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運用 DEMATEL 技術改善 SEM—以網路廣告效果為例

Improving SEM based on DEMATEL technique---
Web-Advertising Effects as an example

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摘　　要

因果分析對決策制定的效率有非常大的影響。近年來，學者通常採用 SEM 建立因果模式。然而，SEM 經常被誤用，在沒有理論基礎下，以資料驅使模式修正，甚至據以理論推導。本研究以決策實驗室分析法(Decision Making Trial and Evaluation Laboratory，DEMATEL)技術修正 SEM。實證結果發現，透過 DEMATEL 方法，可以在合理的基礎下找到 SEM 模式的修正方向，避免上述沒有理論基礎關係存在，讓資料來決定理論，以資料來驅使(data-driven)模式修正的錯誤。研究者不會一味地追求適配，不斷地修正模式，造成過度適配(overfitting) 的情形發生。另一方面，研究者可以重新檢視各構面間的因果關係，而不是侷限於研究者最初建置的研究假說(initially hypotheses)和路徑關係(path relation)，減少模式界定錯誤的機會。顯示透過結合 DEMATEL 和 SEM，可以有效改善過去 SEM 依資料修正模式統計的各項缺失，證實 DEMATEL 技術是一種用以作為 SEM 模式修正的有效且具互補性的工具。此外，透過修正模式，找出影響網廣告影響的最重要因素，有助於管理者制定適切的行銷策略。

關鍵詞：網路廣告效果、結構方程模式、決策實驗室分析法、多準則決策制定模式、網絡關係圖。

Improving SEM based on DEMATEL technique--- Web-Advertising Effects as an example

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ABSTRACT

Causal analysis greatly affects the efficiency of decision-making. Scholars usually adopt SEM (Structural equation modeling) to establish a causal model in recent years. However, statistical data allow researchers to modify the model frequently to arrive at good model fitness, and SEM is often misapplied when the data are merely fitted to a SEM and the theory is then extended from the analytical result based on presumed hypotheses. The paper proposed SEM modified by DEMATEL (Decision making trial and evaluation laboratory) technique, taking causal model of web-advertising effects for example. Having revealed that the new model is the one that conforms to actual data and is better than initial model, the results confirm that the DEMATEL technique can be an efficient, complementary, and confident approach for reprioritization of the amended modes in a SEM model. DEMETAL provides another tool for examining the accuracy of researchers' initial hypotheses. A model may be revised based on the analysis result of the DEMATEL technique, and a better model may be acquired. In addition, the DEMATEL technique may offer reasonable bases for modification of SEM to avoid over fitting and the above-mentioned misuses. In addition, the most important factor affecting the web-advertising effects may be found via the modified model, which benefits the manager for making strategic marketing plans.

Keywords: Web-advertising effects; SEM; DEMATEL; MCDM (multiple criteria decision making).

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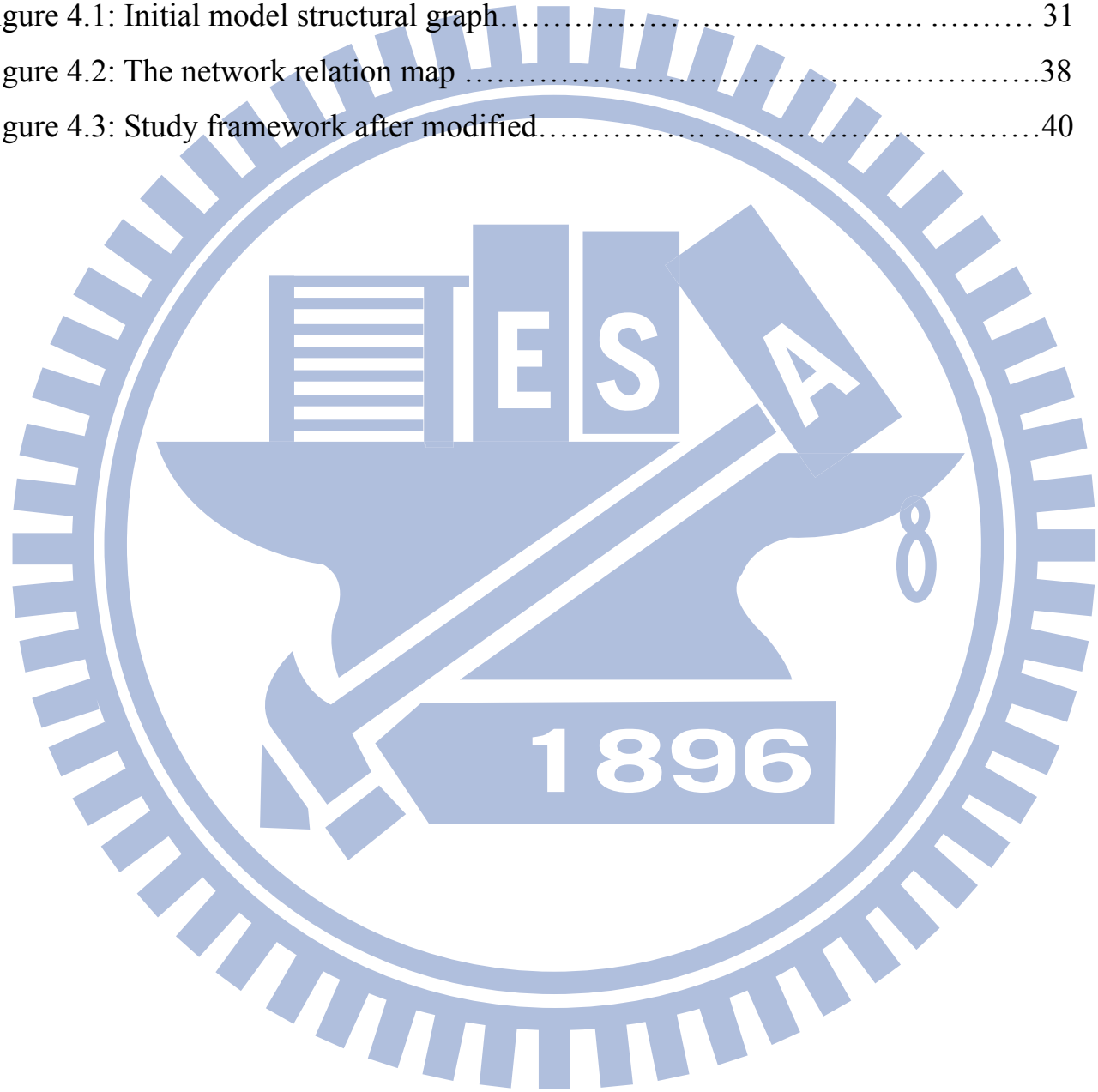


Chapter 1 Introduction

1.1 Research background and motivation

Structural equation modeling (SEM), analysing causal links among latent factors measured by observed variables, is widely used in various disciplines, including marketing (Bruner II and Kumar, 2000; Ko et al., 2005; Wu et al., 2008; Price et al., 1995; Spreng et al., 1996), human resources management (Medsker et al., 1994), psychology (Agho et al., 1992; Shen et al., 1995), sociology (Kenny, 1996), environmental studies (Nevitte and Kanji, 1995), healthcare (Taylor, 1994; Taylor and Cronin, 1994), migration research (Sandu, and DeJong, 1995), cross-national research (Mullen, 1995; Singh, 1995), computer science(Hong et al., 2006) and many others.

One of the biggest problems concerning SEM is model modification. Most SEM models were modified to provide a better fitness or be more succinct. A widespread abuse of SEM may happen when SEM is misapplied when the data are fitted to a SEM, but the analytical result based on presumed hypotheses is without theoretical support. (Kline, 2005; Reisinger and Turner, 1999; Mueller, 1996; Cliff, 1983). As often happens in SEM, the data may be inconsistent with the initially hypothesized model, implying that the researcher must either modify or abandon the model. In practice, researchers frequently choose the former (Kline, 2005). Researchers usually trim the model via modification

indexe, such as the Likelihood Ratio (LR) test, Lagrangian Multiplier (LM) test, and Wald test, all can be found in software of SEM.

Just as Chin (1998) argued that "The models that are initially tested are typically rejected. With modification indices and other such information, the researcher may follow a process of changing and re-estimating the model until it fits the data. The final model is mistakenly believed to be correct". Arbuckle and Wothke (1999) disputed that "A modification must only be considered if it makes theoretical or common sense". Critical Ratios (CRs) or Modification Indices (MIs) alone should not be used utterly as a guide (Sellin, 1990). The purely data-driven model modified without theoretical foundation will cause the following fallacies:

(1) The modified model is only adapted to special sample characteristics; however, it may lack goodness of fit when it is applied to the other sample (Diamantopoulos and Siguaw, 2000);

(2) SEM cannot detect and improve model specification errors by modification indices (Bollen, 1989; Gerbing and Anderson, 1984);

(3) "When should the modification procedure end?" To seek for fit may include too many parameter estimations (fit for fitting?); in pursuit of a continuous fit would bring about an over fitting model (Byrne, 1998);

(4) The nature of data analysis is changed from confirmatory to exploratory (Biddle and Marlin, 1987; Breckler, 1990).

Incorrect model specification always results in bad model fitting.

Constructing causal model should be consistent with sound theoretical basis. Researchers require understanding theoretical, substantive, and philosophical foundations of their research. If not, they may misjudge the model specification by omitting important variables/paths or by including insignificant relations when constructing the path diagrams. Unfortunately, the faults in model specification by the modification index cannot be perceived in SEM (Bollen, 1989). Therefore, we try other ways to modify the model properly.

1.2 Research purposes

In recent years, a number of literatures discussed Multiple Criteria Decision-Making (MCDM) theory to strengthen the comprehensiveness and reasonableness of the decision-making process (Ou Yang et al., 2009; Chang et al., 2009; Fu et al., 2007; Xu, 2009). To improve the aforementioned drawbacks of SEM, this article incorporates MCDM model to address on dependent relationships among criteria, decision-making trial and evaluation laboratory (DEMATEL) to evaluate the effectiveness of web-advertising. We find out main factors that have great impact on web-advertising effects via SEM modified by DEMATEL technique. The DEMATEL technique illustrates the interrelations and feedbacks among criteria (Fontela and Gabus, 1976). Because DEMATEL builds the complex relationship between each dimension/criterion the network relation map (NRM), it can reasonably modify SEM without driving model modification. The researchers would not simply pursue a well-fitting model and

avoid over-fitting. The researcher probably re-inspects the causality among the various dimensions, and refrains from being limited in the initial hypotheses and path relations, and thus reduces the risk of wrong model specification. Consequently, the model-fit and causal analysis should be meaningful, thus influential to the efficiency of decision-making.

The proposed model could be used to evaluate effectiveness, find the central criteria for evaluation, illustrate criteria interrelation, and find elements to improve the effectiveness of Web ads and make strategic marketing plans. Moreover, the results show that the effectiveness calculated by the proposed model is consistent with that from SEM and DEMATEL.

1.3 Organization of the dissertation

The remainder of this dissertation is organized as follows. In Chapter 2, summaries of some important previous research regarding effectiveness of Web ads are introduced. The research hypotheses are also established. In Chapter 3, the research methodologies are proposed, and basic concepts of proposed SEM based on DEMATEL technique are introduced. In Chapter 4, an empirical study of web-advertising effects is illustrated to demonstrate the proposed novel causal modeling. The results, discussions, and implications are presented. Final concluding remarks are offered in Chapter 5.

Chapter 2 Literature Review about Web advertising effects

In this section, we discuss some important factors impacting on Web ads effects based on the scholars' previous researches, and then propose the following hypotheses.

2.1 Web advertising effect measurement

This article examines Web ads for computer products to determine major factors influencing the effectiveness of web-advertising. The measurement for advertising effects is classified into sales effects and communication effects to reflect the increase product sales. The sales conditions may be directly determined by advertising effects (known as sales effects). Lavidge and Steiner (1961) pointed out that ads viewing rate, listening rate, product popularity, and various other factors are indirect means to promote sales (known as communication results). Because actual sales can not be acquired, in terms of web ads effect measuring, this study is based on the communication effects.

During earlier times, the effectiveness of web ads used to be determined by the numbers of click-through users. However, there is no way to know the effects of cognition, attitude and purchase intention after consumer contact. Thus, click-through has its shortcomings and insufficiencies when only a measurement tool for advertising effects was used. Hoffman and Novak (1996)

observed that the mental aspect of consumers through Internet user browsing behavior is similar to traditional advertising where user attitude was used to measure attitude of brand, purchase intention, recall and confirmation etc. In contrast to traditional measurements, Keng and Lin (2006) measured ads effectiveness via recall and recognition of components of the advertisement. Lohtia et al. (2007) used three output variables – click-through-rate, attitude towards the ad, and recall – to measure the efficiency of banner ads. Since there is no consistent web ads to affect measurement variables in use at the moment, and traditional media often use recall effects, attitude of brand and purchase intention in measuring advertising effects. Thus, the traditional method is used as a measurement indicator for Internet ads effect in this study. Moreover, when considering the features of Web ads many scholars also take click-through No. into account in determining whether Web ads are effective. Therefore, this study also lists click-through as part of the measurement indicators for web ads effects, adopting a total of four variables: (i) Ads click-through; (ii) Recall effect; (iii) Attitude of brand; and (4) Purchase intention for measuring Web ads effects.

