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Exploring the influences of virtual brand community members' interaction on brand loyalty

Authors:
Lihong Deng[1]
Fei Liu[1]
Jing He[1]
Wenwen Yin[1]
Xiangyin Kong[1]

Affiliations:
[1]School of Economics and Management, Harbin Engineering University, Harbin, China

Corresponding author:
Fei Liu,
f.liu@hrbeu.edu.cn

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Background: With the rapid development of Internet technology and social media, a growing number of companies now not only transfer their traditional offline business interactions to online but also engage in online customer relationship management, market share expansion and brand building. Consumer interaction in the virtual brand community has become progressively more important in consumers' purchase decision.

Objectives: The purpose of establishing virtual brand community is to obtain brand loyalty, but the existing research rarely discusses the impact of member interaction on brand loyalty. To address this research gap, we explore the influence mechanism between virtual brand community member interaction and brand loyalty.

Method: To verify the research hypothesis, we distributed and collected 393 valid questionnaires on wenjuan.com, one of the largest online questionnaire service companies in China.

Results: Our results reveal that virtual brand community members' interaction has a positive impact on brand loyalty. In addition, community identification also has a partial mediating effect. Moreover, media richness regulates the relationship between member interaction and community identification.

Conclusion: This article mainly investigates the virtual brand community member interaction behaviours. We also explore the influences of different dimensions of virtual brand community interaction on community identification and member brand loyalty.

Contribution: This article deepens our understanding of online platform members' participance behaviours.

Keywords: virtual brand community; community interaction; brand loyalty; community identification; media richness.

Introduction

With the rapid development of Internet technology and social media, a growing number of companies now not only transfer their traditional offline business interactions to online, but also engage in online customer relationship management, market share expansion and brand building. This movement contributes to the emergence of virtual brand communities. The virtual brand community is a social relationship generated by people who have the same interest in a certain brand based on Internet technology (Amine & Sitz 2004). It offers a place for community members to interact and communicate with product experience and feelings through the network (Kozinets 2002). The virtual brand community has the attributes of virtuality, cross-time zone interaction and cross-regional virtual community. It also presents the interactivity of the brand community (Swart, Du Plessis & Greeff 2021). In addition to bringing products and services online, the main objective for companies to establish virtual brand community is to provide consumers with an open and interactive platform (Armstrong & Hagel 1998) to improve customer communication and maintain customer relationships (De Valck, Van Bruggen & Wierenga 2009). By creating virtual brand communities, companies can not only gain economic benefits, but also obtain unprecedented brand loyalty (Armstrong & Hagel 1998).

Many scholars have devoted more attention to the driving factors and the effects of virtual brand community interaction (Brodie et al. 2013; Bruhn, Schnebelen & Schäfer 2014; Huangfu et al. 2022).

Additionally, previous studies have focused on the influence of virtual brand community interaction on consumers' perceived benefits and community identification (Bahri-Ammari, Rather & Kallal 2021; Kuo & Feng 2013; Kwon et al. 2014). Although previous studies have verified the positive impact of community identification on brand loyalty (Kaur et al. 2020), few studies have addressed the relationship between virtual brand community member interaction and brand loyalty. In addition, media richness has been confirmed that it can influence consumer satisfaction and loyalty (Hsu, Lin & Miao 2020; Tseng et al. 2017). However, how media richness affects the relationship between consumer interaction and community identification has been rarely discussed. To solve these problems, this article analyses the interactive relationship between virtual brand community members' interaction and brand loyalty from the perspective of interaction motivation. Specifically, this article divides the virtual brand community interaction into four dimensions: information interaction, social interaction, entertainment interaction, and benefit interaction. At the same time, combined with the mediating variable community identification and moderating variable media richness, this article studies the mechanism of the relationship between virtual brand community interaction and brand loyalty.

In summary, the purposes of this study are to: (1) explore the inner relationship among virtual brand community interaction, community identification and brand loyalty, (2) investigate the mediating role of community identification between virtual brand community interaction and brand loyalty and (3) examine the influence of virtual brand community interaction on community identification under different richness media.

Theoretical background

Virtual brand community interaction

Network interaction refers to the process through which members participate in real time and generate content in a virtual environment (Carlson, Suter & Brown 2008). This article thus defines virtual brand community interaction as the process of information sharing and interpersonal communication among brand stakeholders in virtual brand community. The extant research on the driving factors of virtual brand community interaction focuses on the level of individual characteristics and consumer needs (Bruhn et al. 2014; Casaló, Flavián & Guinalíu 2010; ShiYong et al. 2022). With the improvement of consumer participation, the degree of consumer interaction will increase, which will deepen their dependence on the virtual brand community (Zhao et al. 2019). Akrout and Nagy (2018) argued that consumers can contribute to the virtual brand community and participate in the implementation of the process of interaction, which thus enhances their brand trust and commitment. Also, customer-to-customer social interactions can improve social well-being and tourism brand attachment (Xue et al. 2021). Various elements of virtual brand community, such as interpersonal interaction and audio-visual enjoyment, can increase consumers' enjoyment experience (Lau & Lee 2019). Generally, previous studies have discussed the impact of virtual brand community consumer interaction on consumers, communities and brands.

