AN ANALYSIS ON BLOG USAGE ATTITUDE USING THE CUSP CATASTROPHE MODEL

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ABSTRACT
A blog (a contraction of the term weblog) is a website, usually maintained by an individual with regular entries of commentary, descriptions of events, or other material such as graphics or video. In recent years, the rising of blog has brought the internet a new kind of appearance. Blog produces a media-shocking power, gathering huge crowds in the new virtual broadcasting space. The number of bloggers and browsers is growing rapidly. It can be expected that blogs will influence our learning environment, job, life and perspectives. With aspect to the new developing network media of blog, how a company uses it to acquire an advantage is a key to its future developer, and the position is also worth our attention. The main purpose of this study is to explore how of the perceived usefulness and trust influence the attitude of use blog service by using a catastrophe model. Based on literature review, a nonlinear model of loyalty is suggested by past studies. The data were collected via online questionnaire survey, and 291 respondents were returned. Firstly, the latent variable is defined in the confirmatory factor analysis (CFA). Secondly, the catastrophe model was used to analyze the linkages between perceived usefulness and trust on attitude. Finally, we discuss the findings from an academic and managerial perspective and provide directions for future research.

Keyword: blog, trust, attitude, perceived usefulness, catastrophe model

INTRODUCTION
Blog The term weblog was first coined by John Barger in December, 1997 (Bausch et al., 2002). Weblogs typically describe a personal diary, kept on the web, which can be edited by an end-user with few web publication skills (IP and Wagner, 2008). Although weblogs have exited for only a few years, their principles, functionality and use have already significantly evolved. Weblog is born under 10
years, but it is becoming a great mass fervor in the world. The growth of weblogs, also abbreviated to blogs, on the Internet has been phenomenal. Originally an online writing tool that helped its users keep track of their own online records, the blog quickly turned into a key part of online culture (Hsu and Lin, 2008).

Weblog (sites used for creating and maintaining social connections among individuals) have become an important medium for people to interact in the cyber world. The blog has become a new and significant way of information distribution. According to a survey by Pew Internet & American Life Project, blog readership increased 58% in 2004 (Hsu and Lin, 2008). Studies have indicated that most blog readers and creators are young, affluent males with high online tenure and that they are loyal online shoppers. Bloggers also value the information in blogs. It has thus become an important issue for both managers and researchers to better understand what kind of factors can effect the behavioural of blog usage. Thus, the focus of our study was to investigate why blog participants (including bloggers and readers) participated. Findings were expected to shed lights on developing strategies to understand and promote blog usages.

Due to the difficulty for retailing delivery provider to make difference on the operation process, the customer loyalty has become an important issue for marketing practitioners. A nonlinear model of loyalty by past studies that have found the behavior of the phenomenon is bimodal for some of the control factor (Oliva, Oliver and MacMillian, 1992).

Based on the above-mentioned research background, the purpose of this study is to investigate the significant factors used by blogger to select their blog provider, it includes: (1) to explore the relationship among the trust, attitude to use and behavior intention of blog; (2) describe the nonlinear relationship between attitude to use and perceived usefulness based on different degree of trust using by the cusp catastrophe model. Finally, we will develop a loyalty strategy for a blog choice behavior in the blog market.

To improve our understanding of blog users’ decision-making process, a model that considers blog’s perceived usefulness, trust and attitude to use is established. Based on the literatures review (Wang and Qualls, 2007;IP and Wagner; 2008; Hsu and Lon, 2008;Bausch et al., 2002), the hypothesis and measurement model are formulated for the exogenous variable and the endogenous variables as shown in th following hypothesis, and to explain the relationships among Trust (TR), Attitude (AT) and Perceived usefulness (PU). The following seven hypotheses are formulated as:

H1: Trust has positive effects on behavior intention.

H2: Perceived usefulness has positive effects on behavior intention.

