value of the brand marketing strategy to build customer loyalty in terms of brand loyalty, set up and implementing Marketing Decision Support System (MDSS) for Thailand private universities. Firstly, "from brand co-creating to value co-creating" was the brand marketing strategy; secondly, put the customer experience values which implied practical values, entertainment values, social values in a virtual brand community as important data and indicators for Marketing Decision Support System (MDSS). This is especially evident for private universities and or them to supply the referring guidance for decision makers to obtain more knowledge about the priority of Chinese students.

**Keywords:** Brand loyalty, Marketing Decision Support System, Private University of Thailand, Chinese students

Approved by

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I really appreciate my wife Wang Wenzhen, my mother and father for their understanding and support all through my work in the doctoral program. The special thanks to my one and half years old baby boy, and the second baby who was born in June of 2019, for they are source of my passion and energy to overcome difficulties in the whole process of my doctoral program, especially, when I felt tired, they encouraged me.

Youkai Song

Siam University

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# CHAPTER 1

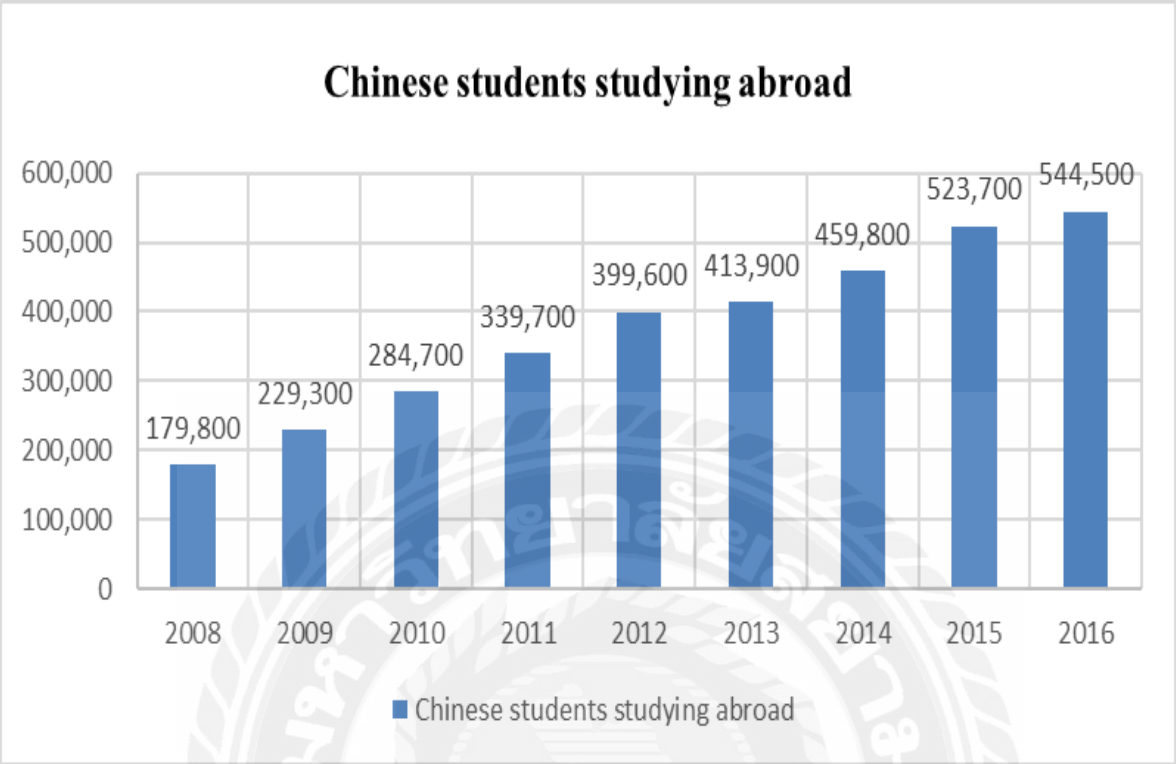
## Introduction

In chapter one, firstly, it is to introduce the higher education market needs by analyzing Chinese students studying abroad, the enrolled international students in Thailand will be introduced briefly, and secondly, the introduction to problem statement and research objectives will be explained, thirdly, pertinent variables, including independent variables and dependent variables will be explored, furthermore, the research framework and research methodology will be described in details. Lastly, the research definition and contribution of the study was explained.

### Problem statement

Studying abroad of Chinese students started 100 years ago, but since 2008, the Chinese students who decided to study abroad increased rapidly, in 2008, only 179,800 students studying abroad, in 2009 and 2010, the students studying abroad are 229,300 and 284,700 students respectively, in 2011, the students who studying abroad increased, and 2012, the number of students studying abroad still under 400,000 students bodies. But the number of students studying abroad in 2013 and 2014 are 413,000 and 459,000 students respectively. In 2015, the students studying overseas reached 523,700 students, and in 2016, the number is 544,500 students. Every year, about 20 percentage increased, see figure 1.

Figure 1 Chinese students studying abroad (N. B. S. C., 2016)

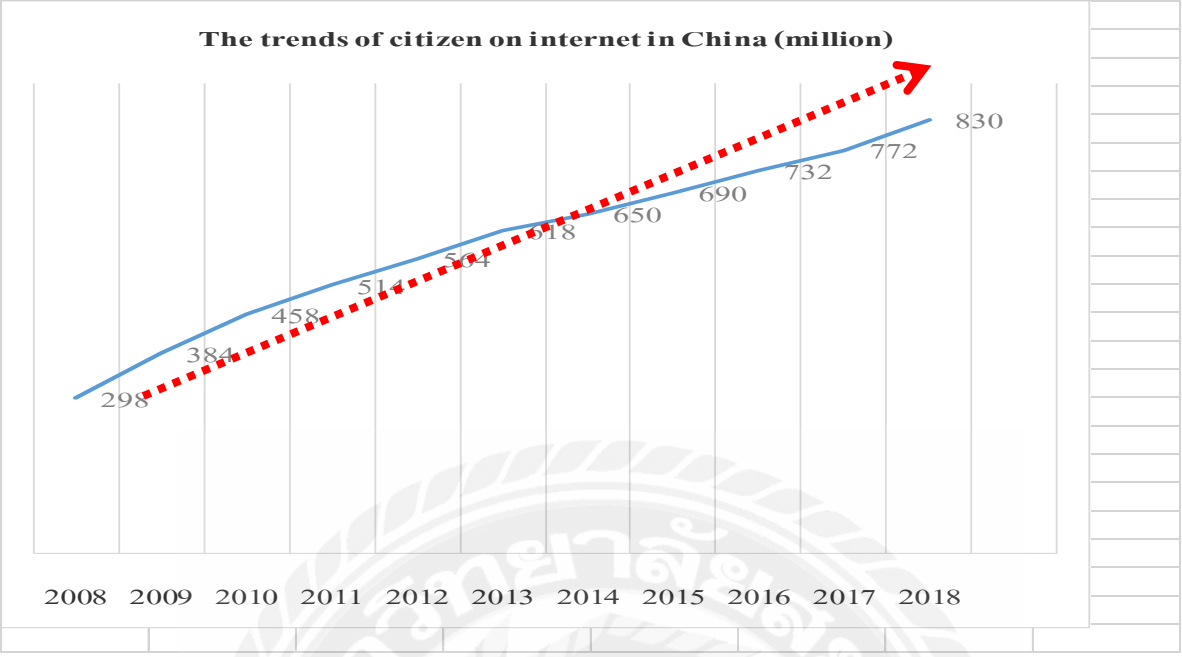



As indicated in Chinese Studying Abroad Development Report (2016), since the beginning of 1980, the time when China started the policy of open and reformation to the world, the Chinese students studying abroad, up to now, with the development of past 40 years, Chinese students studying abroad are totally 5 million, the mainland China, definitely, has become the top one source country of students studying abroad. In 2015, the Chinese students who are studying abroad, including freshman, sophomore more, junior, and senior students, postgraduate and graduate students, totally 1.26 million, which occupied 25 percentage of international students in the world. The target country of studying, both include English language culture and Chinese circle countries, such as Singapore, Japan, and Thailand. The students studying for bachelor degree are increased faster than the students who studying for postgraduate, for example, in year of 2014 – 2015, the students went to the United States of America who studies for

bachelor degree reached to 124,552 peoples, increased 12.7 percentage annually, but the students who study for master degree and doctor degree reached to 120,331 ppeople, only increased 4 percentage annually. According to Chinese Studying Abroad Development Report (2016), there are some new features of Chinese students studying abroad, the first one but not the most one, the age of students studying abroad become younger, which reflects that, lots of families choose to put their children studying abroad for bachelor degree, even for the secondary high school, and because of high competition pressure in domestic, large quantities of family send out their children to study abroad since the preliminary school. The second feature is that the element influencing Chinese students studying abroad is the reputation of universities, 47 percentage of Chinese students said the most important element is reputation of university, only 29 percentage of Chinese students are concern about the tuition and only 14 percentage of Chinese students consider about living cost, which indicates the Chinese medium-income family is increasing rapidly, equipped with the increasing of investment in education.

With the development of information and internet, virtual community has become an important social style that is same as the traditional social style, up to 2015, in China, the internet citizen has reached 690 million and 413 million of them purchased online and 119 of them share their life in bulletin board system, BBS, social media user reached 530 million, almost all internet citizens user virtual community, so that virtual has become one of the strongest platforms (Zhao, 2013). The quantity of internet citizen has reached 830 million, the most important characteristics of all the internet citizens purchased online, shared their comments to the same product and brand (C.I.N.C., 2019), see figure 2.

Figure 2 The citizen on internet in China (C.I.N.C., 2018)




Brand community (BC) was defined as social platforms where consumer–brand encounter takes place. Brand community can be both the manifestation of a management thinking in brand and the idea to put a unique of fans to a same brand. In other words, BC might be seen as the virtual arena where value is correlated through social interactions, virtual brand community has become important platform of value creating and sharing between companies and customers (Porter & Donthu, 2012; Li, 2014). In the virtual platform, companies marketing, customer's experience sharing, communications between companies and customers to get value of customer and sustainable profit of companies, respectively. From the point view of customer, value of customer needs is the value sharing and creating, as per companies, supply value option to customer is the condition to develop sustainable, furthermore, to set high quality relationship between customers and companies, gaining the customer loyalty (Lemke, Clark & Wilson, 2011). In perspectives of customers, creating and sharing value in virtual community is customer experience value, which is a kind of "communicative, relative and preferred experience (Holbrook, 2006)". (Prahalad &

Ramaswamy, 2004) argued that value creating and sharing is the communication process between companies and customers, a type of personality process, virtual brand community becomes customer value creating and sharing platform, obviously, experience value not only be the value of customer get in virtual brand community, but also be the key factors to develop company sustainable. (Jin, 2007; Huang, Liao & Zhou, 2015) studied customer loyalty in virtual community, in terms of defines and measurement index, some researchers discussed the reasons why the customer loyalty was set up in virtual brand community, for instance trust (Casalo, 2012), user engagement, online community promise, customer experience and community recognition (Huang, Liao & Zhou, 2015) but no study focused on value creating and sharing drives to customer loyalty. Although customer value is one of the important factors, influencing to customer loyalty have been tested (Blackwell, Szeibach & Barnes, 2009; Ryan et al., 2009), customer's experience value is different with customer value. In light of customer experience value theory, (Prahalad & Ramaswamy, 2014) argued that value creating and sharing is the communication process between companies and customers, a type of personality process, virtual brand community becomes customer value creating and sharing platform, obviously, experience value not only be the value of customer get in virtual brand community, but also be the key factors to develop companies sustainable. Thailand private university, plays an important role in education sector of Thailand, it is crucial to explore the experience values should be supplied to Chinese students in virtual brand community. The research to the customer experience value influence to customer loyalty in light of value creating and sharing is rarely. Virtual brand community is the common carrier of brand and community, in virtual community, customer experience values influence on customer loyalty. For private universities of Thailand, to explore the

relationship between customer experience values and customer loyalty and to develop the marketing decision support system (MDSS) for recruiting Chinese students is a competitive advantage.

**Research objectives**

Considering the problem statements and introduction, in virtual brand community, on the one hand, customer experience values consisted of practical value, entertainment value and social value, on the other hand, customer loyalty consisted of community loyalty and brand loyalty, the research objectives of this study are to explore:

1. The relationship between customer's practical value and community loyalty in virtual brand community;

2. The relationship between customer's entertainment value and community loyalty in virtual brand community;

3. The relationship between customer's social value and community loyalty in virtual brand community;

4. The relationship between customer's practical value and brand loyalty in virtual brand community;

5. The relationship between customer's entertainment value and brand loyalty in virtual brand community;

6. The relationship between customer's social value and brand loyalty in virtual brand community;

7. The relationship between community loyalty and brand loyalty in virtual brand community; and

8. To analyze the effect of customer experience value on customer loyalty;

9. To propose the Marketing Decision Support System (MDSS) for Private university of Thailand in virtual brand community.

**Research questions of the study**

This paper acknowledges the brand marketing strategy and Marketing Decision Support System (MDSSS) for Private university in Thailand toward Chinese students, in virtual brand community, customer experience values include practical value, entertainment value and social value. Customer experience values influence on customer loyalty in terms of the relationship between practical value, entertainment value & social value have influence on community loyalty and brand loyalty (Jin, 2007). so, the research questions to study are following:

1. In virtual brand community, what is the relationship between the customer experience value and customer loyalty?

2. Which customer experience value that should be put at the priority for Thailand private university to construct brand loyalty toward Chinese customers in virtual brand community?

3. How the customer experience value driving marketing decision support system (MDSS) for private universities in Thailand?

4. What's the brand marketing model in customer experience value on customer loyalty in virtual brand community?

**Backgrounds of the study**

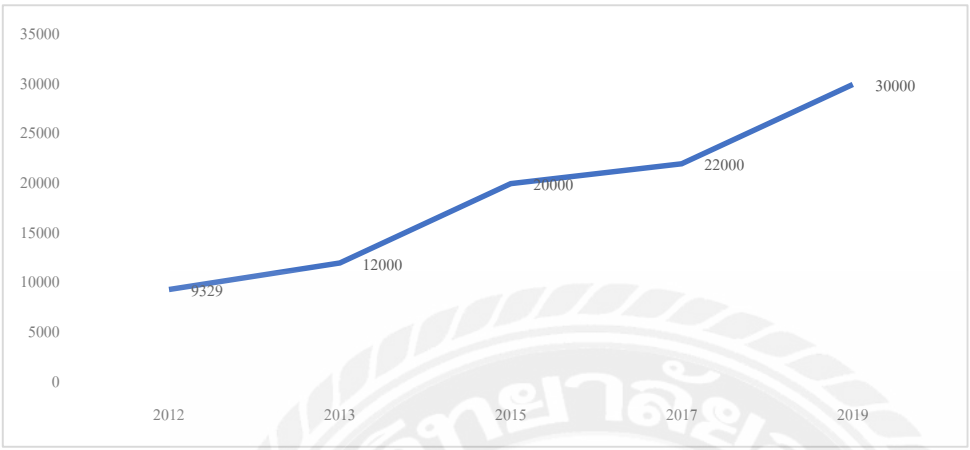
People's Republic of China is the top one source country of students for Thailand, **a**ccording to the data from the Office of Higher Education Commission of Thailand (OHEC), Chinese students have become the first country where the international students of Thailand from the year 2006 (see figure 3).

Figure 3: Foreign students in Thailand (classified in different countries) (OHEC, 2012)


The Office of Higher Education Commission of Thailand (OHEC) reported that there were 9329 Chinese students who enrolled in Thai higher education institutes (HEI) in year 2012, which occupied 46.4 percentage of the total international student. Higher education (HE) is a sector becoming more and more competitive. Countries involved in international student recruitment and enrollment are increasing, since the growing international competition between different universities, so that constructing long-term loyalty is a key element. Totally, there are 172 higher education institutes in Thailand, including 72 private universities, institutes & college, 39 Rajabhat universities, 21 national universities, 13 public universities and colleges, 12 colleges and institutes, 9 Rajamangal universities of technology,3 joint schools, and 1 intergovernmental institute. Private universities and institutes are the main target of Chinese students to apply for the high quality and mobility in management. In 2012, 9,329 Chinese students were enrolled in universities, the number of Chinese students enrolled in private and public increased to 12, 000 in year of 2013, two years later, the number reached to 20,000 in the

end of 2015, in December of 2017, totally, more than 22,000 Chinese students were enrolled in universities, institutes of Thailand, up to the end of 2019, this number will reach 30,000, see figure 4.

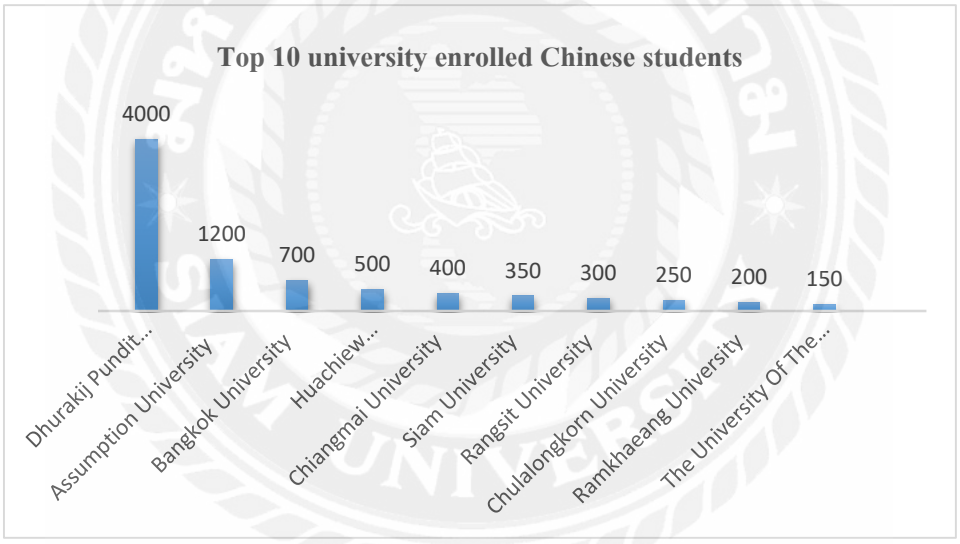
Figure 4: Chinese students enrolled in universities of Thailand (E.M.C., 2018)




Studying overseas has become a popular, but not an old option for Chinese students, and for their parent, with the trends of higher education internationalization and the exchange and cooperation between China and ASEAN country, especially, Kingdom of Thailand which is the promoter and initiator of ASEAN, and the closing in geography and culture, and the trend of China—ASEAN market integration, more and more Chinese students and their family target to study in Kingdom of Thailand, both aiming at degree-seeking, including bachelor degree, master degree and doctor degree, even for vocational education, and culture experience, traveling, for the reason of Kingdom of Thailand is famous of the most popular country of tourist in all the world (Yin & Chen, 2015). P. R.C, as the top second economic body and the 1.37 billion populations in the global, has changed from “factory-China” to “market-China”, higher education, as an important investment for future, there is an enormous market needs in higher education in China (N.B.S.C., 2017). As the advantage of geography and political-geography of Thailand in the China--ASEAN economic and trade integration to recruit more Chinese students move forward and

enter into universities of Thailand, Thailand, especially, the capital of Thailand, Bangkok, has been constructed as the gate way between China to ASEAN countries, which means that, studying in Thailand means to step into the door of career that involves in the China-ASEAN trade (M.C.P.R.C., 2016). In Kingdom of Thailand, private high institutions play an important role, for freedom in academic, flexibility of management, and high quality of education, the gateway in economic and education from China to ASEAN country, Thailand private high institutions has become popular options for Chinese students and their family.

Figure 5: Top ten university of Chinese students enrolled in Thailand (Education Ministry of Thailand, 2017)




Totally, there are 172 higher education institutes in Thailand, including 72 private universities, institutes & college, 39 Rajabhat universities, 21 national universities, 13 public universities and colleges, 12 colleges and institutes, 9 Rajamangal universities of technology,3 joint schools, and 1 intergovernmental institute (see figure 4). Private university and institute are the main target of Chinese students to apply for the high quality and mobility in management (Wiki, 2018).

Universities that Chinese students enrolled in includes private and public universities, most of them are in Bangkok Dhurakij Pundit University is the top one university where about 4000 Chinese students are studying for their bachelor degree, master degree and doctor degree, the programs were instructed in Chinese language, English and Thai, the second one is Assumption University where more than 1200 Chinese students were enrolled in, the third one is Bangkok University where more than 700 Chinese students were enrolled in, the following universities are Huachiew Chalermoprakiet University and Chiangmai University, where more than 400 Chinese students were recruited in respectively, there are more than 300 Chinese students are studying in Rangsit University and Siam University respectively, for bachelor master and doctor degree, Ramkhamhaeng University and Chulalongkorn University recruited more than 200 Chinese students, the University of the Thai Chamber of Commerce enrolled about 150 Chinese students, see figure 5. The favorable fields of study were: International Business Management (22.3%), Hotel and Tourism Management (17.9%), Thai Language (13.4%), Marketing, Business English, Finance and bank management, Business Thai, and product, which means that the students favored to the field that is match with their future career what they will seek job in business and culture, education between China, Thailand and other ASEAN countries, and go to America and Europe through Thailand (Song, 2017).

In conclusion, the trends of higher education internationalization and China—ASEAN trade and market integration, with the increasing higher education market needs from People's Republic of China, Thailand has become a key target studying country of Chinese students and their family. Studying abroad has become a popular, but not an old option for Chinese students, and for their parent, with the

trends of higher education internationalization and the exchange and cooperation between People's Republic of China and ASEAN country, especially, Kingdom of Thailand which is the promoter and initiator of ASEAN, and the closing in geography and culture, and the trend of China—ASEAN market integration, more and more Chinese students and their family target to study in Kingdom of Thailand, both aiming at degree-seeking, including bachelor degree, master degree and doctor degree, even for vocational education, and culture experience, traveling, for the reason of Kingdom of Thailand is famous of the most popular country of tourist in all the world (Yin & Chen, 2015). P. R.C, as the top second economic body and the 1.37 billion populations in the global, has changed from factory-China to market-China, higher education, as an important investment for future, there is an enormous market needs in higher education in China (N.B.S.C., 2017). In Kingdom of Thailand, private high institutions play an important role, for freedom in academic, flexibility of management, and high quality of education, the gateway in economic and education from China to ASEAN country, Thailand private high institutions has become popular options for Chinese students and their family.

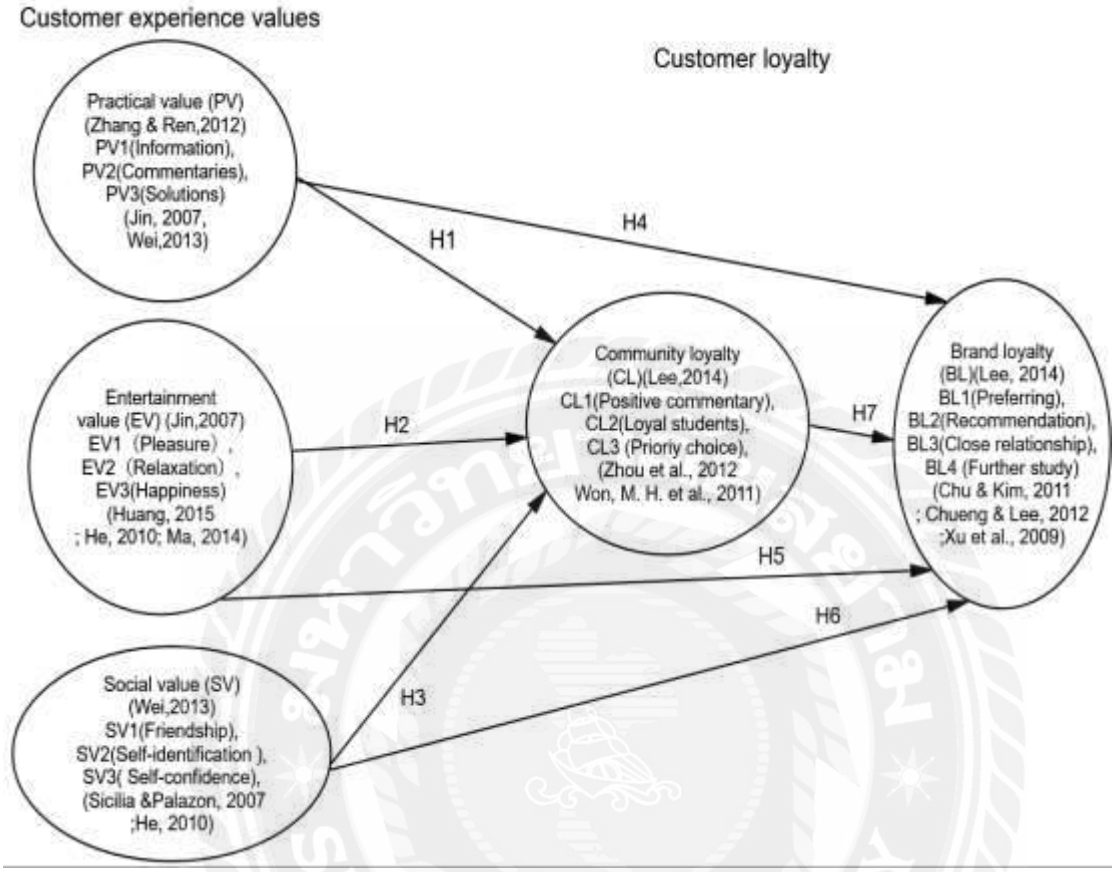
Because the advantage of geography and political-geography of Thailand in the China--ASEAN economic and trade integration to recruit more Chinese students move forward and enter into universities of Thailand, Thailand, especially, the capital of Thailand, Bangkok, has been constructed as the gate way between China to ASEAN countries, which means that, studying in Thailand means to step into the door of career that involves in the China-ASEAN trade (M.C.P.R.C., 2016). Free trade area between China and ASEAN has been established, so that, the talents needs in companies that involves in across border and international trade between China and ASEN countries, the talents needs in culture

exchanges between China-ASEAN countries, the talents' needs in education, such as Chinese teachers in preliminary and secondary school(N.B.S.C., 2017).

The development of community can be defined and understood from geography to internet, in other words, the community was developed in real world at the primary stage, but with the progressive of technology, especially, the internet technology changed the landscape of community, the community was stepped into online community, virtual brand community (VBC). From the idea of community to the concept of brand community, historically the idea of community was thought geographically bounded, based on familiar and emotional values, typically in a rural context (Stefânia & Almeida, 2011). Virtual community is the public space which was established by the people with common interest online with a virtual brand identity, the essential of virtual brand community could be the combination of "brand community" and "virtual community". In fact, different brand communities were formed by similar and comparable products and services, for instance, the cola-wars, the brand community of Pepsi was consisted of teens and even pre-teens that were featured with passion for Pepsi brand that associated with entertainment, such as funny and humorous sprits, and pop music.

**Research Framework**

Figure 6: The conceptual research framework (Source: Literature review)




**Research methodology**

The aims of this study are to explore the brand marketing strategies of Thailand private university toward Chinese students from perspectives of customer experience value in virtual brand community. The instrument employed in this study was survey method by structured questionnaires to perform the assessment to respondents' characteristics and demographic profiles, including gender, marriage and education backgrounds, furthermore, d the behavior of respondents informs of descriptive research, which includes hours of surf on internet per week, times in virtual community per week.

**Independent variables**

**Practical value**

Practical value was defined as the value that customer gain in virtual brand community for meeting the practical needs, wants and demands of customer in their daily consumption life. Customer's opinion of a product's value to him or her, it may have little or nothing to do with the product's market price and depends on the product's ability to satisfy his or her needs or requirements (B.D., 2017).

**Entertainment value**

The value that virtual brand community supplies to customer in community for meeting the mood needs in terms of entertainment and enjoyment, in other words, the entertainment value is the perceived value related to enjoyment and fun seeking (He, 2010; Yung, 2015).

**Social value**

The relative importance that people place on the changes they experience in their lives. Some, but not all the values were captured in market prices. It is important to consider and measure this social value from the perspective of those affected by an organization’s work (He, 2010).

**Dependent variables**

**Community loyalty**

Community loyalty is an essential component of community engagement, when users have the choice to engage in a variety of different communities, they often become loyal to just one, focusing on that community at the expense of others (William & Hamilton, 2016).

**Brand loyalty**

Brand loyalty was defined as positive feelings towards a brand and dedication to purchase the same product or service repeatedly now and in the future from the same brand, regardless of a competitor's actions or changes in the environment. It can also be demonstrated with other behaviors such as positive word-of-mouth advocacy, brand loyalty is where an individual buys products from the same manufacturer repeatedly rather than from other suppliers (Pauwels & Mogos, 2013).

**Research hypothesis**

To support testing of the model and to answer the research questions, several hypotheses have been developed (see figure 6), which are further described as following:

**H1: Practical value (PV) has positive influence on community loyalty (CL)**

**H2: Entertainment value (EV) has positive influence on community loyalty (CL)**

**H3: Social value (SV) has positive influence on community loyalty (CL)**

**H4: Practical value (PV) has positive influence on Brand loyalty (BL)**

**H5: Entertainment value (EV) has positive influence on Brand loyalty (BL)**

**H6: Social value (SV) has positive influence on Brand loyalty (BL)**

**H7: Community loyalty (CL) has positive influence on brand loyalty (BL)**

**Measurement design**

This study aims at the virtual community of Chinese students registered in Thailand private universities. The data were collected through questionnaire and in-depth interview. In light of reading and referring to abundant of academic literature, 9 questions related to customer experiences value and 7 questions related to customer loyalty There will be at least 500 samples of population received the

questionnaires, and the response rates will be over 70%. It took about 3 to 5 minutes to complete the questionnaires.

**Data collection**

The data collection supposed to be done in duration March 1st to August 30th, 2018. The measurement table of this study was designed on "Questionnaire star Website", and distributed to students who registered in different private universities in Bangkok, for reasons that the quantities of customer are abundantly, and the users in virtual community of different private universities who have different backgrounds, so that the samples can be response the features of customer in virtual brand community. Likert 5 scales measurement was employed to measure and take data of customer experience value and customer loyalty in this study, 1=Very disagree, 2=Less disagree, 3=Agree, 4=More agree, 5=Very agree.

**Sample size**

The sample size of this study was determined in light of the $n=(1+N)/(1+N(e)^2)$ (Yamane, 1978). Alternatively, Dean, Velicer, and Harlow (1995) located numerous studies (Anderson & Gerbing, 1988) that agreed that 100 to 150 subjects is the minimum satisfactory sample size when conducting structural equation models. Model conceptualization includes structural model conceptualization and measurement model conceptualization. The measurement model conceptualization means how unobservable variables were defined and measured, the observed variables were reflected by manifest variables and auxiliary theory (Wu,2010). Velicer & Fava (1998) founded on condition that the samples above 200, SEM cold reach stable analysis result. Schumacker & Lomax (1996) founded that the samples should be in duration from 200 to 500, but the samples in social science research always lower than 200 or higher than 500, when the sample was lower than 200, the test power of the model would be reduced (Rigdon,2005).

Thompson (2000) founded the ratio between samples to observed variables should be at least between 10:1 to 15:1. Hair, Anderson, Tatham, and Black (1998) argued that for both regression and structural equation modeling analysis, the preferred ratio of observation to independent variables were 15 to 20. Boomsma (1987) suggested when Maximum Likelihood (ML) was equipped to test structural equation model, 200 samples were the minimum sample requirement.

**Statistical analysis tools**

This study employed structural equation modeling (SEM) for the main relationship model to examine the conceptual model and associated hypotheses. This research hired AMOS version 22.0 to analyze confirmatory analysis in which the maximum likelihood estimation (ML) method was provided. The ML method was employed for theory testing and development (appropriate for testing our conceptual model and hypotheses). Based on the conceptual model and the package of software, SPSS and AMOS version 22.0, as a marketing decision support system by analyzing a set of input data, to specify marketing decisions and recommendations to customers in virtual brand community. Multiple Criteria Decision Making (MCDM) and Analytic Hierarchy Process (AHP) were hired to specify marketing decisions and recommendations to customers for making decision to choose private higher education institutes in virtual brand community, SPSS was hired for testing and drawing the decision tree. AHP-OS, a web-based tool was hired to support rational decision making based on the Analytic Hierarchy Process (AHP) and for defining the hierarchy of criteria for a decision, to calculate priorities and evaluate a set of decision alternatives.

**Research definition**

**Virtual brand community;** Virtual brand community is the classical and typical platform of value creating and sharing between companies and customers (Porter & Donthu, 2012; Schau et al., 2013; Li et al., 2014). The virtual brand community features in the themes of brand, which has become the platform to build customers loyalty to brand, furthermore, customer experience value is the key to drive brand loyalty (Kim et al., 2014).

**Customer experiences value;** Customer experience value is the degree of upside compared to the degree of downside for a customer to do business with an organization, customer experience value quotient is a helpful way of thinking about customer experience value (Lynn, 2017), marketing mix planning begins with building an offering that brings value to target customers (Rebecca, 2015).

**Customer loyalty in virtual brand community;** Customer loyalty was defined as the purchase and repurchase decision making on basic of customer's satisfaction, and trust to the products/services (Oliver, 2009), which means the definition of brand loyalty, customer loyalty means the response between subjects (customers) and objects (brand, products, companies, and community) in attitude and behavior, which focuses on brand in brand loyalty and community in community loyalty.

**Experience;** Experiences is an important part of marketing for some companies, all kinds of firms are recasting their traditional goods and services to create experiences, they create lifestyle experiences that encourage customers to visit more often, hang around, and experience the mobile virtual brand community (Jessica & Joshua,2014).

**Relationship**; In Chinese it was named as "Guan xi", which means the influence between

different things, the special connection between people and things, the impact or bearing, the reason or condition, the concern and affect between different things, objects and people (Bai, 2018).

**Decision tree;** A decision tree is a decision support tool that uses a tree-like model of decisions and their possible consequences, including chance event outcomes, resource costs, and utility. It is one way to display an algorithm that only contains conditional control statistics (Wiki, 2019).

**Virtual brand community;** it is on internet, organized by brand-lover, and sponsored by enterprises, focused on a specific brand, the brand-lovers discuss brand knowledge, share brand experience and feeling so that the systematic online community or forum, for instance, the smart mobile community, car online forum(Jin, 2007; Lee,2014).

**Customer experience values in virtual brand community;** the commentary after judging and weighing the balance between the benefits and costs after taking parting the virtual brand community, not only include the function utilities, but also do include the experience and mood in the process of communication (He, 2010).

**Customer loyalty;** both an attitudinal and behavioral tendency to favor one brand over all others, whether due to satisfaction with the product or service, its convenience or performance, or simply familiarity and comfort with the brand, customer loyalty encourages consumers to shop more consistently, spend a greater share of wallet, and feel positive about a shopping experience, helping attract consumers to familiar brands in the face of a competitive environment (Philip, 2016).

**Thailand private university;** In Kingdom of Thailand, private high institutions play an important role, for freedom in academic, flexibility of management, and high quality of education, the

gateway in economic and education from China to ASEAN country, even from China to the entire world, such as EU, America, private high institutions has become popular options for Chinese students and their family (Song, 2017).

**Contribution of the study**

This study was different from the previous researches in the field of customer experiences value in virtual brand community. Several of factors of customer experience value that drives the customer loyalty in virtual brand community were included into new model. The integrated model allowed inclusion of antecedent and mediator variables making the model became more useful adaptable, and applicable. The measurement model with structural equations modeling was equipped for grouping various variables that resulted in generating a more parsimonious model. The results gained from this study will provide the new brand marketing concept for practitioner which will be able to modify virtual brand community (VBC) components to strategic marketing decision support system (MDSS).

Furthermore, the study explored the creative brand marketing strategies toward Chinese students for private universities of Thailand in the era of digital, and with the trends of China—ASEAN market integration has an influence to public, including higher education department of China and Thailand for establishing the specifications and standards of higher education between China and Thailand. Finally, for the universities of Thailand, especially, private university, (1) to market the new generation of Chinese students, who equipped internet technique tools, (2) to analyze the brand strategy in digital era, and the customer experience value effecting Chinese students and their family decision making, (3) to provide a guidance for brand marketing strategies model for Thailand private university toward Chinese from perspectives of customer experience value impact on brand loyalty in virtual brand community. (4)

to study and develop the marketing decision support system (MDSS) in virtual brand community for Thailand private university toward Chinese customer.

# CHAPTER 2

## Literature Review

In chapter 2, the literature review will be studied in following aspects, first, the existing studies and arguments to community, virtual community, virtual brand community and the development form community to virtual brand community; secondly, the different researchers' studies and arguments to virtual community and virtual brand community; thirdly, the existing researches to customer experience value and customer loyalty in virtual brand community; fourthly, the existing arguments to brand strategies, value co-creating and brand co-creating; lastly, the Decision Support System (DSS) and Marketing Decision Support System (MDSS) were explained.

**Brand community**

Muniz and O'Quinn (2001) were the first scholars who argued that "brand community" was the social relationship of customer, non-geographic and specific community, in the virtual brand community, customer use the same brand of products or service. Hatch and Schultz (2010) explained that a brand community is an important platform for value co-creation between company and customer. Algesheimer (2005) studied the "concentrated customer "model and argued the concept of brand community: a brand community was the platform for brand information sharing, feeling communication between a special customer group who had the preference to the same brand to some degrees.

Mc Alexander (2002) explained the following three social relationships of brand community: firstly, the common value between community members; secondly, the common "responsibility

cognition" between community members; thirdly, community members concern the relationships in the platform. Brand community influences the customer and enterprises positively, including perspectives of promoting the customer-brand relationship, increasing customer promise and loyalty, assisting the identification to the community, and driving the creation and co-value. Muniz and O'Guinn (2001) argued the characteristics as following: first, the group identification and sense to co-support and cooperation; second, the common regulation and tradition; third, the ethic responsibility to maintain the operation of the community.

Therefore, the brand community is the social form in which the people with common brand preference communicate product information and interaction. The brand community featured with following three points: first, there common brand that was preferred by the community members; secondly, in the brand community, members communicating information and promoting some activities for the operation of community; thirdly, the brand community is non-limitation of geographic for users and enterprises.

**Virtual community and virtual brand community**

Virtual community, also named as internet community, online community and cyber community, an internet platform where users share knowledge and information, make new friendship, communication on basic of common interesting and targets, regulations (Williams & Cothrel, 2010). Virtual community featured with non-limitation of time and space, specialized identity, equality, self-theme and self-participation, knowledge sharing, emotion sharing platform.

Virtual brand community was driven by connection between offline brand community and online virtual community, where the members communicate and change information with each other's

(Gao & Shun,2008). Virtual community was originated in the background of cyber society also named as cyber community, in recent years, different scholars defined virtual brand community. Rheingold (1993) was the first one who explained the virtual brand, he argued virtual community was a type of social relationship in cyber space, the public discussion between the members of brand that leading to some common sense or opinions. The more definition and arguments to virtual community, see table 1:

Table 1: Different definition to virtual community

| Author | Definition |
|---|---|
| Rheingold (1993) | virtual community was a type of social relationship in internet space, the public discussion between the members of brand that leading to some common sense or opinions. |
| Romm et al. (1997) | Virtual community is the platform for information transferring, knowledge sharing, products trading by means of internet space between the groups with same targets and aims |
| Gupta & Kim (2004)<br>Blanchard (2007) | Virtual community is a type of internet social groups, the individuals and personals could make public speech, for instance, chat rooms, internet forums. |
| Wang et al (2012) | Victual community is an inter-group in online space, which was composed by individuals in terms of friendship, information, identification and social resources. |
| Gabriela et al (2015) | Virtual community is a kind of social platform, which originated virtual environment for the common regulation, value that respected by members. |

Recently, the studies to virtual community were referred to above definitions, among of them, (Fu & Lv,2009 ;Zhu & Qian, 2015; Li & Piao, 2014), the table 1 indicated the four factors that leading to the origination of virtual community: firstly, the users with common and same aims; secondly, continuously communication in virtual forms; thirdly, no-limitation in geographic and race; fourthly, the common interests and aims drives member's participation and activities in the same community.

Algesheimer (2005) arisen that virtual brand community is one types of virtual community, the themes topics in the virtual community were focused on the brand, and this kind of community covered the characteristics of brand community and virtual community, it is necessary to further studies and researches to the virtual brand community influencing to society. Zhou (2011) argued that the virtual brand community was the brand community developed in internet space, the internet techniques drives the virtual brand community as the main form of brand community. Chen (2007) and Li et al. (2014) studied and founded that virtual brand community is a kind of social relationships which is based on the internet, the common preferences of members, and members' information transferring, brand experiences feeling and sharing in virtual brand community. Virtual brand community constructs and configures the platform for customers, enterprises and other shareholders to communicate and exchange interests, meanwhile, virtual brand community promotes and drives the brand value. Therefore, the definitions and concepts to virtual brand community were argued by referring to the brand community and virtual community. In short, virtual brand community was composed the features of brand community and virtual community, the virtual brand community was built by the groups who have common preference to the same brand for communication in internet space, with the advantages of non-limitation of geographic.

Algesheimer (2005) argued that identification to brand community is the key to user's

involvement and participation. Chu & Kim (2011) studied and found that contact strength, homogeneity, trust, normative impact, information impact are the drives to impact on brand reputation spreading willingness of social medium user. Cheng & Lee (2012) argued egoism, altruism, collectivism, principles, and self-efficacy of knowledge impact on word-of-mouth spreading on internet. Chan et al. (2014) argued that system support, value of community, freedom of expression, award identification are the factors that drive word-of-mouth spreading and repeat purchasing willingness of virtual brand community users.

Hollebeek et al. (2014) argued that brand involvement is the key to influence the willingness of social medium users. Ray et al. (2014) studied and found that knowledge self-efficacy, self-identification, community recognition are the elements that drive word-of-mouth spreading willingness of virtual community users. Xu (2009) found that perceived usefulness, perceived pleasure, perceived easy operation are the factors that drive the users' willingness to virtual community log in. Fu et al. (2009) argued that social identification feeling is the elements that affect word-of-mouth spreading of virtual community user. Tie (2015) argued that trust feeling and perceived value influence word-of-mouth spreading willingness in internet positively (see table 2).

Table 2: Virtual brand community

| References | Conceptual arguments |
|---|---|
| Algesheimer (2005) | Identification to brand community |
| Chu & Kim (2011) | Contact strength, homogeneity, trust, normative impact, information impact. |
| Cheung & Lee (2012) | Egoism, altruism, collectivism, principles, self-efficacy of knowledge. |
| Chan et al. (2014) | System support, value of community, freedom of expression, award identification. |
| Ray et al. (2014) | Knowledge self-efficacy, self-identification, community recognition. |
| Xu et al. (2009) | Perceived usefulness, perceived pleasure, & perceived easy operation. |
| Fu et al. (2009) | Social identification feeling. |
| Tie (2015) | Trust feeling and perceived value. |
| Hollebeek et al. (2014) | Brand involvement. |

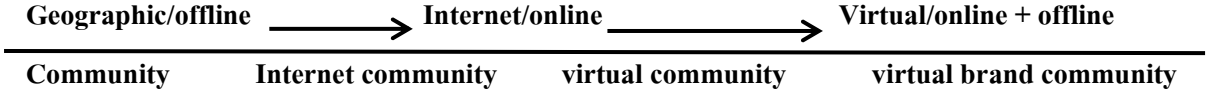
**From community to virtual brand community (VBC)**

The "community" was originated in "community & society" by the Ferdinand Tonie's who indicated that the community is the close relationship with the same value orientation between people. With the development of internet, the virtual community was developed gradually, non-limitation of space is the most important difference between the community and virtual community. Rheingold (1993) is the person who argued the concept of community.

The development of community can be defined and understood from geography to internet, in

other words, the community was developed in real world at the primary stage, but with the progressive of technology, especially, the internet technology changed the landscape of community, the community was stepped into online community, virtual brand community (VBC). The terms of “community” was originated in Latin “communitas” or “communis”, referring to “things held in common”. Urban sociologists and anthropologists have long been interested with what makes a “community” and have generally agreed that a community is a group of three or more people who share or have things in common. Typically, these shared facets have included interests, practices, values, norms, and also extend to symbols, rituals, as well as to “laws” (although these might be more in the nature of informal rules) and language (words that have meanings unique to the community, rather than languages such as English or German). From the idea of community to the concept of brand community, historically the idea of community was thought geographically bounded, based on familiar and emotional values, typically in a rural context (Stefânia & Almeida, 2011). In the late 1990s consumer researchers (Oliver,1999) noted that the groups of customers who agglomerated around brands had much in common with the notion of community studied by other social scientists. In fact, different brand communities were formed by similar and comparable products and services, for instance, the Cola-wars, the brand community of Pepsi was consisted of teens and even preteens that were featured with passion for Pepsi brand that associated with entertainment, such as funny and humorous spirits, and pop music. In comparing, in the brand community of Coke, worldwide diversity, overcoming difficulties, hardships, and other same topics were concerned, so that the Coke brand community featured a strong sense of community and family identification. Clearly, the two brand communities enhanced their brand respectively (see figure 7).

Figure 7: Virtual brand community (VBC) continuum (Li, 2014)




With the progress of the development of the mass media and new telecommunications technologies, an important new ability to share an identity transcending geographical boundaries including people far away from each other. This contributed to the birth of modern marketing in the consumer culture that placed first communal consumption of brands and then the brand itself at the center of the common identity of some communities (Stefânia & Almeida, 2011). The ability to communicate became cheaper and more accessible so members were able to establish the collective practical and emotional relationship between them outlining the brand community as a dispersed network of social relations marked by affinity and emotional bonds situated within consumption context (Muniz & O'Guinn 2001). The large use of internet, the development of interactive platform and digitalized communication route (Web 2.0) supply an intangible context for potentialized creation with many consumers taken individuality or collection in a brand community. On condition that the brand community was equipped with online socialized met (Zaglia, 2013; Brogi, 2014), it is referred to as virtual brand community (VBC). Inside VBC, consumers have similar norms or values and share the same passion for a brand. At this level, a brand is a set of ideas that convey the essence of the organization, and/or the product. It is the framework for innovation that is human centered. Technological innovation presupposes an interaction between consumers, community members and the company in order to create products, services, ideas or experiences together. In other words, entrepreneurial co-creation implies collaboration. Consumers, and brand community members develop personalized experiences in the VBC. "Brand aficionados" perceive

social identities with small friendship groups around the brand (Bagozzi et al., 2012). A brand can reinforce this link with consumers by Brand Identity Prism (Kapferer, 1992).