Community identification

Community identification is defined as the degree to which consumers regard themselves as community members (Algesheimer, Dholakia & Herrmann 2005; Bagozzi & Dholakia 2006a; Muniz & O'Guinn 2001). Tsai and Hung (2019) asserted that community identification has a positive impact on interpersonal trust. In the current study, we define community identification as the degree to which community members regard themselves as community members. Community identification can enhance consumers' psychological sense of belonging to the community, and the brand (Carlson et al. 2008; Lee & Hsieh 2022) can also improve consumer participation in the community (Kaur et al. 2020). Furthermore, Casaló et al. (2010) argued that community identification had a positive impact on community promotion and satisfaction, and satisfaction had a positive impact on community participation. The current research focuses on the direct impact of community identification on community participation and the lack of a direct impact on brand. Therefore, this article considers community identification as a mediating variable to discuss its impact on brand loyalty.

Brand loyalty

According to Oliver (1999), brand loyalty is the promise that consumers will buy a brand's product again and will repeat the purchase under the influence of this promise. This article defines brand loyalty as consumers' willingness not only to buy a brand's products or services repeatedly but also to hold a positive attitude towards the brand. Consumer brand loyalty in the virtual brand community is influenced by many factors, including brand identification (Coelho, Rita & Santos 2018), brand community participation (De Valck et al. 2009; De Vries & Carlson 2014) and experience value (Wang, Tai & Chang 2019). Li, Teng and Chen (2020) proved that during customer participation, brand attachment and customer trust were very important to improve brand loyalty. Handayani (2016) expressed that brand loyalty could be affected by brand affect and brand trust. The current research mainly discusses the direct impact of brand elements on loyalty. However, few studies discuss the direct influence of virtual brand community interaction on brand loyalty, and the mechanism of interaction between the two is also lacking. This is the problem to be solved in this research.

Media richness theory

Media richness refers to the relative ability of channels to convey rich communication information (Carlson & Zmud 1999). Media richness consists of three dimensions. Firstly, information content richness refers to the abundant

information content and types supplied by virtual brand communities. Secondly, expression richness indicates the plentiful information exchange methods (e.g. text, pictures, audio and video) provided by the virtual brand community. Thirdly, information quality richness is defined as the degree to which information is true and reliable in the virtual brand community (He 2020).

Media richness theory is also widely applied in many fields. With the advancement and evolution of social environment and user needs, media richness theory has been used extensively in social media research area. Zhang and Jiang (2016) examined the influencing factors of users' use intention of webcast platform in combination with media richness theory and provided feasible advices for online platform developers and operators to improve user satisfaction. Tseng et al. (2017) took mobile instant messaging as the research object to explore the role of media richness in promoting its perceived value and brand loyalty. This research treats media richness as a moderating variable to explore its impact on community identification when consumers interact with different media richness.

Hypothesis development and research model

The impact of virtual brand community members' interaction on brand loyalty

Customers usually have their own specific needs, and their participation in the virtual brand community is a process in which their needs and motivations are met. When consumers prefer a brand or product, they will voluntarily join the virtual brand community. The main purposes for consumers to join the virtual brand community are to obtain information about products and services and to satisfy their social, entertainment and benefit needs. Moore, Moore and Capella (2005) pointed out that the interaction between community members in the virtual brand community can predict their brand loyalty to a certain extent, and the active interaction was helpful for companies to increase brand loyalty. Community engagement affects brand loyalty by influencing community commitment (Jang et al. 2008). Wang et al. (2013) found that customer interaction in virtual brand communities significantly affects brand loyalty. Customer-to-customer interaction in online brand communities has a positive effect on brand loyalty (Fan et al. 2022).

Referring to the four dimensions of member interaction in the virtual brand community, a study using a sample from Chinese consumer-to-consumer (C2C) websites has shown that information interaction and emotional interaction both boosted mutual trust among members, which in turn boosting their trust in and loyalty to the platform provider (Chen et al. 2009). Zhang et al. (2015) argued that the three key features of corporate microblogs, namely information quality, perceived expertise and social interaction, have a positive impact on community commitment, an important influencer of brand loyalty.

In addition, Sohail et al. (2020) stated that brand communities, entertainment potential, interaction capabilities and customisation features in social media positively influence consumer brand trust and loyalty. Consumers' functional, experiential and symbolic perceived benefits are the dominant factors in inducing consumers' virtual brand community loyalty (Kang & Shin 2016). Van and Wiese (2021) discussed that hedonic motivations are more prevalent in brand communities than utilitarian motivations, and when considering the outcomes of online engagement, loyalty towards the brand community is the strongest outcome, followed by word-of-mouth and purchase intention. The participation and social interactivity of consumers on the brand community drive consumer engagement behaviour and brand loyalty (De Silva 2021; Ting et al. 2021). Brand community managers should closely link these benefits with consumers' interaction. In the process of community interaction, when the various needs of community members are met, they will create positive feedback regarding the brand, thereby increasing their attitude and behavioural loyalty to the brand. Therefore, we propose that:

H1-1: Information interaction is positively related to attitude loyalty.

H1-2: Social interaction is positively related to attitude loyalty.

H1-3: Entertainment interaction is positively related to attitude loyalty.

H1-4: Benefit interaction is positively related to attitude loyalty.

H1-5: Information interaction is positively related to behavioural loyalty.

H1-6: Social interaction is positively related to behavioural loyalty.

H1-7: Entertainment interaction is positively related to behavioural loyalty.

H1-8: Benefit interaction is positively related to behavioural loyalty.

