Effects of Codependency on the Loyalty of Virtual Community Members

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Abstract

Members of virtual communities engage in a multiplicity of relationships. They assume various roles and perform different functions. These roles and functions vary from being a passive browser of the community's pages to being an active contributor or presenter, or from simply updating one's own personal data and satisfying personal reading needs to sharing knowledge, giving others encouragement and affirmation, and answering blog questions. Such virtual activities are vital and create a unique codependency between caregiver and the cared, a kind of relationship described in psychology codependency theory. This study expounds on the concept of codependency and configures the virtual community according to five perspectives: psychological safety (PS), identifiable anonymity (IA), public self-awareness (PSA), group norms (GN), and community engagement (CE). These five perspectives also constitute the latent codependency variables that explain why community members enthusiastically participate in community activities and generously assist one another, thereby boosting community identification (CI) and member loyalty (ML). CI is not only an important prerequisite to ML but also an intermediary variable between virtual community codependency and ML. In actual terms, CI enhances ML. CE has the greatest effect on virtual community codependency, followed by PSA, GN, PS, and IA, in that order. CE highlights member devotion and dedication and is a vital factor in persuading other members to continuously participate in community activities, thereby fostering member codependency. Members value their self-image and the attention they obtain from other members more than they value GN. The safety of the members' community environment and the anonymity of their participation in activities come last in their ranking. We hope this study will assist operators of virtual communities to understand the behavior of their members and enhance the efficiency of community operations.

Keywords: Codependency, virtual community, Internet, community identification, loyalty

1. Introduction

In January 2012, the US network marketing company comScore released its annual community network research report. Their statistics showed that Internet users around the world spend one-fifth of their networking time in virtual communities (Aquino, 2012). In 2013, the top 100 virtual community websites of Taiwan captured a record-setting 30% of the market (Business Next, 2013). Virtual communities have clearly become the center of network activities and the focus of observation for the network industry.

Kozinets (1999) believed that a virtual community constitutes a social relationship created by its users through application programs on the Internet. Previous research has rarely explored the various relationships formed among community members. Some community members assume the roles of presenter and viewer and interact in a seemingly symbiotic relationship, such as that between flowers and bees. Interaction among community members includes

keeping in contact and caring for others, in which the relationship is similar to that between caregiver and cared in the codependency theory of psychology.

This study uses the concept of codependence to examine the codependent relationship of community members. Previous studies show that the operation of virtual communities is greatly influenced by the affirmation and loyalty of their community members. When affirmation and loyalty decrease, the revisit rate also decreases, with some members even leaving the community. As such, this study uses two variables (an intermediate and a dependent variable) to investigate the codependence of community members so as to hopefully make a contribution to understanding their behavior.

2. Review of Literature

2.1 Virtual Communities

Kozinets (1999) says that a virtual community is the virtual space of those users who have created a social relationship through program interactive exchange. Wachter, Gupta, and Quaddus (2000) conceived a virtual community as a networking community in which users exchange and share opinions, with the computer as the medium of exchange.

Dholakia, Bagozzi, and Pearo (2004) found that community members join virtual communities because of shared interests, trading and social purposes, and other needs related to information, knowledge, learning, leisure, entertainment, and problem solutions. Based on the IS success model of DeLone and McLean (2003), Lin (2008) took virtual community members as the objects of study when exploring the success model of virtual communities. Fang and Chiu (2010) used variables, such as justice, trust, and organizational citizenship behavior, to study the participation intention of community members.

The review above has summarized previous studies on virtual communities and defined a virtual community as the virtual space created by Internet users, which allows them to browse one another's achievements, participate in discussions, and circulate works or opinions. Such exchanges connect the members and create a social community.

2.2 Codependency

The concept of codependency originates from the treatment given to alcoholic families in the 1940s. Alcoholics depend on the care of their family members and put many pressures on them. On the other hand, family members obtain a sense of self-affirmation when they satisfy the needs of their alcoholic family member. Studies have found that this interaction between family members and alcoholics becomes a codependency, and the dependence of family members on alcoholics is even more significant than the reverse (Arnold, 1990; O'Brien, 1992; Riley, 1991; Wilson & Kneisl, 1992).

Hughes-Hammer, Martsolf, and Zeller (1998) claim that codependency is the mutual dependence of people who control their emotions. Therefore, in relationships between people, those who have the tendency of codependency are tied down by their significant others, who affect the former's behavior to devote their efforts to the latter. Henceforth, codependency is the dependence on people or things other than one's self and leads to mutual dependence. Such dependence includes the reduction and neglect of the self. Those who have an obvious codependency tendency force themselves to help others control the occurrence of natural incidents by using the excuse of controlling and giving suggestions. They also continuously sacrifice themselves for others and assist them. Codependency makes them emotionally attached to each other. This tendency exists in every person although the degree of its exhibition varies.