REVIEW OF CUSP CATASTROPHE THEORY
The catastrophe structure most commonly has been applied the cusp model (Gresov, Haveman, & Oliva 1993). Cusp catastrophe model can be formalized by potential or gradient structures, a potential function $F(x, c)$ is a function of both the system state $x$ and the control parameter(s) $c$. In mathematical terminology, the Cusp Catastrophe Model (CCM) consists of one behavior variable and only two control variables. The three dimensional phase space (see Fig. 1) of the cusp model can be described by the following potential equation:

$$F(v, u, x) = \frac{1}{4}x^4 + \frac{1}{2}ux^2 + vz$$

(1)

Where $x$ and $y$ are the two control dimensions and $z$ represents the behavior surface. The equilibrium surface $M$ is determined by Eq (2):

$$\frac{\partial F}{\partial x} = z^3 + yz + x = 0$$

$$M_F : \{ (x, y, z) \mid z^3 + yz + x = 0 \}$$

(2)

The values of $x$ in correspondence to which attains a local maximum or minimum satisfaction of the condition as in:

$$3z^2 + y = 0$$

(3)

To obtain the bifurcation set, project the equilibrium surface $M$ into the control space by eliminating $x$ from Eq. (2) and Eq. (3):

$$k = \{ (x, y) : 4y^3 = 27x^2 \}$$

(4)

The Hessian discriminate is expressed with the symbol “$K$”. This allows us to examine how the potential function looks in various regions of parameter space as well as in the set $K$ itself. When the Hessian discriminate is greater than zero, the system only has a steady equalization point; if Hessian discriminate is smaller than zero, the system will have two steady equalization points and an unstable equalization point. The cusp catastrophe occurs in systems whose behavior is dependent two control factors. Its graph is three-dimensional with every point on the surface representing an equilibrium state. The parameter $y$ determines whether the system has one or can have two stable equilibria. When $y > 0$ only one stable equilibrium can exit whatever the value of $v$. When $y < 0$ it depends upon the value set of $(x, y)$ whether the system has a single low level of stable equilibrium, or a low level and a high level equilibria, or a single high level of equilibrium.

GEMCAT approaches have been successfully applied in a number of different organizational research contexts (e.g. Gresov, 1987; Oliva, 1992). Oliva et al.’s (1987)
GEMCAT approach allows all variables in a catastrophe to be latent composites. To accomplish this, the variable $X$, $Y$, and $Z$ in the canonical cusp is presented by Eq. (5)

$$f(x, y, z) = \frac{1}{4} z^4 - \frac{1}{2} yz^2 - xz$$  \hspace{1cm} (5)$$

The equation (5) can be redefined as these three “latent” unobservable constructs which can thus accommodate univariate or multivariate measurements for each type of variable. This allows the cusp catastrophe model to be rewritten as shown in Eq. (1) and its derivative set equal to zero can be stated as:

$$f(X^*, Y^*, Z^*_i) = \frac{1}{4} Z^*_i - X^*_i Z^*_i - \frac{1}{2} Y^*_i Z^*_i$$  \hspace{1cm} (6)$$

From equation Eq. (6) the estimating goal is to minimize Eq. (7) and Eq. (8):

$$\frac{\partial f(X^*, Y^*, Z^*_i)}{\partial Z^*_i} = Z^*_i - X^*_i - Y^*_i Z^*_i = 0$$  \hspace{1cm} (7)$

$$\min_{\omega_{i,j,k}} \Phi = \sum_{i} e^2_i = \sum_{i=1}^{\tau} [Z^*_i - X^*_i - Y^*_i Z^*_i]^2$$  \hspace{1cm} (8)$$

where the $e_t = error$. That is, for a given empirical data on various specified dependent, splitting, and normal variables, one wishes to estimate the impact coefficients that define their respective latent variables, which make $\Phi$ as close to zero as possible. Minimizing $\Phi$ is equivalent to find the best fitting cusp catastrophe surface to the empirical data.