2.2 Web-use Extent

There is still controversy over how users' time spent on the Internet affects the web-advertising effect and their attitude toward web-advertising. Some studies showed that light users (who do not use Internet quite often) have an adverse effect on the web-advertising while heavy users (who frequently use Internet)

accustom to ads being broadcast (Elliott and Speck, 1998). Korgaonkar & Wolin (2002) explored user's level of web advertising interest and level of interest in clicking on the site and how they are significantly correlated with the attitude toward web-advertising. The differences between heavy, medium, and light web users in terms of their beliefs about web-advertising, attitudes toward web-advertising, purchasing patterns, and demographics lead to a more positive attitude toward web- advertising, leading to more frequent web purchasing and higher dollar amounts spent on these purchases.

However, for many web users, web advertising disrupts flow on web sites, potentially leading to an interruption in the hierarchy-of-effects sequence (Rettie, 2001). Napoli & Ewing (2001) indicated that people dislike having advertising while checking or reading e-mail. Web users often have to be interfered by web advertising while collecting information, checking e-mail and reading newspaper through the Internet. The longer time of web usage, the more advertising is encountered. For this reason, people feel annoyed about the forced and frequently interfering web advertising.

H1: Consumers' web use extent has a direct negative influence on attitudes toward web ads.

2.3 Attention toward Web Advertising

Weilbacher (2003) pointed out that a successful advertisement draw customers into purchasing or viewing the product or a company in a more favorable light.

Lavidge and Steiner (1961) divided the advertising lobbying process into three stages namely: cognition, emotion and action. After a consumer is exposed to advertising, through attention, understanding and recall, he learns about the message content an ad conveys. He then develops interest and preference for the product. At last, through advertising attitude and product assessment, his purchase intention is influenced. Rethans et al. (1986) further pointed out that through repeated occurrence or increasing the occurrence frequency of advertising. The consumer's ability to recall is also enhanced. Nua Internet Surveys (2001) said that 85% of advertising, marketing and sales companies believe that online advertising mainly aims to attract the crowd to certain websites. Nua Internet Surveys (2000) estimated that 32% of online trade is the results of online advertising viewing.

Bruner II and Kumar (2000) found that hierarchy effects exist among advertising attention level, advertising attitude, attitude of brand, and purchase intention. Moreover, increasing consumer contact via advertising and attracting consumer attention to web ads leads to a positive attitude towards web ads and improves their effects. Web ads contact and attention of consumers affects the advertising attitude and purchase behavior, therefore this study has proposed the following hypotheses:

H2: Consumers' web ads attention has a direct positive influence on attitudes toward web ads.

2.4 Web ads content design

Ducoffe (1996) pointed out that advertising content presentation is one of the important factors that contribute to advertising effects; these results are supported by Cho (1999). Through message conveyance, consumers form advertising values that affect their consumption pattern. Therefore, if messages found in ads can help consumers make decisions, their attitude and willingness to make purchases will be influenced.

Online advertisements' content includes variables such as: web interface, background colors, pictures, sound effects, textual content and dynamic techniques (Dreze & Zufryden, 1997). Bayles and Chaparro (2001) showed that animated advertising is more likely to be correctly recalled. Researchers have also found that web site complexity influences consumer attitudes such that complexity has a negative impact and interestingness has a positive impact on attitude toward web sites (Bruner II and Kumar, 2000). Associated with this observation, simpler web site backgrounds have significantly more positive impacts on consumer attitude toward the ad, brand, web site, and purchase intention (Stevenson and Bruner II, 2000). Cho's (1999) studied results have found that when an ad is presented through animations, low product involvement groups tend to have greater ads click-through intention. Norris and Colman (1992) studied the effects of advertising content on advertising recall effects and pointed out that different types of advertising design will cause different degrees of involvement, which further affects the recall effects of ads.

Wu et al. (2008) further pointed out that the greater the importance placed on web ads content design by consumers, the greater the degree of product involvement. Therefore, the greater the emphasis placed on web ads content design by consumers, the greater the product involvement will be. After consumers are attracted by the web ads content design, they become better informed about the advertising content and the product, which deepening the product involvement level and further produces web ads effects, which prompted this study to propose the following hypotheses:

H3: Web ads content design has a direct positive influence on consumers' product involvement level.

2.5 Attitudes toward Web ads

Mackenzie and Lutz (1989) defined the attitude toward an advertisement as being the response elicited in a consumer; Perception of advertisements directly affects the consumers' attitudes toward brands and intention toward purchase (Suh and Yi, 2006).

Advertising attitude will affect the purchase intention toward a particular brand (Gorn, 1982). Moore and Hutchinson (1983) stated a positive linear relationship between advertising attitude and the attitude of brand. Lutz et al. (1983) believed the advertising attitude will directly affect the attitude of brand, and will directly affect brand cognition. This brand cognition in turn affects attitude of brand and affects the purchase intention in the end. Later, many

scholars held similar opinions. Consumer cognition toward advertising source forms the advertising attitude, which in turn elicits brand cognitions and affective reactions (MacKenzie et al., 1986). This opinion has been held by many scholars (MacKenzie et al., 1989; Homer, 1990; Brown and Stayman, 1992). Wu et al. (2008) stated that the more positive a consumer's attitude toward an advertisement is, the greater the effect of the advertisement is. In reference to past relevant literature review discussions on the influence of the advertising attitude toward advertising effects, the following hypotheses in this study has been proposed:

H4a: Consumers' attitude toward web ads has a direct positive influence on ads click-through.

H4b: Consumers' attitude toward web ads has a direct positive influence on ads recall effect.

H4c: Consumers' attitude toward web ads has a direct positive influence on attitude of brand.

H4d: Consumers' attitude toward web ads has a direct positive influence on purchase intention

2.6 Product involvement level

McGrath & Mahood (2004) showed that product involvement is a significant intermediary variable which affects the advertising effect. This opinion has been held by many scholars (Chou, 2006; Suh & Yi, 2006; Yoonn & Choi, 2005; Wu

et al., 2008). McWilliams and Crompton (1997) found that different involvement segments have different media choices, information processing, and behavior patterns. Yoon and Kim (2001) also proved that product involvement level is a very important crux for web purchase. Cho (1999) found that when the consumers' product involvement level is high, consumers' intention to click-through ads also increases. Ray (1973) proposed that different degrees of involvement would produce different the product adoption processes. Korgaonkar and Moschis（1982）pointed out that after consumers read about related product messages, those with low product involvement are likely to change their minds as results of changes in messages and their attitudes are maintained for shorter periods of time. Therefore, brand-switch is a frequent occurrence for these people. Those with higher degree of product involvement are likely to carefully think over advertised messages and they are less likely to change their attitudes during advertised messages exposure.

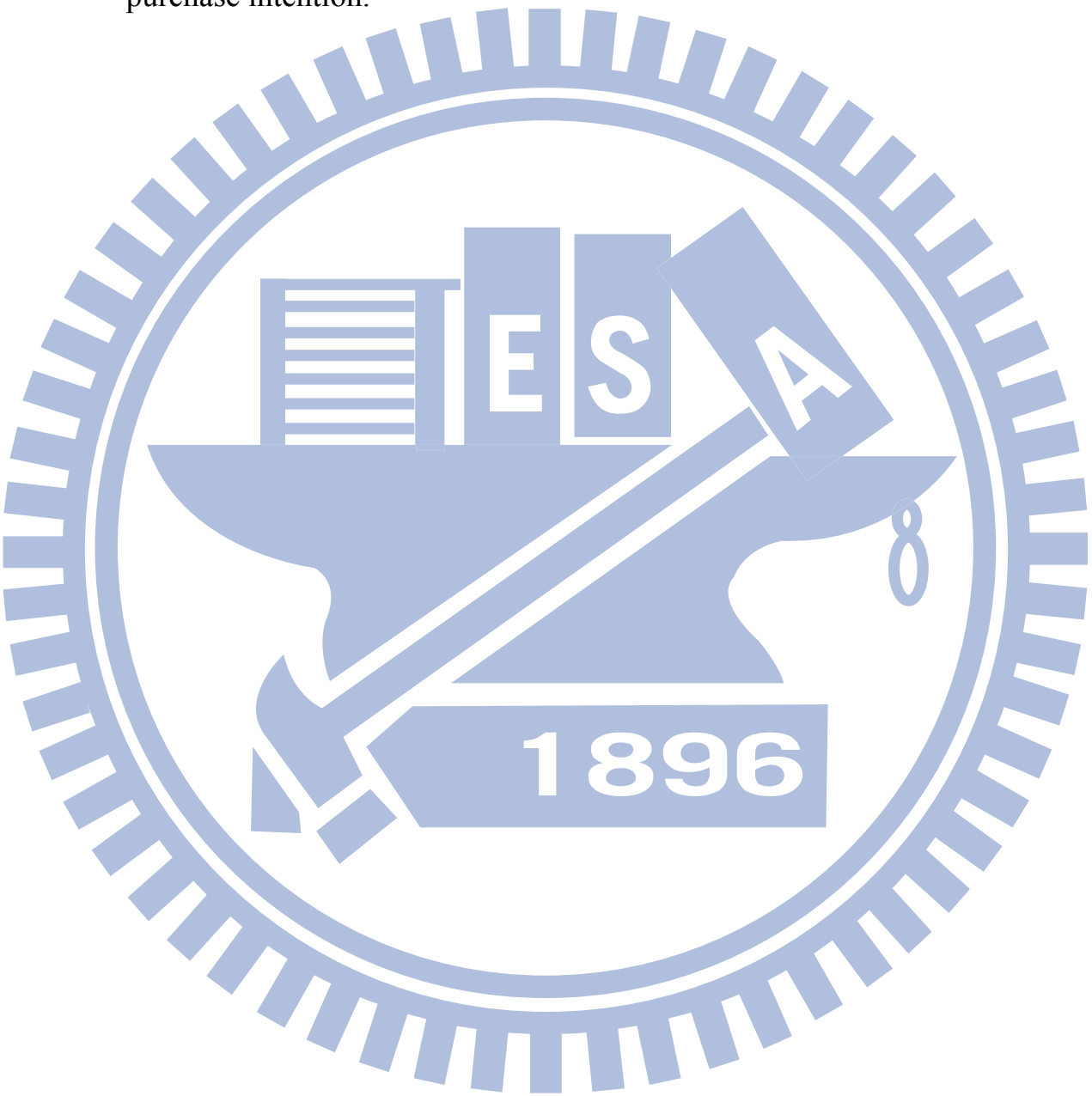
It shows that different involvement degrees affect ads click-through intention, message dealing, and product selection process. The advertising effects triggered are likely to differ as well. Therefore, this study has proposed the following hypotheses:

H5a: Consumers' level of product involvement has a direct positive influence on ads click-through.

H5b: Consumers' level of product involvement has a direct positive influence on ads recall effect.

H5c: Consumers' level of product involvement has a direct positive influence on attitude of brand.

H5d: Consumers' level of product involvement has a direct positive influence on purchase intention.



Chapter 3 Novel causal modeling by improving SEM based on DEMATEL technique

3.1 Structural equation modeling (SEM)

At angle of developing thread of statistics and methodology, SEM is not a new technique. Because the computer popularized and improved with the function, some scholars (Jöreskog, 1973; Keesling, 1972; Wiley, 1973) combined factor analysis with path analysis, joined the analytical technology of the computer, and proposed the preliminary concept of SEM. Jöreskog and Sörbom (1981) further developed the analysis skill of the matrix so as to analyze problems of covariance structure. Because LISREL is very similar with covariance structure models, early scholar named covariance structure models as LISREL model. Henceforth, scholars proposed some software one after another, which can be divided as two main types. One is based on components such as PLSPATH while another is based on covariance such as LISREL, EQS (Benlter, 1985, 1995), AMOS (Arbuckle, 1997), MPLUS (Muthen & Muthen, 1998), CALLS (Hartmann, 1992) and RAMONA (Browne et al., 1994). Partial least square (PLS) is an analyzing technique to probe or construct foreseeing models, especially the analysis of casual model between latent variables (Pirouz, 2006). It's better than common linear construction relation model and won't be restricted by rigorous distributional assumptions and sample size (Darmawan,

2001). Sellin (1995) declared that PLS is "a flexible and extremely powerful technique for the examination of path models with latent constructs measured by multiple indicators." In addition, PLSPATH can handle two types of relationships between latent variables and the associated observed variables, inward mode and outward mode (Darmawan, 2001). The SEM software packages such as LISREL and EQS cannot dispose the inward mode (Darmawan, 2001). The absence of standard errors is one of the limitations of the use of the PLSPATH program, which should be pay attention to (Darmawan, 2001). Among the SEM software which are based on covariance, LISREL, EQS and Amos are the most widely used. These three methods are very closed to each other in terms of efficiency, functionality, parameter estimation and fitting criteria and have a very slightly difference (Reisinger et al., 1999). Albright and Park (2008) had used AMOS, LISREL, MPLUS and CALIS to conduct a confirmatory factor analysis and showed the analytical results for these four types of software were substantially identical. Earlyon, scholars often used LISREL as a tool for SEM methodology analysis. However, AMOS has far more user friendly, so nowadays journal submissions using it are rising quickly and fast approaching equality in numbers with LISREL applications recent years (Babin et al., 2008). There are two major advantages for AMOS. First, AMOS combines SPSS software which is the most familiar for researchers. Second, AMOS is very user-friendly with icons as the operation interface making it even easy for user without the ability of writing programs to use (Babin et al., 2008).