In the field of psychology, the conceptual definition of codependency and its features have been much discussed. The relevant theories are as follows:

1. Social structure and cultural character perspective: Schaef (1987) claimed that

the roles of the various classes and sexes in society are associated with interpersonal relationships that depend on each other. The cultural characteristics of self-repression, self-sacrifice, and devotion to maintaining close interpersonal relationships create codependency.

2. The iceberg model: Friel and Friel (1987) believed that codependency probably results from shame, guilt, and the fear of abandonment, which manifests as an iceberg does, with the tip or only a part of it revealed. It can lead to problems of addictive relationships and compulsive behavior if not taken seriously.
3. The intrapsychic approach: Riley (1991) thinks that the tendency of codependency is created by the love of attention or the fear of being left out and the behavior of deliberately pleasing the significant others.
4. The interpersonal approach: Arnold (1990) says that a child must learn to satisfy its external needs from experience and it assumes the role of caregiver for the purpose of establishing interpersonal relationships.
5. The illness model: Whitfield (1989) claims that codependency is similar to ordinary addiction and, if serious, is likely to evolve into other forms of addiction and compulsive behavior.

In summary, those who show the tendency to be codependent form relationships characterized by various features, such as self-repression, self-sacrifice, dedication, and pleasing others, as a result of their growth environment, family circumstances, social relations, and health status. These features suggest that the tendency to be codependent easily evolves into problematic forms of addictive relationships and compulsive behavior.

2.3 The Formation of Codependency in Virtual Communities

To explore the codependency among virtual community members, this study referred to five pertinent psychological theories: the social structure and cultural character perspective, intrapsychic approach, iceberg model, illness model, and interpersonal approach. These five theories of codependency are applied to virtual communities depending on the relevant context and information theories on virtual communities.

1. Psychological safety (PS): Two theories relate codependency tendency to PS. O'Brien (1992) proposed the concept of surrendering the self and Hands and Dear (1994) proposed the concept of assuming the responsibility of meeting others' needs to the point of self-neglect. Both theories explain that the codependency tendency of certain individuals may be caused by the lack of PS. To compensate for this lack, such individuals deliberately help their significant others, while neglecting their own needs, by means of controlling or giving proposals to their significant others. Kahn (1990) thinks that PS is a self-image and a mental state, in which an individual feels no impending negative consequences. An individual with high PS has confidence and his behavior is safe and does not cause negative consequences. An individual does not express their behavior but uses words and deeds to satisfy their PS. In a virtual community, many members regularly update their diaries, status, and emotions because they regard other community members as significant others and they can satisfy their PS by satisfying their significant others. Such is the codependency of the virtual community (CVC) when viewed from the perspective of PS.
2. Identifiable anonymity (IA): Hinkin and Kahn (1995) claim that those who have the tendency to be codependent normally repress their self-value so as to hide their self and show their self-dedication and responsibility. This situation is also seen in virtual communities, whereby people who interact

with other community members substitute their self with their own virtual identification. This situation is called IA. According to the definition of Nissenbaum (1999), anonymity consists of the interaction with others while concealing the self. The present study adopts the concept of anonymity as IA (Marx, 1999; Wallace, 1999; Yun, 2006).

3. Public self-awareness (PSA): Individuals who have a codependency tendency care about the opinions of others to the point of repressing their own feelings and hiding their own negative emotions. Whitfield (1989) says that such repression leads to a false self, referred to as the hidden self. In virtual communities, members often deliberately neglect and even repress their own sentiments and needs to fulfill the expectations of others. This behavior is similar to PSA. Self-awareness means making the self become the focus of attention (Aronson, Wilson, & Akert, 2001), which is a state and degree of attention related to self-expression (Duval & Wicklund, 1972). However, when we focus our attention on the self, we may focus only on certain aspects (Weber, 1992). If our attention is limited to our public self and our self in the eyes of others, this self-awareness is referred to as PSA. Given this definition, we can understand how this perspective is applicable to the study of codependency in virtual communities.
4. Group norms (GN): Individuals with a codependency tendency often measure themselves against the expectations and standards of others. It is an invisible restriction similar to the GN of virtual communities. Brown (1988) points out that norms refer to explicit and implicit rules that guide the conduct of community members and they may be regarded as an explicit description of the actions and responses expected from the members. The present study also uses this concept to understand codependency in virtual communities.
5. Community engagement: (CE): Favorini (1995) claims that a family environment characterized by strong parental control and caring tendency results in the codependency of children. This circumstance is similar to the environment and situations mentioned in the social cognitive theory of Bandura (1986). An individual exhibits special behavior when they believe that the have some responsibility or commitment or are engaged in some incident. Many virtual community members are influenced by the community environment and believe that they are given the responsibility of taking care of others, which similarly results in codependency. To satisfy other members, they try to publish topics and articles that will attract the attention of other members. Those members who are stimulated also participate in the activities. As such, CE is also an appropriate perspective for examining CVC.