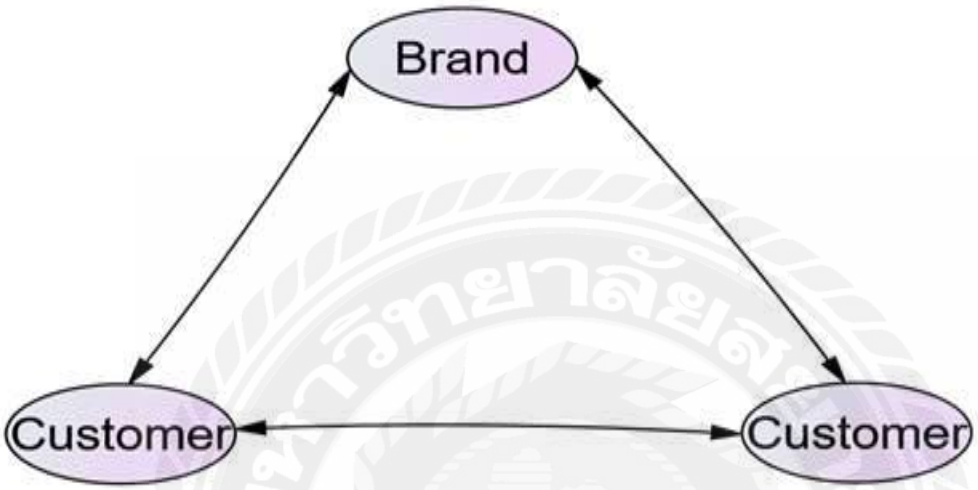
Brand community was planted and originated from consumption community concept. Boorstin (1974) is the person argued the concept of consumption community, he argued that consumption community was composed of the consumers' consumption model and the product with common characteristics, in the consumption community, consumer share their value orientation, consumption philosophy, and the perceived feeling to stores, products and brand. Boost in focused on the connection between consumer and brand, so as enterprises delivered the value and image of product to customer by means of brand, which is the "consumer----brand" model, see figure 8.

Figure 8: The binary relationship in brand community (Boorstin, 1974)


In view of consumption community, Munniz and O'Guinn (2001) defined the brand community which is the non-limitation in geographic social relationship in customer for the same brand, Munniz and O' Guinn found out that the relationship in brand community not only included the binary

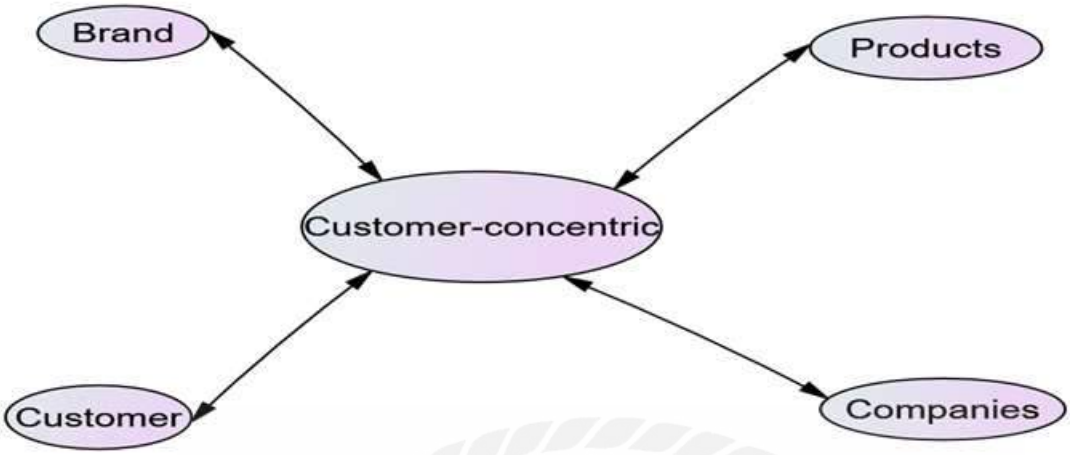
relationship between brand and consumer, but also the triangular relationship between different consumer and brand, see figure 9.

Figure 9: The triangular relationship (Muniz & O'Guinn, 2001)



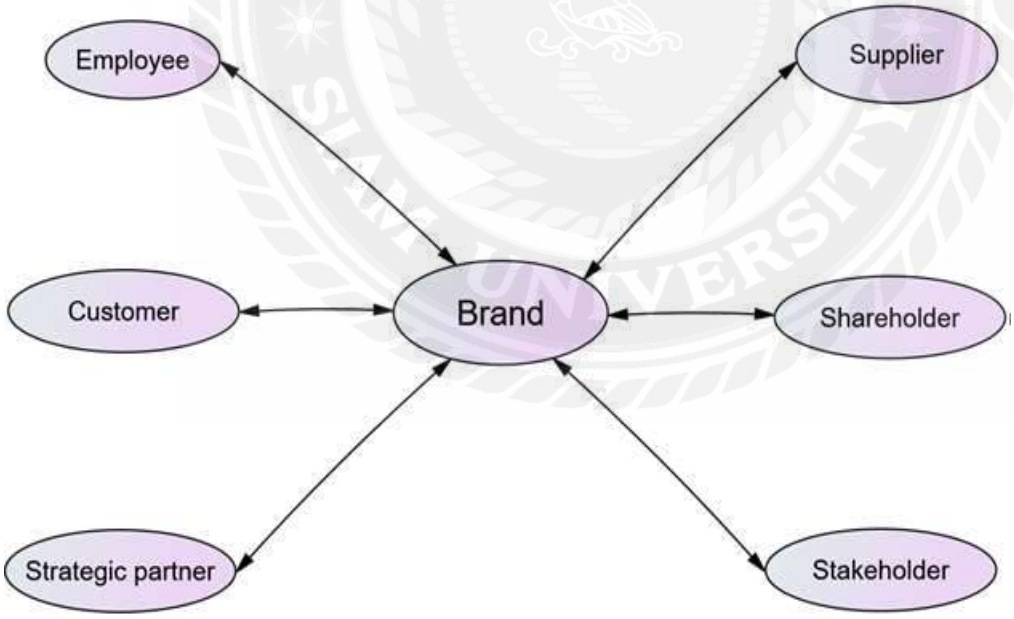

McAlexander et.al. (2002) developed customer concentric model of brand community, in the modified concept, virtual brand community was defined as a social relationship integrated with the common interesting to the same brand, see figure 10.

Figure 10: Customer concentric model (McAlexander et.al., 2002)




Upshaw & Taylor (2001) argued the master brand community in which included all the stakeholders, such as employee, supplier, customer, shareholder, strategic partner and stakeholder, see figure 11.

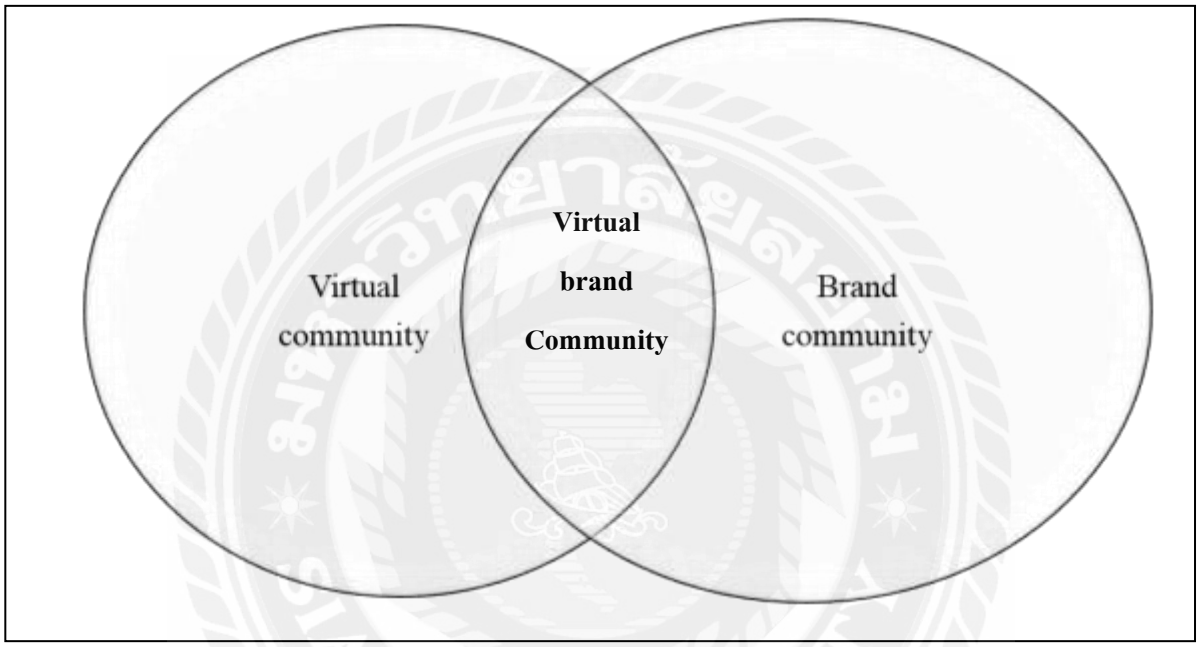
Figure 11 Master brand community model (Upshaw & Taylor, 2001)




Virtual brand community is type of virtual community, which is integrated with brand community and internet. The virtual brand community featured; firstly, virtual brand community was

support by data techniques such as internet and mobile communication; secondly, the drives of virtual brand community was a specific brand; thirdly, the initiator of virtual brand community could be enterprises, brand lover or the third party. The virtual brand community was produced by virtual community and brand community, see figure 12.

Figure 7: The virtual brand community (VBC) (Lee, 2014)




**Customer experience value in virtual community**

Virtual brand community value is the classical value creating and sharing platform; customer is the core of value creating and sharing, experience value. Currently, there is no common sense to virtual brand community/virtual community customer experience value, including the following types of arguments: five perspectives, information value, financial value, social communication vale, image value and entertainment value (Jin, 2007); four perspectives: functional-value, knowledge-value, social-value and mood value (Wei,2013); three perceptions: functional-value, social value and entertainment value (Ma

& Yang,2014); two perceptions: practical value and virtual value (Zhang et al., 2012). Even different researchers define customer experience value in different perceptions, it is easy to get common conceptual contents from different definitions, for instance: function value, practical value and information value, knowledge value, emotional value, entertainment value and hedonism value. Virtual brand community plays a belt role between customer and companies, different customers, the value creating and sharing in virtual brand community, supply knowledge, information, and furthermore, constructs internet relationship, information sharing, emotion communication in social value, and supply entertainment value. Therefore, this study adapts three perceptions as the research perceptions, which define customer experience value into practical value, entertainment value and social value. Customer loyalty was defined as the purchase and repurchase decision-making on basic of customer's satisfaction, and trust to the products/services (Oliver, 2009), which means the definition of brand loyalty. Customer's loyalty means attitude and behavior tendency to favor one brand over all others, whether due to the satisfaction to the product or service. With the development of internet and virtual community, customer loyalty was developed to internet customer loyalty, community loyalty and so on. Therefore, customer loyalty means the response between subjects (customers) and objects (brand, products, companies, and community) in attitude and behavior, which focuses on brand in brand loyalty and community in community loyalty. Therefore, this study defines customer loyalty of virtual brand community to two perceptions, including community loyalty and brand loyalty. More and more companies focus on constructing relationship between platform and customers in terms of brand and loyalty; obviously, there are drives relationships between customers' loyalty to community and brand. Currently, research focus on community loyalty (Jin, 2007), and brand loyalty (Huang et al., 2015), but it is in shortage of researching the influencing system

both in one model.

**Value increasing and creating process in online community**

Customer experience the values in virtual brand community create values for community, which means the course of customer's acceptance, identification to the value of community and the customer co-create value with enterprises (He, 2010). Virtual community value includes two aspects: On the one hand, (1) from the point view of customer, the values in virtual community equals to the value of product and service supplied in virtual brand community, in other words, it was named as "enterprise—customer" value, (2) on the other hand, from point view of enterprises, the values in virtual community equals to the values that customer created for enterprises, which was named as "customer—enterprise" value. Therefore, "enterprise—customer" value drives the "customer--enterprise" value, on condition that customer perceived the value of products and services supplied by enterprises, enterprises gain the value from customer. The process of customer experience value and create value in virtual community as following:

**"Enterprise—customer" value experience and create process**

"Enterprise—customer" value equals to the commentaries and estimations after feeling and experiencing the different function and features of products and services. "Enterprises—customer" value featured with: (1) value was associated with the products and services, (2) value was perceived by customer not supplied by supplier, (3) value was the comparing between the cost and benefit by customer.

**The process of "customer—enterprises" value increasing and creating**

"Customer—enterprises" value, also named as Customer Lifetime Value (CLV), which equals

to the values that customer created for enterprises since the moment the relationship between customer and enterprises was established.

The formula of "customer—enterprises" value: CLV=$\sum_{t=1}^{n}\left(\frac{Rt-Ct}{1=i}\right)$

Where

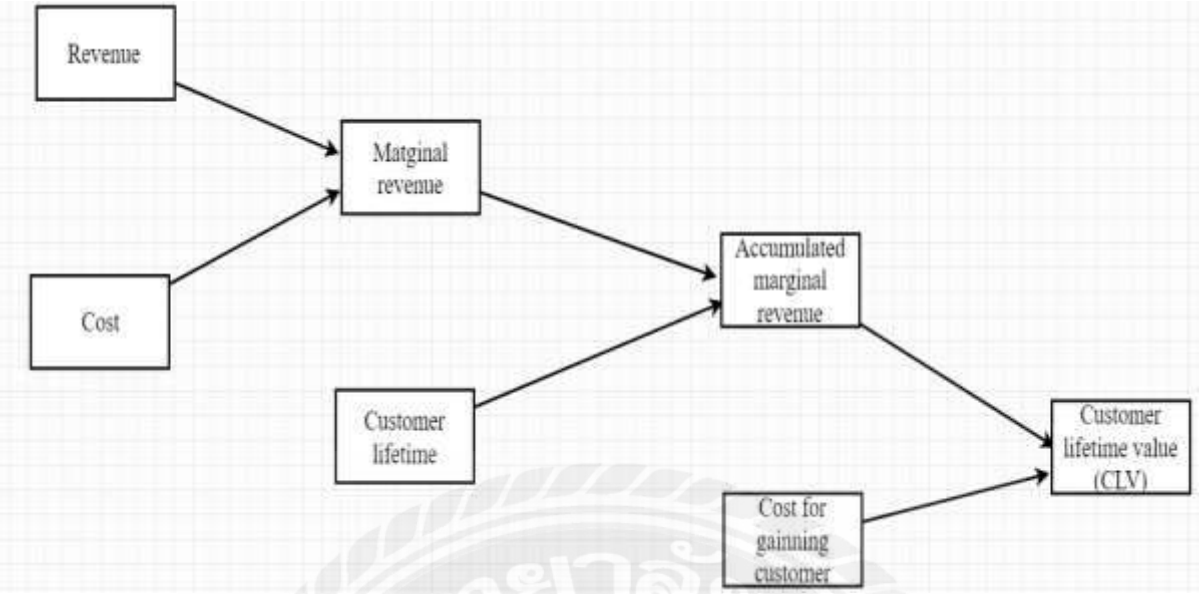
$R_t$= the returns that enterprises gain from customer in a specific time,

$C_t$ = the cost that enterprises pay for meeting the satisfaction of customer in a specific time,

i= the currency ratio,

n= the time of duration the stable relationship between customer and enterprises, see figure 13:

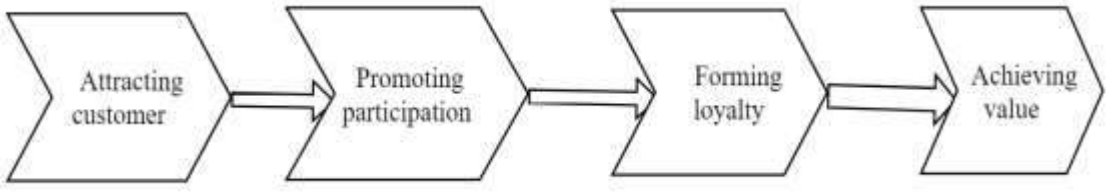
Figure 13: Customer lifetime value




**Process of customer's experience value in virtual brand community**

The targets of customer's participation in virtual brand community is for meeting their needs and gaining the values needed. So, in order to fascinating customer, virtual community have to create and accumulate value, which will be the drives to customer who have the same value to take part in the cyber community. Hagel et. al. (1997) argued that there were four steps for virtual community at drive customer's participation in the community, including attracting customer, promoting participation, forming loyalty, achieving values, see figure 14.

Figure 14: Customer's experience value in virtual brand community



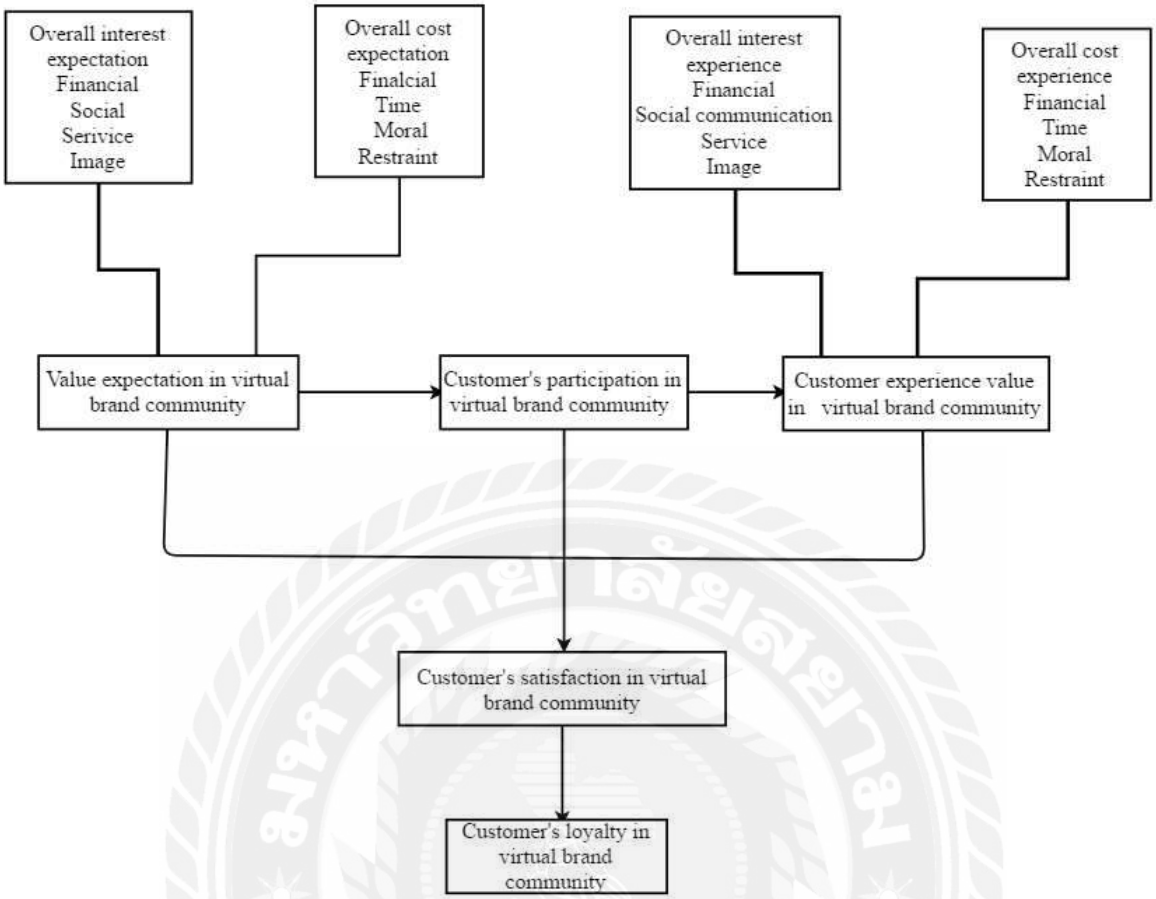

In virtual community, accumulating values devoted by customers drives more customers' participation in activities, discussion, communication and sharing knowledge, to understand, cognize,

accept, satisfy and do loyalty to the virtual community, which is the process of customer experience value.

**Customer's experience value in virtual brand community**

Zhou (2005) argued the main drive to customer's participation in virtual brand community is the concessional value which equals to the D-value between overall interest expectation and overall cost, different customer has different expected value and experience, but they have common results: (1) The concessional value drives customer's participation to the virtual brand community, (2) Members satisfaction leads they stay in the virtual brand community and enlarge the quantity of the members in virtual brand community, (3) Satisfaction could not produce benefits for the community, only customer's loyalty is the key to promote members in virtual brand community benefits, so that enterprises and virtual brand community should take all measurement to cultivate and breed the members loyalty to virtual brand community, see table figure 15.

Figure 15: Customer loyalty in virtual brand community (Zhou, 2005)

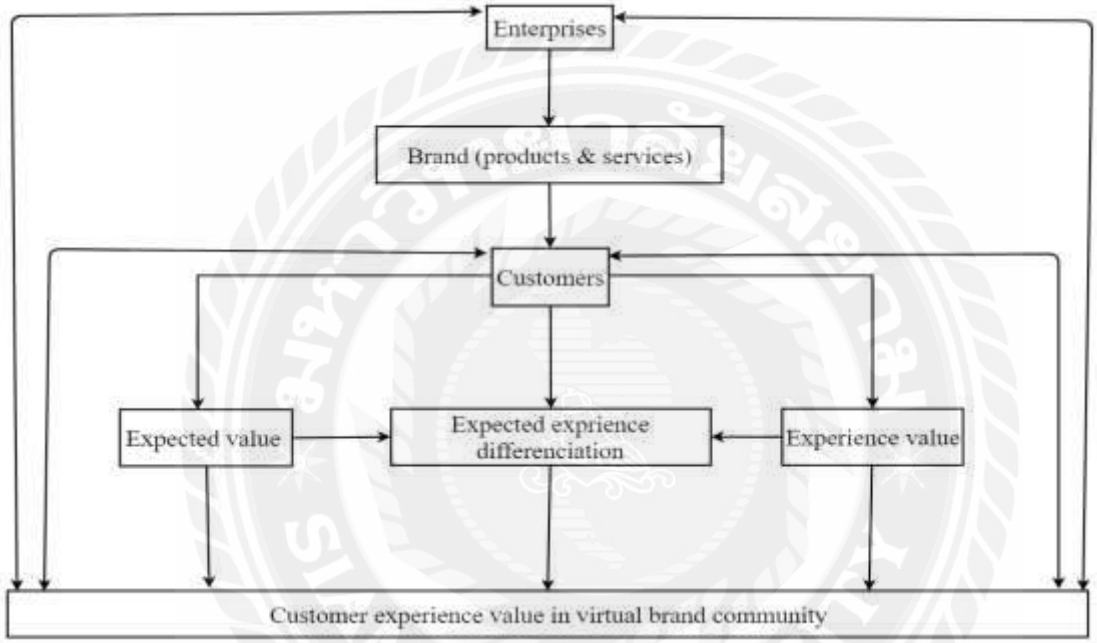



**The responsiveness of customer experience value in virtual brand community**

In virtual brand community, enterprises supply valuable information and brand (products & services) to customer and invite customer to participate in their products research and development, co-create value (He & Liu, 2010). Meanwhile, customers communicate and exchange in virtual brand community, gaining the values that supplied in virtual brand community. Furthermore, customers share their knowledge and information with each other, they devote their own knowledge and experience to others, which create value for virtual brand community. In order to reduce the D-value between expected value and experienced value, customers seek information actively, for the common value in virtual brand

community, community members share their experience and knowledge to other, leading the responsiveness in virtual brand community. They also like to compare their expected value and experienced value, compare their benefits of overall value and the overall cost, in cyber space, different responsiveness is easy to be disseminated, which influence on enterprises and customers' decision making, so take measurement to reply the responsiveness is valuable strategy, see figure 16.

Figure 8: Responsiveness of Customer experience value in virtual brand community (He & Liu, 2010)




**Dimensions of customer experience values in virtual brand community**

On internet, customer's communication and exchange drive customer's experience value after taking part in the virtual brand community. Up to now, there are no study in customer experience value in virtual brand community, only focused on the dimension of customer experience values in brand community. Zhou (2005) and Jin (2007) argued that the customer experience value in virtual brand community could be decided into different dimensions. The researches to dimension of customer

experience value in virtual brand community include two dimensions, three dimensions, four dimensions, and five dimensions. **Two dimensions,** Overby & Lee (2006) founded and argued that online community could be the new forms to supply value to consumer, mainly include content value and environment value, practical value and virtual value (Zhang et al., 2012). The content value means the benefits of product and service, environment value means the extra-value in virtual brand community. **Three dimensions,** Surachart & Patterson (2007) founded that in virtual brand community, members can gain emotion value, social value and function value. Samey, Sicilia & Palazon (2008) studied the motivation of Coca Cola community member in Spain and founded that "in virtual brand community, members gained entertainment value, social value and function value". Function value, society value and entertainment value (Ma & Yang, 2014). **Four dimensions,** Wang et. al (2004) studied and argued a virtual brand community value frame in virtual brand community which includes function value, mentality value, social value, and hedonic value. Mentality value focus on the members' satisfaction, identification feeling in virtual brand community. Function value, knowledge value, society value and mood value (Wei, 2013), Zhou (2005) constructed a customer value metric model on the basic of brand community, analyzed the value essential and direction, divided the customer experience value in virtual brand community to service value (internal/substance), financial value (external/substance), social value (internal/ spirit), image value (external/ substance), and came up that the service value only be available for the member of community. **Five dimensions**, Sheth (1991) argued that customer experience in virtual brand community included the condition value, mentality value, social value, function value and knowledge value. Dholakia (2004) founded that consumer's target value, self-discovering, interpersonal relationship keeping, motivation of

developing community and hedonic/ entertainment are the elements to take part in virtual brand community. Jin, (2007) argued consumer only for satisfying their curiosity and carving for knowledge to take part in the virtual brand community, so he came up information and entertainment value on basic of four dimensions argued by Zhou (2005), information value, financial value, social communication vale, image value and entertainment value (Jin, 2007), furthermore, he argued that customer's needs will be increased step by step with the development of society, not only consumer need the product and service in online brand community, but also, they will focus on self-mentality needs, entertainment and social image needs in virtual brand community.

In conclusion, the above dimensions focused on the importance of substance value and subjective value, but in virtual brand community, customer experience values are different with online. Referring with Jin (2007) and Zhou (2005) (See table 3):

Table 3: Dimension of customer experience value

| | |
|---|---|
| Jin (2007); Sheth (1991); Dholakia (2004); Zhou (2005) | Five dimensions: information value, financial value, social communication value, image value and entertainment value. |
| Wei (2013); Wang et al (2004); Zhou (2005) | Four dimensions: function value, knowledge value, society value and mood value. |
| Ma & Yang (2014); Surachart & Patterson (2007); Sicilia & Palazon (2008) | Three dimensions: function value, society value and entertainment value. |
| Zhang, et al. (2012); Han (2001). | Two dimensions: practical value and virtual value. |

**Customer loyalty in virtual brand community**

Customer loyalty was defined as the purchase and repurchase decision making on basic of customer's satisfaction, and trust to the products/services (Oliver, 2009), which means the definition of brand loyalty, customer loyalty means the response between subjects (customers) and objects (brand, products, companies, and community) in attitude and behavior, which focuses on brand in brand loyalty and community in community loyalty. Community Loyalty is an essential component of multi-community engagement, when users have the choice to engage with a variety of different communities, they often become loyal to just one, focusing on that community at the expense of others, we exploit these general patterns to predict future rates of loyalty (William, 2016).

Brand loyalty is defined as positive feelings towards a brand and dedication to purchase the

same product or service repeatedly now and in the future from the same brand, regardless of a competitor's actions or changes in the environment, it can also be demonstrated with other behaviors such as positive word-of-mouth advocacy, brand loyalty is where an individual buys products from the same manufacturer repeatedly rather than from other suppliers (Pauwels & Mogos, 2013).

This study defined the customer experience value as: Practical value, including the information, financial and monetary value, especially, the information in virtual brand community could reduce the cost of purchase and bring benefits to customer (Zhou, 2005). Entertainment value, in virtual brand community, customer can gain the hedonic feeling such as relaxing, paly in free time, excitements. Social value which is originated from relationship needs, including personal relationship, mentality communication in virtual brand community.

**Relationship between community loyalty and brand loyalty**

The influence of customer experience value to community have been verified, for instance, Wang (2011) studied the non-trade virtual community, which has reflected that the perceived value of customer in virtual community has positive influence on community loyalty. The virtual brand community is one of the types of communities; information value, entertainment value and social value have positive influence on virtual brand community theme in car (Jin, 2007). Experience value is the core target of customer taking part in virtual community, for the non-limited in space and time, it is easy that users take part in and take off from virtual community, therefore, their creating and sharing value experience and perceiving in virtual community influence to their loyalty to community. The virtual brand community features in the themes of brand, which has become the platform to build customers loyalty to brand,

furthermore, customer experience value is the key to drive brand loyalty. Kim et al., (2014) argued customer have loyalty to the internet web community on condition getting information value and practical value. Positive entertainment experience drives entertainment value for customer, the entertainment experience in virtual brand community positively influence to brand loyalty (Huang, 2015), so, it is assumed entertainment has positive influence on brand loyalty. Virtual brand community was set up on the common hobby of customers, which is constructed in special and non-space limitation (Muniz & O'Guinn, 2011), members in community share value in the community, which leads strong recognition feeling (Amine & Sitz, 2014).

Table 4: Relationship between community loyalty and brand loyalty

| | |
|---|---|
| Kim et al (2014) | Customers have loyalty to the internet web community on condition getting information value and practical value. |
| Huang (2015) | Positive entertainment experience drives entertainment value for customer, the entertainment experience in virtual brand community positively influence to brand loyalty. |
| Kim et al. (2004) | The customer who has higher position have deep loyalty to the community which transfer to brand loyalty. |
| Won et al. (2011); Zhou et al. (2012) | Higher means that the community user keep same value with community value which transfer to the emotion and recognition of the brand loaded on the community, finally, becomes the brand loyalty. |

More and more companies construct the non-trade relationship between companies and customer, brand and customer by means of setting up and management to virtual community, further, to

target at the selling and buying relationship, aiming at benefits and profit of companies. As an important media of non-visual word of mouth, virtual community is influencing more and more customer brand attitudes, it is efficiency to influence customer's attitude and behavior to brand by promoting brand and products in the platform. (Kim et al., 2004) studied at an internet store for researching the customer loyalty, which shows that the customer who has higher position in community can organize activities in the platform, becoming the users who have deep loyalty to the community which transfer to brand loyalty. This kind of higher community recognition and community loyalty means that the community user keep same value with community value (Won et al., 2011), which transfer to the emotion and recognition of the brand loaded on the community (Zhou et al., 2012), finally, becomes the brand loyalty. Therefore, customer loyalty to community influences the loyalty to brand. In course of community management, community manger can develop the community sustainable by equipping with the users' recognition and loyalty to brand (Zhou et al., 2012) (see table 5), that is toward to users' loyalty to community.

**Brand strategies**

(Francesca & Olmo, 2015) found the purchase extension attitude is positively related purchase intention and perceived value, brand attitude was positively associated with perceived value, perceived value mediated the relationship of brand attitude and of extension attitude with purchase intention. (Vinod, Manohar & Jayant, 2016) studied and founded brands were influenced by customer leakage positively. (Hong & Yan, 2011) argued that perceived value mediated service quality and brand equity, empathy and network quality effect on brand equity directly. (Brigita & Antonio, 2011) argued that brand identification is vital for building customer loyalty. (Naveen & Tung, 2008) found that managing brand portfolio generates the online sales performance. (Mei, 2015) studied and found the endorsements of athlete role

models influence on word-of-mouth and brand loyalty. (Rajeev, Aaron & Richard, 2012) studied and founded seven core elements in higher-order model: self-brand integration, passion-driven behaviors, positive emotional connection, long-term relationship, positive overall attitude valence, attitude certainty and confidence, and anticipated separation distress. (Helena, Fenik & Felicia (2016) founded that functional brands can improve customers' brands image. Consumption experience influence to brand identification positively (Zheng & Huang, 2018). (Yolamas, 2018) studied and found that brand awareness influences purchasing decision, specially, brand value and favorite factors have high correlated to brand satisfaction and attitudes to online shopping Thai product (see table 5).

Table 5: Brand strategies

| References | Arguments |
|---|---|
| Francesca & Olmo (2015) | brand attitude was positively associated with perceived value. |
| Vinod & Jayant (2016) | Brands were influenced by customer leakage positively. |
| Hongwei & Yan (2011) | Perceived value mediated service quality and brand equity directly. |
| Brigita & António (2011) | Brand identification is vital for building customer loyalty. |
| Naveen & Tung (2008) | Managing brand portfolio generates the online sales performance. |
| Wong& Man (2015) | The endorsements influence on word-of-mouth and brand loyalty. |
| Rajeev& Richard (2012) | Seven core elements in higher-order model. |
| Helena & Felicia (2016) | Functional brands can improve customers' brands image. |
| Yolamas (2018) | Brand awareness influences purchasing decision. |

Brand, is a name, term, sign, symbol, or design or a combination of these that identification

of different needs that meets to customer by a supplier and differentiates them from those of competitors, consumers view a brand as an important part of a product, brand is not only just name and symbol, but also, brand is the key element in the relationships between suppliers and consumers, finally brand was planted in the heads of consumer (Hessian, 2013). Branding is the most distinctive skill and ability of marketer to build and manage brands, to add value to purchase activities of consumer. By branding, brand was increased meaning beyond the physical attributes of a product (Millward, 2014).

Brand equity the differential effect that knowing the brand name has on customer response to the product and its marketing, the measure of the brand's ability to capture consumer preference and loyalty, brand value is the total financial value of a brand (Scott, 2002). Millward (2014) founded that high brand equity provides strong competitive advantages, strong brand experience drives brand awareness and loyalty. For reason that customer's expectation for storing of the brand, so that supply has a more competitive advantage in bargaining, (Hessian, 2013) argued a powerful brand has high brand equity, high brand equity was positioned on strong brand beliefs and values, engaging customer on deep and emotional level. Francesca & Olmo (2015) founded that a powerful brand constructs the fundament for building strong and profitable customer engagement and relationships, the fundamental asset underlying brand equity is customer equity—the value of customer relationships that the brand creates.

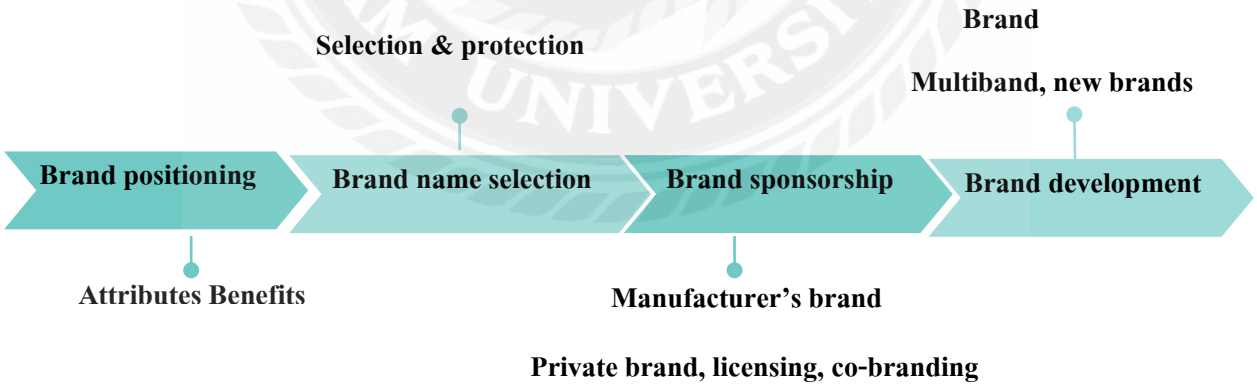
**Co-creating value and co-branding**

Kambil (2014) argued that value co-creating was the process between enterprises and customer for creating value. In consumption field, many researchers and scholars explained customer was the key of value co-creating, they focused on customer experience value in value co-creating and strategies to value co-creating (Prahalad & Ramaswamy, 2010). Recently years, with the emerging of internet, virtual brand community have been become the important platform of value co-creating, comparing to the customer participate value co-creating offline, the value co-creating in virtual brand community included production and consumption, therefore, online value co-creating was more complex (Chuang & Chen, 2015). Zwass (2010) divided value co-creating in virtual brand community to sponsored value co-creating and autonomous value co-creation, sponsored value co-creating was happened in production by enterprises' community. Li et. al. (2014) argued, the value co-creating in virtual brand community included the customer's new creative products image, design and promotion. Customer participate value co-creating was influenced positively and driven by individual's needs, such as cognition needs, personal combination and connection need, social connection needs, and entertainment and enjoyment needs, meanwhile, the individual identification to virtual community also influence to value co-creating in virtual community (Wang & Fan, 2015). Prahalad and Ramaswamy (2004) studied and argued value co-creation was the results of producers and customers, which was reached in the whole service system, for instance, supplier, producer, customer, public interest and other stakeholders. Weng & Yu (2009) explained value co-creating is the process that create additional value by means of supplier and customer seek for the value with common actions and distribute the value properly. Therefore, value co-creating was the value creating and sharing process through cooperation sensitively and the stakeholders participate in the value

co-creating stages with their competitive advantage. (Tang & Jiang, 2018).

Co-branding occurs when two established brand names of different companies are used on the same product, leading many advantages, for reasons that each brand operates in a different category, the combined brands create broader consumer appeal and greater brand equity, co-branding can take advantage of the complementary strengths of two brand and expand existing brand into a category it might otherwise have difficulty entering alone (Devin, 2014). Customer' participation in the co-value creation have influencing to brand perceiving positively, and increasing the commentaries to brand, finally, driving the positive word of mouth to brand. Co-branding occurs when two established brand names of different companies are used on the same product, leading many advantages, for reasons that each brand operates in a different category, the combined brands create broader consumer appeal and greater brand equity, co-branding can take advantage of the complementary strengths of two brand and expand existing brand into a category it might otherwise have difficulty entering alone (Devin, 2014) (see figure 17).

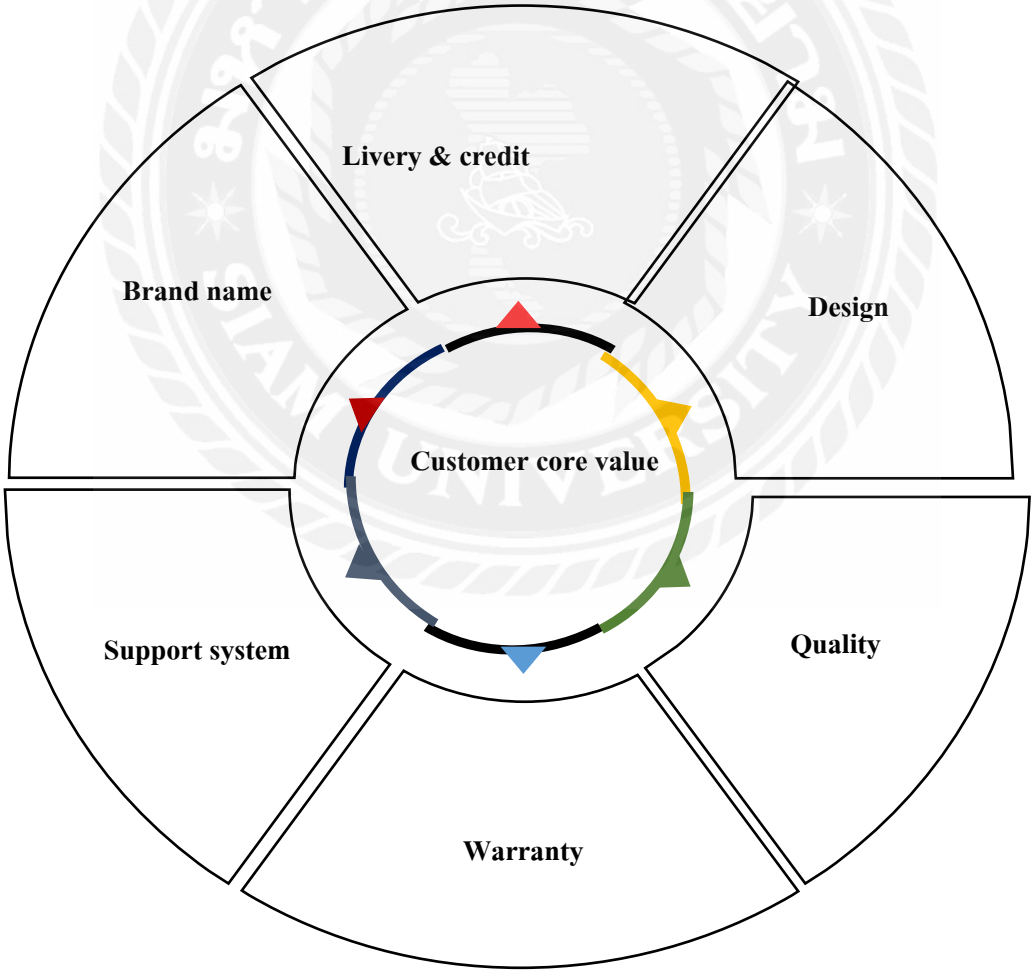
Figure 9: From value co-creating to co-branding (Devin, 2014)




Value delivery network, which is a network composed of the company, suppliers, distributors, and, ultimately, customers who partner with each other to improve the performance of the entire system in

delivering customer value (Gary & Philip, 2016). Identifying value differences and competitive advantages, the process to build profitable relationship by means of understanding needs of customer, delivering more customer value than competitors do, and to gain competitive advantage by means of providing differentiate and superior customer value (Sen & Battacharya, 2015). Experiences is an important part of marketing for some companies, all kinds of firms are recasting their traditional goods and services to create experiences, they create lifestyle experiences that encourage customers to visit more often, hang around, and experience the mobile virtual brand community (Jessica & Joshua, 2014), see figure 18.

Figure 18: customer value creating (Battacharya, 2015).

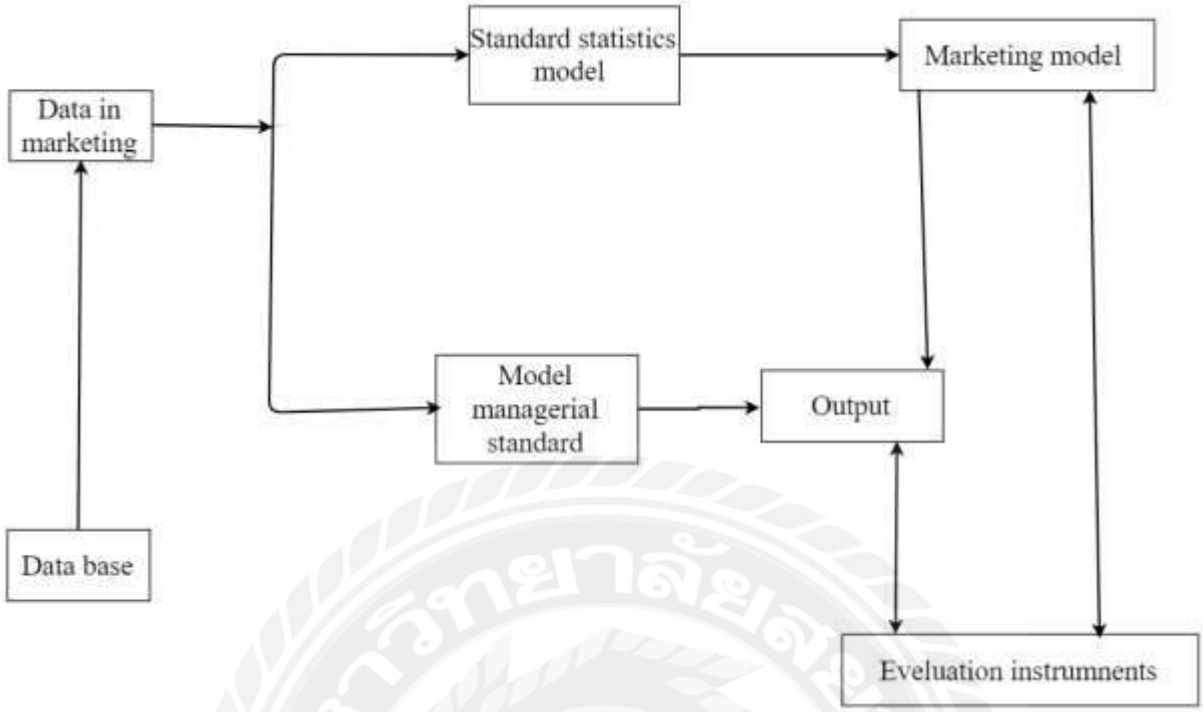


Customers expect products as the package of benefits to meet their needs, when developing products, marketers first must identify the core customer value that consumers seek from the product (Battacharya, 2015). They must then design the actual product and find ways to argument for consumer value created and the satisfaction of experienced brand one hundred percent. (Rebecca, 2015).

**Decision Support System (DDS) and Marketing Decision Support System (MDSS)**

Marketing Decision Support System (MDSS) is a combination tool for database, systematic technological supporting software and hardware for a company gathers and interprets relevant information form business and environment and turns it into a basis for marketing action, in other words, Marketing Decision Support System (MDSS) could be defined as interactive computer systems that support marketing decision makers to use data and models to solve unstructured problems (see figure 19), the system components of MDDS include firstly, the marketing planning and resource allocation model that was taken as input: (1) reference conditions, (2) assumed market growth, (3) anticipated economic scenarios (4) management judgments of sensitivities (marginal sales response changes to changes in marketing variables considered independently ), and (5) marketing plan alternatives. Secondly, the methodologies to evaluate sensitivities, which included (1) an advertising campaign and promotional event evaluation system, (2) a system for designing and analyzing marketing experiments, and (3) an ongoing database and analysis system, see figure 19.

Figure 19: MDSS process model (Harlari,2009)




**Marketing Decision Support System (MDSS) application**

Marketing Decision Support Systems (MDSS) is a coordinated collection of data, of systems, of tools and techniques with software and hardware support for an organization to gather and to interpret relevant system capacity enables the collection and use of a wide range of data across the enterprise. Senior management can access the database ad continuously monitor selling, markets, human resource performance (Rajmysre, 2010). Modern MDSS should be consisted of predicator models, and be able test what happens when exploring a new market or expanding a market (John & Max, 2007). Robert & Harmon (2003) MDSS should include models and tools for a wide range of marketing analysis, such as sensitivity analysis what- analysis, goalsetting, exception reporting, Pareto analysis, forecasting models, simulation models, scorecards and dashboards. With the trend of decentralized decision-making leads organizations are becoming increasingly complex, so that the MDSS generate for effective decision

making. In the process of decision-making, decision makers connect different types of data (e. g. internal data and external data) and knowledge (both tacit knowledge and explicit knowledge) available in various forms in the organization (Berend, Peter, Oude, Eelko, Peter & Van, 1994).