**DATA ANALYSIS AND RESULTS**

**Data collection and Measure Model**

To test the hypotheses, an online field survey was conducted. It used a questionnaire designed to be placed on a web site. The online survey yielded 291 usable responses, including 122 males and 169 females. Eighty percent were under 30 years of age and 84% had at least a college degree, indicating that the respondents were young and educated. All participants indicated that they had some experiences in writing their own blogs and/or reading and commenting on others’. Table 1 summarizes the respondents’ profile.

To ensure the content validity of scales, the scale items selected must represent the concept about which generalizations are made. Hence, validated scale items adapted from prior studies were used to measure the constructs of TAM. Additionally, constructs shared by different investigated TAM were measured using the same scale items. All scale items were measured using 6-point Likert-type scale (from 1 = “strongly disagree” to 6 = “strongly agree”). This study first developed the measurement model by conducting confirmatory factor analysis (CFA) to measure
convergent and discriminate validity. Then, the structural equation model was then estimated for hypotheses testing.

Table 2 indicated the measurement model was first assessed through CFA. The measurement model was further assessed for construct reliability and validity. Construct validity was evaluated by examining the standardized factor loadings within the constructs, average variance extracted (AVE), and the correlation between constructs. Standardized factor loadings on all latent constructs were satisfactory (0.67–0.95), showing satisfactory item convergence on the intended constructs. The AVE of all latent constructs was higher than the suggested value of 0.50. The above tests indicated that the discriminate validity was upheld for the measurement model. Overall, the confirmatory factor model adequately reflected a good fit to the data. The results of structural equation modeling obtained for the proposed conceptual model revealed a good model fit ($\chi^2 = 656.68$, d.f. = 125, $p < 0.001$; CFI = 0.95; IFI = 0.95; RMSEA = 0.12; SRMR = 0.08; NFI = 0.94). Fig. 1 shows the structural model estimates, where the estimate parameters are standardized path coefficients.

<table>
<thead>
<tr>
<th>Measure</th>
<th>Items</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>Male</td>
<td>41.9%</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>58.1%</td>
</tr>
<tr>
<td>Age</td>
<td>Under 25</td>
<td>63.9%</td>
</tr>
<tr>
<td></td>
<td>26-35</td>
<td>32.9%</td>
</tr>
<tr>
<td></td>
<td>Over 36</td>
<td>3.2%</td>
</tr>
<tr>
<td>Location of Taiwan</td>
<td>North</td>
<td>39.4%</td>
</tr>
<tr>
<td></td>
<td>Middle</td>
<td>20.6%</td>
</tr>
<tr>
<td></td>
<td>South</td>
<td>40.0%</td>
</tr>
<tr>
<td>Experience in blogging</td>
<td>Under 1 year</td>
<td>7.8%</td>
</tr>
<tr>
<td></td>
<td>1 year - 2 years</td>
<td>9.3%</td>
</tr>
<tr>
<td></td>
<td>3 years – 4 years</td>
<td>15.4%</td>
</tr>
<tr>
<td></td>
<td>5 years – 6 years</td>
<td>19.7%</td>
</tr>
<tr>
<td></td>
<td>Over 7 years</td>
<td>47.8%</td>
</tr>
<tr>
<td>Time in blogging each time</td>
<td>Under 0.5 h</td>
<td>46.8%</td>
</tr>
<tr>
<td></td>
<td>0.5 h -1 h</td>
<td>34.0%</td>
</tr>
<tr>
<td></td>
<td>1 h- 2 h</td>
<td>14.3%</td>
</tr>
<tr>
<td></td>
<td>2 h- 3 h</td>
<td>2.4%</td>
</tr>
<tr>
<td></td>
<td>Over 3 h</td>
<td>2.6%</td>
</tr>
<tr>
<td>Martial status</td>
<td>Unmarried</td>
<td>82.7%</td>
</tr>
<tr>
<td></td>
<td>Married</td>
<td>17.3%</td>
</tr>
</tbody>
</table>
### TABLE 2 INTERNAL CONSISTENCY RELIABILITY AND CONVERGENT VALIDITY OF THE MEASUREMENT MODEL