Previous studies have not applied the theory of codependency to virtual communities. The present study transposes the relationship between caregiver and cared as described in the codependency theory of psychology into the close ties and mutual dependence of virtual community members. The study considers the members' interactive behavior as the overt behavior of virtual communities to explore the CVC.

In this study, CVC consists of PS, IA, PSA, GN, and CE and refers to the mutual dependence and reliance of community members on virtual community activities. To maintain this relationship, members participate in virtual community activities. The participation behavior of the members appears to be simple, but is actually the expression of their interactive and codependency in the virtual world.. Bloggers publish articles to maintain their popularity or to attract visitors and satisfy the demands of readers who support them. On

online dating sites, members who wish to frequently interact with their beloved friends continually to update their websites or systems.

2.4 Variables Relevant to Virtual Communities

In addition to codependency, two other variables pertinent to the study of virtual communities include the following:

1. Community identification (CI): Algesheimer, Dholakia, and Herrmann (2005) categorize this perspective into emotion and cognition. Emotion refers to the characteristics of an emotional commitment when cognition is merged into the community's emotions. Cognition emphasizes the recognition of the common feelings shared by the other members.
2. Member loyalty (ML): Lin (2008) claimed that the degree of participation in virtual communities can be used as a criterion to measure their success. When a virtual community garners high loyalty from its members, it is considered successful. The present study adopts the definition of Oliver (1999) and translates it into the satisfaction of community members. Such a virtual community will, in the future, continue to win high revisit rates from its members. It will also persuade non-members to join and will discourage transference behavior.

3. Research Methods

This study follows the adaptation conditions of the models discussed above through an analysis of verifying factors and their effects. The purpose is to examine community dependency in general and to understand the influence of the variables in particular.

3.1 Research Framework and Hypothesis

To understand the influence of codependency of the virtual community on its operations, the literature related to virtual communities has been reviewed above. The review shows that the success of a virtual community is clearly related to member loyalty (ML). Community identification (CI) is the probable cause of ML. As such, the present study takes CI as the intermediary variable and ML as the final result. It describes the relationship between virtual community codependency and the variables. The review of the related literature has shown the relationship from various perspectives and has identified models that can be appropriated when proposing the concept of virtual community codependency, which has not yet been nominated in past studies. This study also proposes that virtual community codependency is a potential variable that can influence psychological safety (PS), identifiable anonymity (IA), public self-awareness (PSA), group norms (GN), and community engagement (CE). The research framework is illustrated in Figure 1.

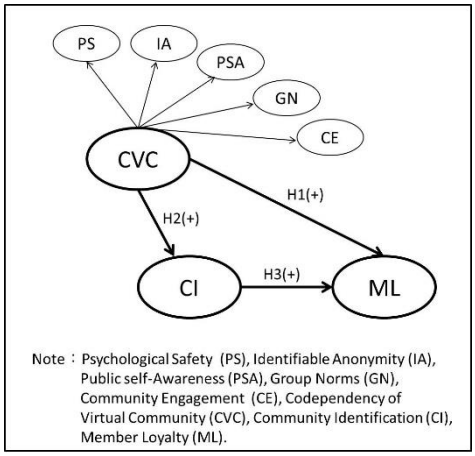

Figure 1: Research Framework

Lin (2008) claims that ML is influenced by system characteristics, social factors, and the sense of belonging that is fostered in the virtual community. Additionally, social factors that result in trust have a significant effect and show that certain factors of the inner world of the members have not yet been explored. Therefore, this study proposes codependency of the virtual community (CVC) as the potential variable that causes ML, following the ideas ex-

pounded by codependency theories, including the social structure and cultural character perspective, intrapsychic approach, iceberg model, illness model, and interpersonal approach. These theories are translated for the purpose of this study into psychological safety (PS), identifiable anonymity (IA), public self-awareness (PSA), group norms (GN), and community engagement (CE). If the potential factors of CVC are formed from the perspective of PS, the degree of CVC and ML both increase. To verify this conclusion, this study hypothesizes the following:

H1. Codependency of the Virtual Community (CVC) positively influences Member Loyalty (ML).

