The influence of product integration on online advertising effectiveness

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ARTICLE INFO

ABSTRACT

With a substantial amount of resources being spent on online advertising, examining the effectiveness of online advertising is now an important subject for scholarly investigation. Cross-product integration has become a source of market advantage and a strategic necessity for online advertising. The issue of product integration has not been sufficiently researched in the online advertising effectiveness literature. To fill this gap, this research examines the antecedents of online advertising effectiveness with an emphasis on the influence of product integration. Viewing product integration as a stimulus that influences users' information processing mechanisms, this article proposes a research model and validates it using two studies: one quasi-experiment and one field study. The findings suggest that the integration level influences the strength of the perceived tie between focal and promoted products, like portals and their associated services, which in turn has a significant impact on advertising effectiveness. Product integration level also has a direct impact on advertising effectiveness. This article contributes to both research and practice by advancing the overall understanding of online user behavior as well as by providing important insights regarding online information product promotion design.

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1. Introduction

Over the last decade, Internet advertising has grown into the third most popular advertising media after newspapers and TV. According to the report from the Interactive Advertising Bureau (IAB) and PricewaterhouseCoopers (PWC), Internet advertising revenues in the US were estimated at $21.1 billion in 2007, a 25% increase over the previous revenue record of nearly $16.9 billion in 2006 (IAB 2008). Also, the Kelsey Group predicted that global Internet advertising revenues will reach $147 billion by 2012 (Pacheco 2008). The success of this market can be partially attributed to the growth and popularity of online information product promotion. Because of the widespread existence of hyperlinks, online information product vendors can easily make use of existing products to promote new ones (Sviokla and Paoni 2005). For example, after its great success in the search engine market, Google has used its search engine to promote its email product (Gmail). Similarly, after becoming a leading portal, Yahoo! used its portal to entice existing users to use its instant messenger product (Yahoo! Messenger). Because a substantial amount of resources are being spent on online advertising, whether and to what extent cross-product integration is an effective online advertising strategy is a critical question for these product providers as well as other vendors (Lohtia et al. 2007).

Online advertising is a form of promotion that uses the Internet and World Wide Web for the purpose of delivering marketing messages to attract customers (Meyers and Gerstman 2001). Recently, online advertising effectiveness has received considerable attention from academics and practitioners. Research has largely examined the influence of content and design elements on advertising effectiveness (Lohtia et al. 2003; Robinson et al. 2007; Calisir and Karaali 2008; Zhang and Kim 2008). However, product integration, as one of the important design elements, remains underresearched. *Information product integration* is defined as the assembling of different information products together to facilitate data sharing (such as information about a user profile, and preference setting), to enhance the overall value to end users through products' mutual cooperation (Nambisan 2002a; Sengupta 1998). Since customers are increasingly placing emphasis on cross-product integration, the success of new products is largely dependent on their integration with other relevant products (Iansiti 1995; Iansiti 1998; Cusumano and Yoffie 1998).

Many online vendors have made significant investments into cross-product integration (Wind and Mahajan 1997; Cooper 2000). For example, to promote Gmail, Google focused on establishing the integration between Google search engine and Gmail.

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Besides adding a link on the homepage of Google's search engine, Google incorporated its search engine functions into Gmail in order to increase the products' coupling. The search feature allows Gmail users to search for information on the Internet without leaving Gmail. This trend of online product integration poses the following questions that will be the focus of our study: (1) To what extent does information product integration influence online advertising effectiveness? (2) What is the underlying cognitive and psychological process that explains the relationship between product integration and online advertising effectiveness?

The current study contributes to existing literature in several important ways. First, although several studies have examined the influence of content and design elements on advertising effectiveness (Robinson et al. 2007; Calisir and Karaali 2008; Zhang and Kim 2008), few studies explore the role of product integration in explaining the success of online advertising. There has been little research at an individual level to examine the underlying cognitive and psychological process that explains the relationships between product integration and online advertising effectiveness. Our study conceptualized and empirically tested a variance and an outcome model to explain the relationship between product integration and online advertising effectiveness. Second, information product integration has been a subject of increasing interest in innovation management field. Innovation management researchers have generally recognized that adoption and diffusion of one innovation usually influenced by other related innovations. Product integration may play an important role in innovation adoption decisions (Fichman and Kemerer 1993; Lee 1994; Adomavicius et al. 2007). However, little is known about users' responses to such integration, especially within the Internet-mediated promotion environment. This study provided theoretical support individuals' responses to product integration, and used a multi-study research design to triangulate research results. Finally, following the call by Chandon et al. (2003), this article aims to make a contribution to the literature by employing different measurements to conceptualize online advertising effectiveness. Particularly, these measurements provide insights to explain users' responses to product integration.

The remainder of the article is organized as follows. The next section presents theoretical development and related research hypotheses to study information product integration and online advertising effectiveness. An overview of the methodology and the results from two empirical studies are then reported. Finally, the article concludes with a discussion of the findings, implications, limitations, and areas for future research.

