Exploring Factors Affecting the Adoption Intention toward the Integration of Traditional Chinese and Western Medicine as a Disruptive Innovation in the Health-Care Service Industry

Shuo-Chang Tsai[1], Yung-Hsin Chen[1] [*], Chang-Hsien Hsu[1], Yi-Shan Ko[1], Kuo-Chin Huang[2]

[1]Department of Business Administration, Asia University, Taichung, Taiwan

[2] Department of Integration of Traditional Chinese and Western Medicine,
China Medical University Hospital, Taichung, Taiwan

sttsai@asia.edu.tw, [*]thomaschen.iem90g@nctu.edu.tw, pci@asia.edu.tw,
ent33@hotmail.com, huangimd@gmail.com

Abstract −**The health care industry in a society plays a significant role for the welfare of people and the advance of medical engineering/bio-technology alike. However, increasing investment in acquiring the sophisticated instruments and world-patented drug prescription quells people's hope to afford the health care service, unless insurance policy allows the access. Concurred with Christensen's framework of disruptive innovation in health care delivery, we observe that the integration of traditional Chinese and Western medicine entitles itself to disrupt the incumbent health care system. Based on Roger's innovation diffusion model and Davies' technology adoption model we propose a framework to explore the influential factors and their interrelationship with customer's adoption intention towards the integration of traditional Chinese and Western Medicine. Hypotheses are made to conceptualize this theoretical framework and allow the methodology of structure equation modeling (SEM) to test the theory. The objective is to identify the causal links of customer perception and motivation towards the integration with construct such as customer's adoption attitude and intention. The outcome of this study makes a contribution in providing insights for the development of appropriate business model for health care service industry.**

Keywords–**Integration of traditional Chinese and western medicine, Innovation adoption intention, Disruptive innovation**

I. INTRODUCTION

In his book "The innovator's dilemma" Christensen [1], a professor in the Harvard University, discussed the theory of 'disruptive innovation'. In contrast to 'sustaining innovation' that are employed by incumbent market leaders to make improvement in existing products/services to attract profitable customers, disruptive innovation merely comes up with products/services that are not rather sophisticated but more affordable or offers different sort of value to the less demanding tier of customers. In the long run when customers assess that the improvement offered by the leader exceeds their needs that can be met by the disruptive innovators, they switch to the latter and become better off. Good examples happened in the computer industry and the steel making industry in U.S.A.

The health care industry plays a significant role in a society for its involvement with the welfare of people as well as the advancement of medical engineering and bio-technology. However, increasing overhead cost due to heavy investment in procuring the sophisticated medical equipments and the world-patented drug prescription for the health care system quells people's hope to afford the service, unless insurance policy allows the access. In the recent time, Christensen urged that disruptive technologies should be paired with the innovation in business model [2]. He categorized the innovative business model for health care service into three types that feature distinct cost structures: 'solution shops' for diagnosis that takes lion's share of resources, 'value-adding process' for repetitive works, and 'facilitated users' network' for patients to help each other. He indicated that organizing health care institutions in this way leads to the solution for affordability and accessibility.

Not until the development in the ninety century when western medicine paradigm focused on the surgery operation techniques and synthesis drugs made of synthesis processes, the prevailing medical treatment around the world relied on herbs and minerals. Bolstered by the outcomes of scientific research and evidenced by the effectiveness of quick-cure, western medicine became the mainstream till people recognized its

side-effects and limitation. Therefore, in the late twenties people switched their attention to traditional Chinese medicine and some kinds of alternative therapy. World Health organization (WHO) published in 2002 the "WHO traditional medicine strategy 2002-2005" to urge countries in the world to accommodate the traditional medicine into their national health care system. This act confirms the significance of Chinese traditional medicine — a crystallization of wisdom within thousands of year —.In Taiwan, the China Medical University Hospital is the upfront to endeavor the integration of traditional Chinese medicine and western medicine. The hospital set up 'the center of joint clinic for traditional Chinese and western medicine' in 1987 and hired physician possessing national certificates of both traditional Chinese medical and western medicine to serve patients who accepted treatment from both disciplines. The hospital also initiated in 1997 a program to cultivate multiple-disciplinary physician and established the Department of Integration of Traditional Chinese and Western Medicine in 2008. During this period, to meet the increasing demand of traditional Chinese medicine in the market 12 state-run medical centers started to provide traditional Chinese medical service. The bureau of National Health Insurance also pays the reimbursement for traditional Chinese medicine service. A sensational events happened in the beginning of this year is the opening of traditional Chinese medicine service in the Taiwan University Hospital—a hospital offering only western medicine for the past 100 years—. This development demonstrates that people trust the traditional Chinese medicine as of non-side-effect, of having advantage in chronic disease, affordable, accessible, and appropriate to supplement the western medicine. We anticipate that the integration of Traditional Chinese and western medicine as the coming wave front of disruptive innovation in the health care service industry. Once medical institution employs the business models proposed by Christensen, the diffusion of this disruptive innovation will be accelerated.