Therefore, the paper adopts AMOS as the analysis tool.

SEM technique deals with relations of multiple criteria constructs simultaneously and fits in proving positive research. The primary aim of SEM technique is the analysis of latent variables and the analysis of causal relations between latent constructs to verify theory so would be called causal model technique.

The structural equation modeling (SEM) Methodology is a confirmatory modeling for data analysis; therefore, researchers must have a theoretical foundation for their proposed research models which are guided by theories. No matter it is to prove any causal relationships or confirm internal structure, both depend on clarifying the contents and the properties of prior research variables, and a clear description of hypothetical relations. Moreover, researchers advance the concrete structural hypothetical relations and seek for statistical confirmation. The investigation of the variable structural relations in the areas of sociological and behavioral science mainly consists of a group of indirectly observed, measured abstractly latent constructs. Precise statistical data is required to prove the existence of the construct, which is one of the major advantages of SEM methodology (Bollen, 1989).

In addition, SEM technique includes one or more linear regression equations that express how the endogenous variables depend upon the exogenous variables. SEM technique is akin to combine multiple regression and factor analysis. As such SEM expresses the linear causal relationship between two separate sets of

latent constructs (which may have been derived by two separate factor analyses). A multiple regression is required to test for several dependent variables from the same set of independent variables simultaneously, particularly if it is possible for one dependent variable to simultaneously cause another with multivariate analysis. SEM technique is a powerful method for effectively dealing with multicollinearity (when two or more variables are highly correlated) which is another benefit of SEM over multiple regression and factor analysis (Reisinger et al., 1999).

3.2 Decision Making Trial and Evaluation Laboratory (DEMATEL)

The DEMATEL technique, which originates from the Geneva Research Centre of the Battelle Memorial Institute (Gabus and Fontela, 1973; Fontela and Gabus, 1976), was used to investigate and solve the complicated problem group. DEMATEL technique was developed in the belief that the proper use of scientific research methods could facilitate comprehension of the specific problematique, the cluster of intertwined problems, and contribute to recognition of practical solutions by a hierarchical structure. The methodology, according to the characteristics of objective affairs, can verify the interdependence among the variables/attributes/criteria and confine the relation that reflects the characteristics with an essential system and evolution trend (Huang and Tzeng, 2007; Chiu et al., 2006). The method is a practical and useful tool, especially for visualizing the structure of complex causal relationships with matrices or

digraphs. The matrices or digraphs show a contextual relation between the elements of the system, in which a numeral represents the strength of influence of each element. Thus, the DEMATEL technique is able to convert the relationship between the causes and effects of criteria into an intelligible structural model of systems. The paper provides an empirical example for web-advertising effects (WAE) to make obviously the proposed method.

DEMATEL technique, a very popular method used in Japan and Taiwan, has been widely applied in a number of disciplines, including airline safety (Liou et al., 2007; Liou et al., 2008), e-learning (Tzeng et al., 2007; Chao and Chen, 2007), decision making (Lin and Wu, 2008; Hajime and Kenichi, 2007; Tseng, 2009), knowledge management (Wu, 2008; Shi et al., 2005), Operations Research (Ou Yang et al., 2008; Zhang et al., 2008), business policy (Wu and Lee, 2007), selecting systems(Tsai and Chou, 2009), agriculture (Kim, 2006), innovation (Huang et al., 2007; Yamashina et al., 2005), consumer behavior (Hsu et al., 2007) and others. The method can be summarized as follows:

Step1: Calculate the direct-influence matrix by scores (depending on the views of the experts) and evaluate the relationship among elements (or called variables/ attributes/criteria) of mutual influence, using the scale ranging from 0 to 4 (indicating "No influence (0)," to "Very high influence (4)"); the digraph portrays a contextual relationship between the elements of the system as shown in Fig. 3.1. For example, an arrow from '*b*' to '*a*' represents that '*b* affects *a*', and its influence score is 2. Subjects are

asked to indicate the direct effect they believe each element exerts on every other element j, as indicated by d_{ij}. The matrix $\boldsymbol{D}$ of direct relations is thus obtained.

Step 2: Normalizing the direct-influence matrix: on the basis of the direct-influence matrix $\boldsymbol{D}$, the normalized direct-relation matrix $\boldsymbol{X}$ is acquired by using Eq. (3.1) and (3.2).

$$\boldsymbol{X} = k\boldsymbol{D} \tag{3.1}$$

$$k = \max_{i,j}\left\{\frac{1}{\max_i \sum_{j=1}^{n} d_{ij}}, \frac{1}{\max_j \sum_{i=1}^{n} d_{ij}}\right\}, \; i, j \in \{1, 2, ..., n\} \tag{3.2}$$

Step3: Attaining the total-influence matrix: once the normalized direct-influence matrix $\boldsymbol{X}$ by summation for i or j is obtained, the total-influence matrix $\boldsymbol{T}$ is arrived at through Eq. (3.3), in which the $\boldsymbol{I}$ is denoted as the identity matrix.

$$\begin{aligned}\boldsymbol{T} &= \boldsymbol{X} + \boldsymbol{X}^2 + \boldsymbol{X}^3 + \ldots + \boldsymbol{X}^k \\ &= \boldsymbol{X}\left(\boldsymbol{I} + \boldsymbol{X} + \boldsymbol{X}^2 + \ldots + \boldsymbol{X}^{k-1}\right)\left[(\boldsymbol{I} - \boldsymbol{X})(\boldsymbol{I} - \boldsymbol{X})^{-1}\right] \\ &= \boldsymbol{X}\left(\boldsymbol{I} - \boldsymbol{X}^k\right)(\boldsymbol{I} - \boldsymbol{X})^{-1}\end{aligned} \tag{3.3}$$

then $\boldsymbol{T} = \boldsymbol{X}(\boldsymbol{I} - \boldsymbol{X})^{-1}$, when $k \to \infty$, $\boldsymbol{X}^k = [0]_{n \times n}$

where $\boldsymbol{X} = [x_{ij}]_{n \times n}$, $0 \le x_{ij} < 1$, $0 < (\sum_{j=1}^{n} x_{ij}, \sum_{i=1}^{n} x_{ij}) \le 1$ and at least one

summation $\sum_{j=1}^{n} x_{ij}$ or $\sum_{i=1}^{n} x_{ij}$ equals one, but not all, then

$\lim_{k\to\infty} \boldsymbol{X}^{k} = [0]_{n\times n}$.

Step 4: Analyzing the results: in the stage, the sum of rows (given influence) and the sum of columns (received influence) are separately expressed as influential vector $\boldsymbol{d} = (d_1,\ldots,d_i,\ldots,d_n)'$ by factor j $(j = 1,2,\ldots,n)$ and influential vector $\boldsymbol{r} = (r_1,\ldots,r_j,\ldots,r_n)'$ by factor i $(i = 1,2,\ldots,n)$ using Eq. (3.4), (3.5), and (3.6). Then, when $i, j \in \{1,2,\ldots,n\}$ and $i = j$ the horizontal axis vector $(\boldsymbol{d}+\boldsymbol{r})$ is made by adding vector $\boldsymbol{d}$ to vector $\boldsymbol{r}$, which exhibits total important influence of each criterion. Similarly, the vertical axis vector $(\boldsymbol{d}-\boldsymbol{r})$ is made by deducting vector $\boldsymbol{d}$ from vector $\boldsymbol{r}$, which may divide criteria into a cause group and an affected group. In general, when $d_i - r_i$ is positive, the criterion is to belong to the cause group. On the contrary, if the $d_i - r_i$ is negative, the criterion is to belong to the affected group. Therefore, the causal-and-effect graph can be achieved by plotting the dataset of $\{(d_i + r_i, d_i - r_i) \mid i = 1,2,\ldots,n\}$, providing valuable approaches for making decisions.

$$\boldsymbol{T} = \left[t_{ij}\right]_{n\times n},\ i, j \in \{1,2,\ldots,n\} \tag{3.4}$$

$$\boldsymbol{d} = \left[\sum_{j=1}^{n} t_{ij}\right]_{n\times 1} = [t_i]_{n\times 1} = [d_i]_{n\times 1} \tag{3.5}$$

$$\boldsymbol{r} = \left[\sum_{i=1}^{n} t_{ij}\right]'_{1\times n} = [t_j]_{n\times 1} = [r_j]_{n\times 1} \tag{3.6}$$

where vector $\boldsymbol{d} = (d_1,...,d_i,...,d_n)$ and vector $\boldsymbol{r} = (r_1,...,r_j,...,r_n)$ express the sum of rows and the sum of columns based on total influence matrix $\boldsymbol{T} = [t_{ij}]_{n\times n}$, separately.

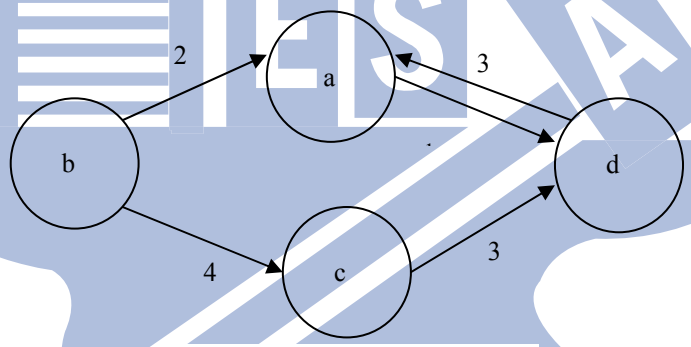


Fig.3.1 The directed graph

3.3 Initially model Study Framework

The paper establishes a cause and effect relational model for Web ads effects to build a relation map by literature review and hypothesis. The study framework of initially model is as shown in Fig.3.2.

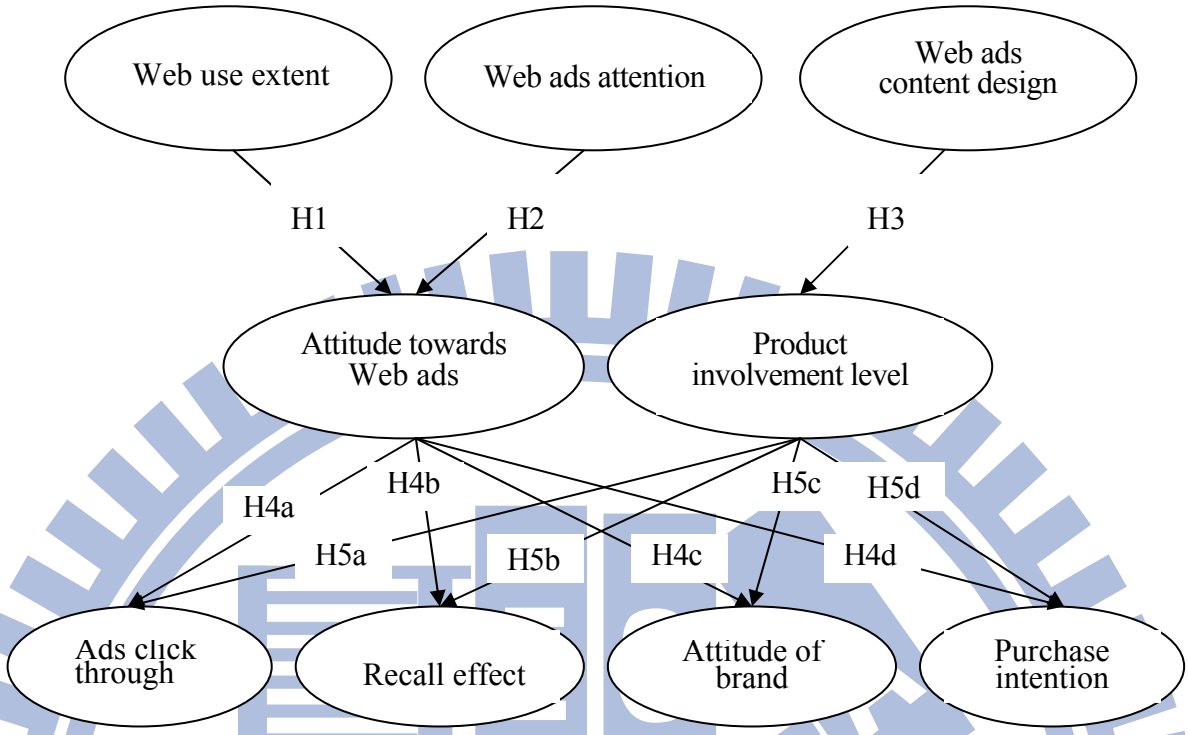


Fig. 3.2 Initially model study framework

3.4 Questionnaire Design and Reliability and Validity Analysis

3.4.1 Questionnaire 1 for SEM

Groups with Internet experiences are questionnaire survey subjects in this study, that is, discussions have been made on those groups that have had global information browsing experiences. Ten college students, who are regular Internet users, have been selected in conducting focus group discussions. The literature reviews and participants of the focus group were gathered to design a preliminary questionnaire draft. In order to obtain effective measurement tools, this study has emended the questionnaire by the pre-test and pilot-test. 15 graduate students and 15 people from the general public have been selected during the pre-test process. Survey investigations were conducted through interviews and convenience sampling was used. In the pre-test, three unclear and indistinct question items were deleted. Afterwards, the corrected pre-test questionnaire was distributed to 50 people from the general public to conduct

the pilot-test. The cronbach's α value and factor analysis was used to verify the reliability and validity of scales.