**Conclusion**

In chapter two, firstly, the literature review was made from different perspectives which is regarded to virtual brand community, and customer experience value and customer loyalty in virtual brand community, which will be the references of conceptual framework of this study. Secondly, the literatures related Marketing Decision Support System (MDSS) was made for further development in higher education consumption in Thailand.

# CHAPTER 3

## Research Methodology

This chapter includes the discussion of research methodology framework, including research design, sample plan, data collection instruments and procedures, operational definitions of research variables, and analytical measurement. The analytical measurement is consisting of statistical procedures of scale validation, scale dimension, exploratory factor analysis, confirmatory factor analysis and structural equation modeling. Furthermore, analytic hierarchy process (AHP), AHP online system (AHP-OS) and decision tree were hired for constructing and developing higher education marketing decision support system in Thailand.

**Research design**

The study of this research is equipped with qualitative and quantitative methodology. Descriptive research was equipped in this study for analyzing the variable components and elements of virtual brand community loyalty model in out-coming perceived values strategies for loyalty constructing toward students from China, the methodology is employed to assessment of customer experience value in virtual community which is defined into practical value, entertainment value, and social value, customer loyalty in virtual brand community which is consisted of community loyalty, the customer loyalty to community, and brand loyalty, the customer loyalty to brand loyalty. Two sources of data are utilized in this study. Firstly, secondary data are mostly obtained and from database in duration from 2000 to 2018, meanwhile, the database also were employed for literature review, model and hypotheses development,

and gathering scale measurement for generating the initial set of items in questionnaire development stage. Secondly, the first-hand and preliminary data were collected in light of self-administered survey methods with questionnaire for the proposed model testing empirically.

**Population and sampling**

**Population**

The population of this study is undergraduate students who are studying in Thailand. They were selected because the hypotheses model of this study is a promotional marketing research approach for intangible industry, the respondents and participants with higher education, the students who could give appropriate answers for the research and study. What's more, the undergraduate Chinese students who are studying in Thailand would significantly be Chinese higher education consumers. So, the survey results of the population could be a predictable reference of consumer. According to the statistics by National Bureau of Statistics of China, up to December 2017, there are 22,000 undergraduate students who are studying in Thailand (N.B.S.C., 2017).

**Sample size**

The sample size of this study was determined in light of the $n=(1+N)/(1+N(e)^2)$ (Yamane, 1978). Alternatively, Dean, Velicer & Harlow (1995) located numerous studies (Anderson & Gerbing, 1988) that agreed that 100 to 150 subjects is the minimum satisfactory sample size when conducting structural equation models. Model conceptualization includes structural model conceptualization and measurement model conceptualization. The measurement model conceptualization means how unobservable variables were defined and measured, the observed variables were reflected by manifest variables and auxiliary

theory (Wu, 2010). Velicer & Fava (1998) founded on condition that the samples above 200, SEM cold reach stable analysis result. Schumacker & Lomax (1996) founded that the samples should be in duration from 200 to 500, but the samples in social science research always lower than 200 or higher than 500, when the sample was lower than 200, the test power of the model would be reduced (Rigdon, 2005). Thompson (2000) founded the ratio between samples to observed variables should be at least between 10:1 to 15:1. Hair, Anderson, Tatham, and Black (1998) argued that for both regression and structural equation modeling analysis, the preferred ratio of observation to independent variables were 15 to 20. Boomsma (1987) suggested when Maximum Likelihood (ML) was equipped to test structural equation model, 200 samples were the minimum sample requirement.

**Sampling plan**

Multistage cluster sampling procedure and non-profitability quota sampling are combined to select sampling groups. Firstly, cluster sampling is applied. On-line questionnaire was distributed to undergraduate Chinese students who are studying in different universities of Thailand. Secondly and finally, non-profitability quota sampling was used to select sampling target. The data collection was started in duration March to August 2018. The measurement table of this study was designed on "Questionnaire star Website", and distributed to students who registered in different private universities in Bangkok, for reasons that the quantities of customer are abundantly, and the users in virtual community of different private universities who have different backgrounds, so that the samples can be response the features of customer in virtual brand community. In order to get correct and real data, the questionnaire of this study was distributed to taking part in the social media, WeChat plat form. The missing items of sample through online questionnaire were deleted.

**Data collection**

**Data collection from questionnaires**

Data collection supposed to be conducted from March to August 2018. Necessary group self-administrated survey was employed as the data collection of this research. The data was collected online, which are the digital social communication platform of Chinese students who are studying in Thailand. The questionnaires were distributed to the student's social media communities, and the response rates will be over 70%. It took about 3 to 5 minutes to complete the questionnaires.

According to Churchill (1999), editing data of each questionnaire as inspected and corrected to ensure minimum quality of raw data. Then the data was assigned a number and transferred SPSS files in a computer. Missing data will be treated by AMOS 22 version by means of interpolation. Respondents take the survey in a group context. Each respondent works individually, but they meet as a group (Burns & Ronald, 2000).

**Questionnaires' development**

Four approaches are divided consecutively in the questionnaire development. Firstly, it is to measure and specify the variables; secondly, it is to develop the first draft questionnaires; thirdly, it is to evaluate the items via critical review and pilot tests; and fourthly, it is to pretest and revise the questionnaires and move ready data collection in the main study.

The variables to be measured are specified in secondary data mostly taken from business and education group, which also are used for literature review, model and analysis development. The study had already identified relevant variables used to conduct empirical test of the proposed model and

hypothesis as reported in the first chapter. The first draft of the questionnaires was employed Likert scale in order to develop the best capture the measuring of the theoretical construct with transforming into item wording, questionnaires format and response alternative, the numeric items, the numeric response alternatives per item, and the overall organization. The questionnaire includes following 7 different sections, 1) the personnel index data; 2) practical value; 3) entertainment value; 4) social value; 5) community loyalty; 6) brand loyalty (See table 6). All items of questionnaires consisted of five-point scales with such anchors as 1=Very disagree, 2=Less disagree, 3=Agree, 4=More agree, 5=Very agree (see table 6).

Table 6: Questionnaire development

| **Dimension** | **Sub-dimension** | **Items in sub-dimension** |
|---|---|---|
| **Customer experience value** | Practical value | 3(PV1, PV2, PV3) |
| | Entertainment value | 3(EV1, EV2, EV3) |
| | Social value | 3(SV1, SV2, SV3) |
| **Customer loyalty** | Community loyalty | 3(CL1, CL2, CL3) |
| | Brand loyalty | 4(BL1, BL2, BL3, BL4) |

**Practical value;** the value that customer gain in virtual brand community for meeting the practical needs, wants and demands of customer in their daily consumption life. A customer's opinion of a product's value to him or her. It may have little or nothing to do with the product's market price and depends on the

product's ability to satisfy his or her needs or requirements (B.D., 2017), see table 7.

Table 7: Measurement to practical value

| No. | Practical value | Adapted from |
|---|---|---|
| PV1 | Information and knowledge from other members in virtual brand community. | Jin, 2007; |
| PV2 | Commentaries and recommendations by community members. | Wei, 2013; |
| PV3 | Solutions to problem and difficulties in community. | Zhang et al., 2012. |

**Entertainment value;** the value that virtual brand community supply to customer in community for meeting the mood needs in terms of entertainment and enjoyment. In other words, the entertainment value is the perceived value related to enjoyment and fun seeking (Yung, 2015), see table 8.

Table 8: Measurement to entertainment value

| **No.** | **Entertainment value** | **Adapted from** |
|---|---|---|
| EV1 | Entertainment after engaging in the community in free time. | Huang, 2015; |
| EV2 | Feeling free from pressure in the community. | Sicilia and Palazon, 2007; |
| EV3 | Get happy mood in the community. | Ma & Yang, 2014; |
| | | Fu et al., 2009. |

**Social value;** the value that virtual brand community supply to customer in community for meeting the needs of social function, such as identity of recognition, friendship, and Social identification feeling (Fu et al., 2009). Social value is the relative importance that people place on the changes they experience in their lives. Some, but not all of this value is captured in market prices. It is important to consider and measure

this social value from the perspective of those affected by an organization's work (Squair, 2016), see table 9.

Table 9: Measurement to social value

| No. | Social Value | Adopted from |
|---|---|---|
| SV1 | Made new friendship in the community. | Won-Moo H. et al., 2011; Zhou et al., 2012; Sicilia and Palazon, 2007; Ma & Yang, 2014. |
| SV2 | Feel fruitful by involving in the community. | |
| SV3 | Improve self-image in the community. | |

**Community loyalty;** the customer loyalty to virtual brand community loyalty which means customer have higher degrees of engagement ad involvement to the community and more self-identification consciousness to the specific virtual brand community. Community loyalty is an essential component of multi-community engagement. When users have the choice to engage with a variety of different communities, they often become loyal to just one, focusing on that community at the expense of others. We exploit these general patterns to predict future rates of loyalty (William & Hamilton, 2016), see table 10.

Table 10: Measurement to community loyalty

| No. | Community loyalty | Adopted from |
|---|---|---|
| CL1 | Making positive commentary to the community. | Won et al., 2011; Zhou et al., 2012; Kim et al. (2004); |
| CL2 | To be the loyal customer of this community. | |
| CL3 | This community is my priority participation. | |

**Brand loyalty;** the customer loyalty to a specific brand in the virtual bran community, customer and

member of the community have positive feelings towards a brand and dedication to purchase the same product or service repeatedly now and in the future from the same brand, regardless of a competitor's actions or changes in the environment. It can also be demonstrated with other behaviors such as positive word-of-mouth advocacy. Brand loyalty is where an individual buys products from the same manufacturer repeatedly rather than from other suppliers (Pauwels & Mogos, 2013), see table 11.

Table 11: Measurement to brand loyalty

| **No.** | **Brand loyalty** | **Adopted from** |
|---|---|---|
| BL1 | Comparing with other same types of product and services brands, I prefer this brand. | Chu & Kim ,2011; Cheung & Lee, 2012; Chan et al. ,2014; Hollebeek et al. (2014); Ray et al. (2014); Xu et al. (2009) |
| BL2 | I'd like to recommend this brand to others. | |
| BL3 | I feel close to this brand. | |
| BL4 | I will buy this brand continuously and repeatedly. | |

The questionnaires were evaluated via critical review by a group of dissertation consultants committee. The committee suggested a short summary of the purpose of the study, the model and the hypotheses. Their comments and feedbacks were used to revise the questionnaires. The pilot test was performed in duration from March to August 2018. The result of the pilot test was used to refine item wordings and questionnaires format. The results of the pretest were checked for their reliability of by Cronbach's alpha which be higher than 0.80 Then each question in the questionnaires was revised to make them clearer for the survey (see table 12).

Table 12: Reliability statistics

| Reliability Statistics | |
|---|---|
| Cronbach's Alpha α | No. of Items |
| 0.884 | 16 |

The composite reliability indices of the model, there were five unobserved variables, three of them were related to customer experience value, including, practical value, entertainment value and social value. Two of them were related to customer loyalty, including community loyalty and brand loyalty. The composite reliability and average variation extracted of practical value was 0.662 and 0.854 respectively. The composite reliability and average variation of entertainment value was 0.492 and 0.813 respectively. The composite reliability and average variation extracted of social value was 0.578 and 0.804 respectively. The composite reliability and average variation extracted of community loyalty was 0.625 and 0.833 respectively. The composite reliability and average variation extracted of brand loyalty was 0.665 and 0.888 respectively (see table 13).

Table 13: Composite reliability indices of model

| Unobserved variables | Observed variables | Indicator loading λ | Reliability | Measurement Error | Composite reliability | Average variation extracted |
|---|---|---|---|---|---|---|
| **PV** | **PV1** | 0.814 | 0.662 | 0.337 | | |
| | **PV2** | 0.831 | 0.690 | 0.309 | | |
| | **PV3** | 0.798 | 0.636 | 0.363 | | |
| | | | | | 0.662 | 0.854 |
| **EV** | **EV1** | 0.745 | 0.555 | 0.445 | | |
| | **EV2** | 0.788 | 0.621 | 0.379 | | |
| | **EV3** | 0.774 | 0.599 | 0.401 | | |
| | | | | | 0.592 | 0.812 |
| **SV** | **SV1** | 0.704 | 0.495 | 0.504 | | |
| | **SV2** | 0.770 | 0.593 | 0.407 | | |
| | **SV3** | 0.800 | 0.693 | 0.360 | | |
| | | | | | 0.578 | 0.804 |
| **CL** | **CL1** | 0.773 | 0.597 | 0.402 | | |
| | **CL2** | 0.814 | 0.663 | 0.337 | | |
| | **CL3** | 0.784 | 0.615 | 0.385 | | |
| | | | | | 0.625 | 0.833 |
| **BL** | **BL1** | 0.832 | 0.692 | 0.308 | | |
| | **BL2** | 0.832 | 0.691 | 0.308 | | |
| | **BL3** | 0.748 | 0.559 | 0.440 | | |
| | **BL4** | 0.847 | 0.718 | 0.286 | | |
| | | | | | 0.665 | 0.888 |

**Data analysis techniques and criteria**

In accordance with arguments by Churchill (1999), editing data of each questionnaire was

inspected and corrected to ensure minimum quality of the raw data. Then, the data were assigned numbers and entered into the computer. Missing data was deleted or put in before further analysis.

**Statistical techniques and criteria**

The statistical techniques and criteria in this study are descriptive and explanation. The statistics applied for data analysis are descriptive statistics such as frequency distribution, percentage, arithmetic mean, and standard deviation with SPSS version 22.0. Structural equation modeling (SEM) analytical procedures AMOS 22.0 version is to be applied for assessing model fit, investigation and explanation the relationship between all independent variables and customer loyalty. Regression supposed to be applied for identifying the connections and relations between relevant factors and elements and customer loyalty, the adjusted R-square of the regression models and the standardized regression coefficients will be presented. Multiple Criteria Decision Making (MCDM) and Analytic Hierarchy Process (AHP) were hired to specify marketing decisions and recommendations to customers for making decision to choose private higher education institutes in virtual brand community, SPSS was hired for testing and drawing the decision tree. AHP-OS, a web-based tool was hired to support rational decision making based on the Analytic Hierarchy Process (AHP) and for defining the hierarchy of criteria for a decision, to calculate priorities and evaluate a set of decision alternatives.

Structural equation modeling technique is used a group of several variables into fewer underlying constructs and analyze the brand loyalty constructs. First, the uni-variate analysis of the data in terms of frequency distribution, mean, standard deviations were used to examine the respondents' characteristics. Second, bi-variate analysis was hired for exploring correlations among variables. This was

the initial check-up for non-dimensional construct and multi-linearity. Third, multivariate analysis was explored. Structural equation modeling (SEM) was equipped to test the model and hypotheses. There were two advantages in us SEM: First, the technique examines a series of dependence relationship (i.e. multiple regression equations) simultaneously and second, the tool provides the measurement model allowed more rigorous evaluation of the measurement reliability and validity of the measures and constructs than performing a factor analysis and using the factor scores in the regression (Hair et al., 1998).

**Structural equation modeling and interpretation**

This study employed structural equation modeling (SEM) for the main relationship model. To examine the conceptual model and associated hypotheses in the previous chapter, structural equation modeling was appropriate due to these confirmatory methods (Bentler, 1990; Joreskog, 1978) provided researchers with a comprehensive means of assessing and modifying theoretical models (Anderson & Gerbing, 1982). Structural Equation Models (SEM) involves in the use of factor analysis to measure latent constructs through manifest indicators and the simultaneous estimation of various regression equations. SEM is a key method to test theoretically driven models and compare alternative theories and can be used to explain a variety of consumer behaviors (Wu, 2015). Structural equation modeling (SEM), also named as latent variable models (LVM) (Moustaki et al.,2004). At the earlier stage, structural equation model was named as linear structural relationship model, covariance structure analysis, latent variable analysis, confirmatory factor analysis, simple LISREL analysis (Hair et al., 1998). SEM, as multivariate statistics, it was divided into the scope of advance statistics, including, factor analysis and path analysis, meanwhile, examine the relationship between observed variables and unobserved variables, disturbance variables or error variables, finally, reach the direct effects, indirect effects and total effect of dependent variables to

independent variables. SEM, as a confirmatory testing method, must be supported by theory and hypotheses, maximum likelihood (ML) was the most useful methods in SEM. But maximum likelihood (ML) only can be used on condition that the data of sample must be multivariate normality (Huang, 2004).

This research hired AMOS and SPSS version 22.0 to analyze confirmatory analysis in which the maximum likelihood estimation (ML) method was provided. The ML method was employed for theory testing and development (appropriate for testing our conceptual model and hypotheses), which included several relative strengths. This method provided the most efficient parameter estimates (Joreskog & Wold, 1982) and an overall test of model fit. Under the assumptions of a multivariate normal distribution of the observed variables, maximum likelihood estimators had the desirable asymptotic, or large-sample, properties of unbiased, consistent, and efficient (Kmenta, 1971).

SEM is a powerful method to estimate multiple and simultaneous relationships involving several dependent and explanatory variables and allows for the inclusion of latent variables which cannot be directly measured but can be expressed as a function of other measurable variables. In linear regression, a single dependent variable is related to one or more independent (explanatory) variables, under the assumptions that these explanatory variables are fixed, independent from each other and exogenous (which means that they are determined outside the relationship). In SEM, several dependent variables can be considered at the same time, explanatory variables can be assumed to be measured with a random error, endogenous variables can be used to explain dependent variables, correlation between explanatory variables is allowed for.

And yet this is not all. Another key feature in SEM is the possibility of including in the model, as endogenous or exogenous variables, some latent (unobserved) variables. These are not directly

measured, but can be approximated by a set of observable variables. In other words, it is possible to incorporate factor analysis into a regression model, where latent factors appear in the structural equation model as explanatory and/ or dependent variables.

At a first glance, the above characteristics of SEM make it look like the "en-companying" comprehensive, model for regression, factor analysis (and possible canonical correlation analysis, given that the relationship between sets of dependent and independent variables are estimated, while this is partially true, one should not get over excited at the perspective of substituting all those specific methods with SEM. This is the reason why SEM is classified as confirmatory rather than exploratory technique and is sometime referred to as confirmatory factor analysis. These distinctions are all the ingredients to understand it properly.

Structural equation modeling (SEM) is a technique that allowed a separate relationship for each of a set of dependent variables. SEM provides the appropriate and most efficient estimation technique for series of separate multiple regression equations estimated simultaneously. It is characterized by two basic components: the structural model and the measurement model. The structural model is the 'path' model, which relates independent to dependent variables. The measurement model allows the researcher to use several variables for a single independent or dependent. In this model, the researcher can assess the contribution of each scale item as well as incorporate how well the scale measures the concept into the estimation of the relationships between dependent and independent variables. In this dissertation, the researcher adopts seven procedures in structural equation modeling (Hair et al., 2006) as follows:

Firstly, developing a theory-based model. Structural equation modeling is based on virtual brand community relationships. Hence, the change of one variable is assumed to result in the change in

another variable.

Secondly, constructing a path diagram of virtual brand community relationships. There are two assumptions that apply to a path diagram. First, all causal relationship is indicated. Second, it related to the nature of the causal relationships that are assumed to be linear. Hence, nonlinear relationships cannot be directly estimated in structural equation modeling; however, the modified structural models can approximate nonlinear relationships.

Thirdly, converting the path diagram into a set of structural equations and measurement equations. The objective is to link operational definitions of the constructs to theory for the appropriate empirical test.

Fourthly, choosing the input matrix type and estimating the proposed model. SEM uses only the variance/co-variance or correlation matrix as its input data. The measurement model specifies which indicators corresponds to each construct. Then, the latent construct scores are employed in the structural model. As mentioned before, the sample size is considered to be the “critical sample size”.

Fifthly, assessing the identification of the model equations. An identification problem is the inability of the proposed model to generate unique estimates. There are four symptoms to detect an identification problem, including very large standard error for one or more coefficients, inability to convert the information matrix, negative error variances and high correlation (¯0.90 or greater) among the estimated coefficients (Hair et al., 2006).

Finally, evaluating the results for goodness-of-fit. SEM includes three assumptions as other multivariate methods, which are independent observations, random sampling of respondents, and the linearity of all relationships. After satisfying these assumptions, the offending estimates are examined.

The next step is to assess the overall model fit with one or more goodness-of-fit measures. There are three categories for the goodness-of-fit measures, comprising absolute fit measures followed by incremental fit measures and parsimonious fit measures, respectively. The absolute fit measures assess the overall model fit (both structural and measurement models), with no adjustment for the degree of 'over fitting' that might occur. The incremental fit measures compare the proposed model to another model specified by the researcher. The parsimonious fit measures adjust the measures of fit to provide a comparison between models with differing numbers of estimated coefficients.

A structural equation model is composed a measurement model, which links the latent constructs to the manifest indicators, and a structural model which summaries the relationships linking the endogenous and exogenous constructs. The measurement model corresponds to confirmatory factor analysis, so that it can be tested to check whether the measurement of the latent variables using the manifest indicators is acceptable.

A structural equation model can be represented through a path diagram, by using the rules that is consisted of manifest variables are in square or rectangular boxes, latent variables and measurement errors are shown through ovals of circles, and causality relationships are indicated through straight arrows; and 4), correlation without causality is shown through a curved arrow.

The path diagram is drawn according to some theory. When the amount of information is exactly what is needed for unique estimation of the parameters, the model is said to be just-identified. In many cases there are several relationships which exceed what is needed for just-identification. In this situation, called over-identification, it is possible to exploit these relationships to test the validity of a theory. To check for identification and over-identification, one may look at the degrees of freedom, the

"free information" after all of the necessary information has been used. If there are more than zero degrees of freedom, the model is over-identified. However, this is only a necessary condition, not a enough one. For identification to have at least three manifest indicators for each latent variable. Identification problems can emerge during estimation (Hair et al., 1998). When standard errors look too large, when indicators are too highly correlated between each other or some of the estimates are unacceptable (like negative variance). Note that while SEM allows for multi-co-linearity. When the correlation is too high (above 0.9) this could lead to identification problems.

Estimation can be achieved through maximum likelihood estimation, provided that the manifest indicators follow a multivariate normal distribution, which implies that they are normally distributed for any value of the other indicators. The latent constructs are also assumed to be normally distributed. While it is not necessary deal with other multivariate techniques. SEM does not use the individual observations cases, for the estimation of the parameters, but only exploits them to estimate the co-variance matrixes, which provide the basis for the actual parameter estimation process. This does not reduce the importance of having an adequate sample size. An identification problem may emerge when many of the elements of the co-variance matrix are close to zero; unless the sample size is large enough, a simple rule of thumb (Steven, 2002) requires at least 15 cases per measured variable or indicator.

The above-mentioned degrees of freedom refer to the element s in the co-variance matrix. When there are more elements in the co-variance matrix than parameters to be estimated, then the model is over-identified, and it is possible to test its theoretical foundation.

First, parameter estimates should be reasonable, both in terms of founding theory and statistical acceptability (negative error variances are unacceptable). Beyond estimates of the parameters,

the main output of SEM consists in a set (usually large) of estimates of the parameters, goodness-of-fit, which fit measures to use depends on whether on is testing a single theory (model) or producing a comparison actor competing theories. The chi-square statistic tests whether the observed co-variance matrix is equal to the estimated one (which is what one hopes). The number of degrees of freedom indicates whether the model is just-identified (zero degrees of freedom). If the P-VALUE of the Chi-square test is larger than 0.05 (0.01), then the observed co-variance matrix is not different form the estimated one at a 95% (99%) level of confidence. Non-rejection of the null hypothesis suggests that a theory is acceptable, although this does not rule out better models. As shown in section 15.3, the output from the tested model is compared to two boundaries, the independence mode (which assumes no correlation between the endogenous and exogenous variables) and structural/structured model no constraints at all, perfect fit with the data, just like in log-linear analysis. The tested model lies between those two extremes.

The minimum sample discrepancy (CMIN) simple tests whether the model perfectly fits the data very unlikely and not useful as a test. When this measure is divided by degree of freedom (CMIN/DF), one obtains the above-mentioned chi-square test. The root means square residual (RMR) refers to the residual s between the estimated and sample co-variance matrix. It can be used to compare alternative models, where a smaller RMR indicates better fit. Another index is the goodness-of-fit (GFI), which should be above 0.9 for acceptable theories (an adjusted version, AGFI, is also shown with similar interpretation). Other indices which are expected to be as close as possible to one (and generally not below 0.9) are the normal fit index (NFI), and the comparative fit index (CFI). THE NON-CENTRALITY PARAMETER (NCP), and the root mean square error of approximation (RMSEA) consider both the

discrepancy criterion as the CMIN and some Parsimony criteria accounting for degrees of freedom. The RMSEA should be less than 0.05 for a good model. The hypothesis that RMSEA<0.05 is tested through the test of close fit (P<CLOSE). Other measures for comparing alternative model are the AIC and BIC information criteria and other similar information indices. Finally, the Hoelter's Critical N shows the largest sample size necessary to accept the model and it is a useful complement to the Chi-square require larger sample sizes to be rejected and generally one would expect a critical N of at least 200 for a good model. To sum up, the presentation of goodness-of-fit criteria is shown in table 14.

Table 14: Structural equation model fitting

| Model goodness-of-fit statistics | Acceptable levels and descriptions of Criteria |
|---|---|
| **Chi-square statistic** | Not significant value for chi-square supports the model (p>0.05). (Hair et al., 2006) |
| **df** | Not more than 3.0 value |
| **CMINDF** | Values less than 1.50 and more than 1.00 indicate a good fit (Hair et al., 2006). Arbuckle suggested a ration in a range of 2 to 1 or 3 to 1 indicates an acceptable fit between the proposed model and sample data (Hair et al., 2006). |
| **p-value** | >0.05 |
| **GFI** | Values from 0.00 to 1.00, where 1.00 indicates perfect fit (Joreskog, 1999). Values greater than 0.90 an acceptable fit; values close to 0.95 represent a good fit (Hu & Bentler, 1999). |
| **AGFI** | Values adjusted for df. Values greater 0.08 are acceptable (Segars & Grover, 1993). Values close to or > 0.90 are recommended for a good fit (Hair et al., 2006). |
| **RMR** | Values closer to 0.00 represent a better model fit. Values < 0.08 indicate acceptable fit (Hu & Bentler, 1999; Schmacker & Lomx, 1996). |

Structural equation model fitting (Continuously)

| | |
|---|---|
| **RMSEA** | Values 0.05 or less indicate a close fit of the model in relation to degrees of freedom (Browne & Robert, 1993). Values < 0.08 are reasonable (Hair et al.2006); values > 0.10 indicate a problem (Browne & Robert, 1993). |
| **NFI** | Values greater than 0.90 are acceptable (Hair et al., 2006); values close to 0.95 indicate a good fit (Hu & Bentler, 1999). |
| **IFI** | Values greater than 0.90 are acceptable (Hair et al., 2006); values close to 0.95 indicate a good fit (Hu & Bentler, 1999). |
| **CFI** | Values greater than 0.90 are recommended Hair et al., 2006); values close to 0.95 indicate a good fit (Hu & Bentler, 1999). |
| **TLI** | Values greater than 0.90 are recommended (Bentler, 1995); values close to 0.95 indicate a good fit (Hu & Bentler, 1999). |
| **PGFI** | Values greater than 0.50 are recommended (Wu, 2017). |
| **PNFI** | Values greater than 0.50 are recommended (Huang, 2005); values close to 0.6 indicate a good fit (Yu, 2006). |
| **CN** | Values greater than 200 are Acceptable (Wu, 2017). |
| Note: * t-value>1.96 had significant at.05 level (*p<.05, ***p<0.001) and supported the hypotheses | |

R Square values, similar to $R^2$ (coefficient of determination) reported in the regression analysis, the usual interpretation of $R^2$ value is the relative amount of variance of the dependent variable explained or accounted for by the explanatory variables (Joreskog, 1999). Structural equations modeling provides an $R^2$ for every linear relationship estimated (measurement and structural equations). In the measurement model, $R^2$ values can be interpreted as the re-liabilities of respective observed variables that define the latent variables; whereas $R^2$ values for the structural equations indicate the amount of variance predicted by the latent variables (Schumacker & Lomax, 1996). SEM is the comprehensive method that includes as special cases confirmatory factor analysis, path analysis and multi-variant regression or simultaneous equation systems.

**Factor analysis**

Factor analysis and principal component analysis are multivariate statistical methods designed to exploit the correlations between the original variables and create a smaller set of new artificial (or latent) variables that can be expressed as a combination of the original ones. The higher the correlation across the original variables, the smaller is the number of artificial variables (factor) or components need to descried adequately the same phenomenon.

Factor analysis can be used as either an exploratory or a confirmatory technique, depending on the final objective of research (Everitt & Dunn, 2001). Exploratory factor analysis starts from observed data to identify unobserved and underlying factors, unknown to the researcher but like to exist. Factor analysis starts from a very simple principle -- the total variability of the original data-set can be split into two parts, shared variability (common to two or more variables) and specific variability (exclusive to each individual original variable). Factor analysis exploits the former part of variability, common to two or

more variables, to synthesize and summarize the initial amount of information into small sets of factors. These factors are a weighted combination of the original variables. The objectives of factor analysis are: 1), to estimate the weights (factor loading) that provide the most effective systematization of the original variability; 2), to interpret the sets of factor loading and derive a meaningful (label) for each of the factors, and 3), to estimate the values of the factors (factor scores) so that these can be used in subsequent analysis instead of the original variables.

**Exploratory factor analysis**

Exploratory factor analysis (EFA) is a methodology for testing the relationship between factors, the quantities of factors, and the relationship between indicators and factors.

**Confirmatory factor analysis**

Confirmatory factor analysis (CFA) is a theory-testing model as opposed to the theory-generating method like exploratory factor analysis (EFA). In CAF, the research starts with a hypothesis prior to the analysis. The hypothesis is based on a strong theoretical and/ or empirical foundation. This method, after specifying the "a priori" factors, seek to optimally match the observed and theoretical factors structures for a given data set in order to determine the "goodness-of-fit" of the predetermined factor model (Gounaris & Stathakopouplos, 2004). Therefore, this study only performed confirmatory factor analysis because all constructs have already been tested by many eminent researches as literature reviewed in previous chapter. The purpose of confirmatory analysis is to test how well the specified measurement model fits the actual data, which is more applicable in this study. Confirmatory factor analysis is a factor analysis where the number of factor and the loading of the original variables are assumed to follow some prior theory. Thus, the researcher runs the factor analysis based on these

assumptions on the number of factors and the loadings constraining to zero the loadings for those variables that are not expected to load on a specific factor, and then evaluates the result with some goodness-of-fit diagnostic.

**Path analysis**

Path analysis is a generalization of the regression model to deal with the (discussed) causality concept. Path analysis is based on the "path diagram", which is also the core of the SEM approach, as it is explained later in this chapter. When one refers to path analysis, the assumptions is that all variables are directly measured, latent constructs are included instead, the path diagram represents the relationship between the variables through arrows and boxes. "Boxes are the variables are representing the relationship between the variables are directly measured, which marks the distinction with SEM, where latent constructs are included". Boxes are the variables and the straight arrows leave the boxes containing predictors and point toward those containing the dependent variables. It is also possible that two variables are correlated without implying causation, in which case the arrows are curved.

**Correlation & Regression**

Both correlation and regression analysis were equipped to analyze the relationship between two or more variables, without assuming a causal link when two variables are correlated. Simple (bi-variant) correlation can be extended to control for other influential variables (partial and semi-partial correlation). Correlation indicates the relationship between two or mare variables, while regression indicates the dependency between two or more variables.

**Correlation measures & co-variance**

Correlation is a very intuitive concept in statistics, but also one of the most powerful, since it introduces the tool for analyzing the relationship between two or more variables and opens the way to the regression models. The term correlation is rather intuitive and thus refers to shared relation between variables (Hu & Pan, 2014).

$$COV(x, y) = Sx, y = \frac{\sum_{i=1}^{n} (x_1 - \bar{x})(y_1 - 1)}{n - 1}$$

$$\text{CORR (X, Y)} = r_{xy} = \frac{S_{xy}}{S_x S_y}$$

The standardization of co-variance into correlation returns an indicator which is bound to vary between -1 and 1 where:

A: r = −1 means perfect negative correlation, so that a p% increase in X corresponds to a p% decrease in y and vice versa;

B: r = 0 means no correlation, so that two variables move with no apparent relation; and

C: r = 1 means perfect positive correlation, where a p% increase (decrease in X corresponds to a p% increase (decrease) in *y*.

Note that no assumption or correlation is made on causality that is the existence of a positive correlation of X and Y does not mean that it is the increase in X which leads to an increase in Y, but only that the two variable moves together to same extent.

To make a proper use of the core relation coefficient, it is necessary to assume (or check) that: 1), the relationship between the two variables is linear (a scatter-plot could allow the identification of

non-linear relationships); 2), the error variance is similar for different correlation levels, and 3), he two variables come from the similar statistical distributions, 4), the multiple correlation coefficient is explored in greater detail in the sections devoted to regression analysis. Multiple correlation looks at the joint relationship between on variable (the dependent variable) and a set of other variables (Wu, 2010).

**Pearson correlation**

**Pearson Correlation formula (Wu et al., 2014):**

$$r = \frac{\sum (X - \overline{X})(Y - \overline{Y})}{\sqrt{\sum (X - \overline{X})^2 \sum (Y - \overline{Y})^2}}$$

Formula of double variables Pearson correlation:

$$r = \frac{\sum (X - \overline{X})(Y - \overline{Y})}{\sqrt{\sum (X - \overline{X})^2 \sum (Y - \overline{Y})^2}} = \frac{l_{XY}}{\sqrt{l_{XX} l_{YY}}}$$

$$-1 \le r \le 1$$

**Linear regression**

Linear regression is a tool to analyze and calculate the dependency relationship between two or more variables. In other words, linear regression indicates the dependency relationship between X and Y by linear structural equation, on condition that firstly, dependent variable (Y) has linear relationship with independent variable (X), secondly, every constructs are independent, thirdly, dependent variable (Y) is normal distribution variable, and fourthly, there is equal variance between X and Y. The formula of linear regression: $y_i = \alpha + \beta x_i + \varepsilon_i$

The regression model for bi-variant linear relationships is portrayed by the equation which opened this section. If we take the generic observation, we can express the observation of the dependent

variable Y as a linear function of the explanatory variable X, where $\beta$ is the regression coefficient which measures the impact of the explanatory variable on the dependent variable (Wu, 2010).

**Multiple linear regressions**

Regression is a tool for analyzing and calculating the relationship between different variables, and for indicating the dependency relationship of variables by means of regression equation, when the independent variable is more than one, the linear equation which indicates the quantity relationship between one dependent variable and several independent variables, the multiple linear regressions is needed. The formula of multiple linear regressions is following (Wu, 2010)

$$y = \beta_0 + \beta_1 x_1 + ... + \beta_p x_p + \varepsilon$$

**Multiple correlation coefficient R**

The multiple correlation coefficient (R), the indicator of the relationship between dependent variables (y) and independent variables ($x_1$, $x_2$, $x_3$..., $x_p$). When p = 1, R = $|r|$, r means the single correlation coefficient, $0 \leqq R \leqq 1$, the higher the R is, the closer the linear correlation is (Wu & Pan, 2014).

**Determinate Coefficient $R^2$**

Determinate coefficient is the square ($R^2$) of multiple correlation coefficient, which is the indicator to the quality of hypothesis model, $0 \leqq R^2 \leqq 1$, the more $R^2$ close to 1, the better the sample and the hypothesis model is. Normally, the hypotheses need to be adjusted, so $R^2$ need to be adjusted as adjusted R-square, the formula is following (Wu & Pan, 2014):

$$\overline{R}^2 = 1 - (1-R^2)\frac{n-1}{n-k-1}$$

**Means analysis**

**Means** is a process of SPSS to calculate and analysis the different descriptive parameter of variables, for instance means, numbers of sample, standard deviation (Wu & Pan, 2014).

Formula of Means:

$$\overline{x1} = \frac{\sum_{i=1}^{n} x1i}{n}$$

**Descriptive analysis**

Descriptive analysis is a kind of methodology to calculate dispersion and concentration of variables, and to standardize values as variables. $Zi = (Xi - \overline{x}) / s$, by standardization.

**Reliability analysis**

The reliability includes Cronbach's $\alpha$ analysis and composite reliability (CR), Hair et al. (1994), when $\alpha$ is higher than 0.6 and 0.7 is acceptable and reliable, the formula of composite reliability (CR) follows: $\mathrm{CR}(P_c) = \dfrac{(\sum \lambda)^2}{(\sum \lambda)^2 + \sum(\theta)}$

Where;

$P_c$ = composite reliability

$\lambda$= factor loading

$\theta$ = the value of measurement error

**Validity analysis**

Validity was measured and analyzed by average variance extracted (AVE), the value of AVE higher than 0.5, the measurement variables indicate the unobserved variables in a good fitness, the

formula of average variance extracted (AVE) follows,

$$\text{AVE } (P_v) = \frac{(\sum \lambda^2)}{(\sum \lambda^2) + \sum(\theta)}$$

Where,

$P_v$ = the average variance extracted

$\lambda$= factor loading

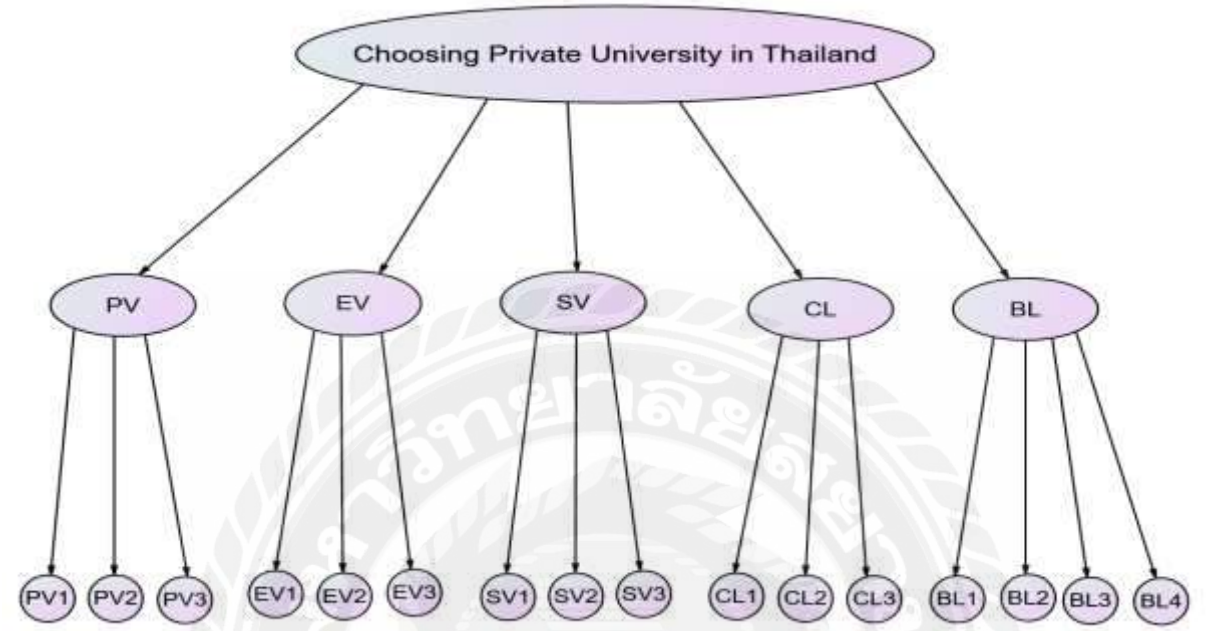
$\theta$ = the value of measurement error

**Multi-criteria decision making (MCDM) & Analytic Hierarchy Process (AHP)**

To select a university is an issue that involves many components or criteria that were assessed (multi criteria) so that in its completion a decision support system with needed multi criterial. AHP (Analytic Hierarchy Process) is one of methods in the Multi-Criteria Decision Making (MCDM). AHP, a method can assist decision-makers to seek the best in accordance with their targets and interpretation to the problem of selection faced. (Thomas,2014; Qiu, 2013) AHP is a method for deriving ratio scales in paired comparisons, the ratio scales were derived from Eigen vectors, and the consistency index was derived from the principle Eigen value (L=V/RV). The dimensions in the model of marketing mix is criteria in choosing private universities (Ragil & Rina, 2019). Marketing mix simultaneously affects the decision to select private universities (Indrayani, 2011). (Suryadi & Ramdhani, 2000) found three principles must be considered in AHP, including principles for preparation to hierarchies, principles of determining priorities, principles of logical consistency. (Permana, 2012) argued the Multi-Criteria Decision Making (MCDM) relates to the selection of choices optimal between alternatives based on attributes or decision criteria, the targets of decision making, assessment criteria, and alternative choices

are the main components in the form of a hierarchy. The hierarchical structure of MDSS in higher education selection is as shown in figure 20.

Figure 20: Hierarchical structure of MDSS in higher education election (Ragil & Rina, 2019)




AHP step composes of following steps, at the first step, the problem should be defined and the desired solution must be determined. Second step, a hierarchical structure that begins with the main target must be set, third step, a paired comparison matrix should be created to indicate the relative contribution or influence of each elements on the objectives or criteria above it, fourth step, pairwise comparisons should be defined for obtaining, fifth step, the eigenvector of each pairwise comparison matrix should be calculated, the last and sixth step, the consistency must to be checked (Klaus, 2018; Suryadi & Ramdhani, 2000) when the expected consistency ratio is less than or equal to 0.1 (10 percentage), the expected consistency near perfect to produce decisions that are closed to valid, the consistency ratio, which is a comparison between consistency index (CI) and random consistency index (RI), in formula:

$$CR=CI/RI$$

Instead of Saaty's original consistency ratio calculation (Satty, 2008), based on the average random consistency index $RI_n$

$$CR = \frac{\lambda - n}{(n-1)RIn}$$

The linear fit proposed by Alonso and Lamata (2006) was hired to calculate the consistency ratio

$$CR = \frac{\lambda - n}{2.7699\ n - 4.3512 - n}$$

It can be used for matrices larger than 10 X 10. In the case of a decision hierarchy with more than one node, CR of each hierarchy node is calculated, and for the global weights the program shows the maximum of all CRs.

AHP-OS features in group consensus calculation based on Shannon $\alpha$ and $\beta$- entropy, weight uncertainty estimation using Mont Carlo simulation, weighted sum model (WSM) and weighted product model (WPM) for the aggregation of alternatives (Klaus, 2018).

In AHP-OS, all pairwise comparisons are internally stored in the format

$$pwc = (a_1, a_{2\ldots}a_{npc}), (x_1, x_{2\ldots}x_{npc})$$

With integers $a_i \in [0,1]$, $x_i \in [1, M]$, M = 9 and $i = 1 \ldots npc$, with $npc$ is the number of pairwise comparisons.

$$npc = (n^2 - n)/2$$

For n criteria the n x n decision matrix is then filled from pwc. For $a_i = 0$ we take $x_i$, for $a_i = 1$ we have to take the reciprocal of $x_i$. For example, for three criteria with $pwc$ = (0,0,1), (3,5,7) the decision matrix is

$$M = \begin{pmatrix} 1 & 3 & 5 \\ \frac{1}{3} & 1 & \frac{1}{7} \\ \frac{1}{5} & 7 & 1 \end{pmatrix}$$

The selected format minimizes redundancy and uses less memory than storing the complete

positive reciprocal matrix. The dominant eigenvalue $\lambda$ of M is calculated using the power method (Larsen, 2003). The number of iterations is limited to 20, this is sufficient for an accepted approximation error of 1.E-7. As a result, we get the local priority vector with weights wi for criterion i = 1 to n.

**Decision Tree**

Decision analysis with probability in expected value criterion, also was named as experience value because the expected (Geng, 2017). A decision tree is a decision support tool that uses a tree-like model of decisions and their possible consequences, including chance event outcomes, resource costs, and utility. It is one way to display an algorithm that only contains conditional control state (Geng, 2019). Decision trees induction algorithms consist of ID3, C4.5, C5.0, CART (Classification and Regression Trees), CHAID (Chi-square Automatic-Interaction-Detection), QUEST (Quik, Unbiased, Efficient Statistical Tree) (Lior & Oded, 2015). The ID 3 and C4.5 were presented by the Quinlan (1993) for gaining ratio as splitting criteria, C5.0 was updated from commercial version of C4.5, C5.0 was much more efficient than C 4.5 in terms of memory and computation time. Chi-squared automatic-interaction-detection (CHIAD) was applied statistics in developing procedures for generating decision trees and originally designed to handle nominal attributes only (Kass, 1980). CART stands for classification and regression trees, it was developed by Breiman, Friedman, Olshen & Stone (1984) and characterized that it constructs binary trees, namely each internal node has exactly two outgoing edges.

**Conclusion**

The purpose of this chapter is to describe the research methodology approaches on which this study is designed and developed. The research design in this study is descriptive research by using survey methodology. Non-probability quota sampling and convenience sampling had used to select sampling size

of 538 respondents. Several statistical methodologies are applied, which are validity and reliability measures such as exploratory factor analysis and confirmatory factor analysis. Structural equation modeling would be employed for hypothesis testing. Analytic Hierarchy Process (AHP), Multi-Criteria Decision Making (MCDM), AHP-OS will be hired for developing marketing decision support system (MDSS) in higher education marketing of Thailand private university.

# CHAPTER 4

## Research Results

In this chapter, the procedures and results of data analysis will be presented. The chapter begins with explanation of data collection, data editing, characteristics of the sample, respondents' opinion toward to observed variables. Then, the initial results of confirmatory factor assessment of the scale were shown in terms of construct reliability and validity. Finally, the description of a structural equation modeling containing will be presented all of variables in this dissertation.