The influence of virtual brand community members' interaction on community identification

The development of social media has increased opportunities to create relationships, and marketers have strengthened the management of customer relationships by establishing brand communities (Labrecque 2014). Community identification is not only the key to the emotional connection between customers and the virtual brand community but also the dominant influencing factor for customers to participate in the community actively over an extended period (Zhou et al. 2012). Sicilia and Palazón (2008) discovered that consumers who joined the virtual community because of the interest in a common brand would generate recognition of the virtual brand community in the process of community interaction. Kwon et al. (2014) further proved that participation motivation has a positive effect on consumers' brand community identification based on consumers' motivation to participate in X.

Community interactions tend to have different impacts on harmonious community relations, thus affecting customers' identification with the community (Luo et al. 2016). Tsai

and Pai (2013) found that social, hedonic and utilitarian community attributes significantly influence proactive participation through community identification and relationship satisfaction. Consumers follow brands on social media because of four primary motivations: incentive seeking, social-interaction seeking, brand usage and likeability and information seeking (Kwon et al. 2014). Chen and Tsai (2020) discussed that utilitarian value, hedonic value and monetary value separately exerted a significantly positive effect on community identification, which indicates that consumers are predisposed to identify with a brand fan page, which can offer them desired values. The social interactions among fellow brand users have a stronger effect on consumer-brand identification than brand prestige and brand distinctiveness (Yoshida et al. 2021). Mousavi and Roper (2023) found that in firm-hosted online brand communities, perceived brand support (i.e. recognising contributions, encouraging interactions and providing quality information) is relating to members' satisfaction by fulfilling their socioemotional needs (community identity) and increases their brand trust. If companies want to implement online brand communities into business models effectively and co-create brand value, they need to deliver brand content useful for customer self-expression and social interaction to enhance consumer-brand identification and customer–customer social bonds, which enable to transform the audience into a community (Kucharska 2019).

Additionally, community members obtain the satisfaction of their own needs through community interaction which can help them to have positive emotions for the community and thus contribute to a sense of belonging, trust and identity. Hence, we propose that:

H2-1: Information interaction is positively related to community identification.

H2-2: Social interaction is positively related to community identification.

H2-3: Entertainment interaction is positively related to community identification.

H2-4: Benefit interaction is positively related to community identification.

The impact of community identification on brand loyalty

Bagozzi and Dholakia (2006a) stated that consumers' community identification exerts a positive impact on brand identification, which ultimately translates into loyal behaviours such as product purchases and word-of-mouth communication. Kaur et al. (2020) suggested that community members' identification with the community positively promotes their brand participation and brand loyalty in virtual brand communities. Zhou et al. (2012) showed that consumers' identification with virtual brand communities could significantly affect consumers' identification with brands. By participating in the virtual brand community, community members can generate community identification after interacting with other community members, through which their sense of belonging is strengthened, and they are motivated to continue to participate in the community. The participation of community members deepens their understanding of and interest in product knowledge and ultimately forms brand loyalty. Therefore, it is necessary for companies to continuously enhance consumers' recognition of virtual brand community with the help of social media platforms in order to improve brand loyalty. Thus, we propose the following hypotheses:

H3-1: Community identification is positively related to attitude loyalty.

H3-2: Community identification is positively related to behavioural loyalty.

The mediating role of community identification

Community identification is the degree to which community members regard themselves as members of the community and feel a sense of belonging to the community. Community identification is likely an important transmission variable between consumer interaction and brand loyalty. Van Doorn et al. (2010) believe that the interaction between customers can engender a sense of belonging and trust in the community and deepen the customer's involvement in the community, thereby enhancing brand loyalty. Upon exploring the ways to improve brand identification in the virtual brand community, Wang et al. (2008) found that brand identification is significantly and positively affected by the participation and perceived usefulness of the virtual brand community. Through interaction, virtual brand community members can not only enhance their perceived value to the community (Lau & Lee 2019) but also strengthen their identification with the community and ultimately promote their attitude towards and behaviour loyalty to the brand. Virtual brand community interaction based on community identification is the basis for members to increase brand loyalty. Enhancing members' identification with the community helps to strengthen their loyalty to the brand. Through deepening interaction, community members can enhance their sense of belonging and trust to the community, and brand loyalty will also be enhanced under the synergistic effect of community identification. Based on the above statement, we propose that:

H4: Community identification plays a mediating role in the relationship between virtual brand community members' interaction and brand loyalty.

Moderating effect of media richness

Daft and Lengel (1986) believed that media richness represents the ability of media to deliver information. High media richness can better reduce the ambiguity of transmitted information than low media richness. Chen and Cheng (2018) found that information richness had a significant positive impact on user satisfaction with Airbnb. Tseng et al. (2017) asserted that high media richness provides rich and diverse information that can increase people's perceived value and customer loyalty for mobile instant messaging. Hsu et al. (2020) conducted a survey based on live streaming services and found that perceived

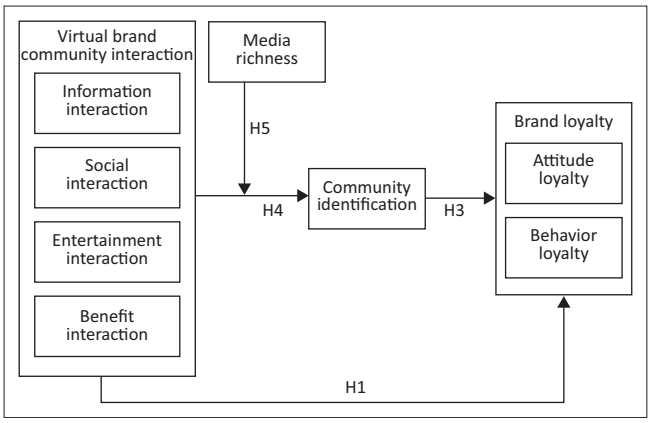

FIGURE 1: Research model.