The formal questionnaire is divided into 6 parts, the dimensions and question items of the questionnaire respectively, as shown in **Appendix A**. The sampling subjects in this study with Internet use experiences underwent convenience sampling. Questionnaires were distributed at the International Computer Show in Taiwan. 598 questionnaires were returned. Invalid questionnaires (with incomplete answers) were eliminated leaving 555 valid questionnaires. The valid questionnaire return rate turned out to be 92.81%.

The overall Cronbach's α reliability value is 0.86 showing consistency of the questionnaire. From factor loading attained from factor analysis, all question items have a factor loading of greater than 0.7 (between 0.71-0.91) and that respective cumulative percent of variance for each factor is greater than 50% (between 54.80%-83.16%) showing that the questionnaire of this study possesses convergent validity (analysis results are as shown in Table 3.1). In addition, the development of this questionnaire is for study purposes, attained in accordance with literature review and is a result of repeated discussions and corrections, thus, this questionnaire possesses content validity.

Table 3.1 Validity Analysis

Dimension	Factor and Variable name(Code)	Factor loading	Eigenvalue	Cumulative Percent of Variance %
Web use extent	● one's surfing Internet period (X_1)	0.79	1.25	62.42%
	● average time spent surfing the Internet per day (X_2)	0.79		
Web ads attention	● How often a consumer is exposed to Web ads (X_3)	0.86	1.48	73.92%
	● the response of seeing Web ads (X_4)	0.86		
Web ads design	● flash design is an important factor in attracting consumers' attention (X_5)	0.81	2.22	74.00%
	● pay attention to picture and text web interface allotment (X_6)	0.90		
	● pay attention to the display of highlighted color (X_7)	0.87		
Product Involvem-ent level	● important(Y_1)	0.75	3.37	67.38%
	● exciting(Y_2)	0.84		
	● means a lot to me(Y_3)	0.85		
	● appealing(Y_4)	0.84		
	● concerning(Y_5)	0.83		
Attitude toward Web ads	● I have faith in Web ads (Y_6)	0.76	2.19	54.80%
	● I trust shopping through advertised telephone and address (Y_7)	0.71		
	● Most Web ads are pleasant (Y_8)	0.74		
	● I am in favor of Web ads in general(Y_9)	0.76		
ads click through	● I am likely to click through Web ads again(Y_{10})	0.91	1.66	83.16%
	● I often click through Web ads(Y_{11})	0.91		
Recall effects	● I can remember most of the Web ads content(Y_{12})	0.85	2.06	68.49%
	● Web ads enhance my impression toward a product(Y_{13})	0.78		
	● I can describe Web ads content (Y_{14})	0.86		
Attitude of brand	● After viewing Web ads , I am more in love with the advertised brand (Y_{15})	0.88	2.23	74.36%
	● After viewing Web ads, I developed preference for the brand in the advertisement(Y_{16})	0.89		
	● After viewing the Web ads, my impression for the product brand is strengthened (Y_{17})	0.82		
Purchase intention	● After viewing the Web ads, I am willing to try using the product (Y_{18})	0.85	2.20	73.48%
	● After viewing the Web ads, I become interested in making a purchase (Y_{19})	0.87		
	● After viewing the Web ads, I will purchase the brand being advertised (Y_{20})	0.85		

3.4.2 Questionnaire 2 for DEMATEL

In order to discuss inter-dependence among dimensions, the dimensions of SEM are regarded as dimensions and variables similar to DEMATEL.

The Questionnaire, as shown in **Appendix B**, was done via an interview approach and delivered to four experts of people who had extensive previous experience of surfing the Internet: (1) computer salesmen; (2) web ads entrepreneurs; (3) marketing professors; (4) consumers who have surfed Internet over ten years and had online trading experience regarding as experts. To find out correlation among dimensions, 12 respondents were requested for pair-wise comparisons in terms of influences and directions between each factor. Their replies are displayed in **Appendix C**.

3.5 The procedure of novel causal modeling by improving SEM based on DEMATEL technique

The paper provides an empirical example for web-advertising effects (WAE) to make obviously the proposed method. The procedures of this proposed model combined with SEM and DEMATEL are displayed as follows (Fig. 3.3).

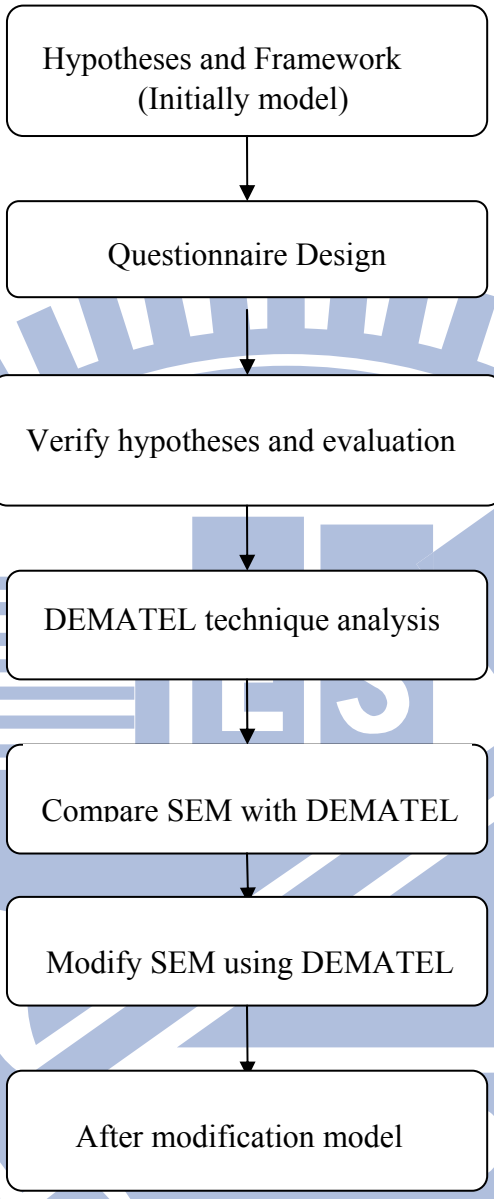


Fig. 3.3 The proposed model procedures

Chapter 4 Empirical Results and Discussion

The empirical results of the paper are demonstrated with the computer product. Since this study is a discussion of advertising effects of the Internet media, in order to measure the communication performance of web advertising, the study subjects should be Internet users who have browsed through WebPages before. Therefore, the sampling in this study with Internet use experiences underwent convenience sampling.

4.1 Verification of hypotheses and evaluation for goodness-of-fit for SEM

The study adopted AMOS 7.0 as the tool for SEM analysis in verifying the causal relationship among the factor under study. The article, which based on previous studies (Bentler, 1990,1992; Jöreskog and Sörbom, 1992; Scott, 1994; Carmines and McIver,1981), conform to the following indexes: goodness of fit index (GFI), increased Fit index (IFI) and the comparative fit index (CFI) should be greater than 0.9; adjust goodness of fit index (AGFI) should be less than 0.8; root mean square error of approximation (RMSEA) should be less than 0.05, and $\chi 2$ relative value to degree of freedom (χ^2/df) should be not exceed 3. This paper is based on the above principles in verifying model fitness.

Results of model fitness for initial model (Table 4.1) addressed that the ratio of Chi-square and degrees of freedom (χ^2/df) was 2.561 (<3), which meant the

model for the study can be established when the sample size is considered for evaluation. In addition, the GFI value was 0.898 (very close to 0.9); CFI value was 0.919; IFI value was 0.919, AGFI value was 0.877 (Scott indicated in 1994 that an AGFI value greater than 0.8 is acceptable); and the RMSEA value was 0.053. As the above-mentioned analysis, RMSEA and AGFI indices do not conformed to the approved standard values. However, compared with Jarvenpaa et al. (2000) suggestion that the RMSEA value less than 0.08 would be acceptable. Scott (1994) indicated that an AGFI value greater than 0.8 is acceptable. In summary, the initial model was not very well-fitting but acceptable.

The relationship among the respective factors and the effects of Web-advertising in the initially structural model of this study were shown in Fig. 4.1. The results exhibited that all *p*-values did not exceed the critical values at the 0.05 (or 0.01, or 0.001) significance level and verified the posited relationships among the latent constructs (Table 4.2). The following conclusions could be drawn from the SEM analysis:

(1) according to H1 and H2, Web-use extent (WUE) and Attention to Web-advertising (AWA) both significantly and directly affected Attitudes Toward Web-advertising (ATWA), but in opposing directions; the former had a negative impact and the latter caused a positive influence;

(2) according to H3, Web-ad design (WAD) had a significant and direct effect on Product-involvement level (PIL) of consumers, which in turn had a

significant and direct influence on WAE (drawing from H4a to H4d); that is, as WAD improves, ATWA level would be enhanced, causing WAE to grow;

(2) according to H3, Web-ad design (WAD) had a significant and direct effect on Product-involvement level (PIL) of consumers, which in turn had a significant and direct influence on WAE (drawing from H4a to H4d); that is, as WAD improves, ATWA level would be enhanced, causing WAE to grow;

(3) drawing from H4 and H5, both ATWA and PIL significantly and directly affected the four dimensions (ACT, RE, ATB, and PI) of WAE;

(4) according to H2 and H5, AWA impacted on WAE through influencing the ATWA; that is, as AWA increased, ATWA level would be enhanced, causing WAE to grow. This finding corresponds with the results of the study conducted by Bruner Ⅱ et al.(2000);

Table 4.1 Initial model-fitness analysis

Fit index	Proposed criteria	Results
the ratio of Chi-square and degrees of freedom (χ^2/df)	<3	2.561
goodness of fit index (GFI)	>0.9	0.898
increased fit index (IFI)	>0.9	0.919
comparative fit index (CFI)	>0.9	0.919
adjusted goodness of fit index (AGFI)	>0.8	0.877
root mean square error of approximation (RMSEA)	<0.05	0.053

(5) by comparing the path coefficients, AWA is concluded to have the largest impact on WAE among all the three independent variables.

Table 4.2 Hypothesis verification

Hypothesis	Assumed relationship	Estimated value	p-value	Result
H1: WUE → ATWA	-	-0.232	0.018*	supported
H2: AWA →ATWA	+	0.459	0.000***	supported
H3: WAD → PIL	+	0.253	0.000***	supported
H4a: ATWA→ ACT	+	0.796	0.000***	supported
H4b: ATWA → RE	+	0.827	0.000***	supported
H4c: ATWA →ATB	+	0.799	0.000***	supported
H4d: ATWA→PI	+	0.886	0.000***	supported
H5a: PIL → ACT	+	0.113	0.008**	supported
H5b: PIL → RE	+	0.160	0.000***	supported
H5c: PIL → ATB	+	0.108	0.008**	supported
H5d: PIL → PI	+	0.171	0.000***	supported

Note: * $p<0.05$, ** $p<0.01$, *** $p<0.001$

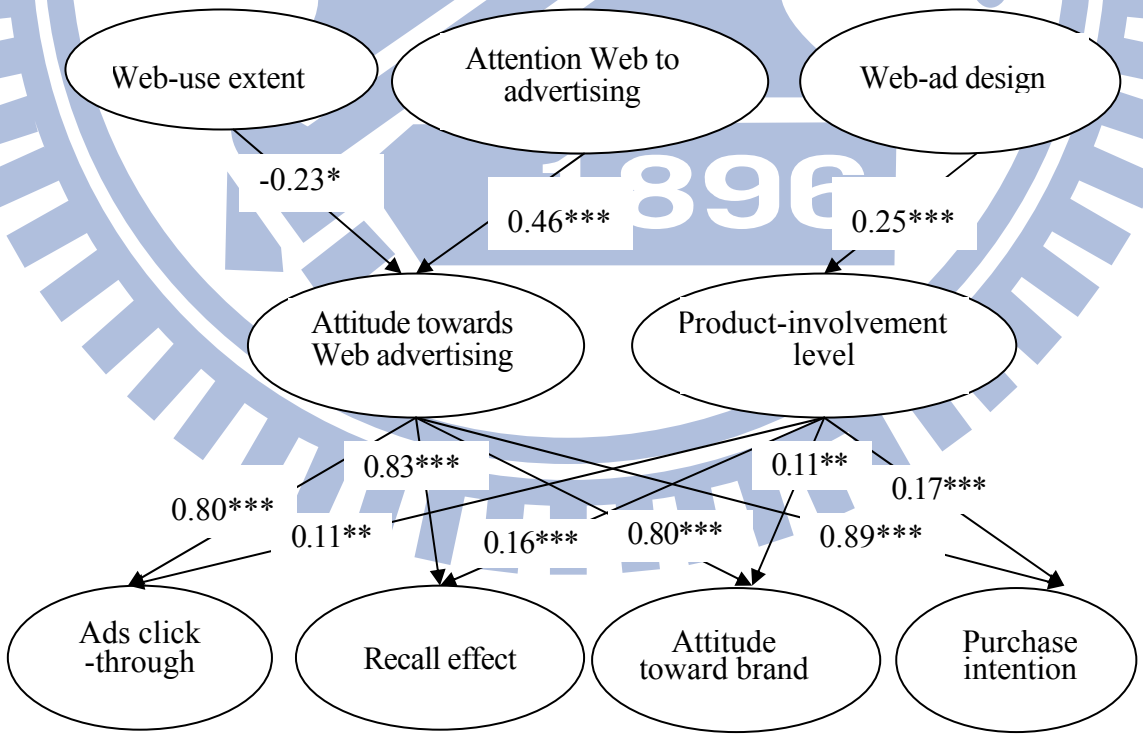


Fig. 4.1 Initial model structural graph
Note: * $p<0.05$, ** $p<0.01$,*** $p<0.001$