[3] defined customer's innovativeness as "the extent to which a person is relatively earlier in adopting new things than others". In the innovation adoption model he classified into five groups of customers accounting for their innovativeness: innovators, early adopters, early majority, later majority, and laggards. This model provides a foundation for researchers to further study the product/service-market interface at the individual level as far as innovative products/services are concerned. [4] presented a model of technology adoption life cycle that described the response of customers in a certain market to the disruptive innovation. He argued that before a disruptive innovation can be accepted by the mainstream market, it must goes through multiple phases of transition where customers in the market respond to innovations differently. Early market encompasses innovators and early adopters who buy up the innovations, whereas customers in the segment of pragmatic majority - the second phase - , are still reluctant to accept the offerings of radical innovation. Because customers are uncertain of the utility of benefits that innovations may offer [5][6] as such there exists a chasm, a time frame of no adoption following the early market. [7] suggested that in order to successfully cross the chasm, company has to elaborate the identification of the customer needs of the first wave of pragmatist segment customers who can influence the second wave of adoption. Therefore, an effort to identify customer traits and person characteristics may help predicting innovative adoption behavior [8] (Im 2007). Successful innovation adoption by customers in this segment drives an influence upon the rest in the pragmatist or early majority segment and then hopefully those in the conservatives or late majority segment. Once the mainstream market accepts the innovation, the firm successfully crosses the chasm.

Based on Roger's 'Paradigm of the innovation-decision process' [9] which depicted factors to affect people's attitude on innovation adoption as: 'relative advantage', 'compatibility', 'complexity', trialability', 'observability', and 'affinity to innovation' as well as Davis' technology adoption model in terms of 'perceived usefulness' and 'perceived ease of use'[10], we propose a framework to explore the influential factors and their interrelationship with customer's adoption intention towards the integration of traditional Chinese and western medicine'. Hypotheses are made to conceptualize this theoretical framework and allow the methodology of structure equation modeling (SEM) to test the theory. The objective is to identify the causal links of customer perception and motivation towards the integration with construct such as customer's adoption attitude and intention with customers' education level as the moderating variable, and customers' adoption attitude as the mediating variable. The outcome of this study makes a contribution to provide insights of customer motivation to support the development of appropriate business model for health care service industry in Taiwan. The remaining part of this paper is as follows: First we present the research methodology, data analysis, next the results and finding. Finally we draw our conclusion.

II. METHODOLOGY

A. Research structure

Based on the outcome of literature review and expert interview, we set up the research questions as the conceptualization framework as shown in Figure 1 in an attempt to explore the relationship between the construct 'adoption intention of customer' and other six constructs: 'relative advantage perceived by customer', 'complexity perceived by customer', 'triable by customer', 'observable by customer', and 'customer's affinity to innovation'. Multiple observable indicator variables are used to infer the latent variable representing the construct. The construct 'customers' adoption attitude' plays the role of the mediating variable to see whether it has effect on the adoption intention. Demographic variables such as gender, age, income, and education level are appropriate base for segmentation. In this particular study on adopting the integration of traditional Chinese and western medicine we select the education level as the dominant. Therefore, we use customer's education level as the moderating variable.
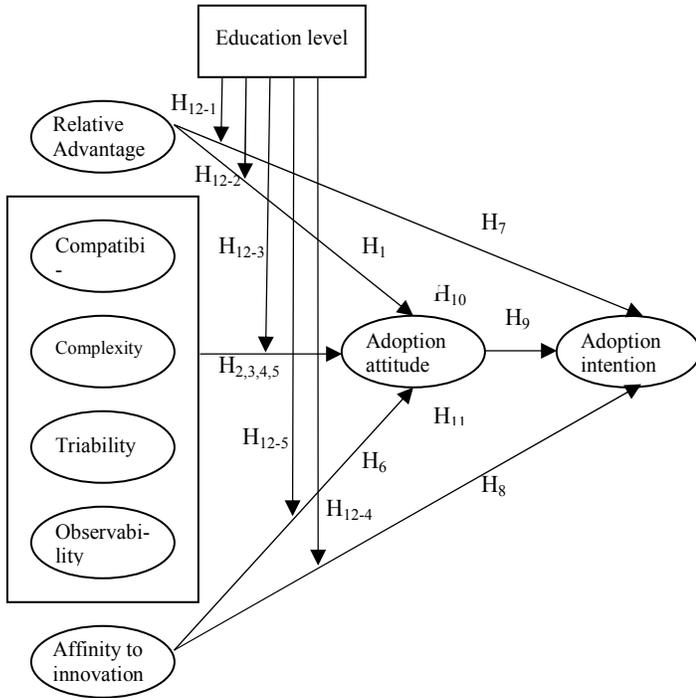
Fig. 1 the conceptualized framework