media richness and gratifications were the antecedents affecting user loyalty. Furthermore, Liao et al. (2020) studied online game communities and concluded that high media richness had a better interactive effect, which increased the network convergence and interdependence of community users and thus increased consumers' commitment to the game community. Shepherd et al. (2006) showed that the richer the media of distance education, the higher the satisfaction among the students in the distance course. It also showed that the richer the communication between teachers and students, the higher the evaluation of the distance course platform. Compared with low media richness, high media richness can eliminate ambiguity by delivering richer and more diverse information in various forms, and community members' interaction motives are more easily satisfied, thereby affecting their subsequent behaviour. Accordingly, we propose that:

H5-1: Media richness has a positive moderating effect on the relationship between information interaction and community identity.

H5-2: Media richness has a positive moderating effect on the relationship between social interaction and community identity.

H5-3: Media richness has a positive moderating effect on the relationship between entertainment interaction and community identity.

H5-4: Media richness has a positive moderating effect on the relationship between interest interaction and community identity.

According to the above theoretical analysis and hypotheses, the proposed research model is shown in Figure 1.

Methodology

Sample and data collection

People who have participated in the virtual brand community are applicable targets for data collection. We collected data through an online survey conducted on wenjuan.com, one of the largest online questionnaire service companies in China. The questionnaire consists of three parts: the demographic information of the respondents, the specific situation of the respondents' participation in the virtual brand community and the measurement of relevant variables in this article. To ensure the authenticity of the collected data, respondents were also asked to write down the names of the communities they frequently visited in the questionnaire, which could help us quickly eliminate unreasonable questionnaires. Before data collection, we did a pre-test. We distributed 170 questionnaires, of which 142 met the recommendation for the number of samples in the small sample test stage. Then, we used SPSS23.0 to conduct factor analysis on the small sample data. The results showed that a total of eight factors with eigenvalues greater than 1 were extracted, and the cumulative explanatory variance was 79.361%. In addition, the factor load of each item on its corresponding factor was greater than 0.5, and the number of factors extracted was consistent with the number of variables in the questionnaire. The pre-test data preliminarily showed that the overall quality of the scale was good, and formal sample collection could be carried out next. In this article, 425 questionnaires were officially collected through online survey, and 393 valid questionnaires were obtained after excluding the invalid ones, with an effective rate of 92.47%. The descriptive statistical analysis results of this survey sample are shown in Table 1.

Measurement development

In the current article, a 5-point Likert scale was used, with response options ranging from 'strongly disagree' to 'strongly agree'. Specifically, the measurement of information interaction

TABLE 1: Descriptive statistics.

Variables	Category	Frequency	Percentage (%)	Total
Gender	Male	144	36.64	393
	Female	249	63.36	
Age range (years)	18–25	274	69.72	393
	26–30	80	20.36	
	31–40	33	8.40	
	> 40	6	1.52	
Education	High school and below	30	7.63	393
	Junior college	42	10.69	
	Undergraduate	262	66.67	
	Master degree and above	59	15.01	
Income (RMB)	≤ 2000	45	11.45	393
	2001–4000	76	19.34	
	4001–6000	71	18.07	
	6001–8000	147	37.40	
	8001–10000	33	8.40	
	≥ 10001	21	5.34	
Participation time	< 6 months	97	24.68	393
	6 months–1 year	101	25.70	
	1–2 years	88	22.39	
	> 2 years	107	27.23	
Visits per week	< 1	51	12.98	393
	1–2	116	29.52	
	3–4	101	25.70	
	5–6	55	13.99	
	≥ 7	70	17.81	
Time duration per visit (Hours)	< 1 h	63	16.03	393
	1–2 h	127	32.31	
	2–3 h	162	41.22	
	3–4 h	26	6.62	
	> 4 h	15	3.82	

mainly was adapted from McAlexander, Kim and Roberts (2003) and Flanagin and Matzger (2001). The measurement of social interaction was adapted from McAlexander et al. (2003), Mckenna and Bargh (1999) and Hoffman and Novak (1996). The measurement of entertainment interaction was adapted from Katz, Blumler and Gurevitch (1973) and Dholakia, Bagozzi and Pearo (2004). Benefit interaction was adapted from Füller (2006) and Wang and Fesenmaier (2004). A total of 16 items were designed for the above four dimensions. Community identification was measured as a single dimensional variable in this article, and five items were adapted from the studies of Algesheimer et al. (2005), Bagozzi and Dholakia (2006b) and Wu and Tsang (2008). As could be seen from the above, brand loyalty was divided into behavioural loyalty and attitude loyalty. Brand loyalty was adapted from the research of Oliver (1999) and Ganesh, Arnold and Reynolds (2000). As media richness existed as a moderating variable in this article, it was measured as a single dimension. Media richness was adapted from the studies of Chen, Gillenson and Sherrell (2004) and Liu, Liao and Pratt (2009). The specific measurement items of all variables are shown in Table 2.

Ethical considerations

This study was approved by the ethics committee of Harbin Engineering University in China. Written informed consent was obtained from all the participants prior to the enrolment of this study.