Algesheimer et al. (2005) claim that CI emotionally engages the community members and has the features of an emotional commitment. If the individual emotions of the members are strengthened, the CI is also strengthened. Of the five factors of CVC, GN directs the behavior of the members. In addition, CE consists of the motives of emotional commitment and the increased virtual community codependency enhances cognition and emotional commitment and increases CI.

H2. CVC positively influences CI.

Algesheimer et al. (2005) claim that CI can positively influence brand emotion, with an increase in CI resulting in a corresponding increase in brand connection and loyalty. Lin (2008) says that the success of a virtual community is closely related to ML, because ML is influenced by various psychological factors and its cause is similar to that of social structure theory. Therefore, the higher the degree of codependency, the closer the relationship of the members. An increase in CI leads to a corresponding increase in ML.

H3. Community Identification (CI) positively influences Member Loyalty (ML).

3.2 Measurement and Data Collection

This study adopts a seven-point Likert Scale to measure the variables from 1 to 7 points ("strongly disagree" to "strongly agree"). The study measures the items according to the variables of the various perspectives in order to conduct a first-order factor analysis, divided into the variables of CVC, CI, and ML. The higher the score of a perspective, the more strongly it is expressed. CVC is derived from the second-order factor analysis of the five perspectives above and the model scores are obtained from the estimation program. The higher the score, the higher the degree of codependency.

The subject of this research includes the users of virtual communities in Taiwan. For the data collection, the Google Doc function was used to produce an online questionnaire. The users of well-known forums, blogs, micro-blogs, community websites, dating websites, video and audio websites, and online games were asked to complete the questionnaire. The investigation period was between December 4th and December 28th 2014 and this study recovered 669 effective questionnaires using the convenience sampling method. According to the proposition of Bagozzi and Youjae (1988), the number of samples should be five times larger than the test variables and greater than 50.

4. Analysis and Result

4.1 Sample Statement

The respondents of the 669 questionnaires all habitually use community websites or have had experience in similar virtual communities. The statistics of the population variables are described in Table 1.

Table 1: Statistics of Population Variables

Population variables	Item	Number	Rate
Sex	Female	343	51.3%
	Male	326	48.7%
Education	Below high school	14	2.1%
	High school	103	15.4%
	College / university	420	62.8%
	Post-graduate and above	132	19.7%
Age	Below 19 years	74	11.1%
	20 to 29 years	267	39.9%
	30 to 39 years	218	32.6%
	40 to 49 years	87	13.0%
	Above 50	23	3.4%
Occupation	Civil service	13	1.9%
	Culture and education	18	2.7%
	Freelance	12	1.8%
	Medical service	14	2.1%
	Service industry	99	14.8%
	Finance	46	6.9%
	Military	43	6.4%
	Housewife	24	3.6%
	Designing	6	0.9%
	Electronics	36	5.4%
	Manufacturing industry	44	6.6%
	Advertising and communication industry	2	0.3%
	Student	266	39.8%
	Other	46	6.9%
Length of participation in this virtual community	Below 1 year	57	8.5%
	1 year and below 2 years	93	13.9%
	2 years and below 3 years	213	31.8%
	3 years and below 4 years	177	26.5%
	4 years and above	129	19.3%
The number of releases, responses, messages, or comments made per day	1 to 3 times	285	42.6%
	4 to 6 times	144	21.5%
	7 to 9 times	140	20.9%
	10 times and above	100	14.9%

4.2 Reliability and Validity Analysis

Reliability refers to the stability of the quantity of the questionnaires. This study adopted Cronbach's α coefficient to determine the internal consistency of the questionnaires. According to the proposition of Nunnally (1978), when the Cronbach's α coefficient value is larger than 0.7, its reliability is acceptable. The Cronbach's α coefficient values of all the items in this research are higher than 0.936, which suggests acceptable reliability. The reliability of all the items are shown in Table 2.