B. Hypotheses and structure equations

Based on the conceptualized framework, we list up sixteen hypotheses to test.

H_1 : Relative advantage has positive influence on the adoption attitude toward the integration of traditional Chinese and western medicine.

H_2 : Compatibility has positive influence on the adoption attitude toward the integration of traditional Chinese and western medicine

H_3 : Complexity has negative influence on the adoption attitude toward the integration of traditional Chinese and western medicine

H_4 : Triability has positive influence on the adoption attitude toward the integration of traditional Chinese and western medicine

H_5 : Observability has positive influence on the adoption attitude toward the integration of traditional Chinese and western medicine

H_6 : Affinity to innovation has positive influence on adoption attitude toward the integration of traditional Chinese and western medicine

H_7 : Relative advantage has positive influence on the adoption intention toward the integration of traditional Chinese and western medicine.

H_8 : Relative advantage has positive influence on the adoption intention toward the integration of traditional Chinese and western medicine.

H_9 : Adoption attitude has positive influence on the adoption intention toward the integration of traditional Chinese and western medicine.

H_{10} : Relative advantage has positive influence on the adoption intention toward the integration of traditional Chinese and western medicine via adoption attitude.

H_{11} : Affinity to innovation has positive influence on the adoption intention toward the integration of traditional Chinese and western medicine via adoption attitude.

H_{12-1} : Education level has positive influence on the causal link between relative advantage and adoption intention

H_{12-2} : Education level has positive influence on the causal link between relative advantage and adoption attitude

H_{12-3} : Education level has positive influence on the causal link between compatibility, complexity, triability, observability and adoption attitude.

H_{12-4} : Education level has positive influence on the causal link between affinity to innovation and adoption intention

H_{12-5} : Education level has positive influence on the causal link between affinity to innovation and adoption attitude.

The path diagram for the framework is shown in Figure 1. In the meanwhile, there are corresponding indicator variables to measure the extent of agreement by correspondents towards the eight latent variables that cannot be directly measured. The equivalent simultaneous linear equations are shown below:

$$\eta_1 = \gamma_{11}\xi_1 + \gamma_{12}\xi_2 + \gamma_{13}\xi_3 + \gamma_{14}\xi_4 + \gamma_{15}\xi_5 + \gamma_{16}\xi_6 + \zeta_1 \qquad (1)$$

$$\eta_2 = \gamma_{21}\xi_1 + \gamma_{26}\xi_6 + \beta_{21}\eta_1 + \zeta_2 \qquad (2)$$

where

η_1 : customer's adoption attitude toward the integration of traditional Chinese and western medicine.

η_2 : customer's adoption intention toward the integration of raditional Chinese and western medicine.

$\xi_1 \sim \xi_6$: represents respectively their perception toward relative advantage, compatibility, complexity, triability, observability, and affinity to innovation

γ、β : the weights of influence factors

ζ : error terms

C. Instrument Design and Data Collection

Being limited by the space allowed for the paper, the question items for the indicator variables in the abbreviated form are shown in the left side of Table I.

The instrument is composed of two parts. The first part includes question items to measure channel employees' perception on the seven constructs. It applies Likert's 7-point summated scale to measure response accommodates 'extremely agree', 'strongly agree', 'moderately agree', 'just agree', 'not agree', 'strongly not agree' to 'extremely agree'. The second part involves data related to the demographic and socioeconomic variables such as age, gender, occupation, income, and education level. Data is collected by random sampling from the patients whose registration form feature a "0" at the last number in the department of integration of traditional Chinese and western medicine in China Medical University Hospital. The effective response rate is 92.1% (212 effective against 230 issued). We use construct reliability (CR) and variance extracted (VE) to test the reliability of indicator

variable measurement system. The preferable value for CR is greater than 0.7 and VE is greater than 0.5. The outcome of pretest justifies the reliability and validity of the survey instrument. Software package SPSS AMOS 5.0 enables us to carry out the Structural Equation Modeling (SEM) task for path analysis with latent variables.