Results

Measurement evaluation

This article used AMOS21.0 to test the measurement model. As shown in Table 3, the value of Cronbach's Alpha was greater than the threshold of 0.7, indicating good reliability of these constructs (Demiray & Burnaz 2019). The fitting indexes of the measurement model were χ^2/ degree of freedom (*df*) = 1.628, Root Mean Square Error of Approximation (RMSEA) = 0.040, Goodness of Fit Index (GFI) = 0.892, Tucker-Lewis Coefficient (TLI) = 0.964, Normed Fit Index (NFI) = 0.921 and Comparitive Fit Index (CFI) = 0.968, and the results showed that the model fit well (Demiray & Burnaz 2019). The Composite Reliability (CR) value of each variable was greater than 0.7, the factor

TABLE 2: Measurement items.

Constructs	Items	Questions	Related research
Information interaction	XH1	I can get some product related expertise from this community	McAlexander et al. (2003)
	XH2	I can get a lot of product or service information from this community	
	XH3	The information I got from this community helped me a lot	Flanagin and Matzger (2001)
	XH4	I am willing to share product-related knowledge and information for members of the community	
Social interaction	SH1	I often exchange product use methods and experience with members of the community	McAlexander et al. (2003)
	SH2	I often respond positively to non-brand-related topics raised by other community members	Mckenna and Bargh (1999)
	SH3	The non-brand-related topics I raised in the community are often positively responded by other community members	
	SH4	I often communicate with other members of the community and expand my social network	Hoffman and Novak (1996)
	SH5	I often participate in community interactions in order to meet people with similar interests in the community	
Entertainment interaction	YH1	I often participate in the interaction of the community for fun and pleasure	Katz et al. (1974)
	YH2	I often participate in the interaction of the community in order to relax and relieve the pressure of reality	Dholakia (2004)
	YH3	I often participate in the interaction of the community in order to pass the time when I am bored	
	YH4	In the process of community interaction, you can get a sense of excitement through thinking	
Benefit interaction	LH1	I often participate in the interaction of the community in order to obtain cash rewards or discount coupons in the community	Füller (2006)
	LH2	I often participate in the interaction of the community in order to get more member points in the community	Wang and Fesenmaier (2004)
	LH3	I often participate in the interaction of the community in order to obtain the prizes provided by the community	
Community identification	SR1	I see myself as a member of the community	Algesheimer et al. (2005)
	SR2	I have a lot of dependence on the community	Bagozzi and Dholakia (2006b)
	SR3	Other members of this community have common or similar goals with me	
	SR4	When communicating with others, I am happy to show that I am active in the virtual brand community	Wu and Tsang (2008)
	SR5	I trust the community and I am willing to register with my real information	
Attitude loyalty	TZ1	Even if the brand's products or services have no price advantage, I will still choose to buy them	Oliver (1999) Ganesh et al. (2000)
	TZ2	When others ask for my opinions, I will recommend the products or services of the brand to others	
	TZ3	If the brand company has negative information, I can give experience and understanding	
Behavioural loyalty	XZ1	I will actively recommend the brand's products or services to friends around me	
	XZ2	I will actively search for information related to the brand	
	XZ3	I will continue to buy products or services of this brand	
Media richness	MF1	The information provided by the community is comprehensive	Chen et al. (2004)
	MF2	The community provides a rich variety of information	Liu et al. (2009)
	MF3	The community provides a variety of expressions, such as text, pictures, audio, video, etc.	
	MF4	In this community, I can interact with information in many ways I like	
	MF5	The quality of information provided by the community is relatively high	
	MF6	The information provided by the community is relatively credible	

Note: Please see full reference of the article for more information.

TABLE 3: Confirmatory factor analysis.

Variables	Cronbach's α	CR	AVE	1	2	3	4	5	6	7	8
Information interaction	0.92	0.92	0.74	0.86	-	-	-	-	-	-	-
Social interaction	0.91	0.92	0.71	0.52	0.84	-	-	-	-	-	-
Entertainment interaction	0.90	0.91	0.71	0.45	0.60	0.84	-	-	-	-	-
Benefit interaction	0.89	0.92	0.80	0.47	0.66	0.52	0.89	-	-	-	-
Community identification	0.88	0.91	0.67	0.48	0.60	0.59	0.61	0.82	-	-	-
Attitude loyalty	0.84	0.90	0.74	0.48	0.57	0.54	0.59	0.62	0.86	-	-
Behavioural loyalty	0.89	0.92	0.80	0.50	0.63	0.58	0.63	0.66	0.71	0.89	-
Media richness	0.94	0.94	0.71	0.77	0.47	0.40	0.42	0.46	0.43	0.42	0.85

CR, Composite Reliability; AVE, Average Variance Extracted.

TABLE 4: Path analysis results of the impact of virtual brand community interaction on brand loyalty.

Path relationship	Path coefficient	Estimate	CR	*P*	Results
Attitude loyalty←Information interaction	0.123	0.105	2.251	0.024	Supported
Attitude loyalty←Social interaction	0.149	0.131	2.337	0.019	Supported
Attitude loyalty←Entertainment interaction	0.130	0.105	4.843	***	Supported
Attitude loyalty←Benefit interaction	0.158	0.160	3.786	***	Supported
Behavioural loyalty←Information interaction	0.114	0.096	2.157	0.031	Supported
Behavioural loyalty←Social interaction	0.167	0.145	2.189	0.029	Supported
Behavioural loyalty←Entertainment interaction	0.166	0.132	2.106	0.035	Supported
Behavioural loyalty←Benefit interaction	0.182	0.183	2.589	0.010	Supported
Community identification←Information interaction	0.121	0.105	2.005	0.045	Supported
Community identification←Social interaction	0.156	0.139	2.805	0.005	Supported
Community identification←Entertainment interaction	0.291	0.236	3.038	0.002	Supported
Community identification←Benefit interaction	0.232	0.239	2.404	0.016	Supported
Attitude loyalty←Community identification	0.223	0.221	3.358	***	Supported
Behavioural loyalty←Community identification	0.247	0.242	4.067	***	Supported