2. Theoretical development

Since an online user's decision-making process is influenced by stimuli from an environment, environmental psychology is a logical theoretical foundation to study the impact of information product integration on online advertising effectiveness. In particular, we draw from the *stimulus-organism-response paradigm*, which posits that environmental cues act as stimuli that affect an individual's cognitive reactions, which in turn affect his or her behaviors (Mehrabian and Russell 1974). The stimulus can be an actual product or the extrinsic attributes of the product such as design and content elements of advertising in an online context (Parboteeah et al. 2009). As a design element of online advertising, product integration works as an extrinsic attribute of the product and may trigger an individual's cognitive reactions. Accordingly, we argue that information product integration acts as an environmental stimulus that influences online users' information processing mechanisms and their adoption and usage decisions while interacting with the promotion environment.

2.1. Information product integration

There are two types of products in product integration and promotion: a focal product and a relevant product under promotion. Nambisan (2002a) identified three types of product integrations based on the nature of coupling (external/internal) and the extent of coupling (comprehensive/value added/minimal): *value-added integration*, *add-on module integration*, and *data interface integration.* The nature of coupling refers to whether the integration is achieved outside or inside of the focal product. The extent of coupling refers to whether the integration is comprehensive with additional value-added functionalities or a minimal level of functional integration across the two products.

Value-added integration involves an internal integration of a focal product with a relevant product by merging the data and the functions of the two products in a seamless fashion (Hurst 1999). Based on the coupling of the products, additional features are offered. Because of the internal coupling and comprehensive functional sharing, the boundary between the focal and the relevant product will become obscured. Google's integration between Picasa, a photo editing service, and Gmail, an email service, is a good example of value-added integration. Picasa users can directly log into Gmail, automatically attach pictures, and send emails without leaving Picasa (see Fig. 1a).

The add-on module integration involves the integration of a focal product with a relevant product through an external module or a component that is separated from the focal product. Through the use of an add-on module, the focal product and the relevant product can share some of their data and functions. For example, in an attempt to promote its new movie reviews and television shows service, RealNetworks uses an external add-on module – Real Messenger (an instant messaging service) – to integrate its focal product, RealPlayer, with Film.com (see Fig. 1b).

The third type of product integration – data interface integration – involves the external integration of a focal product with a relevant product through a technical interface as a means to exchange data between the two products (Sengupta 1998). The integration of Google's search engine and Google calendar represents such integration. To promote Google Calendar, Google added a hyperlink between Google Calendar and Google search engine homepage to facilitate data exchange. Such product interface specification provides a minimal level of functional integration across the two products. This is because any changes made in Google's search engine do not require the company to make changes to the workings of Google calendar (see Fig. 1c).

2.2. Perceived ties

A *perceived tie* is defined as the strength of perceivable interactions between different products (Stewart 2006). When an individual interacts with a stimulus, cognitive reactions from the stimulus, usually in a form of mental processes in her mind, occurs (Eroglu et al. 2001). In a product integration environment where products are presented to individuals, no matter weakly or strongly related to each other, individuals' cognitive reactions to such a stimulus includes a perception of the products as a group (Campbell 1958). Note that the term "entity" and "group" are psychological terms. Entity is a general description of existence (i.e., each online information product in our research) while a group (of entities) is a collection of two or more entities (a focal product and a related product in our research) that may be weakly or strongly related to each other (DeLamater 1974). *Entitativity theory* suggests that perceived tie measures the degree to which a group of entities is perceived as being bonded together (Lickel et al. 2001; Stewart 2003).

(a) Value-Added Integration

(b) Add-On Module Integration

(c) Data Interface Integration

Fig. 1. Screenshots of the three types of online product integration.

Prior literature shows that a perceived tie influences online user's information impression formation, and thereby the information processing mechanism (Hamilton and Sherman 1996; McConnell et al. 1997). When the perceived tie is strong, users will engage in *memory-based information processing* (McConnell et al. 1994, 1997). Memory-based information processing involves the abstraction of a stereotype of the group of entities and the transfer of that stereotype across all the entities (Crawford et al. 2002). Therefore, a group with a strong perceived tie is viewed as constituting a coherent unit in which the entities are bonded together. As a result, the transference of traits from one entity to other entities is stronger for a group with a strong perceived tie.

In contrast, when the perceived tie is weak, individuals will invoke *online information processing* (McConnell et al. 1994). When users engage in online information processing, they tend to form organized and coherent impressions. Therefore, a group with a weak perceived tie is viewed as aggregates of individual entities that tend to be treated separately. That is, no general characterization or stereotype is formed, making the transference of traits to group members more difficult (Crawford et al. 2002). As a result, the transference of traits from one entity to other entities is weaker for a group with a weak perceived tie.

2.3. Online advertising effectiveness

An individual's reactions from interacting with product integration will determine his or her responses to the online environment. In the context of online advertising, three steps are involved in the response process. First, when exposed to a promotion, an individual will evaluate the promotion and form an attitude. Attitude is defined as a psychological tendency expressed by a degree of favor or disfavor towards a particular entity (Zhang et al. 2008). Second, based on the combination of evaluative judgment, the individual will develop usage intention toward the promoted product. Third,

since intention has been regarded as an important predictor of IS usage behavior, the individual acts to fulfill the usage behavior (e.g., clicking on the link to a promoted product) (Davis 1989).