III. RESULTS AND FINDINGS

A. Measurement System Test

Based on the response data, we obtained all the value of CR and VE for indicator variables representing constructs like: 'relative advantage', 'compatibility', 'complexity', 'triability', 'observability', 'affinity to innovation', ' adoption attitude' and 'adoption intention' are greater than 0.7 and 0.5 respectively as shown in Table I. It justifies that the reliability of the measurement system is adequate for this study.

TABLE I
EVALUATION OF RELIABILITY OF THE MEASUREMENT SYSTEM

	Factor loading	CR construct reliability	VE variance extracted
Relative advantage			
less side-effect than western medicine	0.983		
more scientific than traditional Chinese medicine	0.962		
better effectiveness via synergy of both approaches	0.952	0.976	0.875
preferable one-stop medical treatment	0.942		
accessible medical knowledge from both approach	0.897		
accelerated rate of recovery	0.872		
Compatiability			
compatible with the experience of past medical treatment	0.869		
satisfactory outcome through treatment of this sort	0.694	0.785	0.553
consistent medical treatment process	0.651		
Complexity			
bored with the dual prescription	0.968		
inhibitive dosage between two kinds of medicine	0.966	0.928	0.981
medical consequence is not transparent	0.963		
tedious diagnosis process	0.958		
Triability			
understandable clinic procedure	0.885		
sufficient prior consultation	0.851	0.895	0.740
available after treatment service center	0.845		
Observability			
accessible user network	0.72		
available discussion community	0.89	0.911	0.774
perceivable remedy effectiveness	0.86		
Affinity to innovation			
apt to try new stuff	0.970		
active in pursuing new solution	0.958		
confident in the performance of well established treatment way	0.951	0.978	0.902
inclined to accept new concept	0.940		
doubtful about new concept	0.930		

	Factor loading	CR construct reliability	VE variance extracted
Adoption attitude			
It's good idea to adopt the integration of traditional and western medicine	0.982		
It's a right decision to adopt the integration of traditional and western medicine	0.973	0.981	0.947
It's encouraging to take the treatment of the integration of traditional and western medicine	0.965		
Adoption intention			
Pursue more effective remedy	0.977		
Take the integration of treatment as the first priority	0.976	0.978	0.938
Spread the word-of-mouth for the benefits of integration	0.953		

B. Model Goodness Fitting Test

The result of goodness fitting result for SEM is shown in the Table II. The value of CMIN/DF is a little bit larger than the preferred value and the value of goodness of fit index (GFI) is a little bit lower than the preferred value though, the rest of indices conform to the requirement. Therefore, we assume the proposed model is appropriate to explain the causal links in this study.

TABLE II
THE GOODNESS FITTING OF SEM MODEL

Model goodness fitting	Preferred value	Result
CMIN/DF	< 3	3.154
GFI	> 0.9	0.875*
AGFI	> 0.8	0.856
RMR	< 0.05	0.007
RMSEA	< 0.1	0.101

C. Hypotheses Test

All standardized weights for the structural links in the conceptualized framework are positive values except for that of hypothesis 3. However, the hypothesis 3 assumes a negative relationship between complexity and adoption attitude. And all p-value are smaller than 0.001. Therefore, hypothesis 1 to 9 is supported. The test results are shown in the Table III. Please note structural links confirmed by the hypothesis 1 to 9 are direct links between two constructs manifested with groups of indicator observable variables. The effect of mediating and moderating variables will be discussed later on.

TABLE III
STANDARDIZED SEM ESTIMATES

Structural links			Standardized Weights	p - value	Test result
relative advantage	→	adoption attitude	0.19	***	support H_1
compatiability	→	adoption attitude	0.86	***	support H_2
complexity	→	adoption	-0.16	***	support H_3

triability	→	attitude adoption attitude	0.30	***	support H_4
observability	→	adoption attitude	0.46	***	support H_5
affinity to innovation	→	adoption attitude	0.22	***	support H_6
relative advantage	→	adoption intention	0.23	***	support H_7
affinity to innovation	→	adoption intention	0.31	***	support H_8
adoption attitude	→	adoption intention	0.53	***	support H_9

D. The Effect of Mediating Variables

The result of H_9 demonstrates the substantiation of mediating effect, however, From Table V, the direct effect of relative advantage towards adoption intention（0.279）is larger than the indirect effect via adoption attitude（0.090）. The direct effect of affinity to innovation towards adoption intention（0.460）is larger than the indirect effect via adoption attitude（0.091）. Therefore, the finding refers to the being of mediating effect by adoption attitude, although it is not so significant.