4.2 The analysis and results of the DEMATEL technique

As stated above, the dimensions of SEM were used as the factors and variables under one dimension, similar to the criteria used for DEMATEL by experts. The meaning and symbol of every criterion displayed in Table 4.3. The first, the direct influence matrix is shown in Table 4.4. And then, normalizing the direct-influence matrix exhibited in Table 4.5. Subsequently, the total influence matrix was calculated; it is displayed in Table 4.6; the degrees of influence are presented in Table 4.7. It was necessary to set a threshold value '*p*' for explaining the structural relation among factors while simultaneously keeping the complexity of the whole system to a manageable level. Here the threshold value '*p*' was set as 0.7. Only those factors whose effect in the total influence matrix was greater than 0.7 were exhibited in the causal diagrams; thus, the network relation map (NRM) was illustrated in Fig. 4.2. Finally, the cause-and-effect relations among the criteria and dimensions were grouped together in Table 4.8. Several results were obtained from Tables 4.8 and Fig. 4.2, which were summarized as follows:

(1) the key causal factors whose values of $(d_i - r_i)$ were positive, including SIP(f_1), ATS (f_2), FDAA(f_5), APT(f_6) and ADHC(f_7); these criteria were classified under two dimensions: WUE and WAD; both acted as independent variables; the result was the same as the SEM analysis;

Table 4.3 The meaning and symbol of criteria

symbols	criteria
f_1	one's period of surfing the Internet (SIP)
f_2	average time spent surfing the Internet per day(ATS)
f_3	the frequency of exposure to Web ads (FEWA)
f_4	the response on seeing Web ads (RSWA)
f_5	flash design is an important factor in attracting consumers' attention (FDAA)
f_6	pay attention to picture and text Web-interface allotment (APT)
f_7	pay attention to the display of highlighted color (ADHC)
f_8	level of importance of the product (LIP)
f_9	the product brings a consumer excitement (PBE)
f_{10}	the product means a lot to a consumer (PMC)
f_{11}	level of the product appeal (LPA)
f_{12}	level of concern shown toward the product (LCP)
f_{13}	faith content in Web ads (FCWA)
f_{14}	advertising information serves as a good reference (AISR)
f_{15}	most Web ads are pleasant (WAP)
f_{16}	in favor of Web ads in general (FWA)

Table 4.4 The direct-influence matrix of criteria

	f1	f2	f3	f4	f5	f6	f7	f8	f9	f10	f11	f12	f13	f14	f15	f16
f1	0.0000	3.0000	1.8333	1.7500	1.9167	1.9167	2.0000	3.1667	2.8333	2.6667	3.0833	2.4167	1.5833	1.9167	1.5000	1.3333
f2	2.7500	0.0000	1.8333	1.9167	1.4167	2.0000	1.5000	2.8333	2.5000	2.5833	2.9167	2.0000	1.6667	1.6667	1.8333	1.7500
f3	2.0833	2.0833	0.0000	2.3333	2.2500	1.9167	2.0833	1.5833	1.3333	1.7500	1.0000	1.5000	3.0000	3.3333	3.1667	3.2500
f4	2.0000	1.9167	2.2500	0.0000	1.7500	1.8333	2.0000	1.5833	1.4167	1.5000	1.2500	2.0000	3.1667	3.2500	3.0833	3.1667
f5	1.8333	1.5833	2.6667	3.4167	0.0000	2.6667	2.6667	1.7500	2.2500	2.1667	2.5000	1.9167	1.6667	1.6667	2.0833	2.0000
f6	2.0833	1.7500	2.5000	3.3333	3.1667	0.0000	3.0000	2.1667	2.1667	1.6667	2.4167	1.4167	1.5000	1.5000	1.5833	1.8333
f7	1.9167	1.5000	2.6667	3.4167	3.0833	2.7500	0.0000	2.0000	2.4167	2.0000	2.2500	2.0833	1.8333	1.5833	1.7500	1.9167
f8	2.8333	2.3333	1.6667	1.7500	1.8333	1.9167	1.7500	0.0000	3.0000	2.6667	2.9167	2.6667	1.5000	1.7500	1.7500	1.5833
f9	2.0833	2.3333	1.8333	1.7500	1.7500	1.6667	1.8333	2.7500	0.0000	2.6667	3.0833	3.0000	2.0000	1.9167	1.7500	1.8333
f10	2.1667	2.3333	2.0833	1.5833	1.8333	1.6667	1.5833	2.8333	2.8333	0.0000	2.9167	3.0000	2.1667	1.8333	1.9167	2.2500
f11	2.2500	2.5833	1.9167	1.8333	1.8333	2.0000	1.9167	2.9167	2.9167	2.9167	0.0000	3.0833	1.9167	1.8333	2.0000	1.7500
f12	1.7500	2.1667	1.6667	1.2500	1.7500	1.5000	1.7500	3.0000	3.0833	3.0833	3.1667	0.0000	2.0000	1.6667	1.8333	1.7500
f13	1.5833	1.6667	2.3333	1.9167	1.6667	1.4167	1.8333	1.5000	1.5000	1.9167	1.9167	1.8333	0.0000	2.5000	2.3333	2.2500
f14	2.0000	1.8333	2.4167	2.0000	1.4167	1.5000	1.6667	1.8333	1.8333	1.8333	1.7500	2.0000	2.6667	0.0000	2.5000	2.3333
f15	1.4167	1.8333	2.6667	1.9167	2.2500	1.8333	2.3333	1.7500	1.5833	1.5833	1.8333	1.5000	2.7500	2.4167	0.0000	2.4167
f16	1.3333	1.5833	2.3333	2.0833	2.0000	2.0833	2.5000	1.6667	1.8333	1.6667	1.6667	1.5833	2.3333	2.3333	2.5833	0.0000

Table 4.5 Normalizing the direct-influence matrix

	f1	f2	f3	f4	f5	f6	f7	f8	f9	f10	f11	f12	f13	f14	f15	f16
f1	0.0000	0.0865	0.0529	0.0505	0.0553	0.0553	0.0577	0.0913	0.0817	0.0769	0.0889	0.0697	0.0457	0.0553	0.0433	0.0385
f2	0.0793	0.0000	0.0529	0.0553	0.0409	0.0577	0.0433	0.0817	0.0721	0.0745	0.0841	0.0577	0.0481	0.0481	0.0529	0.0505
f3	0.0601	0.0601	0.0000	0.0673	0.0649	0.0553	0.0601	0.0457	0.0385	0.0505	0.0288	0.0433	0.0865	0.0962	0.0913	0.0938
f4	0.0577	0.0553	0.0649	0.0000	0.0505	0.0529	0.0577	0.0457	0.0409	0.0433	0.0361	0.0577	0.0913	0.0938	0.0889	0.0913
f5	0.0529	0.0457	0.0769	0.0986	0.0000	0.0769	0.0769	0.0505	0.0649	0.0625	0.0721	0.0553	0.0481	0.0481	0.0601	0.0577
f6	0.0601	0.0505	0.0721	0.0962	0.0913	0.0000	0.0865	0.0625	0.0625	0.0481	0.0697	0.0409	0.0433	0.0433	0.0457	0.0529
f7	0.0553	0.0433	0.0769	0.0986	0.0889	0.0793	0.0000	0.0577	0.0697	0.0577	0.0649	0.0601	0.0529	0.0457	0.0505	0.0553
f8	0.0817	0.0673	0.0481	0.0505	0.0529	0.0553	0.0505	0.0000	0.0865	0.0769	0.0841	0.0769	0.0433	0.0505	0.0505	0.0457
f9	0.0601	0.0673	0.0529	0.0505	0.0505	0.0481	0.0529	0.0793	0.0000	0.0769	0.0889	0.0865	0.0577	0.0553	0.0505	0.0529
f10	0.0625	0.0673	0.0601	0.0457	0.0529	0.0481	0.0457	0.0817	0.0817	0.0000	0.0841	0.0865	0.0625	0.0529	0.0553	0.0649
f11	0.0649	0.0745	0.0553	0.0529	0.0529	0.0577	0.0553	0.0841	0.0841	0.0841	0.0000	0.0889	0.0553	0.0529	0.0577	0.0505
f12	0.0505	0.0625	0.0481	0.0361	0.0505	0.0433	0.0505	0.0865	0.0889	0.0889	0.0913	0.0000	0.0577	0.0481	0.0529	0.0505
f13	0.0457	0.0481	0.0673	0.0553	0.0481	0.0409	0.0529	0.0433	0.0433	0.0553	0.0553	0.0529	0.0000	0.0721	0.0673	0.0649
f14	0.0577	0.0529	0.0697	0.0577	0.0409	0.0433	0.0481	0.0529	0.0529	0.0529	0.0505	0.0577	0.0769	0.0000	0.0721	0.0673
f15	0.0409	0.0529	0.0769	0.0553	0.0649	0.0529	0.0673	0.0505	0.0457	0.0457	0.0529	0.0433	0.0793	0.0697	0.0000	0.0697
f16	0.0385	0.0457	0.0673	0.0601	0.0577	0.0601	0.0721	0.0481	0.0529	0.0481	0.0481	0.0457	0.0673	0.0673	0.0745	0.0000

Table 4.6 The total-influence matrix of criteria

	f1	f2	f3	f4	f5	f6	f7	f8	f9	f10	f11	f12	f13	f14	f15	f16
f1	0.6068	0.6957	0.6984	0.6855	0.6488	0.6270	0.6600	0.7539	0.7482	0.7294	0.7754	0.7124	0.6788	0.6762	0.6746	0.6651
f2	0.6485	0.5840	0.6652	0.6565	0.6054	0.5992	0.6165	0.7103	0.7042	0.6924	0.7344	0.6678	0.6488	0.6386	0.6509	0.6438
f3	0.6448	0.6536	0.6364	0.6878	0.6441	0.6133	0.6501	0.6908	0.6871	0.6841	0.6989	0.6672	0.7039	0.7015	0.7060	0.7029
f4	0.6336	0.6406	0.6872	0.6144	0.6222	0.6022	0.6386	0.6813	0.6797	0.6686	0.6953	0.6707	0.6987	0.6901	0.6943	0.6913
f5	0.6519	0.6544	0.7195	0.7288	0.5962	0.6447	0.6770	0.7106	0.7260	0.7095	0.7523	0.6932	0.6813	0.6704	0.6898	0.6831
f6	0.6475	0.6471	0.7031	0.7159	0.6694	0.5633	0.6743	0.7085	0.7118	0.6849	0.7377	0.6686	0.6642	0.6538	0.6648	0.6663
f7	0.6601	0.6583	0.7258	0.7354	0.6841	0.6526	0.6116	0.7233	0.7370	0.7120	0.7532	0.7038	0.6913	0.6742	0.6874	0.6869
f8	0.6642	0.6612	0.6757	0.6668	0.6296	0.6102	0.6366	0.6506	0.7328	0.7102	0.7511	0.6999	0.6587	0.6542	0.6627	0.6534
f9	0.6488	0.6645	0.6843	0.6707	0.6311	0.6074	0.6425	0.7276	0.6568	0.7142	0.7589	0.7121	0.6761	0.6629	0.6676	0.6645
f10	0.6625	0.6765	0.7033	0.6789	0.6449	0.6186	0.6483	0.7425	0.7452	0.6554	0.7681	0.7244	0.6929	0.6734	0.6845	0.6875
f11	0.6775	0.6955	0.7125	0.6988	0.6576	0.6390	0.6691	0.7588	0.7616	0.7467	0.7052	0.7400	0.6994	0.6859	0.6991	0.6877
f12	0.6268	0.6465	0.6652	0.6433	0.6175	0.5901	0.6264	0.7191	0.7241	0.7102	0.7461	0.6185	0.6612	0.6419	0.6548	0.6477
f13	0.5597	0.5699	0.6193	0.5984	0.5563	0.5305	0.5690	0.6099	0.6122	0.6110	0.6401	0.5998	0.5459	0.6035	0.6070	0.6004
f14	0.5941	0.5985	0.6464	0.6247	0.5730	0.5547	0.5883	0.6448	0.6470	0.6347	0.6633	0.6293	0.6421	0.5608	0.6358	0.6268
f15	0.5880	0.6065	0.6635	0.6346	0.6043	0.5730	0.6153	0.6511	0.6497	0.6372	0.6745	0.6253	0.6537	0.6353	0.5784	0.6389
f16	0.5778	0.5920	0.6465	0.6305	0.5905	0.5718	0.6118	0.6404	0.6474	0.6305	0.6615	0.6190	0.6347	0.6246	0.6391	0.5653