Table 2: Reliability of All Items

Perspective	Item	Average	Standard difference	Perspective α value
PS	PS1	4.22	1.71	0.950
	PS2	3.89	1.61	
	PS3	4.61	1.98	
IA	IA1	5.10	1.50	0.890
	IA2	4.81	1.40	
	IA3	5.49	1.51	
PSA	PSA1	5.10	1.35	0.716
	PSA2	4.70	1.34	
	PSA3	4.80	1.40	
GN	GN1	4.32	1.20	0.924
	GN2	4.68	1.51	
	GN3	4.64	1.46	
CE	CE1	3.71	1.66	0.865
	CE2	3.57	1.49	
	CE3	4.31	1.37	
CI	CI1	4.56	1.34	0.925
	CI2	4.62	1.40	
	CI3	4.42	1.50	
	CI4	4.22	1.50	
ML	ML1	4.63	1.29	0.892
	ML2	4.70	1.35	
	ML3	4.89	1.29	
	ML4	4.63	1.29	

The questionnaire items in this research were based on the existing literature and theories from Taiwan and abroad. They underwent test decoration and the validity of their surface meaning was evaluated and finely tuned by two university teachers from the fields of information management and psychology. Following the standards of Andersson and Nilsson (1964) and Ronan and Latham (1974), the items have a high face validity and expert validity.

A confirmatory factor analysis was also used to test the model estimation and guarantee the single perspective characteristics of the measurement scale. Composite reliability (structural reliability) tests every potential variable and checks the inconsistency of those variables. After conducting the analyses above, the average extraction variations of the variables in the quantitative table of this study (excluding PSA) reached 0.5 and above. Their composite reliability reached 0.7 and above, which indicates that the variables have good composite and structural reliability (Bagozzietal, 1988). The relationship among the perspectives of most potential exogenous variables is smaller than the relationship within the perspectives, which is the square root value of the average variance extracted. Aside from PSA and ML, the variables are larger than the relevant coefficients under several other perspectives, which shows that the quantitative table has a distinguishing validity (Hairetal, 1998). The correlation, variance matrix, and composite reliability are described in Table 3.

Table 3: Correlation, Variance Matrix, and Composite Reliability

	PS	IA	PSA	GN	CE	CI	ML
PS	**0.922**	0.222	0.353	0.425	0.505	0.541	0.545
IA	0.140	**0.866**	0.271	0.326	0.388	0.416	0.418
PSA	0.293	0.297	**0.696**	0.520	0.617	0.661	0.665
GN	0.249	0.252	0.529	**0.897**	0.745	0.798	0.803
CE	0.288	0.293	0.614	0.521	**0.789**	0.948	0.954
CI	0.319	0.324	0.680	0.578	0.670	**0.874**	1.188
ML	0.337	0.343	0.719	0.61	0.708	0.912	**0.870**
AVE	0.850	0.751	0.485	0.805	0.622	0.764	0.757
C.R.	0.944	0.899	0.735	0.925	0.830	0.928	0.925

Note: The italicized figures in bold represent the square root of AVE and the triangular area at the top right represents the variable coefficients. The correlation coefficients all reached a significance level of $p<0.01$ (two-tailed test). The triangular area at the bottom left represents the variable coefficients that reached a significance level of <0.001 (two-tailed test). CR stands for construct reliability.

4.3 Structural Equation Model Analysis

Path analyses and regression analyses explore the relationship between visible variables. Factor analysis explores the relationship between potential variables and visible variables. The structural equation model analysis is a model that combines the two methods and includes the first measurement model (the relationship between visible variables and potential variables) and the second structural model (the relationship between potential variables). The results above show that the quantitative table has face validity and reliability, and structural validity. The distinguishing validity of all the perspectives is also to an acceptable level. Confirmatory factor analysis was used to test the adaptation of the models. According to Bagozzi and Yi (1988), the size of the samples should be no less than 50 and should be five times greater than the estimation parameters. Given the response of 669 effective samples, the present study meets the above requirements. As such, the samples can be subjected to confirmatory factory analysis to test the adaptation of the overall measurement model.

The analytical results show that the chi-square value of the overall measurement model is as follows: $\chi2(276)= 791.527$, $\chi2/d.f.=3.751$, GFI =0.908, CFI = 0.957, NFI = 0.942, RFI= 0.931, IFI=0.957, TLI=0.948, and RMSEA=0.064. The degree of adaptation exceeds the criteria recommended by scholars, which indicates that the degree of the adaptation of the measurement model in this study is acceptable. The analytical results are described in Table 4.