**Data editing and screening**

As indicated in the previous chapter, the target sample was at least 500 observations. The data collection was started in duration March to August 2018. The measurement table of this study was designed on "Questionnaire star Website", and distributed to students who registered in different private universities in Bangkok, for reasons that the quantities of customer are abundantly, and the users in virtual community of different private universities who have different backgrounds, so that the samples can be response the features of customer in virtual brand community. In order to get correct and real data, the questionnaire of this study was distributed in two ways: first, taking part in the social media, We-chat platform, secondly, putting the questionnaire on the web forum, and members of virtual brand community answer it freely. The missing items of sample through online questionnaire were deleted, in order to ensure the quality of the data, this study tested and kept track the time of answering the questionnaire, average 4.5 minutes for answering the questionnaire, after deleted ineffective questionnaires, finally, 538

samples were kept, the characteristics of the sample: gender, marriage, educations, hours of surf on internet per week, times in virtual community per week, details are as indicated in table 16.

The statistical techniques employed in this study are descriptive and explanation. Structural equation modeling (SEM) was used to examine the conceptual model and associated hypothesis under the literature review, software SPSS 22.0 and AMOS 22.0 were employed as the tools of measurement in this study, maximum likelihood estimation (ML) method was employed for theory testing and development the conceptual model and hypotheses and an overall test of model fit.

**Demographic characteristics of the respondents**

This study had 538 respondents that were representative of Chinese students registered in virtual brand community of Thailand private universities in Bangkok. The profiles of the respondents will be presented in table 15.

Table 15: Demographic characteristics of respondents (n=538)

| Characteristics of sample | | Frequency | Percent | Valid percent | Cumulative percent |
|---|---|---|---|---|---|
| Gender | male | 260 | 48.3 | 48.3 | 48.3 |
| | female | 278 | 51.7 | 51.7 | 100 |
| Age | <23 | 246 | 45.7 | 45.7 | 51.3 |
| | 23-27 | 196 | 36.4 | 36.4 | 87.7 |
| | 27-35 | 66 | 12.3 | 12.3 | 100 |
| | >36 | 30 | 5.6 | 5.6 | 5.6 |
| Marriage | Married | 195 | 36.2 | 36.2 | 36.2 |
| | Single | 327 | 60.8 | 60.8 | 97 |
| | Others | 16 | 3 | 3 | 100 |

Demographic characteristics of respondents (n=538) (Cont.)

| | | | | | |
|---|---|---|---|---|---|
| Education backgrounds | undergraduate | 538 | 100 | 100 | 100 |
| Times in virtual community per-week | < 3 | 237 | 44.1 | 44.1 | 44.1 |
| | 4-8 | 246 | 45.7 | 45.7 | 89.8 |
| | >8 | 55 | 10.2 | 10.2 | 100 |
| | Total | 538 | 100 | 100 | |

Table 16 showed that data cover a variety of respondent which were representative of Chinese students registered in virtual brand community of Thailand private universities in Bangkok. Data indicated that half of the 538 samples were female (278 students and occupied 51.7% respectively), 260 of them were male, 48.3%. In terms of age, 246 of them were lower 23 years old, occupied 45.7% of the sample, 23 to 27 followed, totally 196 and occupied 36.4%. The age of respondents from 27 to 35 was 66 (12.3%), the respondents above 36 years old was 30 (5.6%) only. The majority 63.8% of them were non marriage, including single and others, and the 195 (36.2%) of them were married. Regarding to the education backgrounds of respondents, (211) 39.2% of them were undergraduate students and (173) 32.2% of them were graduated students, 154 (28.6%) of them were postgraduate students 118 (21.9%) of respondents' hours of surfing on internet per-week were lower than 5 hours, 263 (48.9%) of them surf on internet 6 to 15 hours per-week, and 125 (23.2%) of them surf on internet 16 to 25 hours per-week, only 32 (5.9%) of respondents surf on internet higher than 26 hours. 237 (44.1%) of the respondents logged in virtual community less than 3 hours per-week, 246 (45.7%) of them log in virtual community 4 to 8 time per-week, and only 55 (10.2%) of the respondents' log in virtual community more than 8 times.

**Reliability and composite reliability**

There were 16 observed variables to measure 5 latent variables, respectively, practical value included 3 observed variables, and the summary Cronbach's alpha was 0.890. The summary of Cronbach's alpha to entertainment that included 3 observed variables was 0.883. The social value included 3 observed measurements constructs with 0.888 of Cronbach's alpha. There were 3 measurements constructs to latent variable community loyalty with 0.831 of Cronbach's alpha, and 4 measurements constructs to brand loyalty with 0.892 of Cronbach's alpha (see table 16)

Table 16: Summary of Cronbach's alpha

| Variables | Number of items | α |
|---|---|---|
| Practical value | 3 | 0.890 |
| Entertainment value | 3 | 0.883 |
| Social value | 3 | 0.888 |
| Community loyalty | 3 | 0.831 |
| Brand loyalty | 4 | 0.892 |

**Exploratory factor analysis**

To examine the factor influencing to brand loyalty evaluation process, SPSS factor analysis was utilized to determine which factor is most important in increasing the brand loyalty in virtual brand community. Kaiser-Meyer-Olkin measure the sampling adequacy and Bartletts' test of sphericity. The KMO statistics varies between 0 and 1. A value of 0 indicates that the sum of partial correlations is large relative to the sum of correlations, indicating diffusion in the pattern of correlation. A value close to 1 indicates that pattern of correlations is relatively compact so factor analysis should yield distinct and reliable factors. Kaiser recommended values greater than 0.5 are acceptable, values from 0.5 to 0.7 are mediocre, value between 0.7 to 0.8 are good, and values between 0.8 to 0.9 are great, and values above 0.9 are superb.

As indicated in table 18, the exploratory analysis to the measurement variable in virtual brand community, the value of KMO equals to 0.850, Approx. Chi-square of Bartletts' Test Sphericity equals to 4941.731, degree of freedom equals to 120, significance equals to 0.000, so that the exploratory analysis is suit for the hypothesis model. The factors to all measurement variables were above 0.5, and the percentage of five factors was 75.946, so the factors were fit to the hypothesis, which means in virtual brand community, customer experience value included practical value, entertainment value, social value, and customer loyalty was composed community loyalty and brand loyalty. The measurement table of the hypothesis was equipped with good structural validity.

Table 17: Exploratory factor analysis

| Unobserved variables | Measurement variables | Factor1 | Factor2 | Factor3 | Factor 4 | Factor5 | Percentage of variance |
|---|---|---|---|---|---|---|---|
| Practical value | PV1 | **0.778** | | | | | 79.255% |
| | PV2 | **0.799** | | | | | |
| | PV3 | **0.800** | | | | | |
| Entertainment value | EV1 | | **0.771** | | | | 74.916% |
| | EV2 | | **0.696** | | | | |
| | EV3 | | **0.780** | | | | |
| Social value | SV1 | | | **0.796** | | | 74.824% |
| | SV2 | | | **0.833** | | | |
| | SV3 | | | **0.661** | | | |
| Community loyalty | CL1 | | | | **0.709** | | 76.357% |
| | CL2 | | | | **0.789** | | |
| | CL3 | | | | **0.750** | | |
| Brand loyalty | BL1 | | | | | **0.806** | 75.946% |
| | BL2 | | | | | **0.846** | |
| | BL3 | | | | | **0.652** | |
| | BL4 | | | | | **0.734** | |
| KMO=0.850, Bartlett's Test of Sphericity Approx. Chi-square=4941.731, df=120, sig=0.000 | | | | | | | |

**The average score of various dimensions and sub-dimension**

The mean and standard deviation of practical value was 3.66 and 1.024 respectively. There were three observed variables in the practical value (SV) (unobserved variable), among of them, PV1 with a mean of 3.60 and a standard deviation of 1.031, PV2 with a mean of 3.55 and a standard deviation of 1.078, PV3 with a mean of 3.83 and a standard deviation of 0.963. The mean and standard deviation of

entertainment 1 value was 3.76 and 0.878 respectively. There were three observed variables in the entertainment value (SV) (unobserved variable), among of them, EV1 with a mean of 3.64 and a standard deviation of 0.953, EV2 with a mean of 0.90 and a standard deviation of 0.824, EV3 with a mean of 3.73 and a standard deviation of 0.857. The mean and standard deviation of social value (SV) was 3.11 and 1.804 respectively. There were three observed variables in the social value (SV) (unobserved variable), among of them, SV1 with a mean of 3. 05 and a standard deviation of 1.125, SV2 with a mean of 2.91 and a standard deviation of 1.137, SV3 with a mean of 3.37 and a standard deviation of 0.989. The mean and standard deviation of community loyalty (CL) was 3.23 and 1.032 respectively. There were three observed variables in the community loyalty (CL) (unobserved variable), among of them, CL1 with a mean of 3.11 and a standard deviation of 1.068, CL2 with a mean of 3.16 and a standard deviation of 1.027, CL3 with a mean of 3.42 and a standard deviation of 1.002. The mean and standard deviation of brand loyalty (BL) was 3.70 and 0.896 respectively. There were three observed variables in the community loyalty (CL) (unobserved variable), among of them, BL1 with a mean of 3.78 and a standard deviation of 0.873, BL2 with a mean of 3.79 and a standard deviation of 0.867, CL3 with a mean of 3.75 and a standard deviation of 0.92, BL4 with a mean of 3.48 and a standard deviation of 0.932 (see table 18).

Table 18: Average score of various dimensions and sub dimensions in the scale

| Observed Variables | Mean | Std. Deviation | N |
|---|---|---|---|
| **PV** | **3.66** | **1.024** | |
| PV1 | 3.60 | 1.031 | 538 |
| PV2 | 3.55 | 1.078 | |
| PV3 | 3.83 | 0.963 | 538 |
| **EV** | 3.76 | 0.878 | |
| EV1 | 3.64 | 0.953 | 538 |
| EV2 | 3.90 | 0.824 | 538 |
| EV3 | 3.73 | 0.857 | 538 |
| **SV** | **3.11** | **1.084** | |
| SV1 | 3.05 | 1.125 | 538 |
| SV2 | 2.91 | 1.137 | 538 |
| SV3 | 3.37 | 0.989 | 538 |
| **CL** | **3.23** | **1.032** | |
| CL1 | 3.11 | 1.068 | 538 |
| CL2 | 3.16 | 1.027 | 538 |
| CL3 | 3.42 | 1.002 | 538 |
| **BL** | **3.70** | **0.896** | |
| BL1 | 3.78 | 0.873 | 538 |
| BL2 | 3.79 | 0.867 | 538 |
| BL3 | 3.75 | 0.920 | 538 |
| BL4 | 3.48 | 0.932 | 538 |

Communalities indicated the amount of variance in each variable that is accounted. Communalities as shown here before and after extraction where component analysis works on initial assumption that all variance in common therefore before extraction the communalities are all 1.000. The communalities in the column extraction reflecting the performance in the data structure. In the above table,

it is indicated that utmost factor affecting the brand loyalty is brand loyalty (BL2) in which 85.4% of variance associated in the evolution process, whereas other factor which has been given priority are quantitative factors are social value1 (SV1) 84.7%, brand loyalty1 (BL1) generated 82.6%, and practical value2 (PV2) is 80.7%, the lowest factor indicated in the extraction is social value3 (SV3) which shows 66.1% variance association (see table 19).

Table 19: Communalities

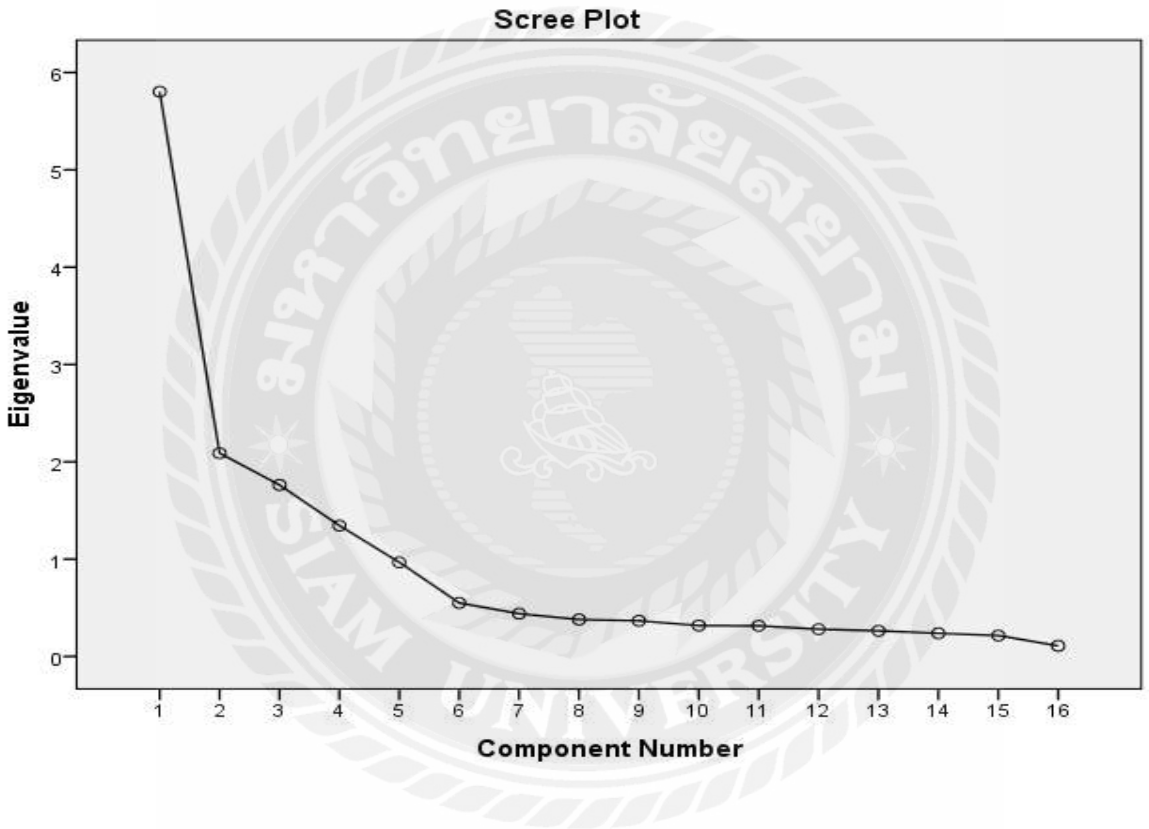
| Factor appraisal influencing brand loyalty | Initial | Extraction |
|---|---|---|
| PV1 | 1.000 | .784 |
| PV2 | 1.000 | .807 |
| PV3 | 1.000 | .804 |
| EV1 | 1.000 | .776 |
| EV2 | 1.000 | .698 |
| EV3 | 1.000 | .781 |
| SV1 | 1.000 | .811 |
| SV2 | 1.000 | .847 |
| SV3 | 1.000 | .661 |
| CL1 | 1.000 | .736 |
| CL2 | 1.000 | .791 |
| CL3 | 1.000 | .770 |
| BL1 | 1.000 | .826 |
| BL2 | 1.000 | .854 |
| BL3 | 1.000 | .659 |
| BL4 | 1.000 | .726 |
| Extraction Method: Principal Component Analysis. | | |

Table 20: Total variance explained

| Component | Initial Eigen values | | | Extraction Sums of Squared Loading | | |
|---|---|---|---|---|---|---|
| | Total | % of Variance | Cumulative % | Total | % of Variance | Cumulative % |
| 1 | 5.996 | 37.473 | 37.473 | 5.996 | 37.473 | 37.473 |
| 2 | 2.166 | 13.538 | 51.010 | 2.166 | 13.538 | 51.010 |
| 3 | 1.670 | 10.436 | 61.446 | 1.670 | 10.436 | 61.446 |
| 4 | 1.493 | 9.334 | 70.780 | 1.493 | 9.334 | 70.780 |
| 5 | 1.006 | 6.287 | 77.067 | 1.006 | 6.287 | 77.067 |
| 6 | 0.578 | 3.615 | 80.683 | | | |
| 7 | 0.448 | 2.799 | 83.482 | | | |
| 8 | 0.401 | 2.508 | 85.990 | | | |
| 9 | 0.399 | 2.494 | 88.484 | | | |
| 10 | 0.358 | 2.235 | 90.719 | | | |
| 11 | 0.324 | 2.023 | 92.742 | | | |
| 12 | 0.286 | 1.785 | 94.527 | | | |
| 13 | 0.281 | 1.754 | 96.281 | | | |
| 14 | 0.248 | 1.549 | 97.830 | | | |
| 15 | 0.205 | 1.282 | 99.112 | | | |
| 16 | 0.142 | 0.888 | 100.000 | | | |
| Extraction Method: Principal Component Analysis. | | | | | | |

The above SPSS output eigenvalues associated with each factor taken for evaluation process before extraction, after extraction, before extraction, SPSS identified 16 factors within the data set. The Eigen values associated with each factor represent the variance explained by the particular factor and SPSS also display the eigenvalue in terms of the percentage of variance. In the above table, the most valuable is practical value that explains 37.473% of total variance (see table 20 & figure 21).

Figure 21: Eigen value (Scree plot)




**Linear regression**

Linear regression is a tool to analyze and calculate the dependency relationship between two or more variables, the formula of linear regression (Wu, 2010): $y_i = \alpha + \beta x_i + \varepsilon_i$

**Descriptive analysis**

Descriptive analysis is a kind of methodology to calculate dispersion and concentration of

variables, and to standardize values as variables. $Zi = (Xi - \bar{x}) / s$, by standardization,

**Personal relevance**

Personal relevance is the level of perceived personal important and/ or interest evoked by a stimulus within a specific situation. According to means score, the respondents agreed with more level on all of personal relevance questions

**Descriptive Statistics of questionnaires**

**Means**

Means is a process of SPSS to calculate and analysis the different descriptive parameter of variables, for instance means, numbers of sample, standard deviation (Wu & Pan, 2014).

Formula of Means:

$$\overline{x1} = \frac{\sum_{i=1}^{n} x1i}{n}$$

**Attitude of the respondents toward observed variables**

A preliminary examination to the data for the sample provided the descriptive statistics for the observed variables. “Likert” statements were used to obtain the respondents’ attitudes towards a give statement. The respondents were given the statement for each observed variable and gave a response with agree level from (5), very more agree (4), more agree (3), moderate agree, (2) less agree, (1) very less agree.

**Practical value**

The value that customer gain in virtual brand community for meeting the practical needs,

wants and demands of customer in their daily consumption life, a customer's opinion of a product's value to him or her, it depends on the product's ability to satisfy his or her needs or requirements (Business dictionary, 2017) (See table 21).

Table 21: Percentage distribution and means of respondents' opinion on practical value (n=538)

| | Practical value | % of total percentages Very more agree ...very less agree → 5 | 4 | 3 | 2 | 1 | Mean $\overline{X}$ | Std. | Average agree level |
|---|---|---|---|---|---|---|---|---|---|
| PV1 | I gain information and knowledge about Thailand universities from other members in community. | 18.8 | **41.8** | 23.0 | 13.4 | 3 | 3.05 | 1.125 | Moderate agree |
| PV2 | The commentaries and recommendation to by community members help me to entrance university of Thailand. | 17.8 | **40.3** | 24.5 | 12.1 | 5.2 | 2.91 | 1.137 | Moderate agree |
| PV3 | I get solutions to my difficulties related to make choice of course, and program in university of Thailand. | 24.9 | **45.0** | 19.7 | 8.6 | 1.9 | 3.37 | 0.989 | More agree |

Remark: Mean=5.00-4.21: very more// Mean=4.20-3.41: More agree// Mean= 3.40-2.61: Moderate agree// Mean=2.60-1.81: Less agree// Mean=1.80-1.00: Very less agree.

**Entertainment value**

The value that virtual brand community supply to customer in community for meeting the mood needs in terms of entertainment and enjoyment. In other words, the entertainment value is the perceived value related to enjoyment and fun seeking (Yung, 2015) (see table 22).

Table 22: Percentage distribution and means of respondents' opinion on entertainment value (n=538)

| | Entertainment value | % of total percentages<br>Very more agree ...very less agree<br>⟶ | | | | | Mean | Std. | Average agree level |
|---|---|---|---|---|---|---|---|---|---|
| | | 5 | 4 | 3 | 2 | 1 | $\overline{X}$ | | |
| EV1 | I get pleasure after engaging in the community in my free time. | 16.9 | **44.6** | 26.8 | 9.1 | 2.6 | 3.64 | 0.953 | More agree |
| EV2 | I get relaxation from heavy pressure in offline by playing games set in the community. | 22.7 | **50.0** | 23.2 | 2.8 | 1.3 | 3.90 | 0.824 | More agree |
| EV3 | I get happy mood in the community. | 18.2 | **44.4** | 29.9 | 6.9 | 0.6 | 3.73 | 0.857 | More agree |

Remark: Mean=5.00-4.21: very more// Mean=4.20-3.41: More agree// Mean= 3.40-2.61: Moderate agree// Mean=2.60-1.81: Less agree// Mean=1.80-1.00: Very less agree

**Social value**

The relative importance that people place on the changes they experience in their lives. Some, but not all of this value is captured in market prices. It is important to consider and measure this social value from the perspective of those affected by an organization's work (Squares, 2016) (See table 23).

Table 23: Percentage distribution and mean of respondents' opinion on social value (n=538)

| | Social value | % of total percentages<br>Very more agree ...very less agree → | | | | | Mean | Std. | Average agree level |
|---|---|---|---|---|---|---|---|---|---|
| | | 5 | 4 | 3 | 2 | 1 | $\overline{X}$ | | |
| SV1 | I made new friendship in the community of this university. | 8.7 | 28.6 | **33.1** | 18.4 | 11.2 | 3.05 | 1.125 | Moderate agree |
| SV2 | I get self-identification by helping other students to solve their difficulties in the community. | 5.8 | 28.3 | **31.4** | 19.9 | 14.7 | 2.91 | 1.137 | Moderate agree |
| SV3 | I feel more self-confidence in the community. | 9.3 | **40.5** | 33.1 | 11.7 | 5.4 | 3.37 | 0.989 | Moderate agree |

Remark: Mean=5.00-4.21: very more// Mean=4.20-3.41: More agree// Mean= 3.40-2.61: Moderate agree// Mean=2.60-1.81: Less agree// Mean=1.80-1.00: Very less agree

**Community loyalty**

Community loyalty is an essential component of multi-community engagement, when users have the choice to engage with a variety of different communities, they often become loyal to just one, focusing on that community at the expense of others (William, 2016) (See table 24).

Table 24: Percentage distribution and means of respondents' opinion on community loyalty (n=538)

| | Community loyalty | % of total percentages Very more agree ...very less agree → 5 | 4 | 3 | 2 | 1 | Mean $\overline{X}$ | Std. | Average agrees level |
|---|---|---|---|---|---|---|---|---|---|
| CL1 | I make positive commentary to the community of the selected university in Thailand. | 8.9 | 28.8 | **33.5** | 21.6 | 7.2 | 3.11 | 1.068 | Moderate agree |
| CL2 | I am the loyal student of the university community in Thailand. | 8.6 | 30.5 | **35.5** | 19.5 | 5.9 | 3.16 | 1.027 | Moderate agree |
| CL3 | This community of university is my priority in Thailand. | 12.5 | **38.8** | 31.0 | 13.8 | 3.9 | 3.42 | 1.002 | More agree |

Remark: Mean=5.00-4.21: very more// Mean=4.20-3.41: More agree// Mean= 3.40-2.61: Moderate agree// Mean=2.60-1.81: Less agree// Mean=1.80-1.00: Very less agree

**Brand loyalty**

Brand loyalty is defined as positive feelings towards a brand and dedication to purchase the same product or service repeatedly now and in the future from the same brand. Regardless of a competitor's actions or changes in the environment, it can also be demonstrated with other behaviors such as positive word-of-mouth advocacy, brand loyalty is where an individual buys products from the same manufacturer repeatedly rather than from other suppliers (Pauwels & Mogos, 2013),see table 25.

Table 25: Percentage distribution and means of respondents' opinion on brand loyalty (n=538)

| | Brand loyalty | % of total percentages Very more agree .....very less agree → | | | | | Mean $\overline{X}$ | Std. | Average agree level |
|---|---|---|---|---|---|---|---|---|---|
| | | 5 | 4 | 3 | 2 | 1 | | | |
| BL1 | Comparing with another universities of Thailand brands, I prefer the elected university I enrolled. | 18.8 | **50.4** | 22.7 | 6.9 | 1.3 | 3.78 | 0.873 | More agree |
| BL2 | I recommend the selected university in Thailand to my friends. | 19.1 | **48.9** | 25.7 | 4.5 | 1.9 | 3.79 | 0.867 | More agree |
| BL3 | I feel close to the selected university in Thailand. | 19.9 | **46.1** | 24.2 | 8.4 | 1.5 | 3.75 | 0.920 | More agree |
| BL4 | I will apply for higher degree and further study in the selected university in Thailand. | 2.2 | **36.4** | 37.2 | 10.8 | 2.2 | 3.48 | 0.932 | More agree |

Remark: Mean=5.00-4.21: very more// Mean=4.20-3.41: More agree// Mean= 3.40-2.61: Moderate agree// Mean=2.60-1.81: Less agree// Mean=1.80-1.00: Very less agree

**Multi-collinearity testing**

Before testing the hypothesized conceptual model, the collinearity or multi-collinearity problem should be addressed. Collinearity is the association between two independent variables, whereas multi-collinearity is the correlation among three of more independent variables. Multi-collinearity represents the degree to which any variable's effect can be predicted or accounted for by the other variables in the analysis. As multi-collinearity rises the ability to define any variable's effect is diminished. The addition of irrelevant or marginally significant variables an only increase the degree of multi-collinearity, which makes interpretation of all variables more difficult. Symptoms of multi-collinearity may be observed in situations: 1) small changes in the data produce wide swings in the parameter estimates, 2) coefficients may have very high standard errors and low significance levels even though they are jointly significant and the $R^2$ for the regression is quite high, 3) coefficients may have the "wrong" signal or implausible magnitude, and 4) when multi-collinearity is extreme, Type II error rates are generally unacceptably high (Grewal et al., 2004).

One way to assess the possibility of multi-collinearity among the study variables is to perform correlations. If a correlation coefficient matrix demonstrates multi-collinearity (Hair et al., 2006). Table 26 showed the the correlation between community loyalty and brand loyalty was 0.618. Therefore, all variables in the study could use for the hypothesized model.

Table 26 Implied (for all variables) Correlations

| | SV | PV | EV | CL | BL | BL4 | BL3 | BL2 | BL1 | CL3 | CL2 | CL1 | SV1 | SV2 | SV3 | EV1 | EV2 | EV3 | PV1 | PV2 | PV3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SV | 1.000 | | | | | | | | | | | | | | | | | | | | |
| PV | .332 | 1.000 | | | | | | | | | | | | | | | | | | | |
| EV | .366 | .389 | 1.000 | | | | | | | | | | | | | | | | | | |
| CL | .549 | .276 | .214 | 1.000 | | | | | | | | | | | | | | | | | |
| BL | .469 | .377 | .339 | **.618** | 1.000 | | | | | | | | | | | | | | | | |
| BL4 | .398 | .320 | .287 | .524 | .849 | 1.000 | | | | | | | | | | | | | | | |
| BL3 | .348 | .280 | .251 | .458 | .742 | .630 | 1.000 | | | | | | | | | | | | | | |
| BL2 | .392 | .315 | .283 | .516 | .836 | .735 | .646 | 1.000 | | | | | | | | | | | | | |
| BL1 | .390 | .313 | .281 | .513 | .831 | .705 | .617 | .853 | 1.000 | | | | | | | | | | | | |
| CL3 | .428 | .215 | .167 | .779 | .481 | .408 | .357 | .402 | .423 | 1.000 | | | | | | | | | | | |
| CL2 | .454 | .228 | .177 | .827 | .511 | .434 | .379 | .427 | .425 | .682 | 1.000 | | | | | | | | | | |
| CL1 | .427 | .215 | .166 | .778 | .480 | .408 | .357 | .401 | .399 | .606 | .643 | 1.000 | | | | | | | | | |
| SV1 | .707 | .235 | .258 | .388 | .332 | .282 | .246 | .277 | .276 | .302 | .321 | .302 | 1.000 | | | | | | | | |
| SV2 | .776 | .258 | .284 | .426 | .364 | .309 | .270 | .304 | .303 | .332 | .352 | .331 | .767 | 1.000 | | | | | | | |
| SV3 | .805 | .267 | .294 | .442 | .378 | .321 | .280 | .316 | .314 | .344 | .366 | .344 | .589 | .620 | 1.000 | | | | | | |

Implied (for all variables) Correlations (Cont.)

| | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EV1 | .274 | .291 | .748 | .160 | .253 | .215 | .188 | .212 | .211 | .125 | .132 | .125 | .288 | .212 | .220 | 1.000 | | | | |
| EV2 | .290 | .308 | .793 | .170 | .268 | .228 | .199 | .224 | .223 | .132 | .140 | .132 | .205 | .220 | .233 | .593 | 1.000 | | | |
| EV3 | .283 | .302 | .775 | .166 | .262 | .223 | .195 | .219 | .218 | .129 | .137 | .129 | .200 | .220 | .228 | .682 | .614 | 1.000 | | |
| PV1 | .272 | **.820** | .319 | .226 | .309 | .262 | .229 | .258 | .257 | .176 | .187 | .176 | .192 | .211 | .219 | .262 | .253 | .247 | 1.000 | |
| PV2 | .277 | **.835** | .325 | .230 | .315 | .267 | .233 | .263 | .261 | .179 | .191 | .179 | .196 | .215 | .223 | .283 | .258 | .252 | .685 | 1.000 |
| PV3 | .267 | .804 | .313 | .222 | .303 | .257 | .225 | .253 | .252 | .173 | .183 | .172 | .189 | .207 | .260 | .260 | .248 | .242 | .654 | .671 | 1.000 |

**Structural equation modeling analysis**

This study hired two-stage structural equation modeling (SEM) analysis (Schmacker & Lomax, 1996) where the measurement model was fixed in the second stage when the structural model was estimated. This approach had advantages for the study such as avoiding the interaction of measurement and structural model and reducing the number of parameters to be estimated. Afterward, the hypothesized paths were modified by model specification.

**Legend to labeling construct/variables**

| Label | Construct/variables |
|---|---|
| **PV** | **Practical value** |
| **PV 1** | **Practical value 1** |
| **PV 2** | **Practical value 2** |
| **PV 3** | **Practical value 3** |
| **EV** | **Entertainment value** |
| **EV 1** | **Entertainment value 1** |
| **EV 2** | **Entertainment value 2** |
| **EV 3** | **Entertainment value 3** |
| **SV** | **Social value** |
| **SV 1** | **Social value 1** |
| **SV 2** | **Social value 2** |
| **SV 3** | **Social value 3** |

| | |
|---|---|
| **CL** | **Community loyalty** |
| **CL 1** | **Community loyalty 1** |
| **CL 2** | **Community loyalty 2** |
| **CL 3** | **Community loyalty 3** |
| **BL** | **Brand loyalty** |
| **BL 1** | **Brand loyalty 1** |
| **BL 2** | **Brand loyalty 2** |
| **BL 3** | **Brand loyalty 3** |
| **BL 4** | **Brand loyalty 4** |

**Confirmatory factor analysis of virtual community brand loyalty model**

Confirmatory factor analysis (CFA) was used to test the measurement model that set of observed (indicator) variables identified the hypothetical latent construct and confirming the theory generated model (Brown, 2006). Testing the measurement model also provided an assessment of convergent and discriminate validity. Criteria for evaluating were no significant chi-square value ($X^2$) $p>.05$, Root mean square residual and Root mean square error of approximation (RMR and RMSEA) <.08, and goodness of fit index, adjusted goodness of Fit index, and Comparative fit index (GFI, AGFI and GFI>.90 as mentioned in Chapter 3. The results of CFA were as follow.

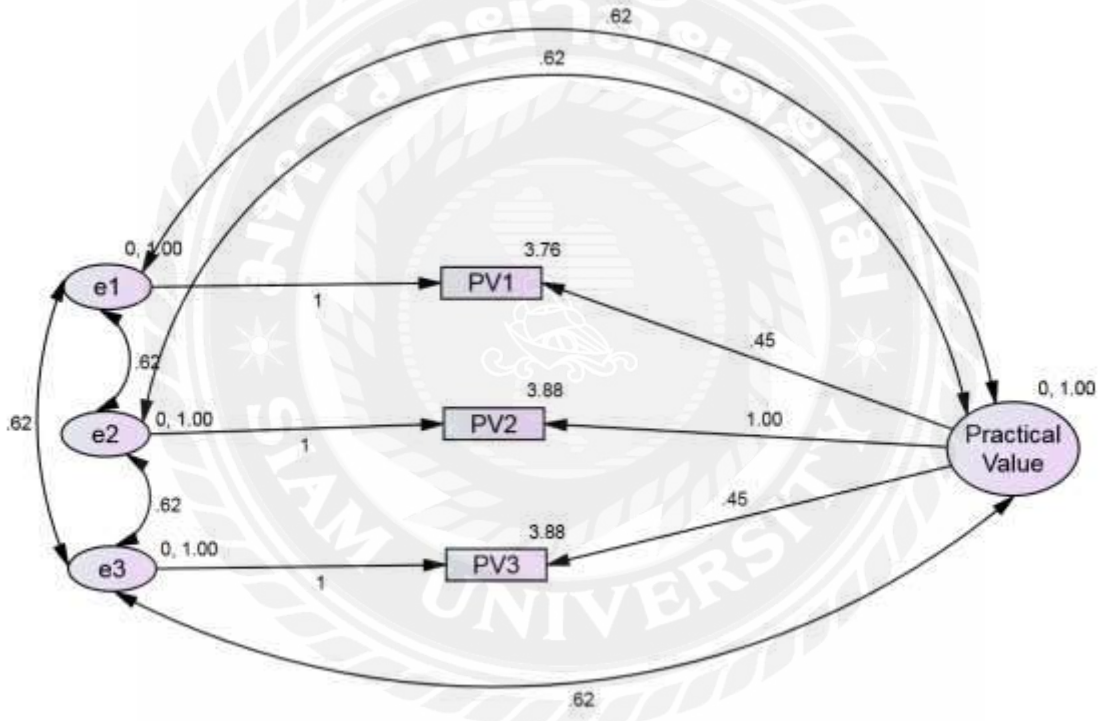
**Practical value**

Practical value was measured with 3 observed variables (PV1, PV2, and PV3). The measurement model practical value was as follow:

$$\begin{cases} X_{p1} = \lambda_{p1}\xi_p + \delta_{p1} \\ X_{p2} = \lambda_{p2}\xi_p + \delta_{p2} \\ X_{p3} = \lambda_{p3}\xi_p + \delta_{p3} \end{cases}$$

The measurement model showed good fitness to data: $X^2$=16.98; p=0.103>0.05; RMR=0.35<0.05; GFI=0.912>0.90; RMSEA=0.032<0.05; AGFI=0.904>0.90. All indices exceed acceptable standards of model fit as shown in figure 22.

Figure 22: Measurement model for practical value

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Chi-square=16.989; p=0.103>0.05; DF=1; RMR=0.35<0.05; GFI=0.912>0.90; RMSEA=0.012<0.05; AGFI=0.904>0.90

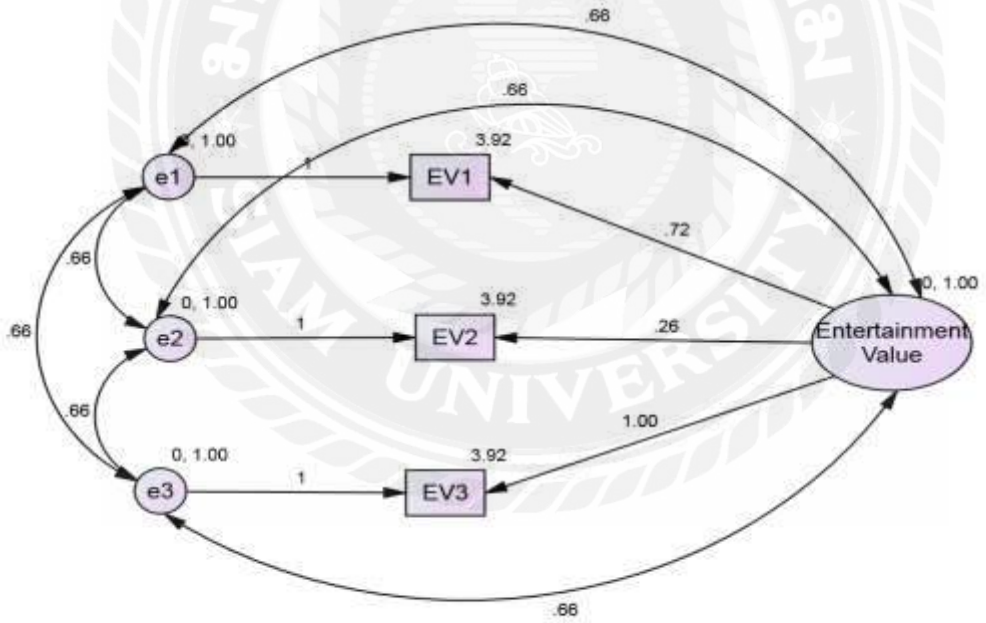
**Entertainment value**

Entertainment value was measured with 3 observed variables (EV1, EV2, and EV3). The measurement model practical value was as follow:

$$\begin{cases} X_{e1} = \lambda_{e1}\xi_e + \delta_{e1} \\ X_{e2} = \lambda_{e2}\xi_e + \delta_{e2} \\ X_{e3} = \lambda_{e3}\xi_e + \delta_{e3} \end{cases}$$

The measurement model showed good fitness to data ($X^2$=24.525; RMR=0.045>0.05; GFI=0.902>0.90; RMSEA=0.035<0.05; AGFI=0.912>0.90). All indices exceed acceptable standards of model fit as shown in figure 23.

Figure 23: Measurement model for entertainment value




Chi-square=24.525; p=0.107>0.05; DF=8; RMR=0.045<0.05; GFI=0.902>0.90; RMSEA=0.035<0.05; AGFI=0.912>0.90

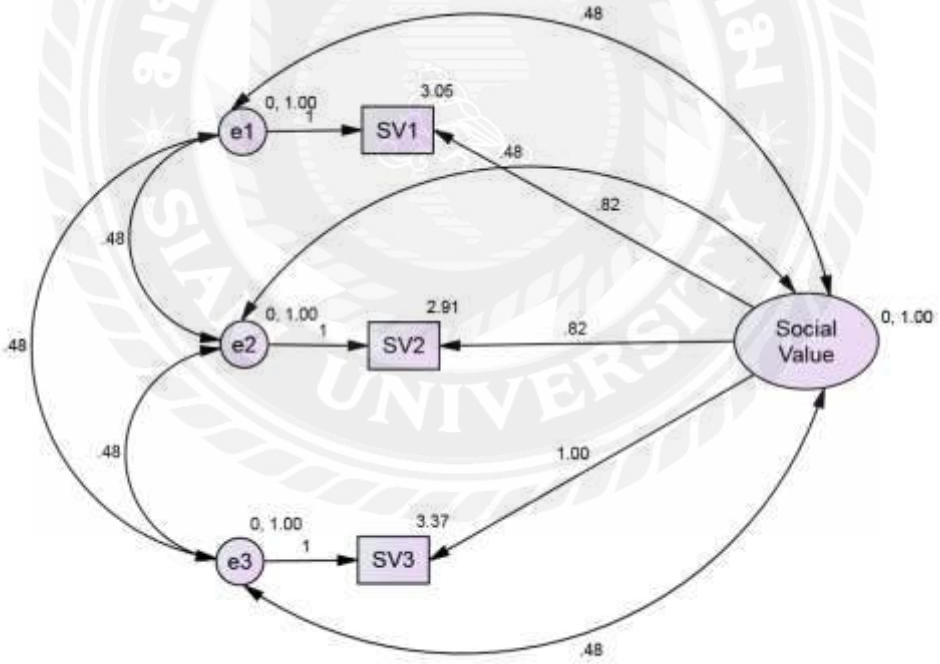
**Social value**

Social value was measured with 3 observed variables (SV1, SV2, and SV3). The measurement model practical value was as follow:

$$\begin{cases} X_{P1} = \lambda_{P1}\xi_s + \delta_{s1} \\ X_{P2} = \lambda_{P2}\xi_s + \delta_{s2} \\ X_{P3} = \lambda_{P3}\xi_s + \delta_{s3} \end{cases}$$

The measurement model showed good fitness to data ($X^2$=21.207; P=0.159>0.05; RMR=0.30<0.05; GFI=0.917>0.90; RMSEA=0.018<0.05; AGFI=0.932>0.90). All indices exceed acceptable standards of model fit as shown in figure 24.

Figure 24: Measurement model for social value




Chi-square=21.207; P=0.159 >0.05; DF=4; RMR= 0.30<0.05; GFI=0.917>0.90; RMSEA=0.018<0.05; AGFI=0.932>0.90.

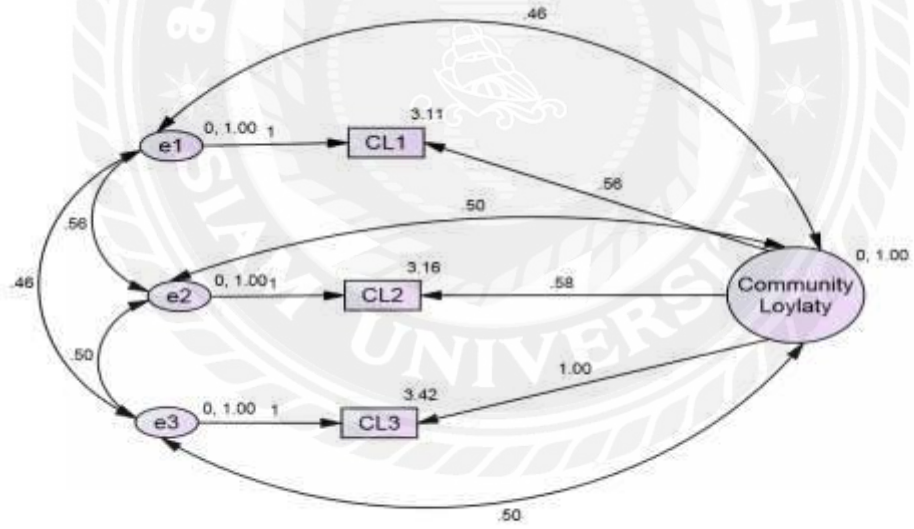
**Community loyalty**

Community loyalty was measured with 3 observed variables (CL1, CL2, and CL3). The measurement model practical value was as follow:

$$\begin{cases} X_{c1} = \lambda_{c1}\xi_c + \delta_{c1} \\ X_{c2} = \lambda_{c2}\xi_c + \delta_{c2} \\ X_{c3} = \lambda_{c3}\xi_c + \delta_{c3} \end{cases}$$

The measurement model showed good fitness to data ($X^2$=16.216; p=0.173>0.05; DF=1; RMR=0.016<0.05; GFI=0.901>0.90; RMSEA=0.036<0.05; AGFI=0.921>0.90). All indices exceed acceptable standards of model fit as shown in figure 25.

Figure 25: Measurement model for community loyalty

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Chi-square=16.216; p=0.173>0.05; DF=1; RMR=0.016<0.05; GFI=0.901>0.90; RMSEA=0.036<0.05; AGFI=0.921>0.90

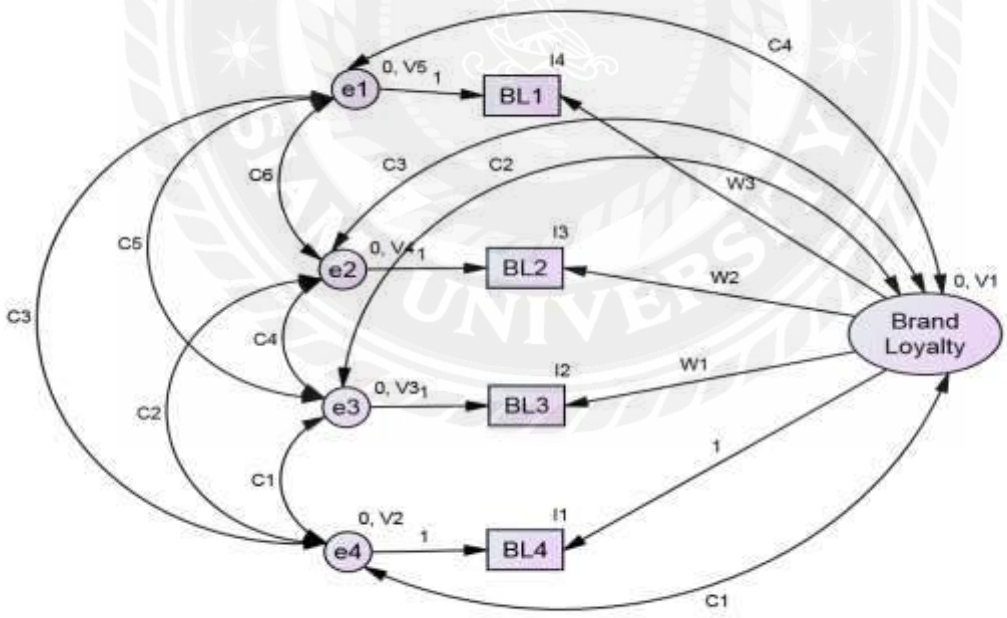
**Brand loyalty**

Brand loyalty was measured with 4 observed variables (BL1, BL2, BL3, and BL4). The measurement model practical value was as follow:

$$\begin{cases} X_{b1} = \lambda_{b1}\eta_b + \delta_{b1} \\ X_{b2} = \lambda_{b2}\eta_b + \delta_{b2} \\ X_{b3} = \lambda_{b3}\eta_b + \delta_{b3} \\ X_{b4} = \lambda_{b4}\eta_b + \delta_{b4} \end{cases}$$

The measurement model showed good fitness to data ($X^2$=25.531; p=0.118>0.5; DF=4; RMR=0.017<0.05; RMR=0.036<0.05; GFI=0.962>0.90; RMSEA=0.046<0.05; AGFI=0.942>0.90). All indices exceed acceptable standards of model fit as shown in figure 26.