<table>
<thead>
<tr>
<th>Constructs and indicators</th>
<th>Factor loadings</th>
<th>t-value</th>
<th>Average variance extracted</th>
<th>Composite reliabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attitude towards use</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AT1</td>
<td>0.79</td>
<td>20.73</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AT2</td>
<td>0.96</td>
<td>21.47</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AT3</td>
<td>0.87</td>
<td>22.22</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trust</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TR1</td>
<td>0.86</td>
<td>17.29</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TR 2</td>
<td>0.92</td>
<td>18.85</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TR 3</td>
<td>0.74</td>
<td>14.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived usefulness</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PU1</td>
<td>0.89</td>
<td>17.27</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PU2</td>
<td>0.89</td>
<td>20.42</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PU3</td>
<td>0.83</td>
<td>18.51</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Because of the proposed measurement model was consistent with the data, the hypothesis were tested with AMOS 5.0, using the covariance matrix. Fig. 1 portrays the hypotheses test results and the completely standardized parameters in the proposed structural model. We assessed overall goodness of fit using the chi-square test. The chi-square test assesses the adequacy of a hypothesized model in terms of its ability to reflect variance and covariance for the data. Fig. 1 shows the structural model estimates, where the estimate parameters are standardized path coefficients. All of our hypothesized associations were significant at $p < 0.01$. Fig. 1 shows the standardized path coefficients for our research model. Results indicate that perceived usefulness ($\beta = 0.15, p < 0.05$) was a significant determinant of perceived usefulness. Perceived ease of use ($\beta = 0.54, p < 0.05$) was a significant determinant of perceived usefulness.

![Figure 1 The Result of Structural Equation Model](image-url)
Model Fit and Discussion

The control variables in the model are (1) the normal variable \( v \) is defined in terms of “relative perceived usefulness” \( (v_k \text{ with weight } \gamma_k) \), and (2) and the splitting variable \( u \) uses the “trust” indicator \( (u_j \text{ with weight } \beta_j) \), whereas the dependent variable \( x \) is defined in terms of relative attitude towards use \( (x_i \text{ with weight } \alpha_i) \). For instance, the latent variables in a cusp catastrophe model take the following general form:

\[
X^* = \alpha_i \times \Delta x_i, \quad i=1, 2, 3; \quad t=1, 2 \ldots 291
\]

\[
u^* = \beta_j \times \Delta u_j, \quad j=1, 2, 3; \quad t=1, 2 \ldots 291
\]

\[
u^* = \gamma_k \times \Delta v_k, \quad k=1, 2 \ldots 3; \quad t=1, 2 \ldots 291
\]

After transforming all variables to z-scores (i.e., M=0, SD=1), GENCAT II was employed to fit the hypothesized cusp catastrophe model. Data were fitted using GEMCAT II version 1.3, substitution of these weights into Eq. (9)-Eq. (11). Figure 2 shows the relationships between control variables and dependent variable. The control space separated from different sets of control variables (splitting variable \( X^* \) and the normal variable \( Y^* \)) and the Hessian discriminate. According to the difference in perceived usefulness, trust and Hessian discriminate \( (K) \), Figure 2 can be divided into two parts. In Figure 2, the blue point means the research sample when the Hessian discriminates is greater than zero.

Figure 3 shows the behavior manifold for the cusp catastrophe model. Consider two points at the far edge of the surface (low trust), they represent attitude with the same value of perceived usefulness, but slightly different values of trust. If the value of perceived usefulness increases, the points move forward toward the front of the surface.