Table 4: Results of the Confirmatory Factor Analysis

Perspective and items	Standardized loadings	t value	Square multiple correlation values
PS (α = 0.950, AVE=0.8506, CR=0.9446)			
PS1	0.891	--	0.794
PS2	0.939	40.288	0.882
PS3	0.936	40.208	0.877
IA (α = 0.890, AVE=0.7514, CR=0.8994)			
IA1	0.732	--	0.536
IA2	0.865	23.200	0.749
IA3	0.984	24.355	0.970
PSA (α=0.716, AVE=0.4857, CR=0.7354)			
PSA1	0.615	--	0.378
PSA2	0.825	14.823	0.681
PSA3	0.631	12.348	0.398
GN (α=0.924, AVE=0.8058, CR=0.9253)			
GN1	0.986	--	0.973
GN2	0.860	36.405	0.74
GN3	0.841	34.562	0.705
CE (α=0.865, AVE=0.6227, CR=0.8309)			
CE1	0.885	--	0.533
CE2	0.743	17.260	0.552
CE3	0.730	16.646	0.782
CI (α=0.925, AVE=0.7644, CR=0.9284)			
CI1	0.768	--	0.768
CI2	0.702	25.952	0.702
CI3	0.811	27.597	0.811
CI4	0.777	25.517	0.777
ML (α=0.892, AVE=0.7573, CR=0.9258)			
ML1	0.859	--	0.739
ML2	0.895	27.221	0.801
ML3	0.842	27.997	0.71
ML4	0.884	29.433	0.781

Note 1: -- The route is set at 1.
Note 2: When the t value is larger than 2.58, it represents a vital level of $p < 0.01$

The confirmatory factor analysis in Table 4 shows the current conditions of the perspectives and the most influential factors. The absence of threats within the environment of the virtual community is the most vital factor in the PS perspective (0.939). Those interviewed are clearly most concerned about the safety of the virtual community environment before they consider participation in any discussions or publishing opinions using a certain identity.

Interaction with others using identifiable virtual identities is the most vital factor for the IA perspective (0.984). This finding means that the respondents participate in activities in virtual communities using identifiable virtual identities. The various users can identify one another's virtual identities.

The most vital factor for the GN perspective is the compliance of the words and deeds of the respondent with the expecta-

tions of the virtual community and other members (0.986). This finding shows that those respondents who interact in the community are influenced by the expectations of other members.

The most vital factor for the CE perspective is the help given to other members from the participation of respondents in the activities of the virtual community (0.885). This finding shows that respondents are willing to dedicate their efforts to participating in the community, sharing their abilities, and assisting other members.

The most vital factor for the PSA perspective is the attention the respondents obtain from other members when using the virtual community (0.825). This finding shows that the respondents care very much whether or not they attract the attention of other community members. The importance of attention is higher than that of care and impressions from others.

The most vital factor for the CI perspective is the importance accorded to respondents in the virtual community (0.777). They want to take pride in being a member of the virtual community, which shows that the degree and sense of CI are highly significant.

The most vital factor for the ML perspective is the willingness of members to participate in the community activities because they feel good in joining the community (0.895). This shows that the respondents have built their community loyalty through use, trust, recommendation, and reuse.

The confirmatory factor analysis shows that the factor loading is between 0.50 and 0.95 and the models can be adapted to the sample data. To determine if there are factor structures at higher levels, a second-order CFA model analysis was conducted to obtain the CVC. The analytical results show that the chi-square value of the overall measurement model is as follows: $\chi 2$ (120)=316.303, $\chi 2$/d.f.=3.811, GFI=0.943, AGFI=0.918, CFI=0.968, NFI=0.958, TLI=0.960, RMSEA=0.065, and IFI=0.969. The degree of matching exceeded the criteria recommended by the scholars, which indicates that the degree of matching is acceptable. The standard loadings of all the perspectives are smaller than the significant level of 0.01. The analytical results of the matching degrees are described in Table 5.

Table 5: CVC Second-order Confirmatory Factor Analysis Results

Perspective and items	Standardized loadings	t value	Square multiple correlation values
CVC			
PS	0.604	--	0.365
IA	0.412	7.589	0.171
PSA	0.778	9.566	0.606
GN	0.676	11.463	0.457
CE	0.791	11.720	0.626

Note 1: -- The route is set at 1.
Note 2: When the t value is larger than 2.58, it represents the vital level of $p < 0.01$.

The confirmatory factor analysis for virtual community codependency shows that the highest score is that obtained by CE (0.791), followed by PSA (0.778), GN (0.676), PS (0.604), and IA (0.412). These results show that virtual community codependency influences the dedication and contributions of members and their continuous participation in community activities for others. In addition, the self-image of the members is more vital than GN, whereas the safety of the community environment has the least effect on their decision to participate, or not, in activities using anonymous identities.

4.4 Hypothesis Testing

The analysis above proves that the potential factor of CVC exists and positively influences ML (0.482), that CVC positively influences CI (0.862), and that

CI positively influences ML (0.497). The results also show that virtual community codependence can be derived from PS, IA, PSA, GN, and CE. Therefore, the results support the hypotheses of this study, as described in Table 6.