Figure 26: Measurement model for brand loyalty



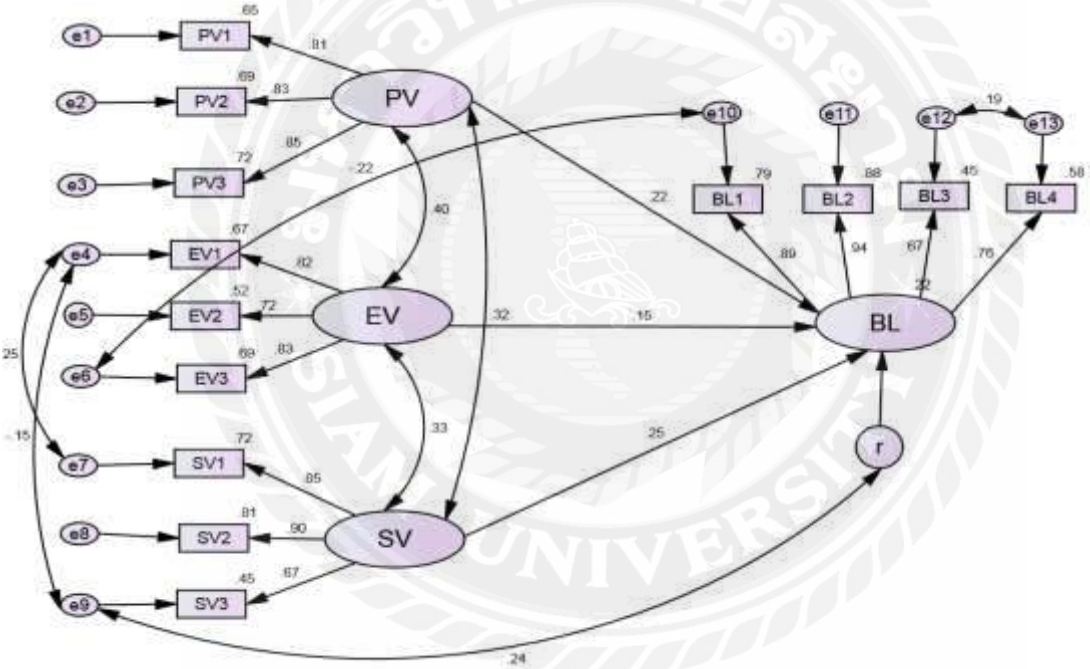

Chi-square=25.531; p=0.118>0.5; DF=4; RMR=0.017<0.05; RMR=0.036<0.05; GFI=0.962>0.90; RMSEA=0.046<0.05; AGFI=0.942>0.90

**Customer experience value influence on brand loyalty**

The Customer experience value, including practical value (PV), entertainment value (EV), and social value (SV) influence to brand loyalty (BL), The Model included 3 exogenous variables: practical value (PV) $\xi_p$, entertainment value (EV) $\xi_e$, social value (SV) $\xi_s$, and 1 endogenous variable: brand loyalty (BL) $\eta_b$ The structural modeling of customer experience value, including practical value (PV), entertainment value (EV), and social value (SV) influence to brand loyalty (BL) was as figure 27:

$$\eta_b = \gamma_p \xi_p + \gamma_e \xi_{e1} + \gamma_s \xi_s + \zeta_2$$

Figure 27: Structural model of customer experience value influence on brand loyalty




The structural model showed good fitness to data: $X^2/df = 2.287 < 3$, RMSEA=0.049<0.05, RMA=0.039<0.05, GFI=0.982>0.90, AGFI=0.944>0.90, CFI=0.967>0.90, CN=314>200.All indices exceed acceptable standards of model fit as shown in table 27.

Table 27: Model fit of statistics of customer experience value to brand loyalty

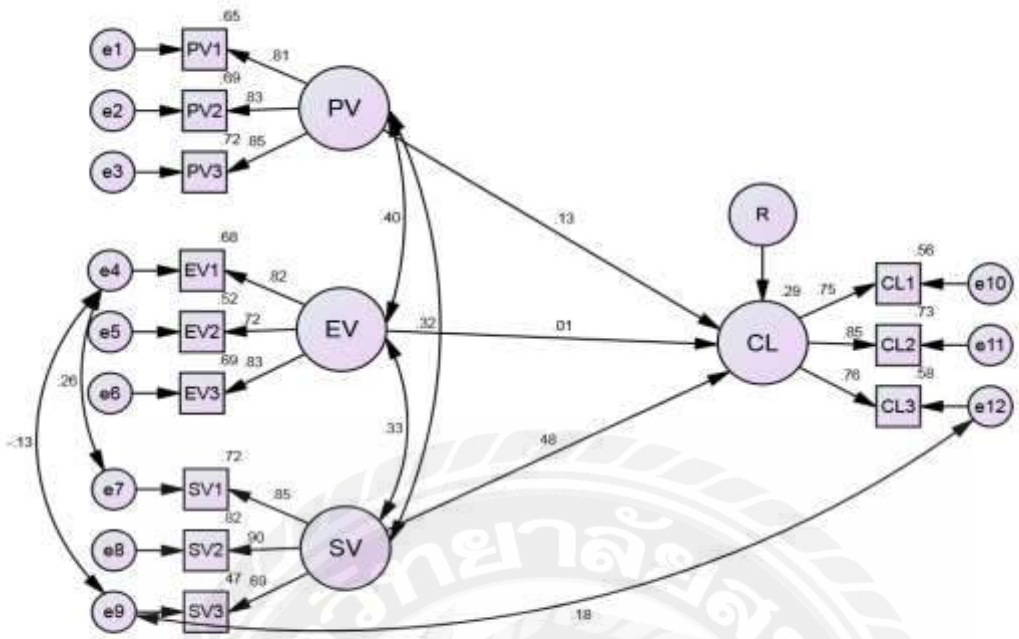
| Items | Hypothesis model | Acceptable levels criteria |
|---|---|---|
| $X^2$(Chi-square) | 123.522 | |
| $X^2$/df | 2.287 | <3 |
| RMSEA | 0.049 | 0.05 |
| RMA | 0.039 | 0.05 |
| GFI | 0.982 | >0.90 |
| AGFI | 0.994 | >0.90 |
| CFI | 0.982 | >0.90 |
| CN | 314 | 200 |

**The customer experience value influence on community loyalty**

The Customer experience value, including practical value (PV), entertainment value (EV), and social value (SV) influence to brand loyalty (BL), The Model included 3 exogenous variables: practical value (PV) $\xi_p$, entertainment value (EV) $\xi_e$, social value (SV) $\xi_s$, and 1 endogenous variable: community loyalty (CL) $\eta_c$. The structural modeling of customer experience value, including practical value (PV), entertainment value (EV), and social value (SV) influence to brand loyalty (BL) was as figure 28:

$$\eta_c = \gamma_p \xi_p + \gamma_e \xi_{e2} + \gamma_s \xi_s + \zeta_1$$

Figure 28: Structural model of customer experience value influence on community loyalty




The structural model showed good fitness to data: $X^2$/df=2.732<3, RMSEA=0.057<0.06, RMA=0.042<0.05, GFI=0.964>0.90, AGFI=0.937>0.90, CFI=0.975>0.90, CN=270>200, all indices exceed acceptable standards of model fit as shown in table 28:

Figure 28: Model fit statistics of customer experience value to community

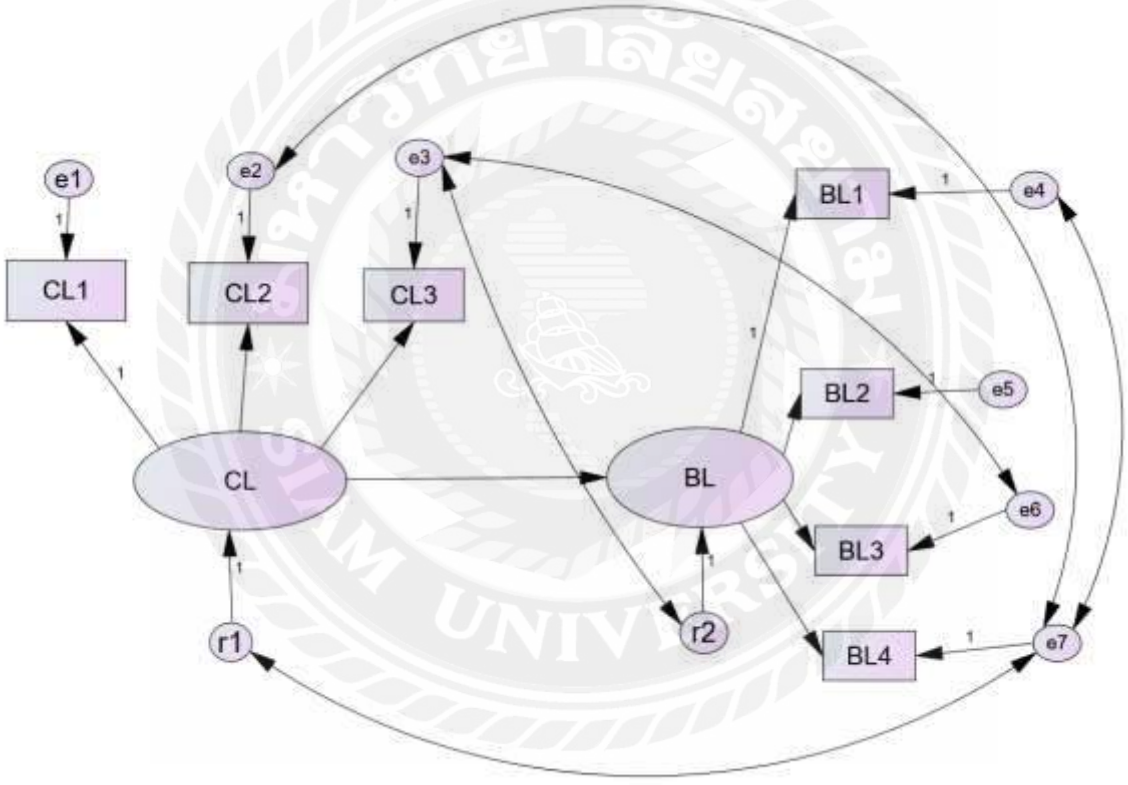
| Items | Hypothesis model | Acceptable levels criteria |
|---|---|---|
| $X^2$(Chi-square) | 122.918 | |
| $X^2$/df | 2.732 | <3 |
| RMSEA | 0.057 | 0.05 |
| RMA | 0.042 | 0.05 |
| GFI | 0.964 | >0.90 |
| AGFI | 0.937 | >0.90 |
| CFI | 0.975 | >0.90 |
| CN | 270 | 200 |

**The influence of community loyalty (CL) on brand loyalty (BL)**

The structure model of the community loyalty (CL) influence to brand community (BL)included 1 Exogenous variable: $\xi_c$ Community loyalty （CL）and 1Endogenous variable: $\eta_b$ brand loyalty (BL), the structural modeling of community loyalty (CL) influence to brand loyalty (BL) was as figure 29:

$$\eta_b = \gamma_c \xi_c + \zeta_2$$

Figure 29: Structural model of community loyalty influence on brand loyalty




The structural model showed good fitness to data: $X^2$/df= 1.671<3, RMSEA=0.035<0.05, RMA=0.018<0.05, GFI=0.993>0.90, AGFI=0.975>0.90, CFI=0.998>0.90, CN=624>200， all indices exceed acceptable standards of model fit as shown in table 29.

Table 29: Model fit of statistics of community loyalty to brand loyalty

| Items | Hypothesis model | Acceptable levels criteria |
|---|---|---|
| $X^2$ （Chi-square） | | |
| $X^2$/df | 1.671 | <3 |
| RMSEA | 0.035 | 0.05 |
| RMA | 0.018 | 0.05 |
| GFI | 0.993 | >0.90 |
| AGFI | 0.975 | >0.90 |
| CFI | 0.998 | >0.90 |
| CN | 624 | 200 |

**Dummy variables**

A critical factor in equation modeling method, metric variables must be used as independent variables, to this point, demography for instance gender, age, marital status, Hours of surfing on internet per-week (hours), education backgrounds, Times in virtual community per-week (see table 30).

Table 30: Dummy variables

| Characteristics | Total (n=538) | | Coded | Remark |
|---|---|---|---|---|
| | n | % | | |
| Gender | | | | |
| Male | 260 | 48.3 | 1 | Code 1: Male |
| Female | 278 | 51.7 | 2 | Code 2: Female |
| Age | | | | |
| <23 | 246 | 45.7 | 1 | Code 1: Age under 23 |
| 23-27 | 196 | 36.4 | 2 | Code 2: Age 23 to 27 |
| 27-35 | 66 | 12.3 | 3 | Code 3: Age 27 to 35 |
| >35 | 30 | 5.6 | 4 | Code 4: Age above 35 |
| Marital status | | | | |
| Married | 195 | 36.2 | 1 | Code 1: Married |
| Single | 327 | 60.8 | 2 | Code 2: Single |
| Others | 16 | 3 | 3 | Code 3: Others and divorce |
| Education backgrounds | | | | |
| Undergraduate | 538 | 100% | 1 | Code 1: Undergraduate students |
| Times in virtual community per-week | | | | |
| < 3 | 237 | 44.1 | 1 | Code 1: Lower than 3 hours |
| 4-8 | 246 | 45.7 | 2 | Code 2: 4 to 8 hours |
| >8 | 55 | 10.2 | 3 | Code 3: Higher than 8 hours |
| Hours of surfing on internet per-week | | | | |
| (hours) | 118 | 21.9 | 1 | Code 1: Lower than 5 hours |
| <5 | 263 | 48.9 | 2 | Code 2: 6 to 15 hours |
| 6-15 | 125 | 43.2 | 3 | Code 3: 16 to 25 hours |
| 16-25 | 32 | 5.9 | 4 | Code 4: Higher than 26 hours |
| >26 | | | | |

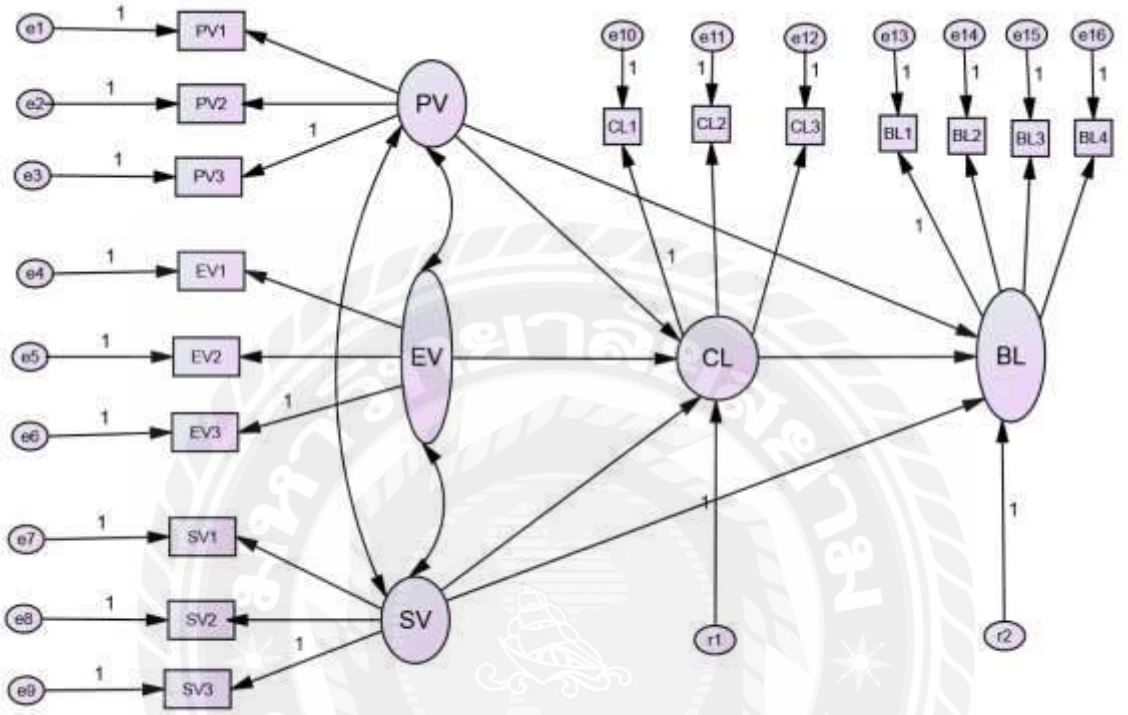
**Structural equation modeling fitting**

The following sections presented the results of the full-hypothesized model. The hypothesized model was estimated using maximum likelihood (ML) estimation in AMOS 22.0 version. The criteria of the better fitted model and greater parsimony were decided by goodness-of-fit measures as mentioned in Chapter 3.

The structural model described the hypothesized relationship linking the model constructs which were divided and measured into five sets: first, practical value which is included three latent variables such as practical value 1, practical value 2 and practical value 3 which were described. Second, entertainment value is consisted of three latent variables: entertainment 1, entertainment 2 and entertainment 3. Third, social value, which is consisted of social value 1, social value 2 and social value 3. Fourth, Community loyalty, which is consisted of community loyalty 1, community loyalty 2 and community loyalty 3. Fifth, brand loyalty which is included brand loyalty 1, brand loyalty 2, brand loyalty 3 and brand loyalty 4. Having satisfied the requirement of measurement model, the structural relationships were tested as hypothesized. Accordingly, all constructs with 7 hypotheses were selected for testing and the conceptual framework was operational into the testable as presented in figure 13. As indicated in figure 13, in virtual brand community, the structural model of customer experience value influence to virtual brand community loyalty and brand loyalty included 4 exogenous variables: practical value (PV)$\xi_{p,}$ entertainment value (EV) $\xi_{e}$, social value(SV)$\xi_{s,}$ and community loyalty (CL) $\xi_{c,}$ and 2 endogenous variables: $\eta_{c}$ (community loyalty) and $\eta_{b}$ (brand loyalty), the structural modeling of customer experience value to customer loyalty was as follow:

$$\begin{cases} \eta_b = \gamma_p \xi_p + \gamma_e \xi_{e2} + \gamma_s \xi_s + \gamma_c \xi_c + \zeta_2 \\ \eta_c = \gamma_p \xi_p + \gamma_e \xi_{e2} + \gamma_s \xi_s + \zeta_1 \end{cases}$$

Figure 30: Hypothesis model for goodness-of-fit testing




In this structural equation modeling correlation between factors was allowed, resulting in chi-square=262.233, p=0.741>0.05 with 101 degree of freedom. A non-significant chi-square value implied that there was no significant discrepancy between the co-variance matrix implied by the model and the population co-variance matrix, hence including the model fit the data. The ratio of chi-square to degrees of freedom (CMIN/DF) =2.596 was lower than 3, CN=257>200. This ratio was an indication that the model adequately fits the data.

AMOS output included many other fit indices, including comparative fit index (CFI=0,967) which indicated a good fit. Root mean square residual (RMR=0.50) and root mean square error of

approximation (RMSEA= 0.055), indicating a good fit for the model. The goodness-of-fit (GFI) and the adjusted goodness-of-fit (AGFI) were 0.943 and 0.924 respectively indicated the amount of variance and co-variances jointly account for by the model and a good fit (see figure 31).

Normal fit index (NFI) and incremental fit index (IFI) were 0.948 and 0.967 the values were more than 0.90 and close to 1 indicated a very good fit as indicated in table 31. PGFI and PNFI were 0.701 and 0.798 the values were higher than 0.50 jointly accounted for by the model and indicated a good fit. CFI (0.976) and TLI (0.961) >0.9, which indicated a good fit. R square values ($R^2$) reported in the regression analysis, the usual interpretation of $R^2$ value was the relative amount of variance of the dependent variable explained or accounted for by explanatory variables. It was estimated that the predictors of brand loyalty in virtual community explain 45.4 percentage of its variance.

Finally, the structural equation modeling of virtual community loyalty was analyzed and presented in Figure 4-2 together with the standard estimate values. The results showed that all structural paths in the model were significant at $p<0.5$. More details about structural paths were presented in the hypotheses testing section (see table 31).

Table 31: Standard parameter estimates and model fit statistics of the hypothesis model (n=538)

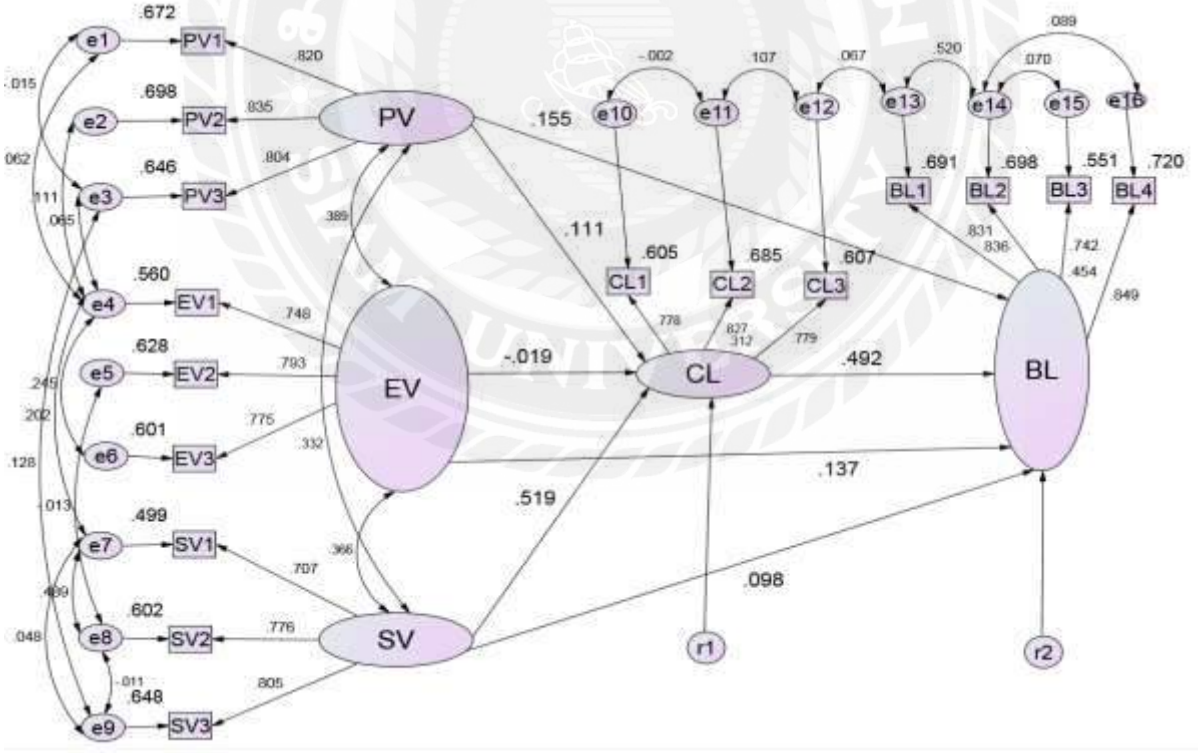
| H | From | to | Hypothesis model | |
|---|---|---|---|---|
| | | | Standardized estimate | t-value |
| H1 | PV | CL | 0.111 | 2.208* |
| H2 | EV | CL | -0.019 | -0.348 |
| H3 | SV | CL | 0.519 | 9.304*** |
| H4 | PV | BL | 0.155 | 3.477*** |
| H5 | EV | BL | 0.137 | 2.850* |
| H6 | SV | BL | 0.098 | 1.688* |
| H7 | CL | BL | 0.492 | 8.689*** |

| Model goodness-of-fit statistics | Acceptable levels Criteria | Hypothesis model |
|---|---|---|
| Chi-square statistic | _ | 262.233 |
| df | -- | 101 |
| CMINDF | <3 | 2.596 |
| p-value | >0.05 | p=0.741 |
| GFI | >0.90 | 0.943 |
| AGFI | > 0.90 | 0.924 |
| RMR | < 0.08 | 0.050 |
| RMSEA | < 0.08 | 0.055 |

Model fit statistics of the hypothesis model (Cont.)

| | | |
|---|---|---|
| NFI | >0.90 | 0.948 |
| IFI | >.90 | 0.967 |
| CFI | >0.90 | 0.967 |
| TLI | >0.90 | 0.961 |
| PGFI | >0.50 | 0.701 |
| CN | > 200 | 257 |
| Note: * t-value>1.96 had significant at 0.05 level (*p<0.05, ***p<0.001) and supported the hypotheses | | |

Figure 31: Standardized estimates results




Chi-square=262.233;p=0.741>0.05;df=101;RMSEA=0.055<0.08;RMR=0.050<.1;GFI=0.92

4>0.90;AGFI=0.943>0.90;NFI=0.948>0.90;IFI=0.967>0.90;CFI=0.967>0.90;TLI=0.961>.90;CN=257>2

00;PGFI=.701>.050;PNFI=0.798>.50;CMINDF=2.596.

In this structural equation modeling correlation between factors were allowed, resulting in chi-square=262.233, p=0.741>0.05 with 101 degrees of freedom. A no significant chi-square value implied that there was no significant chi-square implied that there was no significant discrepancy between the covariance matrix implied by the model and the population covariance matrix, hence indicating the model fit the data. The ratio of the chi-square to degrees of freedom (CMIN/DF) =2.596 was lower than 3. This ratio gave an indication that the model adequately fits the data.

AMOS output included many other fit indices, including comparative fit index (CFI=0.967) which indicated a good fit. Root mean square residual (RMR=0.050<1) and root mean square error of approximation (RNSEA=0.055<0.08), indicating a good fit for the model. The goodness-of-fit index (GFI) and the adjusted goodness-of-fit index (AGFI) were 0.924>0.900 and 0.943>0.90 respectively indicated the amount of variance and co-variances jointly accounted for by the model a good fit. Norm fit index (NFI) and incremental fit index (IFI) were 0.948>0.9 and 0.967>0.9 respectively, tacker-Lewis index TLI=0.961>.90 the values were more than 0.90 and closed to 1 indicated a very good fit, parsimony-adjusted index (PNFI) and parsimony goodness-of-fit index (PGFI) were 0.701 and 0.798 respectively, the values were more than 0.50 indicated a good fit of the model, and critical N (CN=257>200) indicated that the theory model fit the real sample as described in table 31. R square value($R^2$) reported in the regression analysis, the usual interpretation of $R^2$ value was the relative amount of variance of the dependent variable explained or accounted for by the explanatory variables. It was estimated that the predictors of brand loyalty explain 45.4 percent of its variance.

Finally, the structural equation modeling of brand loyalty in virtual brand community was

analyzed and presented in figure 14 together with the standardized estimate values. From the figure, there were 3 exogenous and 2 endogenous constructs. The result showed that all structural paths in the model were significant at $p<0.05$. More details about structural paths were presented in the hypotheses testing section.

**Results of hypotheses testing**

The hypotheses mode for this study fitted date well as above. All structural paths shown in the model were statistically significant at $p<0.05$. Structural paths and their estimates were summarized in table 32 with results of hypotheses tests. The result showed: community loyalty positively impacted by practical value ($\beta$= **0.111**) and social value ($\beta$=**0.519**), but negatively impacted by entertainment value ($\beta$= **—0.019**); brand loyalty positively impacted by practical value ($\beta$=**0.155**), entertainment value ($\beta$=**0.137**), and social value ($\beta$=**0.098**), finally, brand loyalty was positively influenced by community loyalty ($\beta$=0.492). Structural paths and their standardized estimates were summarized in table 32.

Table 32: Summary of structural paths and hypothesis testing results, standard estimates (n=538)

| H | From | to | Brand loyalty model | | Hypotheses support |
|---|---|---|---|---|---|
| | | | Standardized estimate | t-value | |
| H1 | PV | CL | 0.111 | 2.208* | Accepted |
| H2 | EV | CL | -0.019 | -0.348 | Rejected |
| H3 | SV | CL | 0.519 | 9.304*** | Accepted |
| H4 | PV | BL | 0.155 | 3.477*** | Accepted |
| H5 | EV | BL | 0.137 | 2.850* | Accepted |
| H6 | SV | BL | 0.098 | 1.688* | Accepted |
| H7 | CL | BL | 0.492 | 8.689*** | Accepted |

***p<0.001, *p<0.05

Two-tailed test of significance were employed to analyze the significance of each path coefficient. The majority of the hypotheses were statistically significant in the hypotheses direction as expected, except the hypothesized relationship between entertainment value to community loyalty. Results for all 6 hypotheses which were significantly would be discussed in the chapter 5.

**Total direct, direct and indirect effects**

In total, direct and indirect effects of predictors and mediating factors were presented in table 33. It found that 45.4% ($R^2$=0.454) of its total variation can be explained by the regression model consisting of exogenous variables: practical value, entertainment value, social value, and endogenous variables: community loyalty and brand loyalty. The results showed: the direct effects, indirect effects and total effects were examined. The practical value had positive direct effects to community loyalty (0.111)

and positive total effective to brand loyalty (0.210), entertainment had negative direct to community loyalty (-.019) but positive direct to brand loyalty (0.137), social value had positive direct to community loyalty (.519) and positive effective to brand loyalty (0.353), community loyalty had positive direct effective to brand loyalty (0.492) (see table 33).

Table 33: Total, direct and indirect effects

| Exogenous variables | Endogenous variables | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Community loyalty | | | | Brand loyalty | | | |
| | DE | IE | TE | $R^2$ | DE | IE | TE | $R^2$ |
| Practical value | 0.111* | 0.000 | 0.111*** | 0.312 | 0.155* | 0.054 | 0.210* | 0.454 |
| Entertainment value | —0.019 | 0.000 | —0.019 | | 0.137*** | 0.009 | 0.128* | |
| Social value | 0.519*** | 0.000 | 0.519*** | | 0.098*** | 0.255 | 0.353*** | |
| Community loyalty | | | | | 0.492*** | 0.000 | 0.492*** | |
| DE= Direct effect, IE=Indirect effect, TE=Total effect, Significant at*** p<0.001, *p<0.05 | | | | | | | | |

In brand loyalty model in virtual brand community, it was estimated a value for customer experience values to customer loyalty which includes community loyalty and brand loyalty using the following equation:

Brand loyalty = 0.155 (practical value) + 0.137 (entertainment value) + 0.098 (social value) + 0.492 (Community loyalty); $R^2$=0.454 (45.4%).

Community loyalty= 0.111 (practical value) ¯ 0.019 (entertainment value) + 0.519 (social value); $R^2$ = 0.31 (31%).

**Factor loading**

The results of the study in table 34 showed practical value, social value that customers gain in virtual brand community have factor lading of 0.111,0.519 to community loyalty respectively. Practical value, social value has factor loading of 0.155, 0.098 to brand loyalty, which represented the important factors in virtual brand community, entertainment value has factor loading of -0.019 to community loyalty but 0.137 to brand loyalty, finally, community loyalty has factor loading of 0.492 to brand loyalty, more details see table 34 and table 35.

Table 34: Factor loading for the measurement model of brand loyalty in virtual brand community (n=538)

| Factors | | Factor Loading: λ | | | |
|---|---|---|---|---|---|
| Unobserved, endogenous variables | Unobserved, exogenous variables | b | S. E | Beta: β | t |
| Community loyalty | Practical value | 0.133 | 0.060 | 0.111 | 2.208* |
| | Entertainment value | 0.588 | 0.063 | -0.019 | 0.728 |
| | Social value | -0.025 | 0.072 | 0.519 | 9.304*** |
| Brand loyalty | Practical value | 0.165 | 0.047 | 0.155 | 3.477*** |
| | Entertainment value | 0.161 | 0.047 | 0.137 | 2.850* |
| | Social value | 0.098 | 0.058 | 0.098 | 0.032* |
| | Community loyalty | 0.434 | 0.050 | 0.492 | 8.689*** |
| Significant ***p<0.001, *p<0.05 | | | | | |

Table 35: Factor loading for the measurement model of brand loyalty in virtual community (n=538)

| Unobserved variables | Observed variables | Factor Loading: $\lambda$ | | | | |
|---|---|---|---|---|---|---|
| | | b | S.E. | Beta: $\beta$ | t | $R^2$ |
| Practical value | PV1 | 1.124 | 0.036 | 0.820 | 30.858*** | 0.672 |
| | PV2 | 1.192 | 0.048 | 0.835 | 24.820*** | 0.698 |
| | PV3 | 1.000 | - | 0.804 | - | 0.646 |
| Entertainment Value | EV1 | 1.070 | 0.054 | 0.748 | 19.728*** | 0.560 |
| | EV2 | 0.025 | 0.025 | 0.793 | 40.024*** | 0.628 |
| | EV3 | 1.000 | - | 0.775 | - | 0.601 |
| Social value | SV1 | 1.035 | 0.033 | 0.707 | 31.466*** | 0.499 |
| | SV2 | 1.124 | 0.036 | 0.776 | 30.858*** | 0.602 |
| | SV3 | 1.000 | - | 0.805 | - | 0.648 |
| Community loyalty | CL1 | 1.000 | - | 0.778 | - | 0.605 |
| | CL2 | 0.981 | .025 | 0.827 | 40.024*** | 0.685 |
| | CL3 | 0.899 | .034 | 0.779 | 26.414*** | 0.607 |
| Brand loyalty | BL1 | 1.000 | - | 0.831 | - | 0.691 |
| | BL2 | 0.981 | .025 | 0.836 | 40.024*** | 0.698 |
| | BL3 | 0.899 | .034 | 0.742 | 26.414*** | 0.551 |
| | BL4 | 1.035 | .033 | 0.849 | 31.466*** | 0.720 |
| PV3, EV3, SV3, CL1, BL1 un-standardized estimates=1, Significant ***p<0.001 | | | | | | |

**Analytic hierarchy process (AHP) of observed variables**

As indicated in chapter three, AHP (Analytic Hierarchy Process) is one of methods in the Multi-Criteria Decision Making (MCDM). AHP steps include first, defining problem and determining the desired solution, second, creating a hierarchy structure that begins with the main goal, third, creating a paired comparison matrix that describes the relative contribution of each variables on the objectives or criteria above it, fourth, defining pairwise comparisons so that the total number of judgements, fifth, calculating the eigen vector of each pairwise comparison matrix, sixth, checking consistency (Suryadi & Ramdhani, 2000) when the expected consistency ratio is less than or equal to 0.1 (10 percentage).

The decision matrix of observed variables was set as above steps, and analyzed by means of AHP-OS, the principle eigenvalue equals to 18.321, eigenvector solution is consisted of 6 iterations, the delta ($\delta$) =2.6, the consistency ratio equals to 0.097 (9.7%) the above indices showed that the decision matrix is OK, see table 36.

Table 36: Decision Matric observed variables

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | 2.00 | 1.00 | 6.00 | 7.00 | 6.00 | 9.00 | 8.00 | 9.00 | 7.00 | 8.00 | 6.00 | 5.00 | 4.00 | 9.00 | 6.00 |
| 2 | 0.50 | 1 | 2.00 | 1.00 | 3.00 | 7.00 | 3.00 | 7.00 | 8.00 | 6.00 | 7.00 | 5.00 | 3.00 | 4.00 | 7.00 | 6.00 |
| 3 | 1.00 | 0.50 | 1 | 3.00 | 8.00 | 7.00 | 6.00 | 5.00 | 8.00 | 4.00 | 7.00 | 6.00 | 5.00 | 6.00 | 9.00 | 7.00 |
| 4 | 0.17 | 1.00 | 0.33 | 1 | 3.00 | 1.00 | 3.00 | 2.00 | 3.00 | 4.00 | 3.00 | 2.00 | 3.00 | 5.00 | 3.00 | 2.00 |
| 5 | 0.14 | 0.33 | 0.12 | 0.33 | 1 | 3.00 | 2.00 | 4.00 | 2.00 | 5.00 | 2.00 | 2.00 | 1.00 | 4.00 | 3.00 | 4.00 |
| 6 | 0.17 | 0.14 | 0.14 | 1.00 | 0.33 | 1 | 1.00 | 2.00 | 3.00 | 4.00 | 2.00 | 4.00 | 3.00 | 2.00 | 3.00 | 4.00 |
| 7 | 0.11 | 0.33 | 0.17 | 0.33 | 0.50 | 1.00 | 1 | 5.00 | 3.00 | 4.00 | 2.00 | 6.00 | 7.00 | 2.00 | 4.00 | 5.00 |
| 8 | 0.12 | 0.14 | 0.20 | 0.50 | 0.25 | 0.50 | 0.20 | 1 | 2.00 | 1.00 | 1.00 | 4.00 | 3.00 | 2.00 | 2.00 | 4.00 |
| 9 | 0.11 | 0.12 | 0.12 | 0.33 | 0.50 | 0.33 | 0.33 | 0.50 | 1 | 3.00 | 1.00 | 4.00 | 3.00 | 2.00 | 5.00 | 3.00 |
| 10 | 0.14 | 0.17 | 0.25 | 0.25 | 0.20 | 0.25 | 0.25 | 1.00 | 0.33 | 1 | 1.00 | 3.00 | 1.00 | 2.00 | 2.00 | 2.00 |
| 11 | 0.12 | 0.14 | 0.14 | 0.33 | 0.50 | 0.50 | 0.50 | 1.00 | 1.00 | 1.00 | 1 | 1.00 | 1.00 | 4.00 | 3.00 | 4.00 |
| 12 | 0.17 | 0.20 | 0.17 | 0.50 | 0.50 | 0.25 | 0.17 | 0.25 | 0.25 | 0.33 | 1.00 | 1 | 1.00 | 1.00 | 3.00 | 2.00 |
| 13 | 0.20 | 0.33 | 0.20 | 0.33 | 1.00 | 0.33 | 0.14 | 0.33 | 0.33 | 1.00 | 1.00 | 1.00 | 1 | 1.00 | 2.00 | 4.00 |
| 14 | 0.25 | 0.25 | 0.17 | 0.20 | 0.25 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.25 | 1.00 | 1.00 | 1 | 3.00 | 2.00 |
| 15 | 0.11 | 0.14 | 0.11 | 0.33 | 0.33 | 0.33 | 0.25 | 0.50 | 0.20 | 0.50 | 0.33 | 0.33 | 0.50 | 0.33 | 1 | 2.00 |
| 16 | 0.17 | 0.17 | 0.14 | 0.50 | 0.25 | 0.25 | 0.20 | 0.25 | 0.33 | 0.50 | 0.25 | 0.50 | 0.25 | 0.50 | 0.50 | 1 |
| Principal eigen value =18.321, Eigenvector solution: 6 iterations, delta ($\delta$) =2.6E-8, CR = 0.097<0.1. | | | | | | | | | | | | | | | | |

**Analytic hierarchy process (AHP) of unobserved variables**

The decision matrix of observed variables was set as above steps, and analyzed by means of AHP-OS, the principle eigenvalue equals to 5.341, eigenvector solution is consisted of 6 iterations, the delta ($\delta$) =3.3, the consistency ratio equals to 0.076 the above indices showed that the decision matrix is OK, see table 37.

Table 37: Decision matrix of unobserved variables

| | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| 1 | 1 | 6.00 | 7.00 | 8.00 | 9.00 |
| 2 | 0.17 | 1 | 7.00 | 4.00 | 6.00 |
| 3 | 0.14 | 0.14 | 1 | 1.00 | 2.00 |
| 4 | 0.12 | 0.25 | 1.00 | 1 | 2.00 |
| 5 | 0.11 | 0.17 | 0.50 | 0.50 | 1 |
| Principal eigen value= 5.341, Eigenvector solution:6iterations, delta ($\delta$) =3.3, consistency ratio CR=0.076<0.01 | | | | | |

**Conclusion**

This chapter described details of data analysis processes and data analysis results for the conceptual model and associated hypotheses. It emphasized measurement model details and step-by-step procedures that produced satisfactory measurement of the conceptual model's four constructs. The chapter described a final structural model that had a good fit with observed data, statistically supported by major goodness-of-fit indices.

The results of this study showed in virtual brand community, the three dimensions of customers' experience value, namely practical value, entertainment value and social value, firstly, can positively construct brand loyalty, secondly, practical value, and social value can positively construct community loyalty but entertainment value can negatively construct community loyalty, thirdly and last, the community loyalty can construct brand loyalty positively in virtual brand community. From point views of education, practical value, and social value were the focuses of Chinese students. In light of the results of this study, an integrated model with the empirical testing should be developed by the private universities of Thailand, focus on practical value and social value in virtual brand community, in order to construct brand loyalty toward Chinese students. The private universities of Thailand plays an important role in higher education of Thailand, meanwhile, the research results can be a contribution to practice and theory for private universities of Thailand, firstly, the practical value, social value should be put in the priority in the virtual brand community, secondly, in light of the results of this study, the entertainment value has negative impact to the community loyalty, so that, private university of Thailand should focus on the core-value of higher education: education is for equipping knowledge to students not for funny activities, thirdly, community loyalty in virtual brand community should be gained by promoting practical value and social value; last not the least, in virtual brand community, constructing brand loyalty of private university of Thailand toward to Chinese students can be reached on condition that the practical value, social value and community loyalty were concentrated. The data analysis would be discussed in more depth in chapter 5, followed by academic and managerial implications and research limitations.

Table 38: Regression weights

| Variables | | | Estimate | S.E. | C.R. | P | Label |
|---|---|---|---|---|---|---|---|
| CL | <- | PV | .133 | 0.060 | 2.208 | .027 | H1 |
| CL | <- | SV | .588 | 0.063 | 9.304 | *** | H3 |
| CL | <- | EV | -.025 | 0.072 | -.348 | .728 | H2 |
| BL | <- | CL | .434 | 0.050 | 8.689 | *** | H7 |
| BL | <- | PV | .165 | 0.047 | 3.477 | *** | H4 |
| BL | <- | SV | .098 | 0.058 | 1.688 | .032 | H6 |
| BL | <- | EV | .161 | 0.056 | 2.850 | .004 | H5 |
| PV3 | <- | PV | 1.000 | | | | |
| PV2 | <- | PV | 1.192 | 0.048 | 24.820 | *** | W1 |
| PV1 | <- | PV | 1.124 | 0.036 | 30.858 | *** | path_1 |
| SV3 | <- | SV | 1.000 | | | | |
| SV2 | <- | SV | 1.124 | 0.036 | 30.858 | *** | path_1 |
| SV1 | <- | SV | 1.035 | 0.033 | 31.466 | *** | path_3 |
| BL3 | <- | BL | .899 | 0.034 | 26.414 | *** | path_5 |
| BL2 | <- | BL | .981 | 0.025 | 40.024 | *** | path_4 |
| BL1 | <- | BL | 1.000 | | | | |
| CL2 | <- | CL | .981 | 0.025 | 40.024 | *** | path_4 |
| CL3 | <- | CL | .899 | 0.034 | 26.414 | *** | path_5 |

Regression Weights (Cont.)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| BL4 | <- | BL | 1.035 | 0.033 | 31.466 | *** | path_3 |
| CL1 | <- | CL | 1.000 | | | | |
| EV3 | <- | EV | 1.000 | | | | |
| EV2 | <- | EV | .981 | 0.025 | 40.024 | *** | path_4 |
| EV1 | <- | EV | 1.070 | 0.054 | 19.728 | *** | W4 |

Table 39: Standardized regression weights

| Variables | | | Estimate |
|---|---|---|---|
| Community loyalty | <--- | Practical value | 0.111 |
| Community loyalty | <--- | Social value | 0.519 |
| Community loyalty | <--- | Entertainment value | −0.019 |
| Brand loyalty | <--- | Community loyalty | 0.492 |
| Brand loyalty | <--- | Practical value | 0.155 |
| Brand loyalty | <--- | Social value | 0.098 |
| Brand loyalty | <--- | Entertainment value | 0.137 |
| PV3 | <--- | Practical value | 0.804 |
| PV2 | <--- | Practical value | 0.835 |
| PV1 | <--- | Practical value | 0.820 |
| SV3 | <--- | Social value | 0.805 |
| SV2 | <--- | Social value | 0.776 |
| SV1 | <--- | Social value | 0.707 |
| BL3 | <--- | Brand loyalty | 0.742 |
| BL2 | <--- | Brand loyalty | 0.836 |
| BL1 | <--- | Brand loyalty | 0.831 |
| CL2 | <--- | Community loyalty | 0.827 |
| CL3 | <--- | Community loyalty | 0.779 |
| BL4 | <--- | Brand loyalty | 0.849 |
| CL1 | <--- | Community loyalty | 0.778 |
| EV3 | <--- | Entertainment value | 0.775 |
| EV2 | <--- | Entertainment value | 0.793 |
| EV1 | <--- | Entertainment value | 0.748 |

Table 40: Squared multiple correlations

| Variables | Estimate |
|---|---|
| Community loyalty | 0.312 |
| Brand loyalty | 0.454 |
| BL4 | 0.720 |
| BL3 | 0.551 |
| BL2 | 0.698 |
| BL1 | 0.691 |
| CL3 | 0.607 |
| CL2 | 0.685 |
| CL1 | 0.605 |
| SV1 | 0.499 |
| SV2 | 0.602 |
| SV3 | 0.648 |
| EV1 | 0.560 |
| EV2 | 0.628 |
| EV3 | 0.601 |
| PV1 | 0.672 |
| PV2 | 0.698 |
| PV3 | 0.646 |

Table 41: Correlation matrix

| | EV | SV | PV | CL | BL | BL4 | BL3 | BL2 | BL1 | CL3 | CL2 | CL1 | SV1 | SV2 | SV3 | EV1 | EV2 | EV3 | PV1 | PV2 | PV3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EV | 1.000 | | | | | | | | | | | | | | | | | | | | |
| SV | .366 | 1.000 | | | | | | | | | | | | | | | | | | | |
| PV | .389 | .332 | 1.000 | | | | | | | | | | | | | | | | | | |
| CL | .214 | .549 | .276 | 1.000 | | | | | | | | | | | | | | | | | |
| BL | .339 | .469 | .377 | .618 | 1.000 | | | | | | | | | | | | | | | | |
| BL4 | .287 | .398 | .320 | .524 | .849 | 1.000 | | | | | | | | | | | | | | | |
| BL3 | .251 | .348 | .280 | .458 | .742 | .630 | 1.000 | | | | | | | | | | | | | | |
| BL2 | .283 | .392 | .315 | .516 | .836 | .735 | .646 | 1.000 | | | | | | | | | | | | | |
| BL1 | .281 | .390 | .313 | .513 | .831 | .705 | .617 | .853 | 1.000 | | | | | | | | | | | | |

Correlation matrix (Cont.)

| | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CL3 | .167 | .428 | .215 | .779 | .481 | .408 | .357 | .402 | .423 | 1.000 | | | | | | | | | | |
| CL2 | .177 | .454 | .228 | .827 | .511 | .434 | .379 | .427 | .425 | .682 | 1.000 | | | | | | | | | |
| CL1 | .166 | .427 | .215 | .778 | .480 | .408 | .357 | .401 | .399 | .606 | .643 | 1.000 | | | | | | | | |
| SV1 | .258 | .707 | .235 | .388 | .332 | .282 | .246 | .277 | .276 | .302 | .321 | .302 | 1.000 | | | | | | | |
| SV2 | .284 | .776 | .258 | .426 | .364 | .309 | .270 | .304 | .303 | .332 | .352 | .331 | .767 | 1.000 | | | | | | |
| SV3 | .294 | .805 | .267 | .442 | .378 | .321 | .280 | .316 | .314 | .344 | .366 | .344 | .589 | .620 | 1.000 | | | | | |
| EV1 | .748 | .274 | .291 | .160 | .253 | .215 | .188 | .212 | .211 | .125 | .132 | .125 | .288 | .212 | .220 | 1.000 | | | | |
| PV2 | .325 | .277 | .835 | .230 | .315 | .267 | .233 | .263 | .261 | .179 | .191 | .179 | .196 | .215 | .223 | .283 | .258 | .252 | .685 | 1.000 | |
| PV3 | .313 | .267 | .804 | .222 | .303 | .257 | .225 | .253 | .252 | .173 | .183 | .172 | .189 | .207 | .260 | .260 | .248 | .242 | .654 | .671 | 1.000 |

# CHAPTER 5

## Conclusion, Implication & Recommendation

This chapter was divided into four sections. Conclusion of the research results and the results of hypotheses testing to confirm the relationship between practical value, entertainment value, social value and community loyalty and brand loyalty. In the second section, managerial implications were suggested. The third section developed the marketing decision support system on basic of the results of this study, the fourth section discussed the limitation of this study and directions for future research were discussed in the final section.