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1 Our operationalizations of the dependent and independent indicator are measure is as follows

State variable : Attitude : \( x^* = f(x_1, x_2, x_3) \)

Normal factor : Perceived usefulness : \( v^* = f(v_1, v_2, v_3) \)

Splitting factor : Trust: \( u^* = f(u_1, u_2, u_3) \)

Ex : \( x_i \rightarrow \text{relative attitude (use of blog service provide by Yahoo } \rightarrow \text{use of blog service provide by Yahoo and Wretch)} \)

\( v_i \rightarrow \text{relative perceived usefulness (perceived usefulness of Yahoo } \rightarrow \text{perceived usefulness of Wretch)} \)

\( u_i \rightarrow \text{relative trust (trust of Yahoo } \rightarrow \text{trust of Wretch)} \)

Each index will be transformed into standardized value using the following equation: \( x - \bar{x} / \sigma \)

Ex : Repurchase \( (x_i) \rightarrow \Delta x_i \rightarrow \Delta x_i / \sigma, t = 1, 2 \ldots 291 \)
tracing parallel paths. The figure also shows discontinuous change when a point moves from the left to the right of the surface. At the far edge of the surface, a point can pass smoothly from left to right. But if point is at the front of the surface (high trust), a discontinuous jump will occur at the pleat. At the back of the surface where the trust is small; the attitude is dependent only on its perceived usefulness and increases continuously with it. Increases trust its magnitude lead to a progressively larger divergence between the top and the bottom of the response surface.

Figure 2 Plot of Trust versus Perceived Usefulness by K

Figure 3 Plot of Trust versus Perceived Usefulness by K
If the magnitude of change in $u$ (trust) is small, then a smooth change in $x$ (attitude) would occur, directly proportional to the change in $x$ (attitude). A small difference in the initial starting positions (e.g., point a and point b) can result in vastly different values for $x$ (attitude) when the magnitude of $u$ (trust) increases beyond the point where the pleat starts. This phenomenon is illustrated by path A and path B in Figure 3, where point a is driven downward to point c, and point b is driven upward to point d. At higher values of $u$ (trust), however, large changes in $v$ (perceived usefulness) will produce a sudden discontinuous shift in $x$ (attitude) as shown in path C, which then contributes to the reverse behavioral result.

It should be noted that once a sudden shift has happened, reversing the values of $v$ (perceived usefulness) may not cause a substantial downward change in $x$ (attitude) namely hysteresis. There must be a significant reversal in $v$ (perceived usefulness) before a shift down to point f would occur. These lags in response are aggravated or mitigated by the size of the $u$ (trust). Within the cusp area, the state variable $x$ can take on two possible values for a given $(v, u)$ pair. This characteristic allows for the modeling of lag effects (hysteresis).

**DISCUSSIONS AND MANAGERIAL IMPLICATIONS**

The Internet currently plays an important role as a business medium. Recently, there has been a dramatic proliferation in the number of blogs, based on the theory of reasoned action, we developed a model involving technology acceptance model. A large sample survey of online trading investors was employed to empirically examine this research model. A survey of 291 blog participants found strong support for the model. The data were analyzed using the two-step approach. First, confirmatory factor analysis (CFA) was performed to determine whether the measured variables reliably reflected the hypothesized latent variables. Second, structural models were tested to determine overall model fit and path coefficients. Finally, a cusp model of consumer behavior was developed to describe the effects of both trust and perceived usefulness on attitude of use of blog.

This empirical study demonstrates that higher perceived usefulness would lead customers to increase the attitude to switch to Yahoo.com, even though the trust is higher. When the perceived usefulness is set at a lower level, drivers tend to continue choosing Wretch.com. This means that with the perceived usefulness strategy we are unable to reach the anticipated outcome. If the value of perceived usefulness is set at the pleat, the decision of customers in the behavioral system is ambiguous with a higher trust. Several significant catastrophe characteristics, such as divergence, catastrophe, hysteresis, and bimodality can be found in the behavioral models. In addition, online shopping operators should consider how to lower the customers’ trust.
The results of this paper should assist blog providers to judge the effects of the perceived usefulness and realize customers’ discontinuous attitude. We initially proposed the catastrophe model to describe customers’ nonlinear model of customer attitude. Future research should be conducted to collect more relevant factors and to discuss their effects on behavioral decisions in order to more explicitly explain customer loyalty of blog provider.

REFERENCES