Table 6: Hypothesis Test Results

Hypothesis	Content	Test result
Model	Model matching and data adaptation matching	Matching
Hypothesis 1 (H1)	CVC positively influences ML.	Support
Hypothesis 2 (H2)	CVC positively influences CI.	Support
Hypothesis 3 (H3)	CI positively influences ML.	Support

Effect analysis mainly explores the influential effects of the potential endogenous variables, particularly their direct, indirect, and total effects. The effect values of the perspectives are described in Table 7.

The analysis of the effect of the perspectives on the potential variables shows that the vital and influential factors of CVC include PSA, CE, GN, PS, and IA. The influence of CVC on CI is significant and it has direct and indirect effects on ML. CI also plays the role of intermediary variable and the most vital variable regarding the overall effect is the effect of CVC on ML. The standardized route is described in Figure 2.

Table 7: Effect Values of the Perspectives

Structural relationship	Direct effect	Indirect effect	Total effect
PS to CVC	0.371	--	0.371
IA to CVC	0.376	--	0.376
PSA to CVC	0.789	--	0.789
GN to CVC	0.670	--	0.670
CE too CVC	0.778	--	0.778
CVC to CI	0.862	--	0.862
CVC to ML	0.482	0.428	0.910
CI to ML	0.497	--	0.497

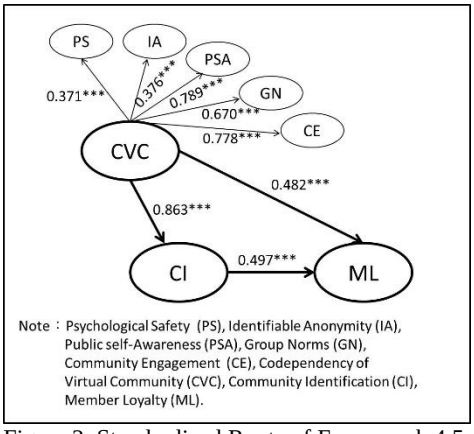

Figure 2: Standardized Route of Framework

4.5. Testing the Intermediary Effect of CI

The analysis of the model effect shows that CI has a certain intermediary effect. A multiple regression test was conducted to understand this intermediary effect.

1. the existence of a CVC →CI route
   $CI = \alpha 0 + \alpha 1 CVC + \epsilon$ (a)
   Test of the supposition of H0: $\alpha 1 = 0$, $\alpha 1 = 0.730^{***}$, adjusted $R2 = 0.532$
   Refuse H0 on the vital level, then coefficient $\alpha 1$ is significant which means it exists.
2. For the test of non-CI, the route of CVC →ML exists.
   $ML = \gamma 0 + \gamma 1 CVC + \epsilon$ (b)
   Test of H0: the supposition of $\gamma 1 = 0$, $\gamma 1 = 0.687^{***}$, adjusted $R2 = 0.471$.
   Refuse H0 on the vital level, then coefficient $\gamma 1$ is significant, which means the route under non-CI exists as described in Figure 3.

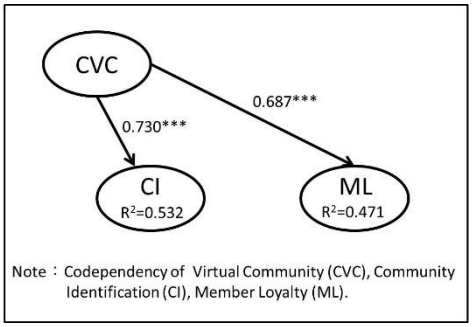

Figure 3: Intermediary Structure Diagram

3. Under CI, test the existence of route CI→ML, which means that the route effect is weakened

   $ML = \beta 0 + \beta 1 CI + \beta 2 CVC + \epsilon$ (c)

   Test and verify H0: the supposition of $\beta 1 = 0$ and $\beta 2 = 0$

   $\beta 1 = 0.292^{***}$ $\beta 2 = 0.473^{***}$ adjusted $R2 = 0.510$

   Refuse H0: $\beta 1 = 0$ on the vital level, then coefficient $\beta 1$ is significant, which means that the route exists and $\beta 2$ is significant. Compared with (b), $\beta 2 = 0.473 < \gamma 1 = 0.687$ shows that ML has a certain intermediary effect, as described in Figure 4.