Table 4.7 The influence of concern criteria

dimensions	symbols	criteria	$d_i + r_i$	$d_i - r_i$
Web-use extent	f_1	SIP	21.1285	0.9437
	f_2	ATS	20.7111	0.2220
Attention to Web ads	f_3	FEWA	21.6245	-0.0796
	f_4	RSWA	21.2795	-0.0624
Web-ad design	f_5	FDAA	20.9638	1.0137
	f_6	APT	20.3784	1.1836
	f_7	ADHC	21.2321	0.9613
Product-involvement level	f_8	LIP	21.8416	-0.4055
	f_9	PBE	21.9606	-0.3810
	f_{10}	PMC	21.9376	0.0757
	f_{11}	LPA	22.7501	-0.2814
	f_{12}	LCP	21.2912	-0.2124
Attitude toward Web ads	f_{13}	FCWA	20.0644	-1.1991
	f_{14}	AISR	20.3116	-0.5829
	f_{15}	WAP	20.6262	-0.5675
	f_{16}	FWA	20.3947	-0.6281

Table 4.8 Cause and Effect criterion/ dimension

Cause dimension	Cause criterion	Effect criterion	Effect dimension
WUE	f_1	f_8, f_9, f_{10}, f_{11}, f_{12}	PIL
	f_2	f_8, f_9, f_{11}	
AWA	f_3	f_{13}, f_{14}, f_{15}, f_{16}	ATWA
WAD	f_5	f_3, f_4	AWA, PIL
		f_8, f_9, f_{10}, f_{11}	
	f_6	f_3, f_4	
		f_8, f_9, f_{11}	
	f_7	f_3, f_4,	
		f_8, f_9, f_{10}, f_{11}, f_{12}	
PIL	f_{10}, f_{11}	f_3	AWA

(2) the main effect factors whose values of $(d_i - r_i)$ were negative, such as LIP(f_8), PBE(f_9), PMC(f_{10}), LPA(f_{11}), and LCP(f_{12}), FCWA(f_{13}), AISR(f_{14}), WAP(f_{15}), and FWA(f_{16}), were intensely affected by the others; these criteria were classified into two dimensions: PIL and ATWA; both played the part of intermediary variables; therefore, this result was in close accord with the prediction (Although the value of $(d_i - r_i)$ for PMC(f_{10}) was positive, judging from the concept of viewing the situation as a whole, the value of $(d_i - r_i)$ for PIL was negative); the result was the same as that of the SEM analysis;

(3) it is worth noting that criteria such as FEWA (f_3) and RSWA(f_4), classified into the dimension of AWA, had negative values of $(d_i - r_i)$; on

the surface, they are effect factors, which are neither the same as anticipated nor similar to the SEM result; drawing from Table 4.8 and Fig. 4.2., FEWA (f_3) and RSWA (f_4) may be affected by FDAA(f_5), APT(f_6), and ADHC(f_7), which belong to the dimension of WAD. FEWA(f_3) and RSWA (f_4) may affect FCWA (f_{13}), AISR (f_{14}), WAP (f_{15}), and FWA(f_{16}), which belong to the dimension of ATWA; that is, AWA not only has an impact on ATWA but is also affected by WAD;

(4) in view of the casual diagram of total relation, SIP (f_1) directly affected LIP(f_8), PBE(f_9), PMC(f_{10}), LPA(f_{11}), and LCP(f_{12}); moreover, ATS(f_2) directly affected LIP(f_8), PBE (f_9) and LPA(f_{11}); these criteria $(f_8 - f_{12})$ were classified under PIL; their relationship implied that WUE had a direct positive influence on the PIL;

(5) FEWA (f_3) impacted on FCWA(f_{13}), AISR(f_{14}), WAP(f_{15}), and FWA(f_{16}); these criteria$(f_{13} - f_{16})$ are classified under the dimension of ATWA and showed that AWA had an influence on ATWA; this result closely resembled the findings for SEM;

(6) PMC(f_{10}) and LPA(f_{11}) impacted on FEWA(f_3); that is, PIL affected AWA.

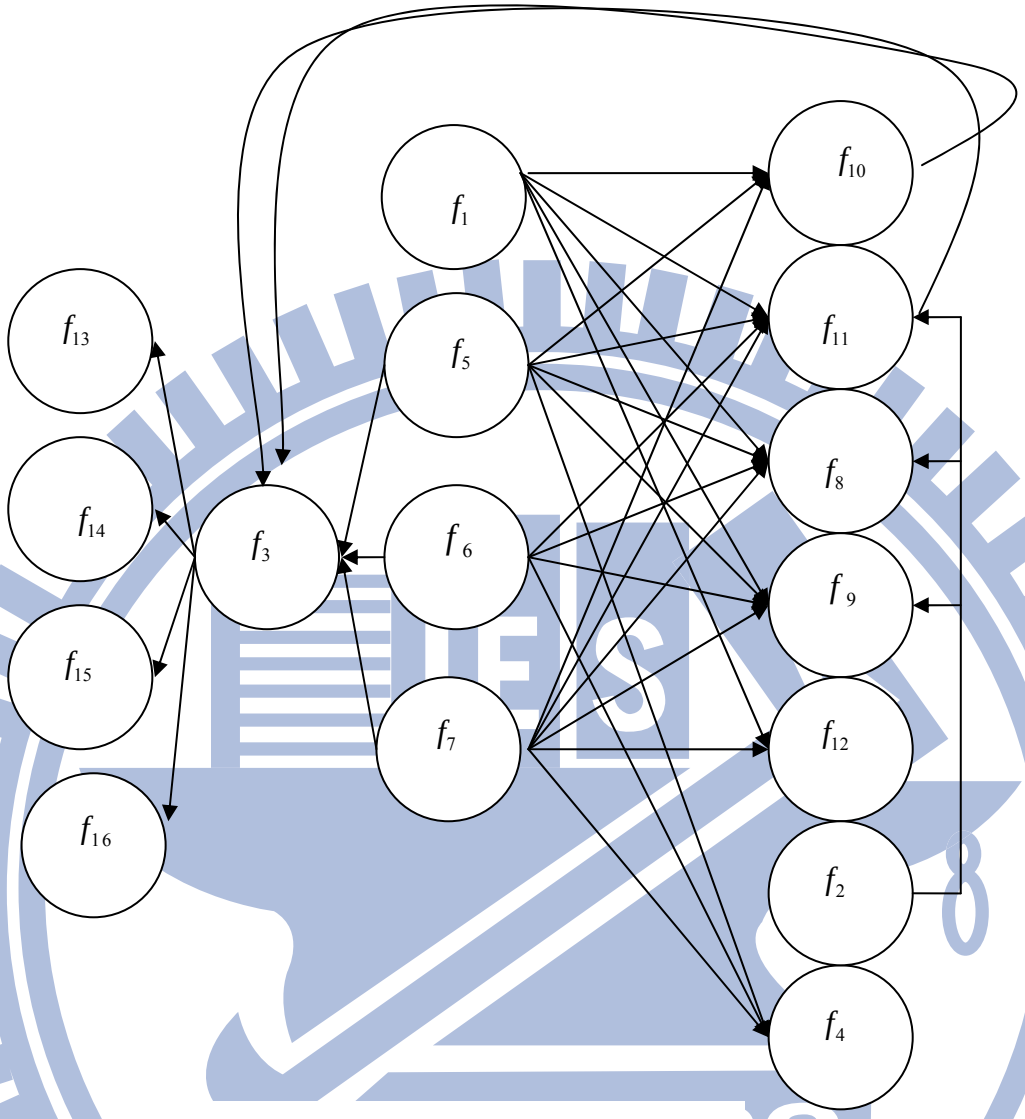


Fig. 4. 2 The network relation map

4.3 Using DEMATEL to modify SEM model

Because of the requirement of 'a priori' specifications for SEM, the relationships among dimensions were determined in advance by the researchers on the basis of available literature. In fact, it is possible that several relationships among dimensions might have been neglected by the researchers. Hence, this study used the DEMATEL technique for further analysis.

On the basis of the results of DEMATEL analysis, there are some possible relationships among the dimensions, which can be listed as follows:

(1) people usually collect information through surfing the Internet nowadays, which has become the main approach of acquiring knowledge; WUE had a direct positive influence on PIL; heavy users of the Internet can often acquire and accumulate information of related products through various communities or search engines; in this situation, consumers form individual opinions and develop involvement in a certain product following the pattern shown by their linked communities, thus increasing the PIL; Singh and Rothschild (1983) further stressed that the repetition effects of commercial advertising contribute to learning by consumers for acquiring more information; as WUE increases, PIL may be extended;

(2) WAD had a direct significant impact on AWA; a vivid and interesting advertisement is able to catch the eyes of people and draw their attention to it; Weilbacher (2003) believed that a successful advertisement lures customers to buy or view the product or a company in a more favorable light;

(3) PIL affected AWA; it may result from the research object being goods shown over a computer; in the absence of related research, it is necessary to deeply probe whether the relationship does really exist.

According to the above analysis, the study further proposed two hypotheses H6 and H7 as follows and the new research framework was displayed in Fig.

4.3.

H6: Web-use extent of the consumers has a direct positive influence on product-involvement level.

H7: Web-ad design has a direct positive influence on attention to Web-advertising.

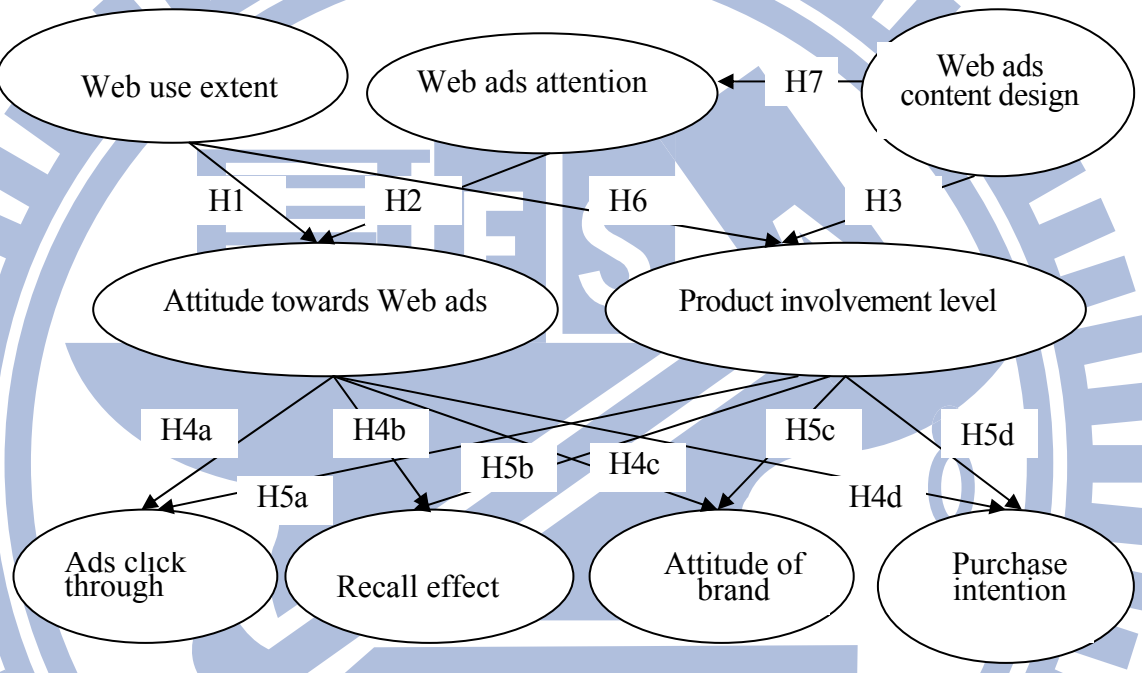


Fig. 4.3 Study framework after modified

4.4 The results of the after modified model

The DEMATEL analysis revealed a new relationship between the variables, led to hypothesis H6 and hypothesis H7, and was instrumental in constructing a new research model. Study results demonstrated that the relative value of degree of freedom (χ^2/df) is 2.401, which is less than the cut-off value of 3.0; in general, the new study model and observation data possessed a good fit. In addition, the

GFI value is 0.905, CFI value is 0.927, and the IFI value is 0.928, meaning that all are greater than the required 0.9. The AGFI value is 0.884 greater than 0.8. The RMSEA value is less than 0.05, indicating that the new model may be established. Generally speaking, the indicators conform to basic requirement values, so the study possesses a good model fit, that is, the new model conforms well to actual data.

After modification, the new model was analyzed by SEM. The results of the comparison between the modified and unmodified models are presented in Table 4.9. An examination of the fitness index shows that the goodness-of-fit of the modified model is better than that for the unmodified model: The GFI value rose to 0.905 (more than the cut-off value of 0.9) from 0.898 (less than 0.9), and the RMSEA value declined to 0.05 from 0.053, exceeding the threshold value 0.05. Overall, the indicators all conform to the basic requirement of values, showing that the modified model possesses a good model fit. Thus, the new model conforms to actual data better than the initial model.