Note: when *t*-value > 2.610, $P < 0.01$; when *t*-value > 1.977, $P < 0.05$; when *t*-value > 1.656, $P < 0.1$.
CR, Composite Reliability.
*, $p < 0.1$; **, $p < 0.05$; ***, $p < 0.01$.

loading value of each item was greater than 0.7 and the Average Variance Extracted (AVE) value of each variable was greater than 0.5, indicating that the scales had good convergence validity (Fornell & Larcker 1981). In addition, the square root of each variable AVE was greater than its correlation coefficient with other variables, indicating that the discriminant validity of all scales was good (Hair et al. 2010).

Hypothesis testing

The fitting indexes of the structural equation model were $\chi^2/df = 1.766$, RMSEA = 0.044, GFI = 0.906, TLI = 0.962, NFI = 0.928 and CFI = 0.967, and all the fitting indexes of the model met the fitting standards (Demiray & Burnaz 2019), so the fitting degree of the model was good. The model path analysis results are shown in Table 4, and the path coefficients were standardised estimated coefficients. Specifically, information interaction (path coefficient = 0.123, $p = 0.024 < 0.05$), social interaction (path coefficient = 0.149, $p = 0.019 < 0.05$), entertainment interaction (path coefficient = 0.130, $p < 0.001$) and benefit interaction (path coefficient = 0.158, $p < 0.001$) had a significant positive impact on attitude loyalty, and H1-1, H1-2, H1-3 and H1-4 were supported. Moreover, information interaction (path coefficient = 0.114, $p = 0.031 < 0.05$), social interaction (path coefficient = 0.16, $p = 0.029 < 0.05$), entertainment interaction (path coefficient = 0.166, $p = 0.035 < 0.05$) and benefit interaction (path coefficient = 0.182, $p = 0.010 < 0.05$) had a significant positive impact on behavioural loyalty, supporting H1-5, H1-6, H1-7 and H1-8. Meanwhile, information interaction (path coefficient = 0.121, $p = 0.045 < 0.05$), social interaction (path coefficient = 0.156, $p = 0.005 < 0.01$), entertainment interaction (path coefficient = 0.291, $p = 0.002 < 0.01$) and benefit interaction (path coefficient = 0.232, $p = 0.016 < 0.05$) had a significant positive impact on community identification, thus supporting H2-1, H2-2, H2-3 and H2-4. Finally, community identification had a significant positive impact on attitude loyalty (path coefficient = 0.223, $p < 0.001$) and behavioural loyalty (path coefficient = 0.247, $p < 0.001$), which supported H3-1 and H3-2.

Mediating effect test

Regression analyses were used to test the mediating effect of community identification. The results are shown in Table 5. In model 1, community interaction had a significant positive effect on brand loyalty ($\beta = 0.624$, $p = 0.000$). In model 2, both community identification and community interaction had significant positive effects on brand loyalty ($\beta = 0.240$, $p = 0.000$ and $\beta = 0.488$, $p = 0.000$), and the *R* square of model 2 was significantly improved, indicating that the explanatory ability of model was enhanced. Therefore, it was proved that community identification played an intermediary role between virtual brand community members' interaction and brand loyalty, thus supporting H4.

Testing the moderating effect

With community identity as the dependent variable, this article used the multilevel regression method to verify the moderating effect of media richness. Three multiple regression models were established to test the moderating effect: the first model introduced the independent variable, the second model introduced the moderating variable and the third model presented the interaction term of independent variable and moderating variable. If the regression coefficient of the interaction term was significant and *R* square was significantly increased, the moderating effect was significant:

1. The moderating effect of media richness on the relationship between information interaction and community identification. The specific results are shown in Table 6. According to Table 6, the regression coefficient of interaction terms was 0.094, $p = 0.016 < 0.05$, and the *R* square of model 3 was significantly improved, indicating that the interpretation ability of the model was enhanced. Therefore, media richness had a significant positive moderating effect on the relationship between information interaction and community identity, thus supporting H5-1.
2. The moderating effect of media richness on the relationship between social interaction and community identification. The specific results are shown in Table 7. According to Table 7, the regression coefficient of the interaction term was −0.185, $p = 0.000$, and the *R* square of model 3 was significantly improved, indicating that the model's interpretation ability was enhanced. As a result, media richness had a significant negative moderating effect on the relationship between social interaction and community identification, and H5-2 was not supported.
3. The moderating effect of media richness on the relationship between entertainment interaction and community identification. According to Table 8, the regression coefficient of interaction terms in Model 3 was −0.190, $p = 0.000$, and the *R* square of model 3 was significantly increased, indicating that media richness had a significant negative moderating effect on the relationship between entertainment interaction and community identification. The above conclusion was contrary to our hypothesis; thus H5-3 was not supported.
4. The moderating effect of media richness on the relationship between benefit interaction and community identification. It could be seen from Table 9 that the regression coefficient of the interaction term in model 3 was −0.176, $p = 0.000$, and the *R* square of model 3 was significantly improved, indicating that media richness had a significant negative moderating effect on the relationship between benefit interaction and community identification. The above conclusion was contrary to our hypothesis; thus H5-4 was not supported.

TABLE 5: Results of mediating effect analysis.