Table IV
Effect Analysis for the Mediating Variables

Structural links	direct effect	indirect effect	total effect
1.relative advantage→ adoption attitude→ adoption intention	0.279	0.090	0.369
2. relative advantage→ adoption attitude	0.307	-	
3.affinity to innovation→ adoption attitude→ adoption intention	0.460	0.091	0.551
4. affinity to innovation→ adoption attitude	0.308	-	
5. adoption attitude→ adoption intention	0.460	-	

E. The Effect of Moderating Variables

Customers' differentiation in the socioeconomic variables has been regarded as a significant factor in innovation adoption process [9]. Medical care are widely recognized as a highly specialized area in knowledge and intellectual domain, thus we select the education level as a better moderating variable among income, occupation status, and educational level. As this study is just a preliminary research work starting with the exploration of customer behavior in adopting the integration of traditional Chinese and western medicine, to simplify the process, we categorize the education level into two groups: who possesses bachelor or higher degree and who doesn't. By the multiple group analysis, the result is shown in the Table V. We found that there is no significant difference taking place between groups of these two educational levels. This implies that the moderating effect of the socioeconomic variable: educational level doesn't make contribution to the adoption intention toward the treatment by integration of traditional Chinese and western medicine. Thus, it nullifies the hypotheses from H_{12-1} to H_{12-5}.

Table V
Coefficient of Multiple Group Analysis

	relative Advent-age	relative Advent-age	compat-ibility	Compl-ex-ibil-i-ty	trial-ability	observ-ability	affinity to inno-vation	affinity to inno-vation
adoption intention	1.27							
adoption attitude		1.95						
adoption attitude			0.73					
adoption attitude				-2.154				
adoption attitude					1.33			
adoption attitude						2.56		
adoption intention							0.687	
adoption attitude								2.69

IV. CONCLUSION

The weights of paths in the SEM model disclose valuable business implication. First, the adoption attitude plays the most significant role, if compared with other constructs like relative advantage to patient and patient's affinity to innovation in developing the adoption intention toward treatment by means of the integration of traditional Chinese and western medicine. Among all constructs in this study, compatibility and observability are the two salient factors in affecting the customer's adoption attitude. Compatibility stems from the treatment procedure being compatible with the experience of past medical treatment, satisfactory outcome through treatment of this sort, and consistent medical treatment processes. This implies that the diagnosis and treatment of the integration approach must not deviate too much from the incumbent western approach that majority of patients used to. It refers that the advanced medical instrument is still needed and switching to the entirely genuine traditional Chinese diagnosis might be not so applausive. Observability comes from accessible user network, available discussion community, and perceivable remedy effectiveness. Sharing the knowledge and experience in the patient network is the hallmark of Christensen's disruptive business model. In our study, users of integration of traditional Chinese and western medicine regard mutual communication in the user network the requisite of adoption attitude. This phenomenon also justifies the predictive power of Christensen's theory of disruptive innovation.

Limitation of this research work is owing to the localized sampling frame. It is confined to the incumbent patients who have already adopted the treatment of the integration approach. The situation leads to the non-significance of the education background as the moderating variable. As we presume that without the absorption capacity of medical report, people will have hard time to identify the real benefit of integration of traditional Chinese medicine and western medicine. A wider

coverage of people as the sampling frame should be accounted for in the further research.

Research in the integration of traditional Chinese and western medicine is a less visited area. Most literatures in this area focus on the technological aspect. Christensen's insight in the health-care service industry opens a door to attract more research input in this domain. The objective of this study is to identify the causal links of customer perception and motivation with construct such as customer's adoption intention. By finding out that the attitude is the most influential factor to the construct of adoption intention, and both constructs such as compatibility and observability are the attributes leading to the development of people's attitude toward adoption. The outcome of this study makes a contribution in trumpeting the imperativeness for the adoption of the integration that may enhance the health of people while lowering the cost of health-care service industry. Just as Christensen's conjecture that technology innovation will not make it unless a disruptive business model is in place. The direction of our further research will be in the area of strategy formulation for an appropriate business model for the integration of traditional Chinese and western medicine.

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