**Research issues and hypotheses testing conclusions**

The first objective of this study was to study the different customer experience values (practical value, entertainment value and social value) impact on customer loyalty (community loyalty and brand loyalty) in virtual brand community.

**Brand loyalty**

The study showed practical value, entertainment value, social value and community loyalty had respectively factor loading of 0.155, 0.137,0.098 and 0.492, which represented that practical value, entertainment value and social value were factors influencing to brand loyalty, and community was important factor influencing to brand loyalty (table 42).

Table 42: Factor loading for the measurement model of brand loyalty in virtual brand community (n=538)

| Factors | Factor Loading | |
|---|---|---|
| | Community loyalty | Brand loyalty |
| Practical value (PV) | 0.111 | |
| Entertainment value (EV) | − 0.019 | |
| Social value (SV) | 0.519 | |
| Practical value (PV) | | 0.155 |
| Entertainment value (EV) | | 0.137 |
| Social value (SV) | | 0.098 |
| Community loyalty (CL) | | 0.492 |

**Practical value**

Practical value is the value that customer gain in virtual brand community for meeting the practical needs, wants and demands of customer in their daily consumption life, a customer's opinion of a product's value to him or her, it may have little or nothing to do with the product's market price, and depends on the product's ability to satisfy his or her needs or requirements (B .D., 2017). The result of this study showed that the information and knowledge that customer gained in virtual brand community was one of important customer experience values in virtual brand community (factor loading 0.820), the commentaries by other members of the community were helpful (factor loading 0.835), in virtual brand community, solutions to problem and difficult were also powerful (factor loading 0.804).

**Community loyalty**

The study results showed that practical value and social value were considered to be used for the community loyalty with more agree level. They had factor loading of 0.111 and 0.519, which represented the importance for values customer experienced in virtual brand community. But the entertainment value was not considered too much in virtual brand community, it had factor loading of − 0.019, which represented the negative importance for customer experienced and needed in virtual brand community.

**Entertainment value**

The value that virtual brand community supplies to customer in community for meeting the mood needs in terms of entertainment and enjoyment, in other words, the entertainment value is the perceived value related to enjoyment and fun seeking (Yung, 2015). The result of this study showed that customer's engaging in the virtual community was high level of entertainment (factor lading 0.748), customer could be free from press and felt relax in virtual community (factor loading 0.793), in the virtual brand community, customer got high level of happy mood (factor loading 0.775).

**Social value**

The relative importance that people place on the changes they experience in their lives. Some, but not all of this value is captured in market prices. It is important to consider and measure this social value from the perspective of those affected by an organization's work (S.P., 2016). The result of this study indicated that customer experienced social value in virtual brand community by means of high quality of friendship (factor loading 0.707), fruitful feeling (factor loading 0.776), and high level of self-image improvement (factor loading 0.805).

**Community loyalty**

In virtual brand community, customer loyalty and brand loyalty were consisted of the scope of customer loyalty (Zhang & Fang, 2010), on condition that customer were loyal to the virtual brand community after gaining the practical and social values, customer would like to make positive commentary to the virtual community strongly (factor loading 0.778), the customer would be more loyal to the community (0.827), and would put the community to the priority for participation (0.779).

**Brand loyalty**

As described chapter one, brand loyalty is defined as positive feelings towards a brand and dedication to purchase the same product or service repeatedly now and in the future from the same brand, regardless of a competitor's actions or changes in the environment, it can also be demonstrated with other behaviors such as positive word-of-mouth advocacy, brand loyalty is where an individual buys products from the same manufacturer repeatedly rather than from other suppliers (Pauwels & Mogos, 2013). The result of this study showed that brand loyalty could be showed by means of higher preference to the same types of product and service brands (factor loading 0.831), customer would like to recommend this brand to others (factor loading 0.836), which reflected the positive word-of-mouth, customer also felt more close to the brand (factor lading 0.742), lastly, customer would like to buy the brand repeatedly and continuously (factor loading 0.849) (See table 43).

Table 43: Factor loading for the measurement model of brand loyalty in virtual brand community (n=538)

| Factors | Factor loading | | | | |
|---|---|---|---|---|---|
| | Practical Value (PV) | Entertainment Value (EV) | Social Value (SV) | Community Loyalty (CL) | Brad Loyalty (BL) |
| PV1 | 0.820 | | | | |
| PV2 | 0.835 | | | | |
| PV3 | 0.804 | | | | |
| EV1 | | 0.748 | | | |
| EV2 | | 0.793 | | | |
| EV3 | | 0.775 | | | |
| SV1 | | | 0.707 | | |
| SV2 | | | 0.776 | | |
| SV3 | | | 0.805 | | |
| CL1 | | | | 0.778 | |
| CL2 | | | | 0.827 | |
| CL3 | | | | 0.779 | |
| BL1 | | | | | 0.831 |
| BL2 | | | | | 0.836 |
| BL3 | | | | | 0.742 |
| BL4 | | | | | 0.849 |

**Hypotheses testing**

The second objective of this study was to study and develop the brand model for brand marketing strategies of Thailand private university toward Chinese from perspectives of customer experience value influencing brand loyalty in virtual brand community. To support testing of the model and to answer the research questions, several hypotheses have been developed and described below:

**H1: Practical value (PV) has positive influence on community loyalty (CL)**

**H2: Entertainment value (EV) has positive influence on community loyalty (CL)**

**H3: Social value (SV) has positive influence on community loyalty (CL)**

**H4: Practical value (PV) has positive influence on brand loyalty (BL)**

**H5: Entertainment value (EV) has positive influence on brand loyalty (BL)**

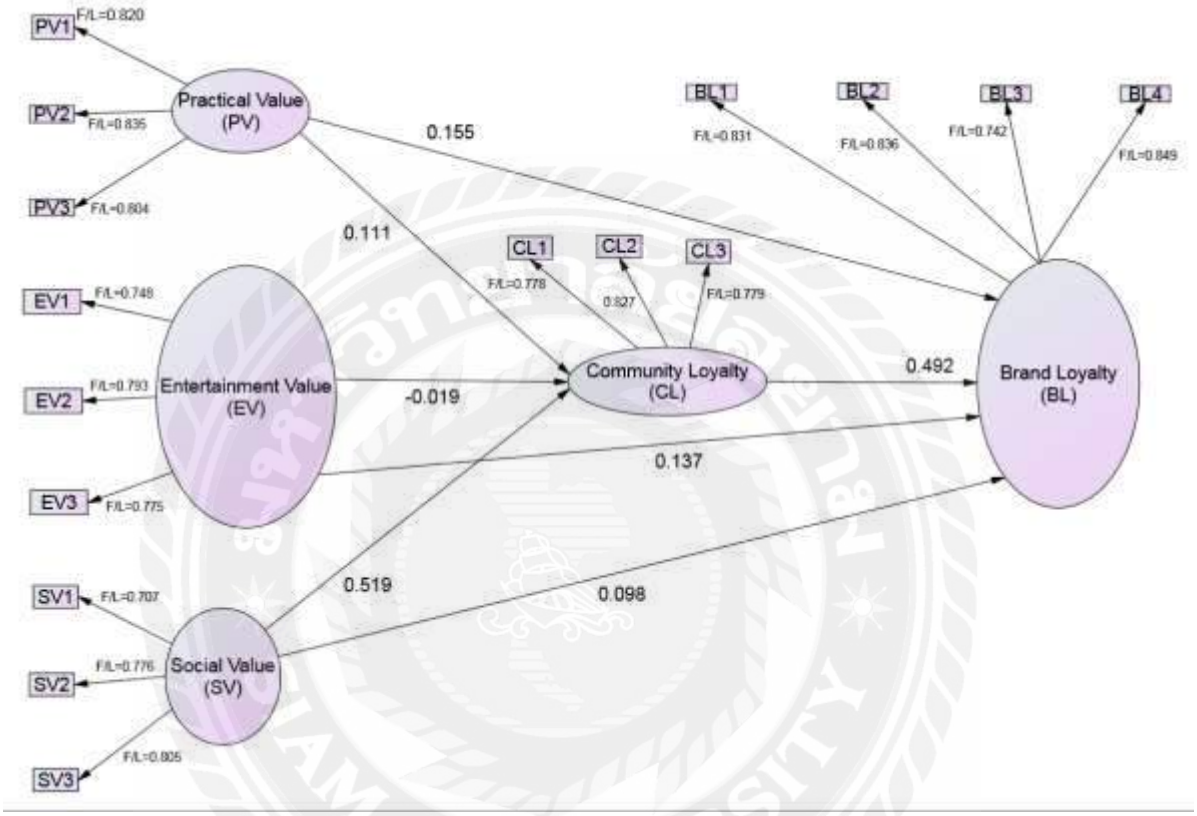
**H6: Social value (SV) has positive influence on brand loyalty (BL)**

**H7: Community loyalty (CL) has positive influence on brand loyalty (BL)**

The seven hypotheses were tested by using a structural equation modeling method. The results indicated that 6 (H1,H3,H4,H5,H6,H7) from 7 hypotheses were statistically significant in the direction as expected, practical value (PV) has positive influence to community loyalty (CL) ($\beta$=0.111), social value (SV) has positive influence to community loyalty (CL) ($\beta$=0.519), practical value (PV) has positive influence to brand loyalty (BL)($\beta$=0.155), entertainment value (EV) has positive influence to brand loyalty (BL) ($\beta$=0.137), social value (SV) has positive influence to brand loyalty (BL) ($\beta$=0.098), community loyalty (CL) has positive influence to brand loyalty (BL) ($\beta$=0.492). But, entertainment value (EV) has negative influence to community loyalty (CL) ($\beta$= − 0.019)(see figure 32).

In short there were 6 paths were statistically significant and hypotheses were accepted, 1 path was not statistically significant, and the hypotheses was rejected. Furthermore, the results of hypotheses testing, and its implication were discussed separately as follows.

Figure 32: A parsimonious model of brand loyalty in virtual brand community




**H1: Practical value (PV) has positive influence to community loyalty (CL)**

The practical value had positive influence to community loyalty (standard parameter estimate= 0.111, t-value = 2.208*), which is consistent with expectation. The study showed that the practical value of customer experienced in virtual brand community had a significant effect on community loyalty in virtual brand community. The more practical value gained by customer, the higher level of loyalty the customer had to the virtual brand community. This result supports that

information value, knowledge and any other practical values could be the element to enforce the loyalty to brand community on internet.

**H2: Entertainment value (EV) has negative influence on community loyalty (CL)**

There was a strong negative relationship between the entertainment value and community loyalty, entertainment value had strong negative influence to community loyalty (standard parameter estimate = ¯0.019, t-value = ¯0.348), which is inconsistent with the expectation. The result of this study indicated that in virtual brand community, the aims and targets of customer were not entertainment, in other words, the more entertainment element the company designed in virtual brand community, the less the customer log in the virtual brand community.

**H3: The social value (SV) has positive influence to community loyalty (CL)**

There strong positive relationship between social value and community loyalty (standard parameter estimate = 0.519, t-value = 9.304***), which is consistent with expectation and previous findings (Wei, 2013). The more social value, such as friendship, social issue engagement customer gained in virtual brand community, which drives the customer loyalty virtual brand community.

**H4: Practical value (PV) has positive influence to Brand loyalty (BL)**

There was a significant and strong relationship between practical value and brand loyalty, in virtual brand community, the brand loyalty was positively influenced by practical value (standard parameter estimates = 0.155, t-value =0.477***), which was consistent with the expectations.

**H5: Entertainment value (EV) has positive influence on Brand loyalty (BL)**

In virtual brand community, there was a significant relationship between entertainment value and brand loyalty, entertainment value influenced brand loyalty positively (parameter standard estimate =0.137, t-value = 2.850*), which is consistent with the expectations.

**H6: Social value (SV) has positive influence on Brand loyalty (BL)**

There was a significant relationship between social value and brand loyalty, in virtual brand community, the social value influenced brand loyalty positively (standard parameter estimate = 0.098, t-value =1.688*), which is consistent with the expectations.

**H7: Community loyalty (CL) has positive influence on brand loyalty (BL)**

There was a strong and significant relationship between community loyalty and brand loyalty, in virtual brand community, brand loyalty was influenced by community loyalty (standard parameter estimate = 0.492, t-value = 8.689***), which is consistent with the expectation and previous findings (Zhang & Ren, 2012) (see table 44).

Table 44: Summary of hypothesis testing results (n=538)

| H | From | to | Brand loyalty model | | Hypotheses support |
|---|---|---|---|---|---|
| | | | Standardized estimate | t-value | |
| H1 | PV | CL | 0.111 | 2.208* | Accepted |
| H2 | EV | CL | -0.019 | — 0.348 | **Rejected** |
| H3 | SV | CL | 0.519 | 9.304*** | Accepted |
| H4 | PV | BL | 0.155 | 3.477*** | Accepted |
| H5 | EV | BL | 0.137 | 2.850* | Accepted |
| H6 | SV | BL | 0.098 | 1.688* | Accepted |
| H7 | CL | BL | 0.492 | 8.689*** | Accepted |

***p<0.001, *p<0.05

**Theoretical contributions**

This research provides empirical testing of relationships have not been subjected to empirical testing in the past. Based on the findings, contributions were highlighted in this section.

**Develop an integrated model with empirical testing**

By taking an integrated approach, the largest theoretical contribution of this study is conceptual refinement, operation, measurement development, and testing of three dimensions of customer experience value, including practical value, entertainment value, social value and two dimensions of customer loyalty, including community loyalty and brand loyalty for examine customer response of brand loyalty and community loyalty in virtual brand community. This study included demography, personal characteristics and the process why and how customer loyalty was developed in virtual brand community.

**Explore the important level of each values that customer experienced in virtual brand community**

This study was the first one that investigated cues in three different perspectives of customer experience value, including practical value, entertainment value and social value that customer gained in virtual brand community, furthermore, this study was the first one that investigated the customer loyalty by dividing into community loyalty and brand loyalty in virtual brand community. The result stated practical value and social value framed significant factor loading to community loyalty, but entertainment value could not be the positive driver to community loyalty, which reflected that customer need practical and social value in virtual community. In addition, practical value, entertainment value and social value framed significant and high factor lading to brand loyalty in virtual brand community, and community loyalty framed a very high factor loading to brand loyalty. This study results showed that in virtual brand community, community loyalty could be driver to brand loyalty.

In virtual brand community, entertainment might be more attractive to customer, and might be the elements leading more attention, but the results of this study showed that entertainment value had negative influence on community loyalty and low level of positive influence to brand loyalty. This study founded that practical and social value should be deemed as more important components of customer experience values in virtual brand community.

**Marketing Management implications**

The third objective of this study was to provide a guidance of practicable brand marketing strategies for Thailand private university toward Chinese from perspectives of customer experience value influencing brand loyalty in virtual brand community. The results of

this study indicated that on the one hand customer value, including practical value, entertainment value, social value, drives the brand loyalty in virtual brand loyalty and practical value and social value had positive influence to community loyalty, on the other hand, in virtual brand community, customer loyalty to community could increase and promote customer loyalty to brand.

There are several managerial and operational strategies derived from the empirical study. The managerial implications were classified into four sections as follow:

Practical value, entertainment value, social value, who should be focused on management the virtual brand community? Secondly, how should alliance between customer value and customer loyalty? Thirdly, how does customer brand loyalty create value for target customer? Fourthly, and last point, how customer brand loyalty and customer value drives marketing decision support system in virtual brand community?

**First, what kinds of value that should be focused on in management the virtual brand community?**

The result of this study stated that practical value and social value had positive influence on community loyalty and brand loyalty, but entertainment value had negative influence to community, comparing, entertainment value had positive influence to brand loyalty. Regarding to the findings of this study, practical value, such as information and knowledge should be focused in the course of operating and managing a virtual brand community, even the entertainment value had negative influence to community, entertainment value some time could be more attractive for customer, and entertainment value could be one of the drives to brand loyalty in marketing.

**Secondly, how should alliance between customer value and customer loyalty?**

Customer value is the key to success marketing, firstly, it is the things that consumer needs, wants and demands, secondly, it is the profit that companies get return from consumer as the profit of the companies.

**Thirdly and last point, how customer brand loyalty and customer value drives marketing decision support system in virtual brand community?**

In virtual brand community, customer loyalty includes customer's loyalty to community and customer's loyalty to brand. This research also highlights the relationship between community loyalty and brand loyalty. This research founded that customer's loyalty to virtual community could drive customer's loyalty to the brand in the virtual community.

**Customer value-driven branding marketing strategy: creating value for target customer:**

Susan (2014) founded that a market segment consists of consumers who responded in a similar way to a given set of marketing efforts. In the car market, for example, consumers who want the biggest, most comfortable car regardless of price make up one market segment. Consumers who care mainly about price and operating economy make up another segment. It would be difficult to make one car model that was the first choice of consumers in both segments. Companies are wise to focus their efforts on meeting the distinct needs of individual market segments (see figure 33).

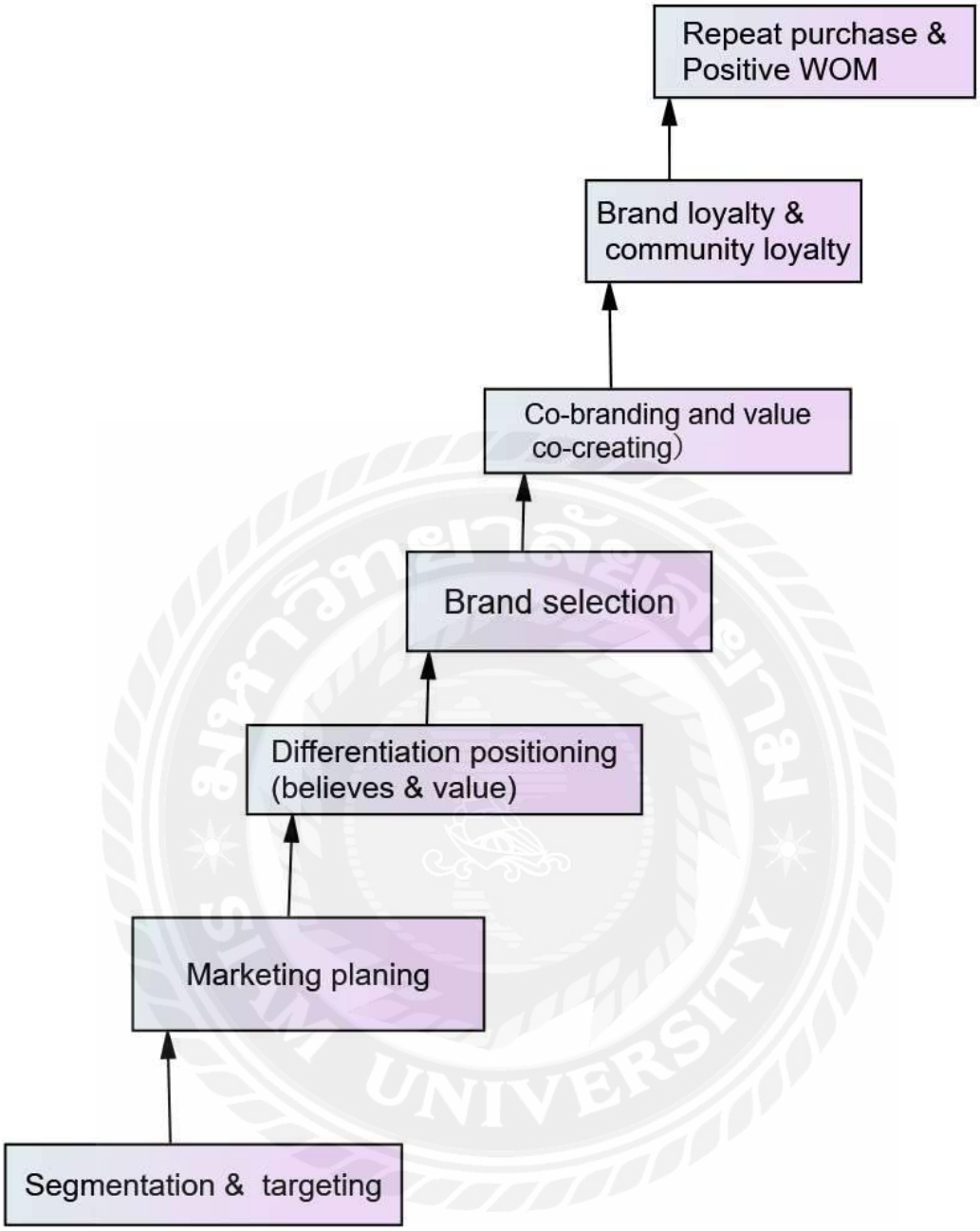



Figure 33: Hierarchy of brand marketing model

Source: Applied from the results of study and Susan (2014)

**Brand marketing implementation**

Brand marketing and operating is the important topic for practitioners and academic. Aaker (1999) argued, brand is the key to future marketing, brand should be the most valuable properties for enterprises. So, brand has become the most important source of value creating, creating the high value brand means to capture the competitive advantage. This research reached results in the light of customer experience values influence to brand loyalty in virtual brand community. The results could be drives to brand management and operation, virtual brand community management and operation for private university of Thailand.

**Firstly, brand marketing orientation logic should be changed: the brand value was co-created**

Vargo & Lusch (2004) argued the marketing logic should be changed from-products oriented to service-oriented, Merz et al. (2009) indicated brand logic also changed from products-oriented to service-oriented, in the new brand marketing logic, brand equity was created by enterprises and stakeholders, and the brand marketing logic was a process, in other words, brand value is a dynamic process for value co-creating.

**Secondly, virtual brand community is the platform for brand value co-creating**

Virtual brand community is a typical value co-creating platform, in the platform, the value was co-created by customer and brand, customer and customer, customer and enterprises, customer and community by means of exchange. In virtual brand community, private university can do different types of value co-creating activities. On the one hand, design and divide the virtual brand community into different topics, promoting the communication and exchange in terms of knowledge, and techniques. On the other hand, to initiate some topics in virtual brand

community, such as the “sustainable development goals & no-plastic action”, “the higher education in 4.0 Thailand”, “belt & road initiative”, “education in digital era”, for encouragement and attraction more members to participate in to the virtual brand community. As an online platform, it is easier to initiate and organize this kind of activities.

**Thirdly, virtual brand community is the platform for customer to experience brand**

The traditional marketing target at meeting customer demands in terms of function of products, but in modern economy, the feeling and experience in brand become the demands and wants fo customer. In market, the products which can meet the concept and experience value of customer will take the top share of market. For branding enterprise, brand experience is a key experience of customer, brand experience means the experience and feeling in the communication on brand. So, to improve and increase customer experience value in brand in communication is critical. Virtual brand community, as the platform for communication between customer and brand, customer and products, customer and enterprise, customer of different brands, all communication focused on brand, so, virtual brand community is the platform where customer gain brand experience.

This research found that practical value, entertainment value and social value were the main customer experience value in virtual brand community, for private universities of Thailand, to initiate practical value and social value for students should be put as tactical and strategic proposal.

**Fourthly, brand equity could be increased in virtual brand community**

This research found that customer values, including practical value, entertainment value and social value were associated with brand loyalty positively. The value co-creating in

virtual brand community drives customers' experience value, so that, on the one hand, private universities of Thailand initiate more value co-creating in virtual brand community for increasing the higher education brand equity, on the other hand, Prahalad Ramaswamy (2004) relationship between members in virtual brand community also affect to customers' experience value, to manage and promote the responsiveness to customer is also a core tactical. It is core tactical to configure and design the landscape of virtual brand community for promoting the customer experience value.

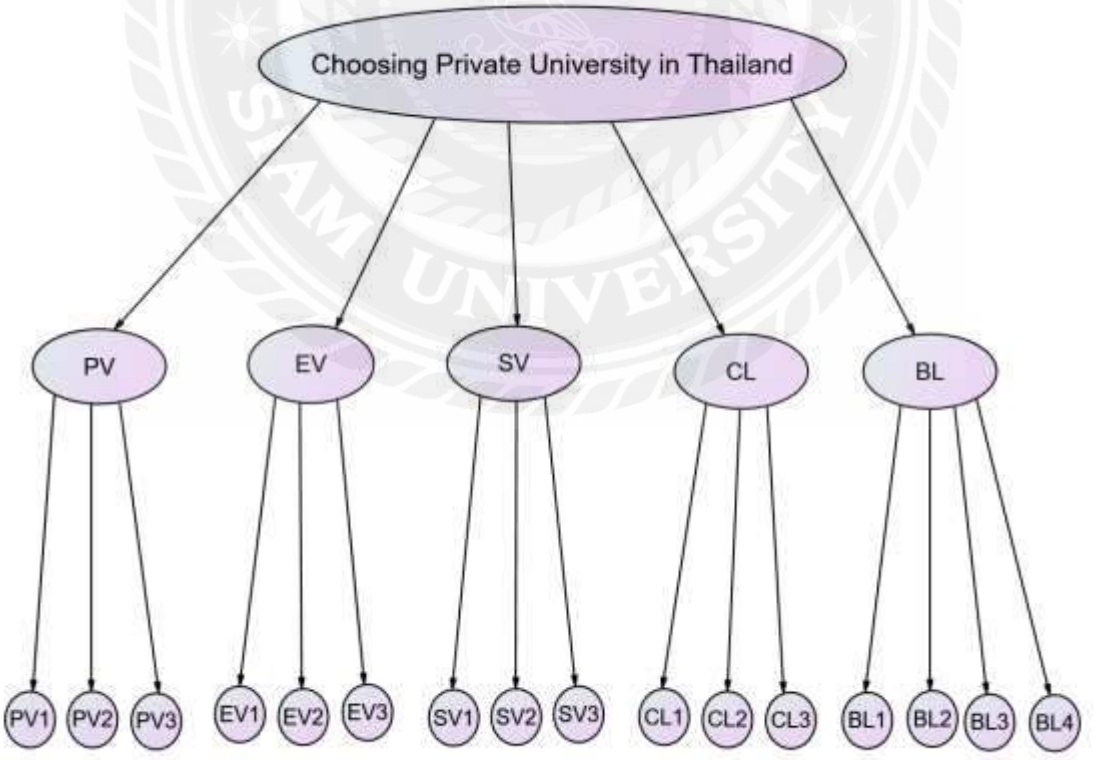
**Marketing Decision Support System Development**

As indicated in chapter three, to select a university is an issue that involves many components or criteria that were assessed (multi criteria) so that in its completion a decision support system with needed multi criterial. AHP (Analytic Hierarchy Process) is one of the methods in the Multi-Criteria Decision Making (MCDM). AHP, a method can assist decision-makers to seek the best in accordance with their targets and interpretation to the problem of selection faced. The dimensions in the model of marketing mix is criteria in choosing private universities (Ragil & Rina, 2019). Marketing mix simultaneously affects the decision to select private universities (Indrayani, 2011). On base of the research result of this study, the marketing decision support system for private university in Thailand was developed, which includes 1), the framework of analytic hierarchy process of choosing private university in Thailand; 2), the evaluation of criteria for choosing private university in Thailand, which was consisted of pairwise comparison of observed and unobserved variables based upon the engine value calculated by SPSS**;** 3), the decision hierarchy of choosing private university in Thailand,(see figure 34).

As indicated in figure 34, three layers in the hierarchy of Multi-criteria Decision

Making, which includes the first layer Choosing Private University in Thailand, the unobserved variables, consisting practical value (PV), entertainment value (EV), social value (SV), community loyalty (CL), and brand loyalty (BL) were consisted in the second layer, the third layer was composed by observed variables, such as information (PV1), commentaries (PV2) and solutions (PV3)were included in practical value (PV), pleasure (EV1), relaxation(EV2) and happiness (EV3) were included in entertainment value (EV), friendship (SV1), self-identification (SV2) and self-confidence (SV3) were composed in social value (SV), positive commentary (CL1), loyal students (CL2) and priority choice (CL3) were included in social value (SV), preferring (BL1), recommendation (BL2), close relationship (BL3) and further study (BL4) were included in brand loyalty (BL).

Figure 34: Analytic Hierarchy Process of Choosing Private University in Thailand




Source: The results of this research

As indicated in Chapter three and chapter four, the Multi-Criteria Decision Making (MCDM) is one of the Analytic Hierarchy Process (AHP). MCDM comprised constructing hierarchy in accordance with the research results, and making pairwise comparison from scale 1 to 9, resulting priority, the analytic hierarchy process comes following,

Figure 45: Pairwise Comparison of unobserved variables

| **A - Importance - or B?** | | | **Equal** | **How much more?** |
|---|---|---|---|---|
| 1 | ◉ PV | or ○ EV | ○ 1 | ○ 2 ○ 3 ○ 4 ○ 5 ◉ 6 ○ 7 ○ 8 ○ 9 |
| 2 | ◉ PV | or ○ SV | ○ 1 | ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ◉ 7 ○ 8 ○ 9 |
| 3 | ◉ PV | or ○ CL | ○ 1 | ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ◉ 8 ○ 9 |
| 4 | ◉ PV | or ○ BL | ○ 1 | ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ◉ 9 |
| 5 | ◉ EV | or ○ SV | ○ 1 | ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ◉ 7 ○ 8 ○ 9 |
| 6 | ◉ EV | or ○ CL | ○ 1 | ○ 2 ○ 3 ◉ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| 7 | ◉ EV | or ○ BL | ○ 1 | ○ 2 ○ 3 ○ 4 ○ 5 ◉ 6 ○ 7 ○ 8 ○ 9 |
| 8 | ◉ SV | or ○ CL | ◉ 1 | ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| 9 | ◉ SV | or ○ BL | ○ 1 | ◉ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| 10 | ◉ CL | or ○ BL | ○ 1 | ◉ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| CR = 7.6% OK | | | | |

AHP Scale: 1- Equal Importance, 3- Moderate importance, 5- Strong importance, 7- Very strong importance, 9- Extreme importance (2,4,6,8 values in-between)

Table 46: Resulting Priorities of unobserved variables

| **Category** | | **Priority** | **Rank** | **(+)** | **(-)** |
|---|---|---|---|---|---|
| 1 | PV | 60.9% | 1 | 39.3% | 39.3% |
| 2 | EV | 23.0% | 2 | 10.6% | 10.6% |
| 3 | SV | 6.0% | 4 | 1.9% | 1.9% |
| 4 | CL | 6.2% | 3 | 0.9% | 0.9% |
| 5 | BL | 3.8% | 5 | 1.4% | 1.4% |

Table 47: Pairwise Comparison Practical Value

| | **PV** | | **Equal** | **How much more?** |
|---|---|---|---|---|
| 1 | ◉ PV1 | ○ PV2 | ○ 1 | ○ 2 ◉ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| 2 | ◉ PV1 | ○ PV3 | ○ 1 | ○ 2 ○ 3 ◉ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| 3 | ◉ PV2 | ○ PV3 | ◉ 1 | ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| CR = 1% OK | | | | |

AHP Scale: 1- Equal Importance, 3- Moderate importance, 5- Strong importance, 7- Very strong importance, 9- Extreme importance (2,4,6,8 values in-between).

Table 48: Resulting Priorities of practical value (PV)

| Cat | | Priority | Rank | (+) | (-) |
|---|---|---|---|---|---|
| 1 | PV1 | 63.4% | 1 | 6.1% | 6.1% |
| 2 | PV2 | 19.2% | 2 | 1.8% | 1.8% |
| 3 | PV3 | 17.4% | 3 | 1.7% | 1.7% |

Table 49: Pairwise Comparison Entertainment Value (EV)

| EV | | | Equal | How much more? |
|---|---|---|---|---|
| 1 | ◉ EV1 | ○ EV2 | ◉ 1 | ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| 2 | ◉ EV1 | ○ EV3 | ○ 1 | ○ 2 ◉ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| 3 | ◉ EV2 | ○ EV3 | ○ 1 | ○ 2 ○ 3 ○ 4 ◉ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| CR = 1.9% OK | | | | |

AHP Scale: 1- Equal Importance, 3- Moderate importance, 5- Strong importance, 7- Very strong importance, 9- Extreme importance (2,4,6,8 values in-between).

Table 50: Resulting Priorities of Entertainment Value (EV)

| Cat | | Priority | Rank | (+) | (-) |
|---|---|---|---|---|---|
| 1 | EV1 | 42.3% | 2 | 5.7% | 5.7% |
| 2 | EV2 | 48.4% | 1 | 6.5% | 6.5% |
| 3 | EV3 | 9.2% | 3 | 1.2% | 1.2% |

Table 51: Pairwise Comparison Social Value (SV)

| SV | | | Equal | How much more? |
|---|---|---|---|---|
| 1 | ◉ SV1 | ○ SV2 | ◉ 1 | ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| 2 | ◉ SV1 | ○ SV3 | ○ 1 | ○ 2 ○ 3 ◉ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| 3 | ◉ SV2 | ○ SV3 | ○ 1 | ○ 2 ◉ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| CR = 1% OK | | | | |

AHP Scale: 1- Equal Importance, 3- Moderate importance, 5- Strong importance, 7- Very strong importance, 9- Extreme importance (2, 4, 6, 8 values in-between).

Table 52: Resulting Priorities of Social Value (SV)

| Cat | | Priority | Rank | (+) | (-) |
|---|---|---|---|---|---|
| 1 | SV1 | 45.8% | 1 | 4.4% | 4.4% |
| 2 | SV2 | 41.6% | 2 | 4.0% | 4.0% |
| 3 | SV3 | 12.6% | 3 | 1.2% | 1.2% |

Table 53: Pairwise Comparison Community Loyalty (CL)

| CL | | | Equal | How much more? |
|---|---|---|---|---|
| 1 | ◉ CL1 | ○ CL2 | ◉ 1 | ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| 2 | ◉ CL1 | ○ CL3 | ○ 1 | ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ◉ 7 ○ 8 ○ 9 |
| 3 | ◉ CL2 | ○ CL3 | ○ 1 | ○ 2 ○ 3 ○ 4 ◉ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| CR = 1% OK | | | | |

AHP Scale: 1- Equal Importance, 3- Moderate importance, 5- Strong importance, 7- Very strong importance, 9- Extreme importance (2,4,6,8 values in-between).

Table 54: Resulting Priorities of Community Loyalty (CL)

| Cat | | Priority | Rank | (+) | (-) |
|---|---|---|---|---|---|
| 1 | CL1 | 48.9% | 1 | 4.7% | 4.7% |
| 2 | CL2 | 44.4% | 2 | 4.3% | 4.3% |
| 3 | CL3 | 6.7% | 3 | 0.6% | 0.6% |

Table 55: Pairwise Comparison Brand Loyalty (BL)

| BL | | | Equal | How much more? |
|---|---|---|---|---|
| 1 | ◉ BL1 | ○ BL2 | ○ 1 | ◉ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| 2 | ◉ BL1 | ○ BL3 | ○ 1 | ○ 2 ○ 3 ○ 4 ○ 5 ◉ 6 ○ 7 ○ 8 ○ 9 |
| 3 | ◉ BL1 | ○ BL4 | ○ 1 | ○ 2 ◉ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| 4 | ◉ BL2 | ○ BL3 | ○ 1 | ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ◉ 8 ○ 9 |
| 5 | ◉ BL2 | ○ BL4 | ○ 1 | ○ 2 ◉ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| 6 | ◉ BL3 | ○ BL4 | ◉ 1 | ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| CR = 5.4% OK | | | | |

AHP Scale: 1- Equal Importance, 3- Moderate importance, 5- Strong importance, 7- Very strong importance, 9- Extreme importance (2,4,6,8 values in-between).

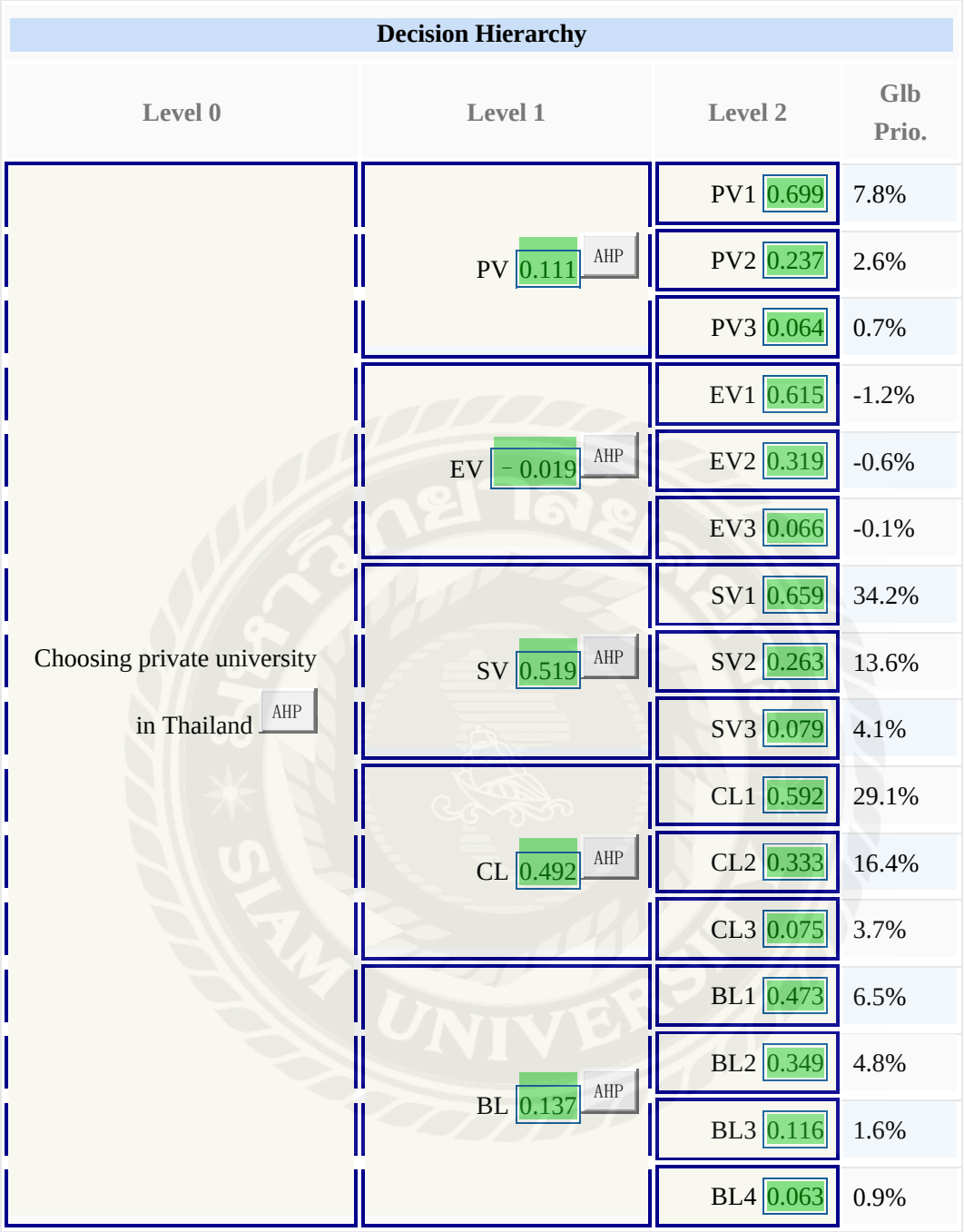
Table 56: Resulting Priorities of Brand Loyalty (BL)

| Cat | | Priority | Rank | (+) | (-) |
|---|---|---|---|---|---|
| 1 | BL1 | 48.3% | 1 | 15.9% | 15.9% |
| 2 | BL2 | 36.7% | 2 | 12.9% | 12.9% |
| 3 | BL3 | 6.3% | 4 | 1.9% | 1.9% |
| 4 | BL4 | 8.7% | 3 | 2.3% | 2.3% |

**Decision Hierarchy of Choosing Private University in Thailand**

In the light of results of this research, the decision hierarchy of choosing private university in Thailand comprised three levels, level one (choosing private university in Thailand), level 2 that is consisted of practical value (PV), entertainment value (EV), social value (SV), community loyalty (CL) and brand loyalty (BL), and level 3 that composed information (PV1), commentaries (PV2) and solutions (PV3)were included in practical value (PV), pleasure (EV1), relaxation(EV2) and happiness (EV3) were included in entertainment value (EV), friendship (SV1), self-identification (SV2) and self-confidence (SV3) were composed in social value (SV), positive commentary (CL1), loyal students (CL2) and priority choice (CL3) were included in social value (SV), preferring (BL1), recommendation (BL2), close relationship (BL3) and further study (BL4) were included in brand loyalty (BL),see figure 35.

Figure 35: Decision hierarchy of choosing private university in Thailand

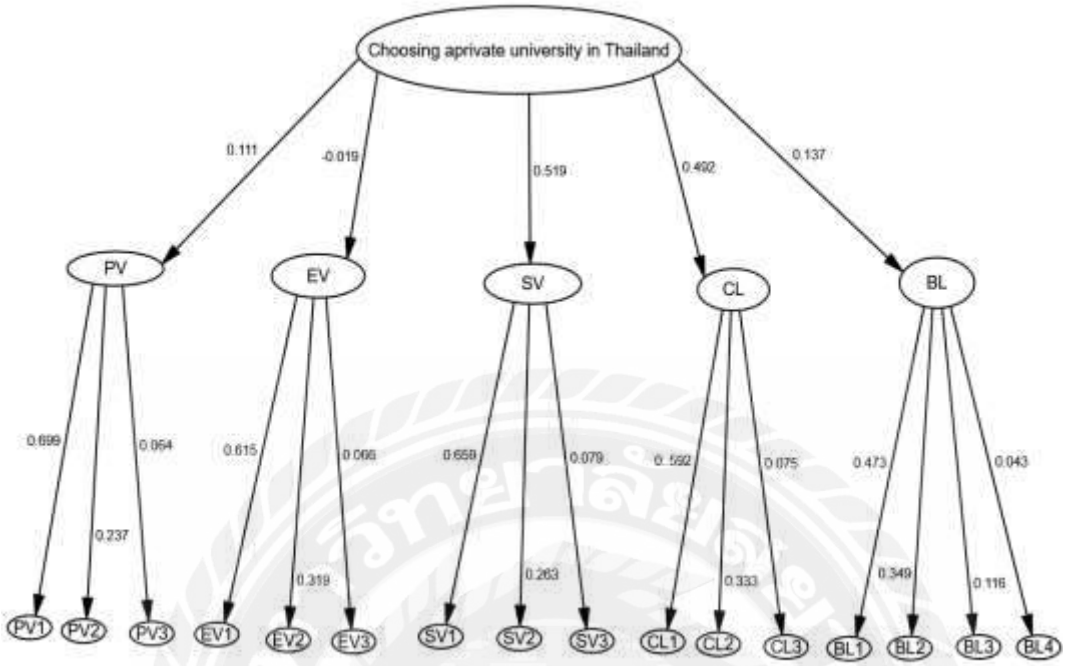



**Decision tree**

The decision tree of choosing private university in Thailand was on account of the results of this research and the decision hierarchy of choosing private university in Thailand, the decision tree includes three layers, the first and the goal of decision is choosing private university

in Thailand, the second layer was consisted of practical value (PV), with a priority value was 0.111, entertainment value (EV) with a priority vale was − 0.019, social value (SV), with a priority value 0.519, community loyalty (CL) with a priority value 0.492 and brand loyalty (BL) with a priority value 0.137 respectively; and the third layer that composed of information (PV1) with a priority value 0.699, commentaries (PV2) with a priority value 0.237 and solutions (PV3) with a priority value 0.064 were included in practical value, pleasure (EV1) with a priority value 0.615, relaxation(EV2) with a priority 0.319 and happiness (EV3) with a priority value 0.066 were included in entertainment value, friendship (SV1) with a priority value 0.659, self-identification (SV2) with a priority value 0.263 and self-confidence (SV3) with a priority value 0.079 were composed in social value, positive commentary (CL1) with a priority value 0.592, loyal students (CL2) with a priority value 0.333 and priority choice (CL3) with a priority value 0.075 were included in social value, preferring (BL1) with a priority value 0.473, recommendation (BL2) with a priority value 0.349, close relationship (BL3) with a priority value 0.116 and further study for degree (BL4) with a priority value 0.063 were included in brand loyalty, see figure 36.

Figure 36: Decision tree of choosing private university in Thailand




**SEM and AHP Combination**

SEM-AHP technique combined two types of questionnaires designed to meet the standard of each technique: Likert scale questionnaire and Saaty scale questionnaire.

Likert scale questionnaire uses the anchors of strongly disagree (1) to strongly agree (5) can support diminishing variability in output, which purposely to check content validity, added to the items envisioned to collect the demographics of participants. Regarding Saaty scale, a scale of absolute judgments that characterize, how much more, one element prevails on another vis-à-vis a given attribute was required for the pairwise comparisons of alternatives, to achieve the weights and later prioritize the alternatives (Glongli,2017).

The research analysis experts to use the combined methodology SEM-AHP in assessing

and prioritizing the various indicator of online brand loyalty perspective adoption in choosing a private university in Thailand.

With the process, SEM application was hired purposely in examining a causative relationship between predictors and adoption behavior (Hair et al., 2006). Being a statistical approach that subsumes and extends regression, correlation, factor analysis and path analysis (Schumacher and Lomas,1996), SEM embodies a pivotal advancement in social work study (Hair et al., 2010). SEM remains emphasized on testing causal processes and hypotheses inherent in the theories as well as extending theory development (Anderson & Gerbing, 1988). The supported relationship in SEM and the significant variables (sub-factors/sub-criteria) will be employed as input to AHP (Glongli,2017).