Model		Non-standardised coefficient		Standardised coefficient	Sig.	*R* square
		B	SE	Beta		
1	Constant	1.523	0.152	-	0.000	0.389
	Community interaction	0.638	0.040	0.624	0.000	
2	Constant	1.191	0.160	-	0.000	0.429
	Community interaction	0.499	0.047	0.488	0.000	
	Community identification	0.213	0.041	0.240	0.000	

SE, standard error; Sig., significance.

TABLE 6: The moderating effect of media richness on the relationship between information interaction and community identification.

Model		Non-standardised coefficient		Standardised coefficient	Sig.	*R* square
		B	SE	Beta		
1	Constant	2.943	0.145	-	0.000	0.120
	Information interaction	0.289	0.040	0.346	0.000	
2	Constant	2.840	0.145	-	0.000	0.148
	Information interaction	0.149	0.055	0.179	0.007	
	Media richness	0.174	0.048	0.238	0.000	
3	Constant	3.713	0.387	-	0.000	0.161
	Information interaction	−0.144	0.132	−0.172	0.278	
	Media richness	−0.131	0.135	−0.179	0.330	
	Information interaction × Media richness	0.094	0.039	0.718	0.016	

SE, standard error; Sig., significance.

TABLE 7: The moderating effect of media richness on the relationship between social interaction and community identification.

Model		Non-standardised coefficient		Standardised coefficient	Sig.	*R* square
		B	SE	Beta		
1	Constant	2.480	0.152	-	0.000	0.204
	Social interaction	0.394	0.039	0.452	0.000	
2	Constant	2.198	0.160	-	0.000	0.248
	Social interaction	0.320	0.041	0.367	0.000	
	Media richness	0.165	0.035	0.225	0.000	
3	Constant	0.217	0.367	-	0.554	0.310
	Social interaction	0.879	0.102	1.007	0.000	
	Media richness	0.848	0.120	1.158	0.000	
	Social interaction × Media richness	−0.185	0.031	−1.340	0.000	

SE, standard error; Sig., significance.

TABLE 8: The moderating effect of media richness on the relationship between entertainment interaction and community identification.

Model		Non-standardised coefficient		Standardised coefficient	Sig.	*R* square
		B	SE	Beta		
1	Constant	2.564	0.141		0.000	0.212
	Entertainment interaction	0.376	0.037	0.460	0.000	
2	Constant	2.188	0.154		0.000	0.265
	Entertainment interaction	0.314	0.037	0.384	0.000	
	Media richness	0.178	0.033	0.244	0.000	
3	Constant	0.165	0.324		0.611	0.347
	Entertainment interaction	0.901	0.091	1.101	0.000	
	Media richness	0.860	0.103	1.175	0.000	
	Entertainment interaction × Media richness	−0.190	0.027	−1.372	0.000	

SE, standard error; Sig., significance.

TABLE 9: The moderating effect of media richness on the relationship between benefit interaction and community identification.

Model		Non-standardised coefficient		Standardised coefficient	Sig.	*R* square
		B	SE	Beta		
1	Constant	2.467	0.162	-	0.000	0.186
	Benefit interaction	0.398	0.042	0.431	0.000	
2	Constant	2.106	0.170	-	0.000	0.245
	Benefit interaction	0.326	0.043	0.353	0.000	
	Media richness	0.186	0.034	0.254	0.000	
3	Constant	0.218	0.365	-	0.551	0.304
	Benefit interaction	0.859	0.101	0.930	0.000	
	Media richness	0.828	0.116	1.131	0.000	
	Benefit interaction × Media richness	−0.176	0.030	−1.215	0.000	

SE, standard error; Sig., significance.

Discussion

Findings

Firstly, this article confirms that virtual brand community interaction has a significant positive impact on community identification and brand loyalty. In the virtual brand community, community members constantly meet their various needs through interactive behaviours and develop a positive attitude towards the community because of the improvement of perceived value. As the members are becoming closely connected, they are getting dependent on the community, which is transformed into their identification with the community. When virtual brand community members perceive the satisfaction of interaction motivation in the process of interaction, they develop a positive attitude towards the brand and actual purchase behaviour to improve brand loyalty.

Secondly, the results show that community identification has a positive impact on brand loyalty and plays a mediating role between virtual brand community members' interaction and brand loyalty. Through community interaction, community members can not only effectively integrate and utilise the knowledge, resources and information collected in the community to meet their own needs but also provide other members with their own experience and knowledge to help them solve problems. This effective and positive interaction helps to enhance members' sense of belonging to the community, thus generating community identification, which will increase brand identification and promote brand loyalty.

Thirdly, we find that media richness plays a positive role in moderating the relationship between information interaction and community identification, but media richness plays a significant negative role in moderating the relationship between social interaction, entertainment interaction, benefit interaction and community identification. Drawing upon the theory of media richness, ambiguity can affect the individual's choice of media. Daft, Lengel and Trevino (1987) verified that tasks with different degrees of ambiguity significantly affect the choice of media. Managers prefer to use rich media to convey tasks with high ambiguity and simple media to convey tasks with low ambiguity (Daft et al. 1987). Lee, Kozar and Larsen (2009) stated that avatar email was different from traditional email in terms of media richness and confirmed that avatar email, which demonstrated high media richness, could send more complete and detailed information regarding tasks with high ambiguity. Generally, the higher the media richness, the better consumers could solve tasks with high complexity, high information demand and high ambiguity, and the lower the media richness, the better able they were to solve the less complex, simple and easy to understand tasks like daily tasks. Therefore, if the ambiguity of the task is relatively low, it is more appropriate to choose a medium of low richness. Conversely, if the ambiguity of the task is high, the medium of high richness is more appropriate. To reduce ambiguity, people will consider the purpose of communication, the difficulty of the task to be solved, and the amount of information that the media can carry comprehensively when choosing a medium. We consider the reason H5-2 – H5-4 are not supported is that information interaction is the task with high information demand and high ambiguity, while social interaction and entertainment interaction are routine and easy-to-understand tasks, and community members hope benefit interaction is a simple task with low ambiguity that is easy to complete. Therefore, media richness has a positive moderating effect on the relationship between information interaction and community identification, but it plays a significant negative moderating effect on the relationship between social interaction, entertainment interaction, benefit interaction and community identification.