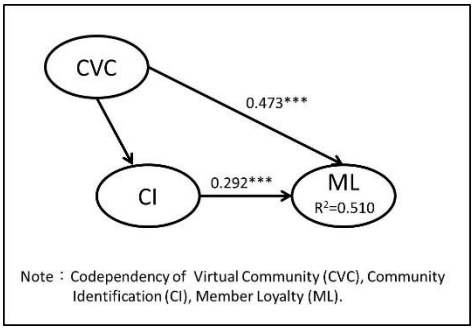

Figure 4: Structural Framework Diagram of the Intermediary Relationship

5. Conclusions

5.1 Discussion of the Research

This study proposed the concept of CVC to explain the behavior of virtual community members through a literature review and observations. The model was verified using a questionnaire investigation with the conclusions of this research provided below.

1. CVC explains the ML of community members.

   The higher the tendency of community members for virtual community codependency, the higher the ML. Previous research has found that when the members of Internet virtual communities have a higher PS, their ML is also higher. This study found that the effects of CE, PSA, and GN are higher than PS, which shows that the members have a vital influence on the sense of responsibility toward the community, their attention to other members, and GN. This finding differs from the previous understanding that an increase in PS increases ML.

   With regard to virtual community codependency, the most effective perspective is CE, which shows that high CE increases the codependency of the members and strengthens their ML. Many members who are influenced by the environment of the community also try to satisfy and care for other members, disseminate topics and articles that are of interest to other members, and continuously participate in such community activities. The other members of the community who have been influenced will continue participating in activities and engaging in effective interactions, which is the CVC described in this study.

   With regard to GN, every community has its explicit and implicit norms, which the members must maintain and follow together in order to continue and enhance loyalty. Good interactions will create a united and rich community. With regard to PSA, the members care about the opinions of the other members and the attention they receive from other members. To impress other members and increase their loyalty, such members share their opinions. With regard to IA, community members normally use identifiable community iden-

tities when sharing knowledge and interacting with other members. The last variable is PS. According to a previous study, an increase in PS increases ML because community members think that they can peacefully participate in community activities and interact with other members in a safe environment.

2. CVC explains the CI of the communities.
   The more significant the tendency toward CVC, the more that CI is influenced. CI is the cause of participation in a virtual community. When the CI is high, the virtual community easily becomes successful. With regard to virtual community codependency, an increase in CI leads to an increase in both CE and ML. The higher the cognition of the community, the more significant the loyalty of the community members. The members' acceptance of the GN of the community enhances the community cognition of the members, who follow and maintain the community rules. With regard to enhancing community cognition through PSA, the more that the image and position of the community members are affirmed by the community, the more the members care about the opinions of other members and the attention they receive, thereby enhancing their community cognition. With regard to IA, community members normally use identifiable community identities. The affirmation of their identities increases their community cognition. Lastly, the higher the level of PS that community members feel, the higher the cognition of the community and the more willing the members become in interacting with the other members.
3. CI has a mediating effect between CVC and ML.
   CI is the cause of participation in virtual communities. In the present study, the impact of CVC on CI is obvious, and CVC on ML has a direct and indirect effect, as CI plays the role of the intermediary variables.

5.2 The Meaning of Management

This study shows that ML is influenced by PS. To make the operation of a virtual community successful, community codependency and community cognition of the members must be enhanced. To enhance these factors, the member's responsibility (CE) must first be enhanced to make them willing to serve other members, create an appropriate and friendly community environment, and establish the community's norms.

In addition to the restricting norms, the community members should reach a common view regarding the acceptance of the community rules. The encouragement of members leads to positive behavior. The encouragement of the members, leading them to positive behavior that conforms to community rules, in turn allows them to receive the necessary attention (PSA). The establishment of a unique style makes every member easily identifiable (IA). The creation of a safe community environment to protect the privacy and personal information of the members (PS) is also a significant factor. In addition, the CI should be enhanced through cognition, emotion, and codependency. Thus, enhancing the CI in turn enhances ML and makes the community operation successful.

5.3 Research Restrictions and Recommendations

The following are the limitations and recommendations of this study:

1. This study gives no single explicit definition of codependency and its conception of the term is unrelated to the concept of interpersonal relationships in psychology or other theories. Therefore, interpersonal relationships are outside the scope of this study.
2. Given the limitations imposed by cost, this study conducted its investigation only with the users of traditional Chinese virtual communities and who are mainly located in Taiwan. In the future,

respondents from other regions should be included.

3. In the future, virtual community codependency can be used as an aggregation index for virtual communities and for direct testing of the effects of virtual community operations.
4. Virtual communities are of a large variety and codependency of every kind must be categorized and discussed.

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