In contrariwise, AHP will be beneficial in sorting the online brand loyalty perspective of choosing a private university in Thailand, which will be the advantage of the approach to be utilized to offset the drawbacks of the other technique. AHP has enticed the interest of many scholars due predominantly to the useful mathematical properties of the technique (Triantaphyllou and Mann,1995). One of the utmost widely acknowledged and employed multi-criteria problem. On the prime phase, a hierarchy containing the decision elements that remains built grounded on the problem. At least, three level of the hierarchy could be employed such as the general objective of the problems put at the top, multiple criteria that enlighten the alternatives in the central part; and the decision alternatives at the bottoms (Albayrak & Erensal, 2004). The pairwise comparison matrix entails of $n(n-1)/2$ comparisons for $n$ number of elements (Lee et al., 2012) based on the decision maker's views for every pair of criteria and alternatives separately. But, the relative weightage of sub-criteria was achieved and calculated by means of

SEM result. Hence, weights of priorities were computed through a normalization of the pairwise comparison metrics (Gbongli, 2017).

**Decision priority ranking**

The SEM output generated were utilized as inputs for analytic hierarchy process (AHP) for ranking perspective (Ravikumar, Marimuthu, Parthiban & Abudl, 2013). The factors scores （Latent factors） given by the SEM could be used for relative weightage of the criteria (Ravikumar, et al., 2013). The decision priority ranking was computed and achieved by SEM-AHP combination. In perspectives of choosing a private university in Thailand from online brand community, the ranking of unobserved variables the social value ranked the first, community ranked the second, brand loyalty ranked the third, practical value ranked the fourth, see table 57. Regarding to ranking of observed variables, information (PV1) ranked the first, friendship (SV1) ranked the second, detailed as table 58.

Table 57: Ranking of unobserved variable

| Variables | Priority | Ranking |
|---|---|---|
| Practical value (PV) | 0.111 | 4 |
| Entertainment value (EV) | -0.019 | 5 |
| Social value (SV) | 0.519 | 1 |
| Community loyalty (CL) | 0.492 | 2 |
| Brand loyalty (BL) | 0,137 | 3 |

Table 58: Ranking of observable

| Variables | Priority/Weights | Ranking |
|---|---|---|
| Practical value 1: information (PV1) | 0.699 | 1 |
| Practical value 2: commentaries (PV2) | 0.237 | 10 |
| Practical value 3: solutions (PV3) | 0.064 | 15 |
| Entertainment value 1: pleasure (EV1) | 0.615 | 3 |
| Entertainment value 2: relaxation (EV2) | 0.319 | 8 |
| Entertainment value 3: happiness (EV3) | 0.066 | 14 |
| Social value 1: friendship (SV1) | 0.659 | 2 |
| Social Value 2: self-identification (SV2) | 0.263 | 9 |
| Social value 3: self-confidence (SV3) | 0.079 | 12 |
| Community loyalty 1: positive commentary (CL1) | 0.592 | 4 |
| Community loyalty 2: loyal students (CL2) | 0.333 | 7 |
| Community loyalty 3: priority choice (CL3) | 0.075 | 13 |
| Brand loyalty 1: preferring (BL1) | 0.433 | 5 |
| Brand loyalty 2: recommendation (BL2) | 0.349 | 6 |
| Brand loyalty 3: close relationship (BL3) | 0.116 | 11 |
| Brand loyalty 4: further study for degree (BL4) | 0.063 | 16 |

**Research Limitation for the study**

Although this study significantly contributes to the knowledge surrounding brand model

marketing, one important issue deserving discussion is the limitations of the study. In this dissertation, the research method includes five limitations, which offer an opportunity for future study as following:

Firstly, the data of this investigation was derived from perspectives of Chinese students registered in different universities of Bangkok, which emphasized only a specific segment of customers. This narrow focus may limit the generalization to Chinese customers. The sample in this dissertation considered only Chinese students in some universities of Bangkok. Therefore, the structures and characteristics of the customers and their attitude to virtual brand community may be different from whole Chinese customer and the customers from other nations. The results from the sample in this dissertation could not be generalized for the whole population of Chinese customer.

Secondly, the participants were drawn from quota sampling and convenience sampling of students, which were non-profitability sampling techniques. As such, this technique is quite arbitrary, as researchers rely heavily on personal judgment. There are no appropriate statistical for measuring random sampling error from a non-probability sample. Nevertheless, there are occasions when non-probability samples are best suited for the researcher's purpose. This is appropriate when examine theoretical foundations and exploratory research (Zikmund, 2002) which were purposes of this study.

Thirdly, the ability to generalize the findings from this study is limited due to a number of factors. This study focused on few samples of customer experience value and customer loyalty in virtual brand community. As such, the findings may not relate to the other customer values and loyalty. Although comparisons of the selected values in the present study were made

to check for differences in virtual brand community, the example exposed in the survey may not have been strong enough to touch the respondents in the degree of caring more about the customer values and loyalty.

Fourthly, a standardized questionnaire, which was used in this dissertation, may not be applicable in Chinese customer context. Additionally, the subjects could have been asked if they had prior experiences in virtual community that they care about or even if at the present, they would like to log in and purchase the brand products or services in the virtual brand community.

A final limitation is the model itself. While the model fit the data reasonably well, that does not mean it is the only model or the best own to assess the relationships inherent in a virtual brand community. The determinants in the model explain 45.4 percentage of the variance for post exposure attitudes toward customer experience values and customer loyalty in virtual brand community. While these determinants provide some indication of what influences the endogenous variables, clearly there is unexplained variance in this model. In defense of the model, it is parsimonious and does explain a reasonable amount of the variance for endogenous variables given its parsimony. Therefore, while there may be other models with more and greater explanatory power, this model does present a reasonably good conceptualization of components and elements of customer experience value and customer loyalty.

**Future research**

Future research that builds on the findings of this study and overcomes its limitations were recommended. This study focused on three components, which there are various observed variables. It may be useful from a managerial perspective to assess the effect another observed variable has on a relatively unfamiliar. Therefore, this study should be replicated using a number

of customer experiences types to determine whether these results can be extended to other conditions. Similarly, this study should be replicated with a non-student sample to determine whether these findings can be generalized to the overall population.

It is also important from a managerial perspective to assess what effect customer experiences value has on customer loyalty, especially, the brand loyalty. This model has made an important contribution toward the understanding of how customers perceive their values and loyalty in virtual brand community. The next is to expand the model in future research to include customer's overall attitude toward the brand and cognitive knowledge about a brand as the outcome variables and assess what influence customer loyalty has on the important dependent variables.

The findings of this research suggest that practical value and social value are critical factors in facilitating customer loyalty in virtual brand community. Therefore, it is suggested that future research explore these factors in more detail. For example, with regard to perception of fit, qualitative research could provide insight into how customer assess whether there is value in virtual brand community. The research should also explore the use of other types of products and other causes. The study examined the alliance between causes and firm in the service sector.

**Mobile internet virtual brand community**

In digital age, with the development of the mobile internet, the boundaries between online and offline will be cut, so that customers' experience value online and offline will be in the same dimension. Supplying the value that consumer need and want is the key to construct customer loyalty, in other words, the future research should be focused on strengthening the customer experience values by ways of increasing consumer engagement.

This study only explored the virtual community brand community from perspectives of internet in personal computer, which leads this study ignored the most important trends of internet, the mobile internet, in other words, the mobile internet has become reality of internet system, the virtual brand community that installed on mobile internet, definitely, will be the fields for future research.

It is highly recommended that for companies who supply products and services to consumer, especially, for internet companies to construct strategy of customer loyalty on the foundation of the interrelationship among the customer experience value and the virtual brand community.

**Reconfiguration of business ethic in virtual brand community**

Profit-orientation or non- profit orientation is the key ethic of education, in light of the results of this study, an integrated model with the empirical testing should be developed by the private universities of Thailand, focus on practical value and social value in virtual brand community, in order to construct brand loyalty toward Chinese students. The private universities of Thailand plays an important role in higher education of Thailand, meanwhile, the research results can be a contribution for private universities of Thailand, firstly, the practical value, social value should be put in the priority in the virtual brand community, secondly, in light of the results of this study, the entertainment value has negative impact to the community loyalty, so that, private university of Thailand should focus on the core-value of higher education: education is for equipping knowledge to students not for funny activities, thirdly, community loyalty in virtual brand community should be gained by promoting practical value and social value; last not least point, in virtual brand community, constructing brand loyalty of private university of Thailand

toward to Chinese students can be reached on condition that the practical value, social value and community loyalty were concentrated.

**Marketing Decision Support System (MDSS) integrates with Education Decision Support System (EDSS)**

Higher education was featured in intangible and long-term consumption, the elements of the teaching quality, campus facility could be match with the value with customer, this study only propose the marketing decision support system (MDSS) on basic of the research results, which may not meet the practical use for private university in Thailand, the further research could be enlarged and engaged in marketing decision support system (MDSS) plus education decision support system (EDSS) to develop the decision support system for higher education consumer and the higher education service supplier, in other words, marketing decision support system (MDSS) could be developed by matching with the education decision form the perspectives of customer's experience value in virtual brand community and the sides of higher education service supplying.

It was proven that the brand strategies that equipped with information techniques and digital data, which is combined with the factors effecting Chinese students and their family's decision making to target the private universities of Thailand, such as practical value, entertainment value, social value in virtual brand community, and the elements in reality, the internationalization level, the campus, the facilities, the living standard of Thailand and the cultural distance, and the service and management level.

With the development of economy, China has become the top two country of GDP,

studying abroad has been a normal choice of Chinese students and their family, meanwhile, correspondingly private universities in the entire world, especially, the private universities in America, Europe, and ASEAN countries have competing to the huge market, with population of 1.4 billion, and huge high education needs from new generations. But, unquestionably, education, especially, higher education is totally different with any other industry, because of the aiming and function of education is cultivating students, equipping knowledge and technique for student's career, leading students to master critical thinking ability and seek their happiness in their life, more even, high education change the lifestyle of student and change fate of their family. So, high education is an industry with profits in two sides of a coin, for-profit and for-social progressive.

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**Appendix**

**Questionnaire (English version)**

This research is a part of doctoral dissertation in marketing program Siam University, in order to reach the objective of studying the strategies for constructing sustainable loyalty of Chinese students to private universities of Thailand, The questionnaire includes 1) the profile of respondents' personnel index data; 2), customer experience values in virtual brand community, including practical value is consisted of PV1, PV2, PV3, entertainment value is consisted of EV1, EV2, EV3, and social value is consisted of SV1, SV2, SV3; 3), the customer loyalty in virtual brand community, including community loyalty is consisted of CL1, CL2,CL3 and brand loyalty is consisted of BL1,BL2 and BL3. The questionnaire is equipped with "Likert" questionnaire approach, including the five aspects of the perceptions ranging from 1 to 5 as follows; 1) strongly agree, 2) more agree, 3) moderate, 4) less agree, and 5) strongly disagree.

**Firstly, profile of respondents' personnel index data**

The personnel characteristics, please mark ✓ to the item suited to you

**Gender:**

(  )1. Male  (  ) Female

**Age:**

(  ) Under 18  (  ) 19 to 23 years old

(  ) 24 to 25 years old  (  ) more than 26 years old

**Hours of surfing on internet per-week (hours)**

( ) less than 5 hours ( ) 6 to 15 hours,

( ) 16 to 25 hours ( ) Higher than 26 hours.

**Times in virtual community per-week**

( ) Less than 3 times ( ) 4 to 8 times ( ) More than 8 hours.

**Second section: Firstly,** measurements to variables, the variables include customer experience value that is consisted of practical value, entertainment value, social value, and the customer loyalty in virtual brand community which comprise community loyalty and brand loyalty, please mark ✓ under the items suited to you.

**Secondly** the constructs to customer experience value, totally, 9 observed variables are as the indicators to customer experience value, among them, 3 variables are constructs of practical value, enjoyable value and social value, respectively.

| **Practical value** | Strongly agree... strongly disagree → | | | | |
|---|---|---|---|---|---|
| | 5 | 4 | 3 | 2 | 1 |
| I gain information and knowledge about Thailand universities from other members in community (PV1). | | | | | |
| The commentaries and recommendation to by community members help me to entrance university of Thailand (PV2). | | | | | |
| I get solutions to my difficulties related to make choice of course, and program in university of Thailand (PV3). | | | | | |
| **Entertainment value** | Strongly agree... strongly disagree → | | | | |
| | 5 | 4 | 3 | 2 | 1 |
| I get pleasure after engaging in the community in my free time (EV1). | | | | | |
| I get relaxation from heavy pressure in offline by playing games set in the community (EV2). | | | | | |
| I get happy mood in the community (EV3). | | | | | |

| **Social value** | Strongly agree... strongly disagree → | | | | |
|---|---|---|---|---|---|
| | 5 | 4 | 3 | 2 | 1 |
| I made new friendship in the community of this university (SV1). | | | | | |
| I get self-identification by helping other students to solve their difficulties in the community (SV2). | | | | | |
| I feel more self-confidence in the community (SV3). | | | | | |

**Thirdly,** the constructs to customer loyalty in virtual brand community, totally, 7 observed variables are as the indicators to customer loyalty in virtual brand community, among them, 3 variables are constructs to community loyalty variables are constructs to brand loyalty, respectively.

| **Community loyalty** | Strongly agree... strongly disagree → | | | | |
|---|---|---|---|---|---|
| | 5 | 4 | 3 | 2 | 1 |
| I make positive commentary to the community of the selected university in Thailand (CL1). | | | | | |
| I am the loyal student of the university community in Thailand (CL2). | | | | | |
| This community of university is my priority in Thailand (CL3). | | | | | |
| **Brand loyalty** | Strongly agree... strongly disagree → | | | | |
| | 5 | 4 | 3 | 2 | 1 |
| Comparing with another universities of Thailand brands, I prefer the elected university I entranced (BL1). | | | | | |
| I recommend the selected university in Thailand to my friends (BL2). | | | | | |
| I feel close to the selected university in Thailand (BL3). | | | | | |
| I will apply for higher degree and further study in the selected university in Thailand (BL4). | | | | | |

Notes for Group (Group number 1)

The model is recursive.

Sample size = 538

Variable Summary (Group number 1)

Your model contains the following variables (Group number 1)

Observed, endogenous variables

PV3
PV2
PV1
EV3
EV2
EV1
SV3
SV2
SV1
CL1
CL2
CL3
BL1
BL2
BL3
BL4

Unobserved, endogenous variables

Brand loyalty
Community loyalty

Unobserved, exogenous variables

Practical value
e3
e2
e1
e6
e5
e4
Social value
e9
e8
e7

e10
e11
e12
e13
e14
e15
e16
Entertainment value
r2
r1

**Variable counts (Group number 1)**

| | |
|---|---|
| Number of variables in your model: | 39 |
| Number of observed variables: | 16 |
| Number of unobserved variables: | 23 |
| Number of exogenous variables: | 21 |
| Number of endogenous variables: | 18 |

**Parameter Summary (Group number 1)**

| | Weights | Covariances | Variances | Means | Intercepts | Total |
|---|---|---|---|---|---|---|
| Fixed | 23 | 0 | 0 | 0 | 0 | 23 |
| Labeled | 18 | 18 | 21 | 0 | 0 | 57 |
| Unlabeled | 0 | 2 | 0 | 0 | 16 | 18 |
| Total | 41 | 20 | 21 | 0 | 16 | 98 |

Assessment of normality (Group number 1)

| Variable | min | max | skew | c.r. | kurtosis | c.r. |
|---|---|---|---|---|---|---|
| BL4 | 1.000 | 5.000 | -.258 | -2.446 | -.176 | -.832 |
| BL3 | 1.000 | 5.000 | -.583 | -5.520 | .074 | .351 |
| BL2 | 1.000 | 5.000 | -.681 | -6.453 | .729 | 3.454 |
| BL1 | 1.000 | 5.000 | -.662 | -6.268 | .419 | 1.986 |
| CL3 | 1.000 | 5.000 | -.407 | -3.858 | -.281 | -1.333 |
| CL2 | 1.000 | 5.000 | -.183 | -1.730 | -.495 | -2.344 |
| CL1 | 1.000 | 5.000 | -.129 | -1.222 | -.627 | -2.967 |
| SV1 | 1.000 | 5.000 | -.208 | -1.971 | -.684 | -3.238 |
| SV2 | 1.000 | 5.000 | -.179 | -1.695 | -.847 | -4.012 |
| SV3 | 1.000 | 5.000 | -.540 | -5.114 | -.025 | -.120 |
| EV1 | 1.000 | 5.000 | -.588 | -5.571 | .110 | .522 |
| EV2 | 1.000 | 5.000 | -.672 | -6.363 | .849 | 4.020 |
| EV3 | 1.000 | 5.000 | -.320 | -3.034 | -.235 | -1.112 |
| PV1 | 1.000 | 5.000 | -.530 | -5.021 | -.339 | -1.603 |
| PV2 | 1.000 | 5.000 | -.578 | -5.475 | -.262 | -1.239 |
| PV3 | 1.000 | 5.000 | -.724 | -6.853 | .156 | .738 |
| Multivariate | | | | | 92.654 | 44.773 |

Observations farthest from the centroid (Mahalanobis distance) (Group number 1)

| Observation number | Mahalanobis d-squared | p1 | p2 |
|---|---|---|---|
| 350 | 95.583 | .000 | .000 |
| 246 | 64.420 | .000 | .000 |
| 294 | 61.962 | .000 | .000 |
| 303 | 61.614 | .000 | .000 |
| 236 | 57.940 | .000 | .000 |
| 7 | 53.662 | .000 | .000 |
| 232 | 49.515 | .000 | .000 |
| 208 | 48.277 | .000 | .000 |
| 259 | 47.422 | .000 | .000 |
| 210 | 46.658 | .000 | .000 |
| 199 | 46.507 | .000 | .000 |
| 235 | 46.479 | .000 | .000 |
| 513 | 46.152 | .000 | .000 |
| 426 | 41.163 | .001 | .000 |
| 448 | 41.083 | .001 | .000 |
| 475 | 41.083 | .001 | .000 |
| 226 | 40.773 | .001 | .000 |
| 367 | 40.735 | .001 | .000 |
| 408 | 40.407 | .001 | .000 |
| 503 | 39.646 | .001 | .000 |
| 359 | 39.392 | .001 | .000 |
| 157 | 38.792 | .001 | .000 |
| 376 | 38.668 | .001 | .000 |
| 254 | 38.181 | .001 | .000 |
| 228 | 38.180 | .001 | .000 |
| 505 | 37.995 | .002 | .000 |
| 163 | 37.947 | .002 | .000 |
| 520 | 37.722 | .002 | .000 |
| 419 | 37.081 | .002 | .000 |
| 229 | 36.666 | .002 | .000 |
| 3 | 35.752 | .003 | .000 |
| 336 | 35.259 | .004 | .000 |
| 521 | 35.211 | .004 | .000 |
| 421 | 34.915 | .004 | .000 |
| 249 | 34.877 | .004 | .000 |

| Observation number | Mahalanobis d-squared | p1 | p2 |
|---|---|---|---|
| 2 | 34.831 | .004 | .000 |
| 439 | 34.220 | .005 | .000 |
| 463 | 33.634 | .006 | .000 |
| 4 | 33.591 | .006 | .000 |
| 278 | 33.095 | .007 | .000 |
| 378 | 32.930 | .008 | .000 |
| 288 | 32.710 | .008 | .000 |
| 240 | 32.670 | .008 | .000 |
| 515 | 32.549 | .008 | .000 |
| 250 | 32.337 | .009 | .000 |
| 537 | 32.330 | .009 | .000 |
| 243 | 32.125 | .010 | .000 |
| 39 | 31.219 | .013 | .000 |
| 321 | 31.009 | .013 | .000 |
| 128 | 30.890 | .014 | .000 |
| 533 | 30.681 | .015 | .000 |
| 353 | 30.426 | .016 | .000 |
| 406 | 30.334 | .016 | .000 |
| 131 | 30.135 | .017 | .000 |
| 469 | 30.023 | .018 | .000 |
| 337 | 29.708 | .020 | .000 |
| 156 | 29.612 | .020 | .000 |
| 466 | 28.199 | .030 | .000 |
| 470 | 28.199 | .030 | .000 |
| 500 | 28.156 | .030 | .000 |
| 169 | 28.078 | .031 | .000 |
| 118 | 28.044 | .031 | .000 |
| 300 | 28.011 | .032 | .000 |
| 231 | 27.969 | .032 | .000 |
| 237 | 27.900 | .032 | .000 |
| 532 | 27.824 | .033 | .000 |
| 149 | 27.668 | .035 | .000 |
| 194 | 27.667 | .035 | .000 |
| 215 | 27.633 | .035 | .000 |
| 404 | 27.575 | .036 | .000 |
| 468 | 27.575 | .036 | .000 |
| 496 | 27.575 | .036 | .000 |
| 416 | 27.386 | .037 | .000 |

| Observation number | Mahalanobis d-squared | p1 | p2 |
|---|---|---|---|
| 202 | 27.222 | .039 | .000 |
| 457 | 27.097 | .040 | .000 |
| 72 | 26.975 | .042 | .000 |
| 375 | 26.927 | .042 | .000 |
| 242 | 26.845 | .043 | .000 |
| 204 | 26.817 | .044 | .000 |
| 322 | 26.702 | .045 | .000 |
| 265 | 26.692 | .045 | .000 |
| 9 | 26.346 | .049 | .000 |
| 509 | 26.332 | .050 | .000 |
| 182 | 26.279 | .050 | .000 |
| 166 | 25.819 | .057 | .000 |
| 111 | 25.767 | .057 | .000 |
| 370 | 25.634 | .059 | .000 |
| 287 | 25.461 | .062 | .000 |
| 8 | 25.125 | .068 | .000 |
| 508 | 25.066 | .069 | .000 |
| 221 | 24.813 | .073 | .000 |
| 491 | 24.614 | .077 | .000 |
| 23 | 24.400 | .081 | .000 |
| 108 | 24.262 | .084 | .000 |
| 225 | 24.192 | .085 | .000 |
| 471 | 24.153 | .086 | .000 |
| 492 | 24.069 | .088 | .000 |
| 411 | 24.047 | .088 | .000 |
| 209 | 23.839 | .093 | .000 |
| 115 | 23.733 | .095 | .000 |

Notes for Model (Default model)

Computation of degrees of freedom (Default model)

| | |
|---|---|
| Number of distinct sample moments: | 152 |
| Number of distinct parameters to be estimated: | 51 |
| Degrees of freedom (152 - 51): | 101 |

Result (Default model)

Minimum was achieved
Chi-square = 262.233
Degrees of freedom = 101
Probability level = 0.741

Intercepts: (Group number 1 - Default model)

| | Estimate | S.E. | C.R. | P | Label |
|---|---|---|---|---|---|
| PV3 | 3.825 | .039 | 97.636 | *** | par_36 |
| PV2 | 3.535 | .045 | 78.681 | *** | par_37 |
| PV1 | 3.600 | .043 | 83.401 | *** | par_38 |
| EV3 | 3.729 | .037 | 101.045 | *** | par_39 |
| EV2 | 3.900 | .035 | 110.220 | *** | par_40 |
| EV1 | 3.641 | .041 | 89.085 | *** | par_41 |
| SV3 | 3.366 | .042 | 80.868 | *** | par_42 |
| SV2 | 2.905 | .049 | 59.829 | *** | par_43 |
| SV1 | 3.054 | .049 | 62.276 | *** | par_44 |
| CL1 | 3.106 | .049 | 63.680 | *** | par_45 |
| CL2 | 3.162 | .045 | 70.303 | *** | par_46 |
| CL3 | 3.422 | .044 | 78.133 | *** | par_47 |
| BL1 | 3.784 | .040 | 94.017 | *** | par_48 |
| BL2 | 3.790 | .039 | 96.523 | *** | par_49 |
| BL3 | 3.745 | .041 | 92.391 | *** | par_50 |
| BL4 | 3.480 | .041 | 85.316 | *** | par_51 |

Covariances: (Group number 1 - Default model)

| | | | Estimate | S.E. | C.R. | P | Label |
|---|---|---|---|---|---|---|---|
| Entertainment_value | <--> | Practical_value | .188 | .021 | 9.069 | *** | C9 |
| Entertainment_value | <--> | Social_value | .188 | .021 | 9.069 | *** | C9 |
| Practical_value | <--> | Social_value | .188 | .021 | 9.069 | *** | C9 |
| e9 | <--> | e7 | .022 | .008 | 2.654 | .008 | C4 |
| e8 | <--> | e7 | .279 | .035 | 7.886 | *** | C5 |
| e3 | <--> | e4 | .022 | .008 | 2.654 | .008 | C4 |
| e2 | <--> | e4 | .040 | .013 | 3.128 | .002 | C1 |
| e1 | <--> | e4 | .022 | .008 | 2.654 | .008 | C4 |
| e3 | <--> | e9 | .040 | .013 | 3.128 | .002 | C1 |
| e12 | <--> | e13 | .022 | .008 | 2.654 | .008 | C4 |
| e13 | <--> | e14 | .135 | .014 | 9.852 | *** | par_34 |
| e14 | <--> | e15 | .022 | .008 | 2.654 | .008 | C4 |
| e10 | <--> | e11 | -.001 | .034 | -.025 | .980 | C2 |
| e11 | <--> | e12 | .040 | .013 | 3.128 | .002 | C1 |
| e14 | <--> | e16 | .022 | .008 | 2.654 | .008 | C4 |
| e6 | <--> | e4 | .083 | .023 | 3.567 | *** | par_35 |
| e5 | <--> | e8 | -.004 | .012 | -.383 | .702 | C6 |
| e4 | <--> | e7 | .102 | .021 | 4.874 | *** | C8 |
| e9 | <--> | e8 | -.004 | .012 | -.383 | .702 | C6 |
| e3 | <--> | e1 | -.004 | .012 | -.383 | .702 | C6 |

Correlations: (Group number 1 - Default model)

| | | | Estimate |
|---|---|---|---|
| Entertainment_value | <--> | Practical_value | .389 |
| Entertainment_value | <--> | Social_value | .366 |
| Practical_value | <--> | Social_value | .332 |
| e9 | <--> | e7 | .048 |
| e8 | <--> | e7 | .489 |
| e3 | <--> | e4 | .065 |
| e2 | <--> | e4 | .111 |
| e1 | <--> | e4 | .062 |
| e3 | <--> | e9 | .128 |
| e12 | <--> | e13 | .067 |
| e13 | <--> | e14 | .520 |
| e14 | <--> | e15 | .070 |
| e10 | <--> | e11 | -.002 |
| e11 | <--> | e12 | .107 |
| e14 | <--> | e16 | .089 |
| e6 | <--> | e4 | .245 |
| e5 | <--> | e8 | -.013 |
| e4 | <--> | e7 | .202 |
| e9 | <--> | e8 | -.011 |
| e3 | <--> | e1 | -.015 |

Variances: (Group number 1 - Default model)

| | Estimate | S.E. | C.R. | P | Label |
|---|---|---|---|---|---|
| Practical_value | .532 | .033 | 16.014 | *** | var_b |
| Entertainment_value | .439 | .036 | 12.248 | *** | V2 |
| Social_value | .603 | .047 | 12.821 | *** | V3 |
| r1 | .532 | .033 | 16.014 | *** | var_b |
| r2 | .328 | .014 | 22.641 | *** | var_a |
| e3 | .292 | .019 | 15.103 | *** | V4 |
| e2 | .328 | .014 | 22.641 | *** | var_a |
| e1 | .328 | .014 | 22.641 | *** | var_a |
| e6 | .292 | .019 | 15.103 | *** | V4 |
| e5 | .250 | .013 | 18.709 | *** | var_c |
| e4 | .395 | .037 | 10.573 | *** | V9 |
| e9 | .328 | .014 | 22.641 | *** | var_a |
| e8 | .504 | .037 | 13.557 | *** | V11 |
| e7 | .646 | .050 | 13.018 | *** | V12 |
| e10 | .504 | .037 | 13.557 | *** | V11 |
| e11 | .343 | .041 | 8.311 | *** | V14 |
| e12 | .405 | .037 | 11.018 | *** | V15 |
| e13 | .269 | .022 | 12.313 | *** | V16 |
| e14 | .250 | .013 | 18.709 | *** | var_c |
| e15 | .396 | .029 | 13.835 | *** | V18 |
| e16 | .250 | .013 | 18.709 | *** | var_c |

Minimization History (Default model)

| Iteration | Negative eigenvalues | Condition # | Smallest eigenvalue | Diameter | F | NTries | Ratio |
|---|---|---|---|---|---|---|---|
| 0 | e | 9 | -1.363 | 9999.000 | 5108.596 | 0 | 9999.000 |
| 1 | e | 8 | -.617 | 1.791 | 2279.691 | 19 | .585 |
| 2 | e | 1 | -.687 | .520 | 1306.984 | 6 | .913 |
| 3 | e* | 0 | 2020.227 | .446 | 822.406 | 5 | .781 |
| 4 | e | 0 | 709.153 | .849 | 461.355 | 3 | .000 |
| 5 | e | 0 | 457.416 | .622 | 291.747 | 1 | .967 |
| 6 | e | 0 | 439.382 | .122 | 263.066 | 1 | 1.089 |
| 7 | e | 0 | 418.115 | .017 | 262.235 | 1 | 1.033 |
| 8 | e | 0 | 436.459 | .001 | 262.233 | 1 | 1.003 |
| 9 | e | 0 | 428.390 | .000 | 262.233 | 1 | 1.000 |

Model Fit Summary

CMIN

| Model | NPAR | CMIN | DF | P | CMIN/DF |
|---|---|---|---|---|---|
| Default model | 51 | 262.233 | 101 | .000 | 2.596 |
| Saturated model | 152 | .000 | 0 | | |
| Independence model | 32 | 4999.139 | 120 | .000 | 41.659 |

Baseline Comparisons

| Model | NFI Delta1 | RFI rho1 | IFI Delta2 | TLI rho2 | CFI |
|---|---|---|---|---|---|
| Default model | .948 | .938 | .967 | .961 | .967 |
| Saturated model | 1.000 | | 1.000 | | 1.000 |
| Independence model | .000 | .000 | .000 | .000 | .000 |

Parsimony-Adjusted Measures

| Model | PRATIO | PNFI | PCFI |
|---|---|---|---|
| Default model | .842 | .798 | .814 |
| Saturated model | .000 | .000 | .000 |
| Independence model | 1.000 | .000 | .000 |

NCP

| Model | NCP | LO 90 | HI 90 |
|---|---|---|---|
| Default model | 161.233 | 117.152 | 212.990 |
| Saturated model | .000 | .000 | .000 |
| Independence model | 4879.139 | 4651.455 | 5113.488 |

FMIN

| Model | FMIN | F0 | LO 90 | HI 90 |
|---|---|---|---|---|
| Default model | .488 | .300 | .218 | .397 |
| Saturated model | .000 | .000 | .000 | .000 |
| Independence model | 9.309 | 9.086 | 8.662 | 9.522 |

RMSEA

| Model | RMSEA | LO 90 | HI 90 | PCLOSE |
|---|---|---|---|---|
| Default model | .055 | .046 | .063 | .172 |
| Independence model | .275 | .269 | .282 | .000 |

AIC

| Model | AIC | BCC | BIC | CAIC |
|---|---|---|---|---|
| Default model | 364.233 | 367.567 | | |
| Saturated model | 304.000 | 313.938 | | |
| Independence model | 5063.139 | 5065.231 | | |

ECVI

| Model | ECVI | LO 90 | HI 90 | MECVI |
|---|---|---|---|---|
| Default model | .678 | .596 | .775 | .684 |
| Saturated model | .566 | .566 | .566 | .585 |
| Independence model | 9.429 | 9.005 | 9.865 | 9.432 |

HOELTER

| Model | HOELTER .05 | HOELTER .01 |
|---|---|---|
| Default model | 257 | 281 |
| Independence model | 16 | 18 |

Execution time summary

Minimization: .062
Miscellaneous: 1.235
Bootstrap: .000
Total: 1.297

Sample Covariances (Group number 1)

| | BL4 | BL3 | BL2 | BL1 | CL3 | CL2 | CL1 | SV1 | SV2 | SV3 | EV1 | EV2 | EV3 | PV1 | PV2 | PV3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BL4 | .867 | | | | | | | | | | | | | | | |
| BL3 | .520 | .844 | | | | | | | | | | | | | | |
| BL2 | .580 | .499 | .750 | | | | | | | | | | | | | |
| BL1 | .536 | .490 | .631 | .760 | | | | | | | | | | | | |
| CL3 | .467 | .429 | .399 | .409 | 1.002 | | | | | | | | | | | |
| CL2 | .491 | .344 | .359 | .358 | .688 | 1.054 | | | | | | | | | | |
| CL1 | .395 | .317 | .322 | .335 | .615 | .680 | 1.139 | | | | | | | | | |
| SV1 | .331 | .209 | .268 | .227 | .273 | .421 | .442 | 1.263 | | | | | | | | |
| SV2 | .382 | .204 | .296 | .244 | .315 | .476 | .521 | .979 | 1.290 | | | | | | | |
| SV3 | .358 | .236 | .337 | .352 | .347 | .385 | .365 | .616 | .682 | .976 | | | | | | |
| EV1 | .204 | .160 | .192 | .161 | .066 | .132 | .042 | .315 | .217 | .150 | .907 | | | | | |
| EV2 | .182 | .121 | .163 | .162 | .133 | .150 | .052 | .180 | .193 | .198 | .458 | .678 | | | | |
| EV3 | .247 | .163 | .213 | .153 | .144 | .194 | .129 | .266 | .242 | .226 | .561 | .421 | .733 | | | |
| PV1 | .305 | .272 | .290 | .234 | .247 | .230 | .245 | .226 | .224 | .252 | .258 | .209 | .217 | 1.061 | | |
| PV2 | .293 | .246 | .272 | .249 | .192 | .211 | .263 | .283 | .242 | .282 | .276 | .176 | .207 | .753 | 1.160 | |
| PV3 | .249 | .221 | .253 | .239 | .165 | .166 | .171 | .255 | .262 | .302 | .289 | .246 | .241 | .674 | .733 | .925 |

Condition number = 53.351

Eigenvalues

5.792 2.085 1.759 1.342 .965 .549 .438 .378 .366 .317 .314 .279 .263 .237 .214 .109

Determinant of sample covariance matrix = .000

Sample Correlations (Group number 1)

| | BL4 | BL3 | BL2 | BL1 | CL3 | CL2 | CL1 | SV1 | SV2 | SV3 | EV1 | EV2 | EV3 | PV1 | PV2 | PV3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BL4 | 1.00 | | | | | | | | | | | | | | | |
| BL3 | .608 | 1.00 | | | | | | | | | | | | | | |
| BL2 | .720 | .627 | 1.00 | | | | | | | | | | | | | |
| BL1 | .661 | .611 | .836 | 1.00 | | | | | | | | | | | | |
| CL3 | .501 | .466 | .460 | .468 | 1.00 | | | | | | | | | | | |
| CL2 | .514 | .365 | .404 | .400 | .670 | 1.00 | | | | | | | | | | |
| CL1 | .398 | .323 | .348 | .360 | .576 | .620 | 1.00 | | | | | | | | | |
| SV1 | .316 | .202 | .275 | .232 | .242 | .365 | .369 | 1.00 | | | | | | | | |
| SV2 | .361 | .196 | .301 | .246 | .277 | .408 | .430 | .767 | 1.00 | | | | | | | |
| SV3 | .389 | .260 | .394 | .409 | .351 | .380 | .346 | .555 | .607 | 1.00 | | | | | | |
| EV1 | .230 | .182 | .233 | .193 | .069 | .135 | .041 | .294 | .201 | .159 | 1.00 | | | | | |
| EV2 | .237 | .160 | .229 | .226 | .162 | .178 | .059 | .195 | .206 | .244 | .585 | 1.00 | | | | |
| EV3 | .310 | .208 | .287 | .205 | .168 | .221 | .141 | .276 | .249 | .267 | .688 | .597 | 1.00 | | | |
| PV1 | .318 | .287 | .325 | .260 | .239 | .218 | .223 | .195 | .192 | .248 | .263 | .246 | .246 | 1.00 | | |
| PV2 | .293 | .249 | .292 | .265 | .178 | .191 | .229 | .234 | .198 | .265 | .269 | .199 | .224 | .679 | 1.00 | |
| PV3 | .278 | .250 | .304 | .285 | .171 | .168 | .167 | .236 | .240 | .318 | .315 | .311 | .292 | .680 | .708 | 1.00 |

Condition number = 42.190

Eigenvalues

5.996 2.166 1.670 1.493 1.006 .578 .448 .401 .399 .358 .324 .286 .281 .248 .205 .142

Sample Means (Group number 1)

| | BL4 | BL3 | BL2 | BL1 | CL3 | CL2 | CL1 | SV1 | SV2 | SV3 | EV1 | EV2 | EV3 | PV1 | PV2 | PV3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 3.480 | 3.745 | 3.790 | 3.784 | 3.422 | 3.162 | 3.106 | 3.054 | 2.905 | 3.366 | 3.641 | 3.900 | 3.729 | 3.600 | 3.535 | 3.825 |

Implied Covariances (Group number 1 - Default model)

| | BL4 | BL3 | BL2 | BL1 | CL3 | CL2 | CL1 | SV1 | SV2 | SV3 | EV1 | EV2 | EV3 | PV1 | PV2 | PV3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BL4 | .893 | | | | | | | | | | | | | | | |
| BL3 | .559 | .882 | | | | | | | | | | | | | | |
| BL2 | .632 | .552 | .828 | | | | | | | | | | | | | |
| BL1 | .622 | .541 | .724 | .870 | | | | | | | | | | | | |
| CL3 | .392 | .340 | .371 | .401 | 1.030 | | | | | | | | | | | |
| CL2 | .427 | .371 | .405 | .413 | .722 | 1.086 | | | | | | | | | | |
| CL1 | .436 | .379 | .413 | .421 | .695 | .757 | 1.277 | | | | | | | | | |
| SV1 | .302 | .263 | .287 | .292 | .349 | .380 | .388 | 1.291 | | | | | | | | |
| SV2 | .329 | .286 | .312 | .318 | .379 | .413 | .421 | .980 | 1.266 | | | | | | | |
| SV3 | .292 | .254 | .277 | .283 | .337 | .368 | .375 | .646 | .673 | .930 | | | | | | |
| EV1 | .192 | .167 | .182 | .186 | .120 | .131 | .133 | .310 | .226 | .201 | .897 | | | | | |
| EV2 | .176 | .153 | .167 | .171 | .110 | .120 | .122 | .191 | .203 | .184 | .461 | .672 | | | | |
| EV3 | .180 | .156 | .171 | .174 | .112 | .122 | .125 | .195 | .212 | .188 | .553 | .431 | .731 | | | |
| PV1 | .248 | .215 | .235 | .240 | .179 | .195 | .199 | .219 | .238 | .212 | .248 | .207 | .212 | 1.001 | | |
| PV2 | .263 | .228 | .249 | .254 | .190 | .207 | .211 | .232 | .252 | .224 | .280 | .220 | .224 | .713 | 1.084 | |
| PV3 | .220 | .192 | .209 | .213 | .159 | .173 | .177 | .195 | .212 | .228 | .223 | .184 | .188 | .594 | .634 | .824 |

Implied Correlations (Group number 1 - Default model)

| | BL4 | BL3 | BL2 | BL1 | CL3 | CL2 | CL1 | SV1 | SV2 | SV3 | EV1 | EV2 | EV3 | PV1 | PV2 | PV3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BL4 | 1.000 | | | | | | | | | | | | | | | |
| BL3 | .630 | 1.000 | | | | | | | | | | | | | | |
| BL2 | .735 | .646 | 1.000 | | | | | | | | | | | | | |
| BL1 | .705 | .617 | .853 | 1.000 | | | | | | | | | | | | |
| CL3 | .408 | .357 | .402 | .423 | 1.000 | | | | | | | | | | | |
| CL2 | .434 | .379 | .427 | .425 | .682 | 1.000 | | | | | | | | | | |
| CL1 | .408 | .357 | .401 | .399 | .606 | .643 | 1.000 | | | | | | | | | |
| SV1 | .282 | .246 | .277 | .276 | .302 | .321 | .302 | 1.000 | | | | | | | | |
| SV2 | .309 | .270 | .304 | .303 | .332 | .352 | .331 | .767 | 1.000 | | | | | | | |
| SV3 | .321 | .280 | .316 | .314 | .344 | .366 | .344 | .589 | .620 | 1.000 | | | | | | |
| EV1 | .215 | .188 | .212 | .211 | .125 | .132 | .125 | .288 | .212 | .220 | 1.000 | | | | | |
| EV2 | .228 | .199 | .224 | .223 | .132 | .140 | .132 | .205 | .220 | .233 | .593 | 1.000 | | | | |
| EV3 | .223 | .195 | .219 | .218 | .129 | .137 | .129 | .200 | .220 | .228 | .682 | .614 | 1.000 | | | |
| PV1 | .262 | .229 | .258 | .257 | .176 | .187 | .176 | .192 | .211 | .219 | .262 | .253 | .247 | 1.000 | | |
| PV2 | .267 | .233 | .263 | .261 | .179 | .191 | .179 | .196 | .215 | .223 | .283 | .258 | .252 | .685 | 1.000 | |
| PV3 | .257 | .225 | .253 | .252 | .173 | .183 | .172 | .189 | .207 | .260 | .260 | .248 | .242 | .654 | .671 | 1.000 |

Residual Covariances (Group number 1 - Default model)

| | BL4 | BL3 | BL2 | BL1 | CL3 | CL2 | CL1 | SV1 | SV2 | SV3 | EV1 | EV2 | EV3 | PV1 | PV2 | PV3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BL4 | -.027 | | | | | | | | | | | | | | | |
| BL3 | -.039 | -.038 | | | | | | | | | | | | | | |
| BL2 | -.052 | -.054 | -.078 | | | | | | | | | | | | | |
| BL1 | -.085 | -.051 | -.093 | -.110 | | | | | | | | | | | | |
| CL3 | .075 | .089 | .028 | .008 | -.028 | | | | | | | | | | | |
| CL2 | .064 | -.027 | -.046 | -.055 | -.033 | -.032 | | | | | | | | | | |
| CL1 | -.040 | -.062 | -.091 | -.086 | -.080 | -.077 | -.138 | | | | | | | | | |
| SV1 | .029 | -.054 | -.019 | -.065 | -.076 | .040 | .054 | -.028 | | | | | | | | |
| SV2 | .053 | -.081 | -.015 | -.074 | -.064 | .063 | .100 | -.001 | .024 | | | | | | | |
| SV3 | .066 | -.018 | .060 | .070 | .010 | .017 | -.010 | -.030 | .009 | .045 | | | | | | |
| EV1 | .011 | -.008 | .010 | -.025 | -.054 | .002 | -.092 | .005 | -.009 | -.051 | .009 | | | | | |
| EV2 | .005 | -.032 | -.004 | -.008 | .023 | .030 | -.071 | -.011 | -.010 | .014 | -.002 | .005 | | | | |
| EV3 | .067 | .007 | .042 | -.021 | .032 | .072 | .004 | .071 | .030 | .038 | .008 | -.010 | .002 | | | |
| PV1 | .057 | .056 | .055 | -.006 | .068 | .035 | .046 | .007 | -.014 | .041 | .010 | .002 | .005 | .061 | | |
| PV2 | .031 | .018 | .023 | -.005 | .003 | .004 | .052 | .051 | -.010 | .057 | -.004 | -.043 | -.018 | .040 | .075 | |
| PV3 | .029 | .030 | .044 | .026 | .006 | -.008 | -.006 | .060 | .051 | .074 | .065 | .062 | .053 | .080 | .099 | .101 |

Standardized Residual Covariances (Group number 1 - Default model)

| | BL4 | BL3 | BL2 | BL1 | CL3 | CL2 | CL1 | SV1 | SV2 | SV3 | EV1 | EV2 | EV3 | PV1 | PV2 | PV3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BL4 | -.487 | | | | | | | | | | | | | | | |
| BL3 | -.869 | -.713 | | | | | | | | | | | | | | |
| BL2 | -1.123 | -1.223 | -1.551 | | | | | | | | | | | | | |
| BL1 | -1.834 | -1.144 | -1.930 | -2.069 | | | | | | | | | | | | |
| CL3 | 1.680 | 2.026 | .646 | .181 | -.442 | | | | | | | | | | | |
| CL2 | 1.383 | -.601 | -1.026 | -1.197 | -.603 | -.488 | | | | | | | | | | |
| CL1 | -.809 | -1.268 | -1.910 | -1.753 | -1.384 | -1.281 | -1.772 | | | | | | | | | |
| SV1 | .594 | -1.138 | -.406 | -1.371 | -1.460 | .753 | .941 | -.361 | | | | | | | | |
| SV2 | 1.108 | -1.718 | -.335 | -1.567 | -1.230 | 1.175 | 1.726 | -.019 | .312 | | | | | | | |
| SV3 | 1.587 | -.436 | 1.512 | 1.712 | .231 | .379 | -.206 | -.540 | .155 | .795 | | | | | | |
| EV1 | .282 | -.198 | .259 | -.654 | -1.293 | .037 | -1.968 | .099 | -.198 | -1.270 | .173 | | | | | |
| EV2 | .160 | -.948 | -.131 | -.242 | .648 | .810 | -1.754 | -.261 | -.241 | .399 | -.057 | .133 | | | | |
| EV3 | 1.884 | .193 | 1.220 | -.583 | .851 | 1.860 | .106 | 1.659 | .716 | 1.032 | .186 | -.280 | .041 | | | |
| PV1 | 1.356 | 1.356 | 1.350 | -.144 | 1.524 | .764 | .929 | .144 | -.274 | .957 | .230 | .042 | .140 | .994 | | |
| PV2 | .700 | .406 | .550 | -.108 | .058 | .085 | 1.010 | .988 | -.192 | 1.294 | -.089 | -1.143 | -.445 | .727 | 1.139 | |
| PV3 | .754 | .788 | 1.206 | .697 | .142 | -.185 | -.133 | 1.328 | 1.127 | 1.896 | 1.702 | 1.872 | 1.526 | 1.703 | 2.005 | 1.999 |