The test results for hypothesis verification are shown in Table 4.10. The results show that, in addition to hypotheses H1~H5, the two newly proposed hypotheses, H6 and H7, are supported as well. Hence, the proposed model differs from the initial one based on SEM with respect to certain results. Through the revised SEM by DEMATEL techniques, the results of this study suggest several important relationships:

Table 4.9 Comparing of model-fitness

Fit index	Model after modification	Model before modification
The ratio of Chi-square and degrees of freedom (χ^2/df)	2.410	2.561
Goodness of fit index (GFI)	0.905	0.898
Increased fit index (IFI)	0.928	0.919
Comparative fit index (CFI)	0.927	0.919
Adjusted goodness of fit index (AGFI)	0.884	0.877
Root mean square error of approximation (RMSEA)	0.050	0.053

Table 4.10 Verification of model hypotheses after modification

Hypothesis	Assumed relationship	Estimated value	p-value	Result
H1: WUE → ATWA	-	-0.197	0.007**	upported
H2: AWA → ATWA	+	0.474	0.000***	upported
H3: WAD → PIL	+	0.240	0.000***	upported
H4a: ATWA → ACT	+	0.796	0.000***	upported
H4b: ATWA → RE	+	0.830	0.000***	upported
H4c: ATWA →ATB	+	0.802	0.000***	upported
H4d: ATWA→PI	+	0.889	0.000***	upported
H5a: PIL → ACT	+	0.123	0.005**	upported
H5b: PIL → RE	+	0.171	0.000***	upported
H5c: PIL → ATB	+	0.118	0.006**	upported
H5d: PIL → PI	+	0.183	0.000***	upported
H6: WUE → PIL	+	0.341	0.000***	upported
H7: WAD → AWA	+	0.277	0.000***	upported

Note: * p<0.05, ** p<0.01,*** p<0.001

(1) judging from hypotheses H1 and H4, WUE influences WAE through ATWA; judging from hypotheses H6 and H5, WUE influences WAE through PIL; that is, WUE influences WAE through ATWA as well as PIL; however, they work in opposite directions, so the manner in which WUE influence WAE depends on the ebb and flow of these two effects; as WUE increases,

customer's PIL may increase, causing WAE to rise; on the other hand, the higher the WUE is, the more interference net users receive, which may then cause a negative attitude toward web advertising and influence WAE; consequently, how the increase of the WUE influences the WAE depends on the ebb and flow of these two effects; because of the rapid development of networks, the WUE grows with each passing day, and investigation of how the extent of Web use influences the effect of Web advertising becomes even more important and is worthy of scholars' further analysis;

(2) in the initial SEM model, AWA is an independent variable; however, because H7 is supported, based on H7, H2 and H4, WAD affected WAE through AWA and ATWA (that is, WAD → AWA → ATWA → WAE); accordingly, hierarchy effects exist among WAD, AWA, ATWA, and WAE. AWA transforms from an independent variable to an intermediary variable in the new modified model; in addition to ATWA and PIL, AWA is also a significant intermediary variable impinging on WAE; in the past, scholars tended to regard AWA as an independent variable and discussed only the intermediary characteristics of PIL and ATWA, but they neglected the intermediary effect of AWA.

Finally, the study used total impact analysis to compare the two models, and the results are presented in Table 4.11. Before modification, the total impact effects of AWA on ACT, RE, ATB and PI are 0.366, 0.393, 0.380 and 0.367, respectively; the total impact effects of WAD are 0.028, 0.040, 0.027 and 0.043,

respectively, and the total impact effects of WUE are 0.185, 0.192, 0.186 and 0.206, respectively; therefore, among all the independent variables, AWA had the largest impact on WAE. After modification, AWA is no longer an independent variable but an intermediary variable. The total impact effects of WAD on ACT, RE, ATB and PI are 0.134, 0.150, 0.134 and 0.161, respectively, and the total impact effects of WUE are 0.115, 0.105, 0.118 and 0.113, respectively. Thus, the total impact effects of WAD on ACT, RE, ATB and PI are greater than WUE's, meaning that WAD is the most important factor affecting WAE.

Table 4.11 Total impact effect

Variables		WAD	WUE	AWA	PIE	ATWA
AWA	after modification	0.277	-	-	-	-
	before modification	-	-	-	-	-
PIL	after modification	0.24	0.341	-	-	-
	before modification	0.253	-	-	-	-
ATWA	after modification	0.131	-0.197	0.474	-	-
	before modification	-	-0.232	0.459	-	-
ACT	after modification	0.134	-0.115	0.377	0.123	0.796
	before modification	0.028	-0.185	0.366	0.113	0.796
RE	after modification	0.15	-0.105	0.393	0.171	0.83
	before modification	0.04	-0.192	0.38	0.16	0.827
ATB	after modification	0.134	-0.118	0.38	0.118	0.802
	before modification	0.027	-0.186	0.367	0.108	0.799
PI	after modification	0.161	-0.113	0.422	0.183	0.889
	before modification	0.043	-0.206	0.407	0.171	0.886

Note: Total impact effect is the summary of direct effect and indirect effect.

4.5 Discussions and Implications

When the initial model is a poor fit, the researcher should identify the possible reasons for this poor fit, such as violation of the assumption that the data distribution, non-linear relationship between variables, too many missing values, mistaken model specification, etc (Kaplan, 1988; Kaplan, 1989). However, many researchers do not understand the reasons in practice and amend the model in according to modification indices (MIs) or Critical ratios (CRs). A clear abuse of SEM may happen when data are simply consistent with the model and the theory is then extended from the analytical result based on presumed hypotheses Kline, 2005; Chin, 1998; Reisinger and Turner, 1999; Mueller, 1996; Cliff, 1983). The essence of SEM is verifying the rationality of the presumed hypothetical model provided by the researcher. Though modification of the model efficaciously assists researchers in attaining the best goodness-of-fit index, the principle of theoretical derivation is violated. Therefore, there is some controversy among researchers about model-modification procedures (Kline, 2005; Chin, 1998; Reisinger and Turner, 1999; Mueller, 1996; Cliff, 1983; Long, 1983; Bollen, 1989; Byrne, 1998; Diamantopoulos and Siguaw, 2000; MacCallum et al., 1992; Diamantopoulos, 1994).

The researchers originally intended to release certain parameters when the model-fit evaluation was not good. However, solely considering technical adjustability without any theoretical basis results in SEM losing its confirmatory essence and still retains the value of exploration. Hence the validity of adopting

SEM to deal with the problems portrayed by the researcher has been queried (Diamantopoulos, 1994). The modified model is reanalyzed using the same data set, not necessarily because it is a truly "better" model, but simply because the model has been fitted to a particular sample data set. Although the researcher acquired an acceptable model, other samples or population cannot be inferred from the theorized model because of the above-mentioned modifying process. This result usually implies that the theoretical basis of the ex-post modified model of the researcher is not sufficiently efficient (MacCallum et al., 1992; Diamantopoulos, 1994).

It is extremely necessary to construct the causal hypothesis of SEM according to basic theory. All post-hoc modifications to a model must make substantive sense and be theoretically justifiable. Not numerical data set but the substantive theory drives force behind model conceptualization and evaluation. A very serious problem arises if researchers reckon on giving the statistical data their priority and reverse the basic concept by modifying the model. Without a strong theoretical basis for the relationships, letting the data determine the theory and drive model modification creates the probability for a special sample based on covariance matrix to include unique characteristics broader. Finally, the model is likely to be accepted (Diamantopoulos and Siguaw, 2000).

Maintaining in pursuit of good-fit may result in too many parameters being evaluated (fit for fitting). The continual modification often results in an over-fitted model. The problem of an over-fitted model is the addition of several

improper parameters or erroneous elimination of evaluated parameters. Owing to an acceptable model-fit index, which corresponds to actually observed data, the over-fitted model will consequently not be rejected in SEM analysis and cause incorrect models to be regarded as an ideal model. This is the key reason why model modification is questioned.

Constructing causal model should be consistent with sound theoretical basis. Researchers require understanding theoretical, substantive, and philosophical foundations of their research. If not, they may misjudge the model specification by omitting important variables/paths or by including insignificant relations when constructing the path diagrams. A misfit observed data-driven model usually arises from model specification errors. Model specification error arises from the omission of important exogenous variables in the model and the important link path between the variables in the model, the containment of unimportant parameters and inappropriate relation in the model or researchers having problems with theories or methods. Furthermore, SEM is a statistical technique without directionality (independent variables and dependent variables are set up by the researcher), so opposite directions may lead to identical results. Unfortunately, SEM cannot perceive the faults in model specification by the modification index (Bollen, 1989).

A number of studies (MacCallum, 1986; MacCallum et al., 1992; Spirtes et al., 1990) have indicated that it is more likely to be successful for the amendment by the limited theory-driven model than the data-driven model. Compared to the

data-driven model which amendment model is in accordance with revision of criteria, DEMATEL method provided by this study uses theory-driven model as the method of amendment. To re-examine the causal relationships among all dimensions on the basis of the experts' opinions from industrious, governmental and academic aspects, and then to test the initial model constructed by the researchers in order to find out the amendment direction for SEM methodology under the reasonably foundation. Respondents judge the relationship between two variables according to their specialty, resulting in three relationships: A affects B (A→B), B affects A (B→A), or A and B mutually affect each other (A↔B). Thus, DEMETAL provides another tool for examining the accuracy of researchers' initial hypotheses. It will not only be confined in the researchers initially hypotheses and path relation, reduce the model specifications errors, and minimize the occurrence of capitalization on chance error, but also will maintain the nature of confirmatory and over-fitting model will not be occurred.

Chapter 5 Concluding Remarks

5.1 Conclusions and contributions

The study constructs a causal model of WAE, verified through the SEM statistical technique to confirm its efficiency. The proposed model used SEM to find the causal factors and applied DEMATEL to determine the important dimension/criterion greatly influencing the WAE, carrying out comparisons of pairs of mutual relationships in the survey materials and clarified the problem. The combination of SEM and DEMATEL techniques increases the reliability when these two different methods engender comparable conclusion (Peng et al., 2008). The study reveals the new relationship between variables in accordance with the result of the DEMATEL analysis, advancing H6 and H7 and then recognizing WAD as the most significant factor influencing WAE. Revising the conclusion of the original model, the empirical research reveals that AWA, transformed from an independent variable to an intermediary variable, is an important intermediary variable after modification. Thus, the crux of the problems could be deduced based on the novel hybrid MCDM model method; therefore, the method could be applied to develop strategic plans.

The SEM technique has many advantages, including dealing effectively with multicollinearity and settling the causal relationship between latent variables. However, a particular structure cannot be confirmed whether it is the right

model, even though the fit may be acceptable since the data set will fit alternative structures. All perspectives of the SEM technique should be conducted through theory, critical for model development and modification. An explicit mishandling of SEM may occur when the data are fitted to a SEM, but the analytical result based on presumed hypotheses is without theoretical support. (Cliff, 1983; Long, 1983; Bollen, 1989; Byrne, 1998; Diamantopoulos and Siguaw, 2000).

DEMETAL provides another tool for examining the accuracy of researchers' initial hypotheses. A model may be revised based on the analysis result of the DEMATEL technique, and a better model may be acquired. In addition, the DEMATEL technique may offer reasonable bases for modification of SEM to avoid over fitting and the above-mentioned misuses.

Causal analysis largely influences the effectiveness of decision-making and marketing actions. Only correct causal analysis helps manager make right decision. The results of the study demonstrated that the the DEMATEL technique is efficient, complementary, and confident to SEM. Therefore, the model-fit and causal analysis could be meaningful, affecting the efficiency of decision-making.

5.2 Recommendation for future study

SEM includes one or more linear regression equations that express how the endogenous variables depend upon the exogenous variables by using the

standardized data set. It can be shown as the matrix $[z_{ij}]_{q\times q}$ and $z_{ij} = (x_{ij} - \bar{x}_i)/s_i$, where variable i, $i = 1,2,...,q$ and sample j, $j = 1,2,...,n$; the correlation coefficient r_{ik} can be represented as follows:

$$r_{ik} = r(X_i, X_k) = \frac{1}{n-1}\sum_{j=1}^{n}[(x_{ij} - \bar{x}_i)/s_i][(x_{kj} - \bar{x}_k)/s_i] \quad (5.1)$$

The correlation coefficient $r(Y, X_i)$ between the dependent variable (Y) and independent variables (X_i, $i = 1,2,...,q$) is considered as these weights show the effect of the independent variables (X_i, $i = 1,2,...,q$) on the dependent variable(Y). Therefore, these weights (correlation coefficients) can be used to infer the degree of influence. However, the correlation coefficient only indicates the relative degree of relationship among variables. It cannot measure the true degree of influence and is unable to quantify the relation intensity among various constructs. SEM uses standardized regression coefficients to infer the comparative magnitude of the impact of the independent variable on the dependent variables. However, SEM does not measure with mathematical precision the relation intensity among various dimensions. Because of an already existing relation between the dimensions, the magnitude of influence is not the same, and the relative weights of criteria are not necessarily equal. For example, in the current model under study, though the WAE is influenced by PIL and ATWA, the importance and influences of the two dimensions on WAE are not the same. SEM assumes that if the criteria weights are equal, they may

distort the results, and is thus unable to describe the intensity of the relation that exists among dimensions. Using DEMATEL along with an analytical network process (ANP), the relative weights of criteria can be decided. DEMATEL technique is applied to illustrate the interrelations among the criteria, thus facilitating the finding of the central criteria to represent its effectiveness. Subsequently, the ANP method derives the weights of criteria and obtains the effective score of each Web-advertising, so that the WAE could be measured more efficiently. Thus, DEMATEL could be used to overcome the problem of evaluation and could be applied with an ANP to construct a new measurement model for WAE, which may be worth pursuing in further researches. It is helpful to select alternatives when these weights are used with one of the techniques of MCDM (Alfares and Duffuaa, 2008).