Theoretical implications

Firstly, starting from the interaction motivation of virtual brand community members, this article establishes a theoretical model of virtual brand community interaction, community identification, brand loyalty and media richness and then analyses the influence process of virtual brand community members' interaction on brand loyalty in detail. It also confirms the mediating role of community identification and the moderating role of media richness. Previous studies on virtual brand community interaction mainly focused on its driving factors and influencing effects. In the marketing field, studies on the effect of virtual brand community interaction have focused on consumer experience, consumer evaluation, consumer satisfaction and consumer behaviour and attitude. However, few studies have examined the effect of virtual brand community interaction on brand loyalty. Unlike previous studies, we directly link brand interaction in virtual communities to brand loyalty.

Secondly, extant studies regarding community identification only focused on value co-creation and knowledge contribution. In this article, the relationship model of 'virtual brand community interaction – community identification – brand loyalty' is constructed, and the community identification is treated as a mediating variable to enrich the relevant research. In addition, we explore the moderating role of media richness, which plays different roles for the four types of interactive motivations. As previous studies have shown, high media richness is not necessarily better than low

media richness. These results also show that community interaction does not necessarily promote community identification, so we should choose the appropriate media for different methods of interaction.

Thirdly, this article attempts to categorise the virtual brand community interaction and brand loyalty. Specifically, we categorise the virtual brand community interaction into four dimensions: information interaction, social interaction, entertainment interaction and benefit interaction. We classified brand loyalty into two dimensions: behaviour loyalty and attitude loyalty. Our research further clarifies the different roles of various dimensions of virtual brand community interaction in the establishment of consumer brand loyalty.

Practical implications

Firstly, our findings confirm the role of information interaction, social interaction, entertainment interaction and benefit interaction, which requires enterprises to attach importance to virtual brand community members' interaction and constantly take measures to improve the participation of community members. The following suggestions are put forward to help community managers: (1) The quality of information content should be strictly controlled to ensure the accuracy and timeliness. In addition, community managers should strictly manage the information released by community members and delete bad information in time. (2) It is very important to pay attention to improving the social contact mechanism of the community. Community managers should often release some brand activities and hot topics to stimulate the interaction among community members and constantly improve the mechanism of making friends and chat tools. (3) Furthermore, it is also important to create a leisure and entertainment section, which can include games, movies, music and other topics. (4) It is suggested that managers improve the reward mechanism. The brand can provide cash, products, product accessories, points and other material rewards to stimulate consumers to participate in community interaction.

Secondly, community managers should place emphasis on enhancing community members' identification of the community by perfecting the management standard mechanism and strengthening the cultural construction of brand community. In the virtual brand community, enterprises can spread community culture by telling brand stories or holding brand activities. Based on the core values of the community, enterprises can embed the development history of the enterprise, the successful elements of the brand, the business philosophy of the brand and the milestones of the brand into the community culture.

Thirdly, the results of this study indicate that high richness media are not necessarily effective in promoting community identification, so community managers ought to choose and use media reasonably. Enterprises should not blindly pursue higher forms of expression; sometimes the more digital channels are, the less likely community members are to reach them, so leaders should choose appropriate marketing strategies according to the interactive motivation. Because social interaction, entertainment interaction and benefit interaction are simple tasks with low ambiguity that are easy to complete, enterprises can choose to use media with low richness. In terms of the social section, entertainment section and reward rules, community managers should not only pay attention to the conciseness and clarity of information content but also pay attention to optimising the website interface and enhancing the customer experience.

Limitations and future research

Firstly, the sample of this study does not restrict any research groups. Future research can investigate and compare different groups to expand the research results. Secondly, the sample size obtained in this study is limited. Future research can increase the sample size and carry out large sample research to verify the effectiveness of this model. Thirdly, this article verifies the moderating effect of media richness, but media richness is also subject to differences in personal preferences. Future studies can add the role of these influencing factors to enrich this model. In addition, future research can also include more other moderating variables, such as gender and product type.

Conclusion

This article explores the relationship between the interaction of virtual brand community members and brand loyalty. The results show that each dimension of virtual brand community interaction has a significant positive impact on consumer brand loyalty, community identification plays a partial intermediary role, and media richness can adjust the relationship between virtual brand community interaction and community identification. The research conclusion of this article can not only provide some help for the future research on virtual brand community interaction, but also provide some opinions for community managers to make rational use of media.

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Competing interests

The authors declare that they have no financial or personal relationships that may have inappropriately influenced them in writing this article.

Authors' contributions

Conceptualisation, formal analysis, funding acquisition and original draft were organised by L.D., F.L., and J.H. Data curation, investigation, methodology and revision process were organised by W.Y. Data collection and language review were done by X.K.

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Data availability

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

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