Factor Score Weights (Group number 1 - Default model)

| | BL4 | BL3 | BL2 | BL1 | CL3 | CL2 | CL1 | SV1 | SV2 | SV3 | EV1 | EV2 | EV3 | PV1 | PV2 | PV3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Social_value | .018 | .010 | .010 | .010 | .026 | .036 | .027 | .083 | .223 | .364 | -.008 | .035 | .030 | .022 | .024 | -.027 |
| Practical_value | .013 | .007 | .006 | .009 | .002 | .003 | .002 | .015 | .006 | -.012 | -.043 | .034 | .042 | .247 | .261 | .249 |
| Entertainment_value | .014 | .007 | .006 | .010 | -.003 | -.003 | -.002 | -.035 | .040 | .026 | .186 | .333 | .237 | .018 | .009 | .013 |
| Community_loyalty | .049 | .027 | .038 | .009 | .230 | .310 | .233 | .011 | .025 | .042 | -.006 | -.004 | -.002 | .005 | .005 | -.001 |
| Brand_loyalty | .296 | .161 | .141 | .205 | .013 | .035 | .025 | .002 | .009 | .013 | .004 | .014 | .010 | .011 | .011 | .009 |

Total Effects (Group number 1 - Default model)

| | Social_value | Practical_value | Entertainment_value | Community_loyalty | Brand_loyalty |
|---|---|---|---|---|---|
| Community_loyalty | .588 | .133 | -.025 | .000 | .000 |
| Brand_loyalty | .353 | .223 | .150 | .434 | .000 |
| BL4 | .365 | .230 | .155 | .449 | 1.035 |
| BL3 | .317 | .200 | .135 | .390 | .899 |
| BL2 | .346 | .218 | .147 | .425 | .981 |
| BL1 | .353 | .223 | .150 | .434 | 1.000 |
| CL3 | .529 | .120 | -.023 | .899 | .000 |
| CL2 | .577 | .131 | -.025 | .981 | .000 |
| CL1 | .588 | .133 | -.025 | 1.000 | .000 |
| SV1 | 1.035 | .000 | .000 | .000 | .000 |
| SV2 | 1.124 | .000 | .000 | .000 | .000 |
| SV3 | 1.000 | .000 | .000 | .000 | .000 |
| EV1 | .000 | .000 | 1.070 | .000 | .000 |
| EV2 | .000 | .000 | .981 | .000 | .000 |
| EV3 | .000 | .000 | 1.000 | .000 | .000 |
| PV1 | .000 | 1.124 | .000 | .000 | .000 |
| PV2 | .000 | 1.192 | .000 | .000 | .000 |
| PV3 | .000 | 1.000 | .000 | .000 | .000 |

Standardized Total Effects (Group number 1 - Default model)

| | Social_value | Practical_value | Entertainment_value | Community_loyalty | Brand_loyalty |
|---|---|---|---|---|---|
| Community_loyalty | .519 | .111 | -.019 | .000 | .000 |
| Brand_loyalty | .353 | .210 | .128 | .492 | .000 |
| BL4 | .300 | .178 | .109 | .417 | .849 |
| BL3 | .262 | .156 | .095 | .365 | .742 |
| BL2 | .295 | .175 | .107 | .411 | .836 |
| BL1 | .293 | .174 | .106 | .409 | .831 |
| CL3 | .405 | .086 | -.015 | .779 | .000 |
| CL2 | .430 | .092 | -.016 | .827 | .000 |
| CL1 | .404 | .086 | -.015 | .778 | .000 |
| SV1 | .707 | .000 | .000 | .000 | .000 |
| SV2 | .776 | .000 | .000 | .000 | .000 |
| SV3 | .805 | .000 | .000 | .000 | .000 |
| EV1 | .000 | .000 | .748 | .000 | .000 |
| EV2 | .000 | .000 | .793 | .000 | .000 |
| EV3 | .000 | .000 | .775 | .000 | .000 |
| PV1 | .000 | .820 | .000 | .000 | .000 |
| PV2 | .000 | .835 | .000 | .000 | .000 |
| PV3 | .000 | .804 | .000 | .000 | .000 |

Direct Effects (Group number 1 - Default model)

| | Social_value | Practical_value | Entertainment_value | Community_loyalty | Brand_loyalty |
|---|---|---|---|---|---|
| Community_loyalty | .588 | .133 | -.025 | .000 | .000 |
| Brand_loyalty | .098 | .165 | .161 | .434 | .000 |
| BL4 | .000 | .000 | .000 | .000 | 1.035 |
| BL3 | .000 | .000 | .000 | .000 | .899 |
| BL2 | .000 | .000 | .000 | .000 | .981 |
| BL1 | .000 | .000 | .000 | .000 | 1.000 |
| CL3 | .000 | .000 | .000 | .899 | .000 |
| CL2 | .000 | .000 | .000 | .981 | .000 |
| CL1 | .000 | .000 | .000 | 1.000 | .000 |
| SV1 | 1.035 | .000 | .000 | .000 | .000 |
| SV2 | 1.124 | .000 | .000 | .000 | .000 |
| SV3 | 1.000 | .000 | .000 | .000 | .000 |
| EV1 | .000 | .000 | 1.070 | .000 | .000 |
| EV2 | .000 | .000 | .981 | .000 | .000 |
| EV3 | .000 | .000 | 1.000 | .000 | .000 |
| PV1 | .000 | 1.124 | .000 | .000 | .000 |
| PV2 | .000 | 1.192 | .000 | .000 | .000 |
| PV3 | .000 | 1.000 | .000 | .000 | .000 |

Standardized Direct Effects (Group number 1 - Default model)

| | Social_value | Practical_value | Entertainment_value | Community_loyalty | Brand_loyalty |
|---|---|---|---|---|---|
| Community_loyalty | .519 | .111 | -.019 | .000 | .000 |
| Brand_loyalty | .098 | .155 | .137 | .492 | .000 |
| BL4 | .000 | .000 | .000 | .000 | .849 |
| BL3 | .000 | .000 | .000 | .000 | .742 |
| BL2 | .000 | .000 | .000 | .000 | .836 |
| BL1 | .000 | .000 | .000 | .000 | .831 |
| CL3 | .000 | .000 | .000 | .779 | .000 |
| CL2 | .000 | .000 | .000 | .827 | .000 |
| CL1 | .000 | .000 | .000 | .778 | .000 |
| SV1 | .707 | .000 | .000 | .000 | .000 |
| SV2 | .776 | .000 | .000 | .000 | .000 |
| SV3 | .805 | .000 | .000 | .000 | .000 |
| EV1 | .000 | .000 | .748 | .000 | .000 |
| EV2 | .000 | .000 | .793 | .000 | .000 |
| EV3 | .000 | .000 | .775 | .000 | .000 |
| PV1 | .000 | .820 | .000 | .000 | .000 |
| PV2 | .000 | .835 | .000 | .000 | .000 |
| PV3 | .000 | .804 | .000 | .000 | .000 |

Indirect Effects (Group number 1 - Default model)

| | Social_value | Practical_value | Entertainment_value | Community_loyalty | Brand_loyalty |
|---|---|---|---|---|---|
| Community_loyalty | .000 | .000 | .000 | .000 | .000 |
| Brand_loyalty | .255 | .058 | -.011 | .000 | .000 |
| BL4 | .365 | .230 | .155 | .449 | .000 |
| BL3 | .317 | .200 | .135 | .390 | .000 |
| BL2 | .346 | .218 | .147 | .425 | .000 |
| BL1 | .353 | .223 | .150 | .434 | .000 |
| CL3 | .529 | .120 | -.023 | .000 | .000 |
| CL2 | .577 | .131 | -.025 | .000 | .000 |
| CL1 | .588 | .133 | -.025 | .000 | .000 |
| SV1 | .000 | .000 | .000 | .000 | .000 |
| SV2 | .000 | .000 | .000 | .000 | .000 |
| SV3 | .000 | .000 | .000 | .000 | .000 |
| EV1 | .000 | .000 | .000 | .000 | .000 |
| EV2 | .000 | .000 | .000 | .000 | .000 |
| EV3 | .000 | .000 | .000 | .000 | .000 |
| PV1 | .000 | .000 | .000 | .000 | .000 |
| PV2 | .000 | .000 | .000 | .000 | .000 |
| PV3 | .000 | .000 | .000 | .000 | .000 |

Implied Covariances (Group number 1 - Default model)

| | BL4 | BL3 | BL2 | BL1 | CL3 | CL2 | CL1 | SV1 | SV2 | SV3 | EV1 | EV2 | EV3 | PV1 | PV2 | PV3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BL4 | .893 | | | | | | | | | | | | | | | |
| BL3 | .559 | .882 | | | | | | | | | | | | | | |
| BL2 | .632 | .552 | .828 | | | | | | | | | | | | | |
| BL1 | .622 | .541 | .724 | .870 | | | | | | | | | | | | |
| CL3 | .392 | .340 | .371 | .401 | 1.030 | | | | | | | | | | | |
| CL2 | .427 | .371 | .405 | .413 | .722 | 1.086 | | | | | | | | | | |
| CL1 | .436 | .379 | .413 | .421 | .695 | .757 | 1.277 | | | | | | | | | |
| SV1 | .302 | .263 | .287 | .292 | .349 | .380 | .388 | 1.291 | | | | | | | | |
| SV2 | .329 | .286 | .312 | .318 | .379 | .413 | .421 | .980 | 1.266 | | | | | | | |
| SV3 | .292 | .254 | .277 | .283 | .337 | .368 | .375 | .646 | .673 | .930 | | | | | | |
| EV1 | .192 | .167 | .182 | .186 | .120 | .131 | .133 | .310 | .226 | .201 | .897 | | | | | |
| EV2 | .176 | .153 | .167 | .171 | .110 | .120 | .122 | .191 | .203 | .184 | .461 | .672 | | | | |
| EV3 | .180 | .156 | .171 | .174 | .112 | .122 | .125 | .195 | .212 | .188 | .553 | .431 | .731 | | | |
| PV1 | .248 | .215 | .235 | .240 | .179 | .195 | .199 | .219 | .238 | .212 | .248 | .207 | .212 | 1.001 | | |
| PV2 | .263 | .228 | .249 | .254 | .190 | .207 | .211 | .232 | .252 | .224 | .280 | .220 | .224 | .713 | 1.084 | |
| PV3 | .220 | .192 | .209 | .213 | .159 | .173 | .177 | .195 | .212 | .228 | .223 | .184 | .188 | .594 | .634 | .824 |

Implied Correlations (Group number 1 - Default model)

| | BL4 | BL3 | BL2 | BL1 | CL3 | CL2 | CL1 | SV1 | SV2 | SV3 | EV1 | EV2 | EV3 | PV1 | PV2 | PV3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BL4 | 1.000 | | | | | | | | | | | | | | | |
| BL3 | .630 | 1.000 | | | | | | | | | | | | | | |
| BL2 | .735 | .646 | 1.000 | | | | | | | | | | | | | |
| BL1 | .705 | .617 | .853 | 1.000 | | | | | | | | | | | | |
| CL3 | .408 | .357 | .402 | .423 | 1.000 | | | | | | | | | | | |
| CL2 | .434 | .379 | .427 | .425 | .682 | 1.000 | | | | | | | | | | |
| CL1 | .408 | .357 | .401 | .399 | .606 | .643 | 1.000 | | | | | | | | | |
| SV1 | .282 | .246 | .277 | .276 | .302 | .321 | .302 | 1.000 | | | | | | | | |
| SV2 | .309 | .270 | .304 | .303 | .332 | .352 | .331 | .767 | 1.000 | | | | | | | |
| SV3 | .321 | .280 | .316 | .314 | .344 | .366 | .344 | .589 | .620 | 1.000 | | | | | | |
| EV1 | .215 | .188 | .212 | .211 | .125 | .132 | .125 | .288 | .212 | .220 | 1.000 | | | | | |
| EV2 | .228 | .199 | .224 | .223 | .132 | .140 | .132 | .205 | .220 | .233 | .593 | 1.000 | | | | |
| EV3 | .223 | .195 | .219 | .218 | .129 | .137 | .129 | .200 | .220 | .228 | .682 | .614 | 1.000 | | | |
| PV1 | .262 | .229 | .258 | .257 | .176 | .187 | .176 | .192 | .211 | .219 | .262 | .253 | .247 | 1.000 | | |
| PV2 | .267 | .233 | .263 | .261 | .179 | .191 | .179 | .196 | .215 | .223 | .283 | .258 | .252 | .685 | 1.000 | |
| PV3 | .257 | .225 | .253 | .252 | .173 | .183 | .172 | .189 | .207 | .260 | .260 | .248 | .242 | .654 | .671 | 1.000 |

Residual Covariances (Group number 1 - Default model)

| | BL4 | BL3 | BL2 | BL1 | CL3 | CL2 | CL1 | SV1 | SV2 | SV3 | EV1 | EV2 | EV3 | PV1 | PV2 | PV3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BL4 | -.027 | | | | | | | | | | | | | | | |
| BL3 | -.039 | -.038 | | | | | | | | | | | | | | |
| BL2 | -.052 | -.054 | -.078 | | | | | | | | | | | | | |
| BL1 | -.085 | -.051 | -.093 | -.110 | | | | | | | | | | | | |
| CL3 | .075 | .089 | .028 | .008 | -.028 | | | | | | | | | | | |
| CL2 | .064 | -.027 | -.046 | -.055 | -.033 | -.032 | | | | | | | | | | |
| CL1 | -.040 | -.062 | -.091 | -.086 | -.080 | -.077 | -.138 | | | | | | | | | |
| SV1 | .029 | -.054 | -.019 | -.065 | -.076 | .040 | .054 | -.028 | | | | | | | | |
| SV2 | .053 | -.081 | -.015 | -.074 | -.064 | .063 | .100 | -.001 | .024 | | | | | | | |
| SV3 | .066 | -.018 | .060 | .070 | .010 | .017 | -.010 | -.030 | .009 | .045 | | | | | | |
| EV1 | .011 | -.008 | .010 | -.025 | -.054 | .002 | -.092 | .005 | -.009 | -.051 | .009 | | | | | |
| EV2 | .005 | -.032 | -.004 | -.008 | .023 | .030 | -.071 | -.011 | -.010 | .014 | -.002 | .005 | | | | |
| EV3 | .067 | .007 | .042 | -.021 | .032 | .072 | .004 | .071 | .030 | .038 | .008 | -.010 | .002 | | | |
| PV1 | .057 | .056 | .055 | -.006 | .068 | .035 | .046 | .007 | -.014 | .041 | .010 | .002 | .005 | .061 | | |
| PV2 | .031 | .018 | .023 | -.005 | .003 | .004 | .052 | .051 | -.010 | .057 | -.004 | -.043 | -.018 | .040 | .075 | |
| PV3 | .029 | .030 | .044 | .026 | .006 | -.008 | -.006 | .060 | .051 | .074 | .065 | .062 | .053 | .080 | .099 | .101 |

Standardized Residual Covariances (Group number 1 - Default model)

| | BL4 | BL3 | BL2 | BL1 | CL3 | CL2 | CL1 | SV1 | SV2 | SV3 | EV1 | EV2 | EV3 | PV1 | PV2 | PV3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BL4 | -.487 | | | | | | | | | | | | | | | |
| BL3 | -.869 | -.713 | | | | | | | | | | | | | | |
| BL2 | -1.123 | -1.223 | -1.551 | | | | | | | | | | | | | |
| BL1 | -1.834 | -1.144 | -1.930 | -2.069 | | | | | | | | | | | | |
| CL3 | 1.680 | 2.026 | .646 | .181 | -.442 | | | | | | | | | | | |
| CL2 | 1.383 | -.601 | -1.026 | -1.197 | -.603 | -.488 | | | | | | | | | | |
| CL1 | -.809 | -1.268 | -1.910 | -1.753 | -1.384 | -1.281 | -1.772 | | | | | | | | | |
| SV1 | .594 | -1.138 | -.406 | -1.371 | -1.460 | .753 | .941 | -.361 | | | | | | | | |
| SV2 | 1.108 | -1.718 | -.335 | -1.567 | -1.230 | 1.175 | 1.726 | -.019 | .312 | | | | | | | |
| SV3 | 1.587 | -.436 | 1.512 | 1.712 | .231 | .379 | -.206 | -.540 | .155 | .795 | | | | | | |
| EV1 | .282 | -.198 | .259 | -.654 | -1.293 | .037 | -1.968 | .099 | -.198 | -1.270 | .173 | | | | | |
| EV2 | .160 | -.948 | -.131 | -.242 | .648 | .810 | -1.754 | -.261 | -.241 | .399 | -.057 | .133 | | | | |
| EV3 | 1.884 | .193 | 1.220 | -.583 | .851 | 1.860 | .106 | 1.659 | .716 | 1.032 | .186 | -.280 | .041 | | | |
| PV1 | 1.356 | 1.356 | 1.350 | -.144 | 1.524 | .764 | .929 | .144 | -.274 | .957 | .230 | .042 | .140 | .994 | | |
| PV2 | .700 | .406 | .550 | -.108 | .058 | .085 | 1.010 | .988 | -.192 | 1.294 | -.089 | -1.143 | -.445 | .727 | 1.139 | |
| PV3 | .754 | .788 | 1.206 | .697 | .142 | -.185 | -.133 | 1.328 | 1.127 | 1.896 | 1.702 | 1.872 | 1.526 | 1.703 | 2.005 | 1.999 |

## Hierarchy Info

Mode: Hierarchy evaluation

2 (6) hierarchy level(s), 16 (100) hierarchy leaves, 6 (50) hierarchy node(s), 389 (6000) hierarchy characters.

## Input/Edit Hierarchy

Input or edit text in the text area below, then submit.

```
Choosing private university in Thailand: PV=0.111, EV=-0.019,
SV=0.519，CL=0.492, BL=0.137;
PV: PV1=0.699，PV2=0.237, PV3=0.064;
EV: EV1=0.615, EV2=0.319, EV3=0.066;
SV: SV1=0.659, SV2=0.263, SV3=0.079;
CL: CL1=0.592, CL2=0.333, CL3=0.075;
BL: BL1=0.473, BL2=0.349, BL3=0.016, BL4=0.063;
```

## Project: Choosing private university in Thailand

**Decision Hierarchy**

| Level 0 | Level 1 | Level 2 | Glb Prio. |
|---|---|---|---|
| Choosing private university in Thailand AHP | PV 0.111 AHP | PV1 0.699 | 7.8% |
| | | PV2 0.237 | 2.6% |
| | | PV3 0.064 | 0.7% |
| | EV - 0.019 AHP | EV1 0.615 | -1.2% |
| | | EV2 0.319 | -0.6% |
| | | EV3 0.066 | -0.1% |
| | SV 0.519 AHP | SV1 0.659 | 34.2% |
| | | SV2 0.263 | 13.6% |
| | | SV3 0.079 | 4.1% |
| | CL 0.492 AHP | CL1 0.592 | 29.1% |
| | | CL2 0.333 | 16.4% |
| | | CL3 0.075 | 3.7% |
| | BL 0.137 AHP | BL1 0.473 | 6.5% |
| | | BL2 0.349 | 4.8% |
| | | BL3 0.116 | 1.6% |
| | | BL4 0.063 | 0.9% |

# Pairwise Comparison AHP-OS

**Evaluation of Criteria for Choosing private university in Thailand**

**Pairwise Comparison Choosing private university in Thailand** 10 pairwise comparisons.

**AHP Priority Calculator**

Select number and names of criteria, then start pairwise comparisons to calculate priorities using the Analytic Hierarchy Process.

**AHP Criteria**

Select number of criteria:

**Input number and names (2 - 20)** 5 Go OK

**Pairwise Comparison AHP priorities**

10 pairwise comparisons. Please do the pairwise comparison of all criteria. When completed, click *Check Consistency* get the priorities.

**Which criterion with respect to *AHP priorities* is more important, and how much more on a scale 1 to 9?**

| | A - Importance - or B? | | Equal | How much more? |
|---|---|---|---|---|
| 1 | ○ PV | or ○ EV | ○ 1 | ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| 2 | ◉ PV | or ○ SV | ○ 1 | ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| 3 | ○ PV | or ○ CL | ○ 1 | ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ◉ 7 ○ 8 ○ 9 |
| 4 | ◉ PV | or ○ BL | ○ 1 | ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ◉ 9 |
| 5 | ◉ EV | or ○ SV | ○ 1 | ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ◉ 7 ○ 8 ○ 9 |
| 6 | ◉ EV | or ○ CL | ○ 1 | ○ 2 ○ 3 ◉ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| 7 | ◉ EV | or ○ BL | ○ 1 | ○ 2 ○ 3 ○ 4 ○ 5 ◉ 6 ○ 7 ○ 8 ○ 9 |

| A - Importance - or B? | | | Equal | How much more? |
|---|---|---|---|---|
| 8 | SV | or CL | 1 | 2 3 4 5 6 7 8 9 |
| 9 | SV | or BL | 1 | 2 3 4 5 6 7 8 9 |
| 10 | CL | or BL | 1 | 2 3 4 5 6 7 8 9 |
| CR = 7.6% OK | | | | |

AHP Scale: 1- Equal Importance, 3- Moderate importance, 5- Strong importance, 7- Very strong importance, 9- Extreme importance (2,4,6,8 values in-between).

**Priorities**

These are the resulting weights for the criteria based on your pairwise comparisons

| Category | | Priority | Rank | (+) | (-) |
|---|---|---|---|---|---|
| 1 | PV | 60.9% | 1 | 39.3% | 39.3% |
| 2 | EV | 23.0% | 2 | 10.6% | 10.6% |
| 3 | SV | 6.0% | 4 | 1.9% | 1.9% |
| 4 | CL | 6.2% | 3 | 0.9% | 0.9% |
| 5 | BL | 3.8% | 5 | 1.4% | 1.4% |

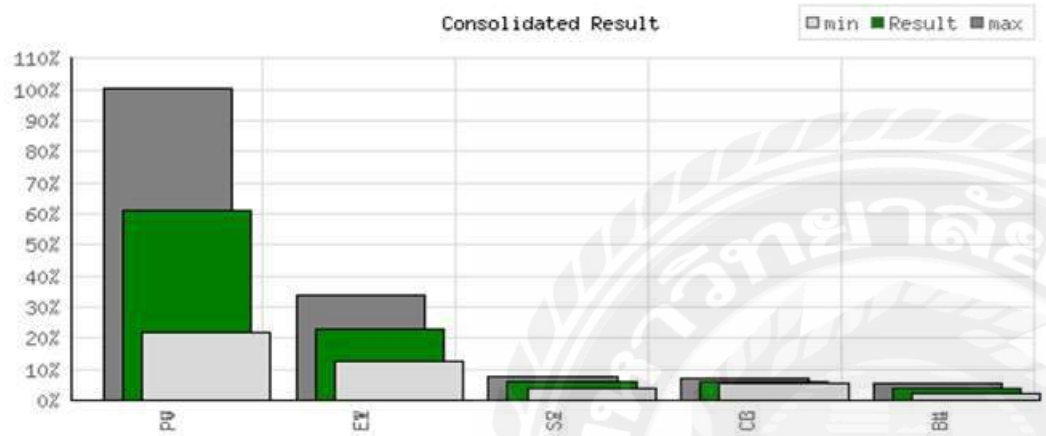
**Decision Matrix**

The resulting weights are based on the principal eigenvector of the decision matrix

| | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| 1 | 1 | 6.00 | 7.00 | 8.00 | 9.00 |
| 2 | 0.17 | 1 | 7.00 | 4.00 | 6.00 |
| 3 | 0.14 | 0.14 | 1 | 1.00 | 2.00 |
| 4 | 0.12 | 0.25 | 1.00 | 1 | 2.00 |
| 5 | 0.11 | 0.17 | 0.50 | 0.50 | 1 |

Number of comparisons = 10, **Consistency Ratio CR** = 7.6%

Principal eigen value = 5.341. Eigenvector solution: 6 iterations, delta =3.3E-9


Consolidated Result
min
Result
max
110%
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%

**AHP Priority Calculator**

Select number and names of criteria, then start pairwise comparisons to calculate priorities using the Analytic Hierarchy Process.

**AHP Criteria**

Select number of criteria:

nput number and names (2 - 20) 16 Go OK

**Pairwise Comparison AHP priorities**

120 pairwise comparisons. Please do the pairwise comparison of all criteria. When completed, click *check Consistency* to get the priorities.

Which criterion with respect to ***AHP priorities*** is more important, and how much more on a scale 1 to 9?

| | A - Importance - or B? | | | Equal | How much more? |
|---|---|---|---|---|---|
| 1 | ◉ PV1 | or ○ PV2 | | ○ 1 | ◉ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| 2 | ◉ PV1 | or ○ PV3 | | ◉ 1 | ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| 3 | ◉ PV1 | or ○ EV1 | | ○ 1 | ○ 2 ○ 3 ○ 4 ○ 5 ◉ 6 ○ 7 ○ 8 ○ 9 |

| | A - Importance - or B? | | | Equal | How much more? |
|---|---|---|---|---|---|
| 4 | ◉ PV1 | or ○ | EV2 | ○ 1 | ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ◉ 7 ○ 8 ○ 9 |
| 5 | ◉ PV1 | or ○ | EV3 | ○ 1 | ○ 2 ○ 3 ○ 4 ○ 5 ◉ 6 ○ 7 ○ 8 ○ 9 |
| 6 | ◉ PV1 | or ○ | SV1 | ○ 1 | ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ◉ 9 |
| 7 | ◉ PV1 | or ○ | SV2 | ○ 1 | ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ◉ 8 ○ 9 |
| 8 | ◉ PV1 | or ○ | SV3 | ○ 1 | ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ◉ 9 |
| 9 | ◉ PV1 | or ○ | CL1 | ○ 1 | ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ◉ 7 ○ 8 ○ 9 |
| 10 | ◉ PV1 | or ○ | CL2 | ○ 1 | ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ◉ 8 ○ 9 |
| 11 | ◉ PV1 | or ○ | CL3 | ○ 1 | ○ 2 ○ 3 ○ 4 ○ 5 ◉ 6 ○ 7 ○ 8 ○ 9 |
| 12 | ◉ PV1 | or ○ | BL1 | ○ 1 | ○ 2 ○ 3 ○ 4 ◉ 5 ○ 6 ○ 7 ○ 8 ○ 9 |

| | A - Importance - or B? | | | Equal | How much more? |
|---|---|---|---|---|---|
| 13 | ◉ | PV1 | or ○ BL2 | ○ 1 | ○ 2 ○ 3 ◉ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| 14 | ◉ | PV1 | or ○ BL3 | ○ 1 | ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ◉ 9 |
| 15 | ◉ | PV1 | or ○ BL4 | ○ 1 | ○ 2 ○ 3 ○ 4 ○ 5 ◉ 6 ○ 7 ○ 8 ○ 9 |
| 16 | ◉ | PV2 | or ○ PV3 | ○ 1 | ◉ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| 17 | ◉ | PV2 | or ○ EV1 | ◉ 1 | ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| 18 | ◉ | PV2 | or ○ EV2 | ○ 1 | ○ 2 ◉ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| 19 | ◉ | PV2 | or ○ EV3 | ○ 1 | ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ◉ 7 ○ 8 ○ 9 |
| 20 | ◉ | PV2 | or ○ SV1 | ○ 1 | ○ 2 ◉ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| 21 | ◉ | PV2 | or ○ SV2 | ○ 1 | ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ◉ 7 ○ 8 ○ 9 |

| | A - Importance - or B? | | | Equal | How much more? |
|---|---|---|---|---|---|
| 22 | ◉ | PV2 | or ○ SV3 | ○ 1 | ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ◉ 8 ○ 9 |
| 23 | ◉ | PV2 | or ○ CL1 | ○ 1 | ○ 2 ○ 3 ○ 4 ○ 5 ◉ 6 ○ 7 ○ 8 ○ 9 |
| 24 | ◉ | PV2 | or ○ CL2 | ○ 1 | ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ◉ 7 ○ 8 ○ 9 |
| 25 | ◉ | PV2 | or ○ CL3 | ○ 1 | ○ 2 ○ 3 ○ 4 ◉ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| 26 | ◉ | PV2 | or ○ BL1 | ○ 1 | ○ 2 ◉ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| 27 | ◉ | PV2 | or ○ BL2 | ○ 1 | ○ 2 ○ 3 ◉ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| 28 | ◉ | PV2 | or ○ BL3 | ○ 1 | ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ◉ 7 ○ 8 ○ 9 |
| 29 | ◉ | PV2 | or ○ BL4 | ○ 1 | ○ 2 ○ 3 ○ 4 ○ 5 ◉ 6 ○ 7 ○ 8 ○ 9 |
| 30 | ◉ | PV3 | or ○ EV1 | ○ 1 | ○ 2 ◉ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |

| | A - Importance - or B? | | | Equal | How much more? |
|---|---|---|---|---|---|
| 31 | ◉ | PV3 | or ○ EV2 | ○ 1 | ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ◉ 8 ○ 9 |
| 32 | ◉ | PV3 | or ○ EV3 | ○ 1 | ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ◉ 7 ○ 8 ○ 9 |
| 33 | ◉ | PV3 | or ○ SV1 | ○ 1 | ○ 2 ○ 3 ○ 4 ○ 5 ◉ 6 ○ 7 ○ 8 ○ 9 |
| 34 | ◉ | PV3 | or ○ SV2 | ○ 1 | ○ 2 ○ 3 ○ 4 ◉ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| 35 | ◉ | PV3 | or ○ SV3 | ○ 1 | ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ◉ 8 ○ 9 |
| 36 | ◉ | PV3 | or ○ CL1 | ○ 1 | ○ 2 ○ 3 ◉ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| 37 | ◉ | PV3 | or ○ CL2 | ○ 1 | ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ◉ 7 ○ 8 ○ 9 |
| 38 | ◉ | PV3 | or ○ CL3 | ○ 1 | ○ 2 ○ 3 ○ 4 ○ 5 ◉ 6 ○ 7 ○ 8 ○ 9 |
| 39 | ◉ | PV3 | or ○ BL1 | ○ 1 | ○ 2 ○ 3 ○ 4 ◉ 5 ○ 6 ○ 7 ○ 8 ○ 9 |

| A - Importance - or B? | | | | Equal | How much more? |
|---|---|---|---|---|---|
| 40 | ◉ PV3 | or ○ | BL2 | ○ 1 | ○ 2 ○ 3 ○ 4 ○ 5 ◉ 6 ○ 7 ○ 8 ○ 9 |
| 41 | ◉ PV3 | or ○ | BL3 | ○ 1 | ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ◉ 9 |
| 42 | ◉ PV3 | or ○ | BL4 | ○ 1 | ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ◉ 7 ○ 8 ○ 9 |
| 43 | ◉ EV1 | or ○ | EV2 | ○ 1 | ○ 2 ◉ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| 44 | ◉ EV1 | or ○ | EV3 | ◉ 1 | ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| 45 | ◉ EV1 | or ○ | SV1 | ○ 1 | ○ 2 ◉ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| 46 | ◉ EV1 | or ○ | SV2 | ○ 1 | ◉ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| 47 | ◉ EV1 | or ○ | SV3 | ○ 1 | ○ 2 ◉ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| 48 | ◉ EV1 | or ○ | CL1 | ○ 1 | ○ 2 ○ 3 ◉ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |

| A - Importance - or B? | | | | Equal | How much more? |
|---|---|---|---|---|---|
| 49 | ◉ EV1 | or ○ | CL2 | ○ 1 | ○ 2 ◉ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| 50 | ◉ EV1 | or ○ | CL3 | ○ 1 | ◉ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| 51 | ◉ EV1 | or ○ | BL1 | ○ 1 | ○ 2 ◉ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| 52 | ◉ EV1 | or ○ | BL2 | ○ 1 | ○ 2 ○ 3 ○ 4 ◉ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| 53 | ◉ EV1 | or ○ | BL3 | ○ 1 | ○ 2 ◉ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| 54 | ◉ EV1 | or ○ | BL4 | ○ 1 | ◉ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| 55 | ◉ EV2 | or ○ | EV3 | ○ 1 | ○ 2 ◉ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| 56 | ◉ EV2 | or ○ | SV1 | ○ 1 | ◉ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| 57 | ◉ EV2 | or ○ | SV2 | ○ 1 | ○ 2 ○ 3 ◉ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |

| A - Importance - or B? | | | | Equal | How much more? |
|---|---|---|---|---|---|
| 58 | ◉ EV2 | or ○ SV3 | | ○ 1 | ◉ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| 59 | ◉ EV2 | or ○ CL1 | | ○ 1 | ○ 2 ○ 3 ○ 4 ◉ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| 60 | ◉ EV2 | or ○ CL2 | | ○ 1 | ◉ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| 61 | ◉ EV2 | or ○ CL3 | | ○ 1 | ◉ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| 62 | ◉ EV2 | or ○ BL1 | | ◉ 1 | ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| 63 | ◉ EV2 | or ○ BL2 | | ○ 1 | ○ 2 ○ 3 ◉ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| 64 | ◉ EV2 | or ○ BL3 | | ○ 1 | ○ 2 ◉ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| 65 | ◉ EV2 | or ○ BL4 | | ○ 1 | ○ 2 ○ 3 ◉ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| 66 | ◉ EV3 | or ○ SV1 | | ◉ 1 | ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |

| A - Importance - or B? | | | | Equal | How much more? |
|---|---|---|---|---|---|
| 67 | ◉ EV3 | or ○ SV2 | | ○ 1 | ◉ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| 68 | ◉ EV3 | or ○ SV3 | | ○ 1 | ○ 2 ◉ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| 69 | ◉ EV3 | or ○ CL1 | | ○ 1 | ○ 2 ○ 3 ◉ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| 70 | ◉ EV3 | or ○ CL2 | | ○ 1 | ◉ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| 71 | ◉ EV3 | or ○ CL3 | | ○ 1 | ○ 2 ○ 3 ◉ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| 72 | ◉ EV3 | or ○ BL1 | | ○ 1 | ○ 2 ◉ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| 73 | ◉ EV3 | or ○ BL2 | | ○ 1 | ◉ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| 74 | ◉ EV3 | or ○ BL3 | | ○ 1 | ○ 2 ◉ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| 75 | ◉ EV3 | or ○ BL4 | | ○ 1 | ○ 2 ○ 3 ◉ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |

| A - Importance - or B? | | | | Equal | How much more? |
|---|---|---|---|---|---|
| 76 | ◉ SV1 | or ○ | SV2 | ○ 1 | ○ 2 ○ 3 ○ 4 ◉ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| 77 | ◉ SV1 | or ○ | SV3 | ○ 1 | ○ 2 ◉ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| 78 | ◉ SV1 | or ○ | CL1 | ○ 1 | ○ 2 ○ 3 ◉ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| 79 | ◉ SV1 | or ○ | CL2 | ○ 1 | ◉ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| 80 | ◉ SV1 | or ○ | CL3 | ○ 1 | ○ 2 ○ 3 ○ 4 ○ 5 ◉ 6 ○ 7 ○ 8 ○ 9 |
| 81 | ◉ SV1 | or ○ | BL1 | ○ 1 | ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ◉ 7 ○ 8 ○ 9 |
| 82 | ◉ SV1 | or ○ | BL2 | ○ 1 | ◉ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| 83 | ◉ SV1 | or ○ | BL3 | ○ 1 | ○ 2 ○ 3 ◉ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| 84 | ◉ SV1 | or ○ | BL4 | ○ 1 | ○ 2 ○ 3 ○ 4 ◉ 5 ○ 6 ○ 7 ○ 8 ○ 9 |

| A - Importance - or B? | | | | Equal | How much more? |
|---|---|---|---|---|---|
| 85 | ◉ SV2 | or ○ | SV3 | ○ 1 | ◉ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| 86 | ◉ SV2 | or ○ | CL1 | ◉ 1 | ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| 87 | ◉ SV2 | or ○ | CL2 | ◉ 1 | ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| 88 | ◉ SV2 | or ○ | CL3 | ○ 1 | ○ 2 ○ 3 ◉ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| 89 | ◉ SV2 | or ○ | BL1 | ○ 1 | ○ 2 ◉ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| 90 | ◉ SV2 | or ○ | BL2 | ○ 1 | ◉ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| 91 | ◉ SV2 | or ○ | BL3 | ○ 1 | ◉ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| 92 | ◉ SV2 | or ○ | BL4 | ○ 1 | ○ 2 ○ 3 ◉ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| 93 | ◉ SV3 | or ○ | CL1 | ○ 1 | ○ 2 ◉ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |

| A - Importance - or B? | | | | Equal | How much more? |
|---|---|---|---|---|---|
| 94 | ◉ SV3 | or ○ | CL2 | ◉ 1 | ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| 95 | ◉ SV3 | or ○ | CL3 | ○ 1 | ○ 2 ○ 3 ◉ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| 96 | ◉ SV3 | or ○ | BL1 | ○ 1 | ○ 2 ◉ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| 97 | ◉ SV3 | or ○ | BL2 | ○ 1 | ◉ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| 98 | ◉ SV3 | or ○ | BL3 | ○ 1 | ○ 2 ○ 3 ○ 4 ◉ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| 99 | ◉ SV3 | or ○ | BL4 | ○ 1 | ○ 2 ◉ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| 100 | ◉ CL1 | or ○ | CL2 | ◉ 1 | ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| 101 | ◉ CL1 | or ○ | CL3 | ○ 1 | ○ 2 ◉ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| 102 | ◉ CL1 | or ○ | BL1 | ◉ 1 | ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |

| A - Importance - or B? | | | | Equal | How much more? |
|---|---|---|---|---|---|
| 103 | ◉ CL1 | or ○ | BL2 | ○ 1 | ◉ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| 104 | ◉ CL1 | or ○ | BL3 | ○ 1 | ◉ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| 105 | ◉ CL1 | or ○ | BL4 | ○ 1 | ◉ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| 106 | ◉ CL2 | or ○ | CL3 | ◉ 1 | ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| 107 | ◉ CL2 | or ○ | BL1 | ◉ 1 | ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| 108 | ◉ CL2 | or ○ | BL2 | ○ 1 | ○ 2 ○ 3 ◉ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| 109 | ◉ CL2 | or ○ | BL3 | ○ 1 | ○ 2 ◉ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| 110 | ◉ CL2 | or ○ | BL4 | ○ 1 | ○ 2 ○ 3 ◉ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| 111 | ◉ CL3 | or ○ | BL1 | ◉ 1 | ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |

| A - Importance - or B? | | | | Equal | How much more? |
|---|---|---|---|---|---|
| 112 | ◉ CL3 | or ○ BL2 | | ◉ 1 | ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| 113 | ◉ CL3 | or ○ BL3 | | ○ 1 | ○ 2 ◉ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| 114 | ◉ CL3 | or ○ BL4 | | ○ 1 | ◉ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| 115 | ◉ BL1 | or ○ BL2 | | ◉ 1 | ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| 116 | ◉ BL1 | or ○ BL3 | | ○ 1 | ◉ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| 117 | ◉ BL1 | or ○ BL4 | | ○ 1 | ○ 2 ○ 3 ◉ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| 118 | ◉ BL2 | or ○ BL3 | | ○ 1 | ○ 2 ◉ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| 119 | ◉ BL2 | or ○ BL4 | | ○ 1 | ◉ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |
| 120 | ◉ BL3 | or ○ BL4 | | ○ 1 | ◉ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 |

AHP Scale: 1- Equal Importance, 3- Moderate importance, 5- Strong importance,

7- Very strong importance, 9- Extreme importance (2,4,6,8 values in-between).

**CR = 9.7% OK**

**Priorities**

These are the resulting weights for the criteria based on your pairwise comparisons

| Priorities | | | | | |
|---|---|---|---|---|---|
| **Category** | | **Priority** | **Rank** | **(+)** | **(-)** |
| 1 | PV1 | 21.5% | 1 | 12.2% | 12.2% |
| 2 | PV2 | 14.7% | 3 | 8.1% | 8.1% |
| 3 | PV3 | 17.6% | 2 | 10.0% | 10.0% |
| 4 | EV1 | 7.5% | 4 | 4.3% | 4.3% |
| 5 | EV2 | 5.9% | 6 | 3.7% | 3.7% |
| 6 | EV3 | 5.0% | 7 | 2.2% | 2.2% |
| 7 | SV1 | 6.3% | 5 | 4.2% | 4.2% |
| 8 | SV2 | 3.3% | 9 | 1.8% | 1.8% |
| 9 | SV3 | 3.4% | 8 | 2.0% | 2.0% |

| Priorities | | | | | |
|---|---|---|---|---|---|
| 10 | CL1 | 2.4% | 12 | 1.2% | 1.2% |
| 11 | CL2 | 2.9% | 10 | 1.4% | 1.4% |
| 12 | CL3 | 2.0% | 14 | 1.0% | 1.0% |
| 13 | BL1 | 2.5% | 11 | 1.3% | 1.3% |
| 14 | BL2 | 2.2% | 13 | 1.0% | 1.0% |
| 15 | BL3 | 1.4% | 15 | 0.6% | 0.6% |
| 16 | BL4 | 1.4% | 16 | 0.9% | 0.9% |

**Decision Matrix**

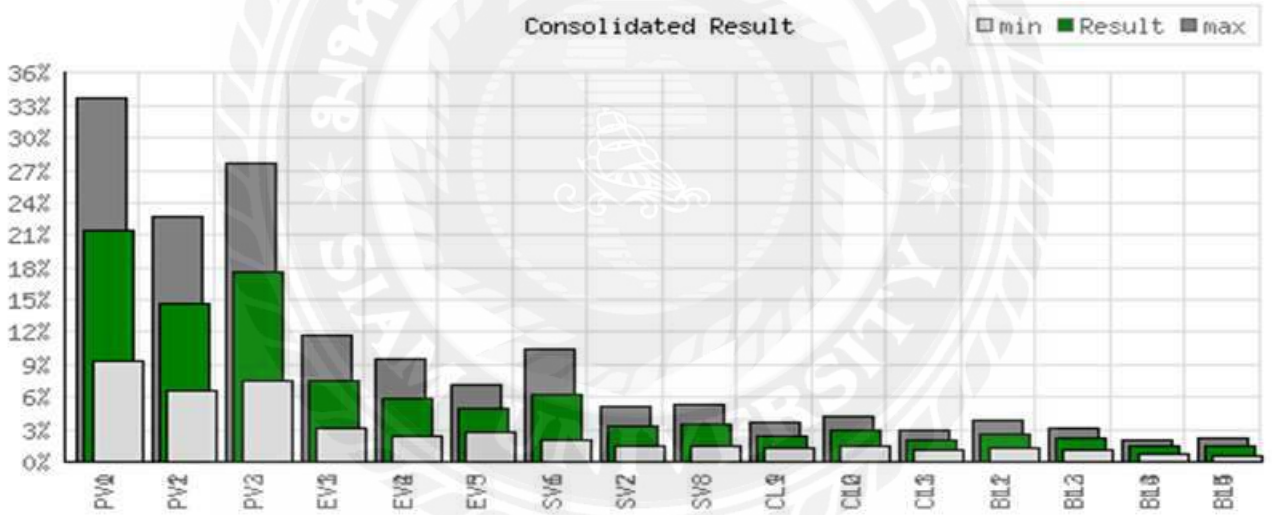
The resulting weights are based on the principal eigenvector of the decision matrix

| Decision Matrix | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | |
| 1 | 1 | 2.00 | 1.00 | 6.00 | 7.00 | 6.00 | 9.00 | 8.00 | 9.00 | 7.00 | 8.00 | 6.00 | 5.00 | 4.00 | 9.00 | 6.00 |
| 2 | 0.50 | 1 | 2.00 | 1.00 | 3.00 | 7.00 | 3.00 | 7.00 | 8.00 | 6.00 | 7.00 | 5.00 | 3.00 | 4.00 | 7.00 | 6.00 |
| 3 | 1.00 | 0.50 | 1 | 3.00 | 8.00 | 7.00 | 6.00 | 5.00 | 8.00 | 4.00 | 7.00 | 6.00 | 5.00 | 6.00 | 9.00 | 7.00 |
| 4 | 0.17 | 1.00 | 0.33 | 1 | 3.00 | 1.00 | 3.00 | 2.00 | 3.00 | 4.00 | 3.00 | 2.00 | 3.00 | 5.00 | 3.00 | 2.00 |
| 5 | 0.14 | 0.33 | 0.12 | 0.33 | 1 | 3.00 | 2.00 | 4.00 | 2.00 | 5.00 | 2.00 | 2.00 | 1.00 | 4.00 | 3.00 | 4.00 |
| 6 | 0.17 | 0.14 | 0.14 | 1.00 | 0.33 | 1 | 1.00 | 2.00 | 3.00 | 4.00 | 2.00 | 4.00 | 3.00 | 2.00 | 3.00 | 4.00 |

| Decision Matrix | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7 | 0.11 | 0.33 | 0.17 | 0.33 | 0.50 | 1.00 | 1 | 5.00 | 3.00 | 4.00 | 2.00 | 6.00 | 7.00 | 2.00 | 4.00 | 5.00 |
| 8 | 0.12 | 0.14 | 0.20 | 0.50 | 0.25 | 0.50 | 0.20 | 1 | 2.00 | 1.00 | 1.00 | 4.00 | 3.00 | 2.00 | 2.00 | 4.00 |
| 9 | 0.11 | 0.12 | 0.12 | 0.33 | 0.50 | 0.33 | 0.33 | 0.50 | 1 | 3.00 | 1.00 | 4.00 | 3.00 | 2.00 | 5.00 | 3.00 |
| 10 | 0.14 | 0.17 | 0.25 | 0.25 | 0.20 | 0.25 | 0.25 | 1.00 | 0.33 | 1 | 1.00 | 3.00 | 1.00 | 2.00 | 2.00 | 2.00 |
| 11 | 0.12 | 0.14 | 0.14 | 0.33 | 0.50 | 0.50 | 0.50 | 1.00 | 1.00 | 1.00 | 1 | 1.00 | 1.00 | 4.00 | 3.00 | 4.00 |
| 12 | 0.17 | 0.20 | 0.17 | 0.50 | 0.50 | 0.25 | 0.17 | 0.25 | 0.25 | 0.33 | 1.00 | 1 | 1.00 | 1.00 | 3.00 | 2.00 |
| 13 | 0.20 | 0.33 | 0.20 | 0.33 | 1.00 | 0.33 | 0.14 | 0.33 | 0.33 | 1.00 | 1.00 | 1.00 | 1 | 1.00 | 2.00 | 4.00 |
| 14 | 0.25 | 0.25 | 0.17 | 0.20 | 0.25 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.25 | 1.00 | 1.00 | 1 | 3.00 | 2.00 |
| 15 | 0.11 | 0.14 | 0.11 | 0.33 | 0.33 | 0.33 | 0.25 | 0.50 | 0.20 | 0.50 | 0.33 | 0.33 | 0.50 | 0.33 | 1 | 2.00 |

| Decision Matrix | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 16 | 0.17 | 0.17 | 0.14 | 0.50 | 0.25 | 0.25 | 0.20 | 0.25 | 0.33 | 0.50 | 0.25 | 0.50 | 0.25 | 0.50 | 0.50 | 1 |

Number of comparisons = 120, **Consistency Ratio CR**=9.7%, Principal eigen value =18.321, Eigenvector solution:6 iterations, delta =2.6E-8



Printout of SPSS Decision Tree