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Appendix A-----SEM 問卷

親愛的受訪者您好：

我是交通大學管理科學系博士班學生，目前正進行一項有關「網路廣告」的研究報告。以下問題請依照您的主觀感受填寫，本研究僅提供學術研究之用，不會做研究外之使用，絕對保密，請您放心。非常感謝您撥空填寫問卷。

順 頌

時祺

交通大學管理科學系

指導教授：黃仁宏 博士

曾國雄 博士

研 究 生：魏寶蓮 敬上

說明：1. 本問卷請有上網經驗並看過網路廣告者填寫

2. 本研究所謂的網路廣告包含所有在網路上對產品或服務的介紹與促銷等資訊

第一部份：網路使用程度

說說您使用網路的經驗（請單選）。

1.請問您接觸網際網路有多久了？

□ ❶未滿 1 年 □ ❷1 年以上～未滿 2 年 □ ❸2 年以上～未滿 3 年

□ ❹3 年以上～未滿 4 年 □ ❺4 年以上～未滿 5 年 □ ❻5 年以上

2.您每天平均約花多少時間上網際網路？

□ ❶未滿 1 小時 □ ❷1 小時～未滿 2 小時 □ ❸2 小時～未滿 3 小時

□ ❹3 小時～未滿 4 小時 □ ❺4 小時～未滿 5 小時 □ ❻5 小時以上

第二部份：廣告接觸與注意程度

1.您平均多久會去注意一下網路廣告？（指至少會去稍微注視一下，但不一定要去點選）

□ ❶一個月不到一次 □ ❷大約一個月一次 □ ❸一個月 2-3 次

□ ❹約一週 1-2 次 □ ❺幾乎每天

2.當您看到網路廣告時會：

□ ❶直接跳過　□ ❷稍微注意　□ ❸偶爾會注意

□ ❹挑有興趣的看　□ ❺幾乎都看

第三部份：網路廣告內容表現方式偏好程度

下列問題是想瞭解您對網路廣告內容表現方式的偏好程度，請依您的感覺於適當方格中勾選。

	非常不同意	不同意	沒有意見	同意	非常同意
1.網路廣告的動畫設計是引起我注意的重要因素。	□	□	□	□	□
2.我會重視網路廣告中的圖形與文字版面配置。---	□	□	□	□	□
3.我會重視網路廣告中色彩的表現。----------	□	□	□	□	□
4.整體而言，我會非常重視網路廣告內容表現方式。	□	□	□	□	□

第四部份：產品涉入程度

下列問題是想瞭解您對「**電腦產品**」的觀感。（請選擇 1～7，越接近表示您就越同意該方向的文字敘述）

例如：「**電腦產品**」對我而言是很重要的：　重要的　☑□□□□□□　不重要的

「電腦產品」對您而言是：

	7	**6**	**5**	**4**	**3**	**2**	**1**	
重要的	□	□	□	□	□	□	□	不重要的
令人興奮的	□	□	□	□	□	□	□	不令人興奮的
對我有意義的	□	□	□	□	□	□	□	對我沒有意義的
吸引人的	□	□	□	□	□	□	□	不吸引人的
我關心的	□	□	□	□	□	□	□	我不關心的

第五部份：網路廣告態度

關於「電腦產品」的網路廣告態度，依您的感覺於適當方格中勾選。

	非常不同意	不同意	沒意見或沒印象	同意	非常同意
1.一般而言，我覺得我可以相信網路廣告。	□	□	□	□	□
2.有網路廣告的商品會比沒廣告的商品讓我覺得更有價值	□	□	□	□	□
3.我所看到的大多數網路廣告都令人覺得愉快。	□	□	□	□	□
4.整體而言，我喜歡網路廣告。	□	□	□	□	□

第六部份：網路廣告效果

	非常不同意	不同意	沒意見或不知道	同意	非常同意
1.我會想再次點閱網路廣告。----------	□	□	□	□	□
2.我時常點選網路廣告。----------	□	□	□	□	□
記憶效果：					
1.我能記得大部分網路廣告內容。----------	□	□	□	□	□
2.網路廣告內容加強了我對產品的印象。----------	□	□	□	□	□
3.對於網路廣告內容我可以敘述得出來。----------	□	□	□	□	□
品牌態度：					
1.看過網路廣告之後我更喜歡廣告中的品牌。----------	□	□	□	□	□
2.看過網路廣告之後我會對廣告中的品牌產生偏好。----------	□	□	□	□	□
3.看過網路廣告後會加強我對該產品的品牌印象。----------	□	□	□	□	□
購買意願：					
1.看過網路廣告之後我願意嘗試使用該產品。----------	□	□	□	□	□
2.看過網路廣告之後會引發我的購買興趣。----------	□	□	□	□	□
3.看過網路廣告之後我會購買廣告中的品牌。----------	□	□	□	□	□

第七部份：個人基本資料

1.性別：　□❶男　□❷女

2.年齡：　□❶19（含）歲以下　□❷20～29 歲　□ ❸30 ～39 歲　□❹40～49 歲

□❺50 歲以上

3.教育程度：□❶國中及國中以下 □❷高中、高職 □❸專科 □❹大學或學院 □❺碩博士

4.平均每月所得：

□❶20,000 元以下 □❷20,001～40,000 元 □❸40,001～60,000 元

□❹60,001～80,000 元 □❺80,001～100,000 元 □❻100,001 元以上

5.職業：□製造業 □商業 □服務業 □軍公教 □農漁牧業 □家管 □學生 □其他

<<本問卷全部結束，非常感謝您的竭誠參與！謝謝您！>>

Appendix B-----DEMATEL 問卷

親愛的受訪者您好：

我是交通大學管理科學系博士班學生，目前正進行一項有關「網路廣告」的研究報告。以下問題請依照您的主觀感受填寫，本研究僅提供學術研究之用，不會做研究外之使用，絕對保密，請您放心。非常感謝您撥空填寫問卷。

順 頌

時 祺

交通大學管理科學系
指導教授：黃仁宏 博士
曾國雄 博士
研 究 生：魏寶蓮 敬上

說明：本問卷請有上網經驗並看過網路廣告者填寫

第一部份：構面準則關聯性評估

構面準則關聯性調查表(範例)

網站型態偏好構面	1. 挑選喜歡的網站上網	2. 上網主要考量因素	3. 選擇網站型態
1.挑選喜歡的網站上網		［註 2］1	
2.上網主要考量因素	［註 1］ 3		
3.選擇網站型態			

(0:無影響；1:低度影響；2:中度影響；3:高度影響；4:極高度影響)

註 1: 假如「上網主要考量因素」對「挑選喜歡的網站上網」與有高度影響，則如上表[註 1]所示填入 3。

註 2: 假如「挑選喜歡的網站上網」對「上網主要考量因素」低度影響，則如上表[註 2]所示填入 1。

註 3: 無影響(0)代表兩個準則之間是無關係的，如準則 A 是不會對準則 B 造成影響。

註 4: 低度影響(1)代表準則之間是彼此低度關聯的，如準則 A 滿意度上升則準則 B 也會上升，不過上升幅度不明顯。

註 5: 中度影響(2)代表準則之間是彼此中度關聯的，如準則 A 滿意度上升則準則 B 也會上升，不過上升幅度較小。

註 6: 高度影響(3)代表準則之間是彼此高度關聯的，如準則 A 滿意度上升則準則 B 也會上升，上升幅度明顯可見。

註 7: 極高度影響(4)代表準則之間是彼此極高度關聯的，如準則 A 滿意度上升則準則 B 也會上升，上升幅度非常明顯。

	a1.接觸網路期間	a2.平均上網時間	b1.注意網路廣告頻率	b2.對網路廣告的反應	c1.重視動畫設計	c2. 重視版面配置	c3. 重視色彩表現	d1.電腦具重要性	d2. 電腦令人興奮	d3. 電腦是有意義的產品	d4. 電腦是吸引人的	d5.關心電腦產品	e1.相信網路廣告內容	e2.放心進行網路購物	e3.看網路廣告覺得愉快	e4.喜歡網路廣告
a1.接觸網路期間																
a2.平均上網時間																
b1.注意網路廣告頻率																
b2.對網路廣																

告的反應															
c1.重視動畫設計															
c2.重視版面配置															
c3.重視色彩表現															
3d.電腦具重要性															
d2.電腦令人興奮															
d3.電腦是有意義的產品															
d4.電腦是吸引人的															

d5. 關心電腦產品																
e1. 相信網路廣告內容																
e2. 放心進行網路購物																
e3. 看網路廣告覺得愉快																
e4. 喜歡網路廣告																

(0:無關聯性；1:低度相關；2:中度相關；3:高度相關；4:極高度相關)

第二部份：

1. 性別：□男性 □女性　　2. 教育程度：□高中職□專科□大學 □碩士 □博士

3. 服務行業：____　4. 服務部門：_____　5. 職務名稱：____

6. 年齡：□30 歲（含）以下□30~35 歲（含）□35~40 歲（含）□40~50 歲（含）□50 歲以上

7. 開始接觸網路迄今：□5 年以內（含）□5~10 年（含） □10~15 年（含） □15~20 年（含）□20 年以上
8. 網路購物經驗：□無經驗□1-2 次（含） □3-5 次（含） □5-10 次（含）□10 次以上

問卷到此結束，麻煩您再檢查一次是否全部作答，感謝您的大力支持，謝謝!

Appendix C---the content filled in by twelve respondents

	f1	f2	f3	f4	f5	f6	f7	f8	f9	f10	f11	f12	f13	f14	f15	f16
f1		3	1	1	3	3	4	4	4	2	4	1	1	2	1	1
f2	3		2	4	4	4	1	3	3	2	2	3	1	2	3	1
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f4	1	2	1		4	2	2	2	1	1	1	2	4	4	4	4
f5	3	1	2	4		3	3	3	2	3	3	2	2	2	3	2
f6	3	1	2	3	4		3	4	2	3	4	3	2	2	1	2
f7	4	1	3	3	3	3		3	3	2	1	2	4	2	1	1
f8	4	3	3	2	3	4	3		2	2	3	2	1	2	1	1
f9	4	3	3	3	2	2	3	2		2	3	4	1	2	2	2
f10	2	1	2	3	3	3	2	2	3		2	4	2	3	1	2
f11	4	1	1	2	3	4	1	3	2	2		4	2	3	1	3
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f7	3	3	3	3	4	3		2	2	2	3	2	1	2	0	1
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f9	1	0	0	0	0	0	0	3		4	3	3	0	0	0	0
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f11	1	0	0	0	0	0	0	4	4	4		3	0	0	0	0
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f5	1	1	3	4		4	4	2	3	2	2	1	0	1	1	2
f6	2	1	3	4	4		4	2	1	2	2	0	1	1	1	2
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f8	3	2	2	3	1	2	3		4	4	3	3	1	2	3	0
f9	1	2	3	1	1	3	3	4		4	3	3	3	2	2	2
f10	1	3	3	1	1	2	2	4	4		3	3	3	1	2	3
f11	1	4	3	1	1	3	3	4	4	4		3	3	3	3	0
f12	0	2	2	1	1	3	2	4	4	2	2		3	2	2	3
f13	1	2	2	2	2	2	2	1	2	2	2	2		2	0	2
f14	2	1	2	2	2	2	2	2	2	2	2	2	2		2	1
f15	1	1	2	2	2	1	4	2	2	1	2	1	2	2		2
f16	2	2	2	2	2	2	4	2	2	2	2	2	2	2	2	

	f1	f2	f3	f4	f5	f6	f7	f8	f9	f10	f11	f12	f13	f14	f15	f16
f1		3	2	2	3	3	3	3	3	3	4	3	2	2	2	2
f2	2		1	2	1	3	1	3	2	3	4	2	2	1	2	2
f3	2	2		1	2	2	2	2	2	2	1	1	4	4	4	4
f4	2	2	4		3	3	3	3	1	1	1	3	4	4	4	4
f5	3	3	2	2		3	3	1	3	3	3	3	3	2	3	3
f6	3	3	2	2	3		3	3	3	1	3	1	1	1	2	3
f7	3	3	3	3	3	2		3	3	3	3	3	3	2	2	3
f8	3	2	2	3	3	3	3		3	3	2	3	1	2	3	0
f9	1	3	3	1	3	3	3	2		3	1	3	3	2	2	3
f10	1	3	3	1	3	3	3	2	2		1	3	3	1	3	3
f11	1	4	3	1	3	3	3	2	2	2		3	3	2	3	0
f12	1	3	2	1	3	3	3	2	2	2	2		3	2	3	3
f13	1	2	2	2	2	2	2	1	2	2	2	2		2	0	2
f14	2	1	2	2	2	2	2	2	2	2	2	2	2		2	2
f15	1	1	4	2	2	2	4	2	2	2	2	1	2	2		2
f16	2	2	2	2	2	2	4	2	2	2	2	2	2	2	2	


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