Prior research has identified design and advertising contents as two groups of antecedents of online advertising effectiveness. The first group of antecedents mainly deals with the design of advertising campaigns. In these studies, researchers studied the effects of image, animation, ads location, banner sizes, the number of colors, and the degree of interactivity on advertising effectiveness (Baltas 2003; Dreze and Hussherr 2003; Lohtia et al. 2003, 2007; Robinson et al. 2007; Calisir and Karaali 2008; Zhang and Kim 2008). For example, using the click-through rate as the measurement of advertising effectiveness, Tsang and Tse (2005) found that animated color, text and graphics had significant effects on click-through rate. Robinson et al. (2007) reported that a larger banner size was associated with a higher level of click-through rate. The second group of antecedents mainly deals with the content of advertising. In these studies, researchers generally focus on the impact of promotional incentives, emotional appeal, action phrases, company logos, and message length on advertising effectiveness (Lohtia et al. 2003; Robinson et al. 2007). For instance, Lohtia et al. (2003) found that the use of emotional appeal increased the click-through rate, while the presence of promotional incentives did not improve the click-through rate. Robinson et al. (2007) found significant influence of message length on advertising effectiveness. Although several studies have examined the influence of content and design elements on advertising effectiveness, product integration, one of the important design elements, remains under-researched.

Researchers have used various measurements to assess online advertising effectiveness. For instance, some studies (Briggs and Hollis 1997; Ryu et al. 2007; Chen et al. 2009b) asked participants to report their attitude toward promotion and usage intention without capturing actual clicking behaviors. However, in other

studies (Chandon et al. 2003; Tan and Wei 2006; Lohtia et al. 2007), researchers use the click-through rate as the single measurement of online advertising effectiveness. Because of the complexity of users' responses to product integration, this study will examine the influence of product integration on advertising effectiveness using different types of measurements in two separate empirical studies.

3. Research model and hypothesis development

Fig. 2 presents a model of the relationship between product integration and online advertising effectiveness. The model argues that different types of product integration serve as the stimulus that evokes users' information processing mechanisms through a perceived tie, which lead to adoption and usage decisions of a promoted product.

3.1. Product integration level and perceived tie

Considering the extent and nature of coupling and the direct perceivable benefits, the value-added integration is likely to have the highest integration level and the data interface integration has the lowest integration level while the add-on module integration falls somewhere between the two. When the level of the integration is low (low data interface integration), the two products share data through parameters or a public interface (Stevens et al. 1974; Myers 1978; Briand et al. 1999) and these products are not dependent upon each other. Therefore, online users are likely to perceive a low degree of tie between the focal product and the promoted product. In other words, these products will be perceived as being aggregates of individual products.

When the level of the integration is high (value-added integration), the level of functional sharing becomes so salient that the focal product modifies or relies on the internal workings of a promoted product. Future changes in the way in which the promoted product functions will also require additional changes in the focal product (Myers 1978, Wand and Weber 1990, Pressman 2005). Facing the high interaction between the focal and promoted products, online users will perceive higher degree of tie.

Hypothesis 1 (*The Influence of Product Integration on Perceived Tie Hypothesis*). The product integration level between a focal product and a promoted product has a positive impact on the strength of the perceived tie.

3.2. Perceived tie and online advertising effectiveness

When the perceived tie is strong, products being integrated are perceived as being bonded together into a coherent group. Users may then begin to focus on group traits and similarities among group members rather than on their individual differences. As a result, the transference of traits from one group member to other group members is likely to happen. For example, values associated with a focal product (such as utilitarian value, hedonic value, and social value) will be transferred to a promoted product (Crawford et al. 2002). Therefore, users will be more likely to try out and use the new product.

Conversely, when the perceived tie is weak, the products are perceived as being an aggregate of individual members. Each product will be treated as a separate unit and the transference of values from a focal product to a new product will be more difficult. This will increase the uncertainty of the value of the new product. Hence, users will be less likely to use the promoted product. Empirical studies generally supported the positive relationship between perceived tie and trait transference in online information products (Stewart 2006; Song et al. 2009). For example, Stewart (2006) reported that perceived relationship positively influence trust transfer between a linker and a linked. Song et al. (2009) found that perceived interaction positively impacts the perceived usefulness transference between products sharing the same brands. This analysis results in the following hypothesis:

Hypothesis 2 (*The Mediating Role of Perceived Tie Hypothesis*). A perceived tie between a focal product and a promoted product has a positive impact on online advertising effectiveness.

3.3. Direct effect of product integration on online advertising effectiveness

Online product integration is a strategy to introduce a promoted product by referring to its focal product. Differences in the levels of product integration may influence learning efficacy (Vessey and Galletta 1991, Carroll and Mack 1999). When the level of integration is high (through value-added integration), the integration offers additional product features. The available cues or stimuli for learning the quality and performance of a promoted product will increase. As the number of available cues or stimuli increases, learning will be more effective (Severin 1967). Furthermore, value-added integration has the most transparent product
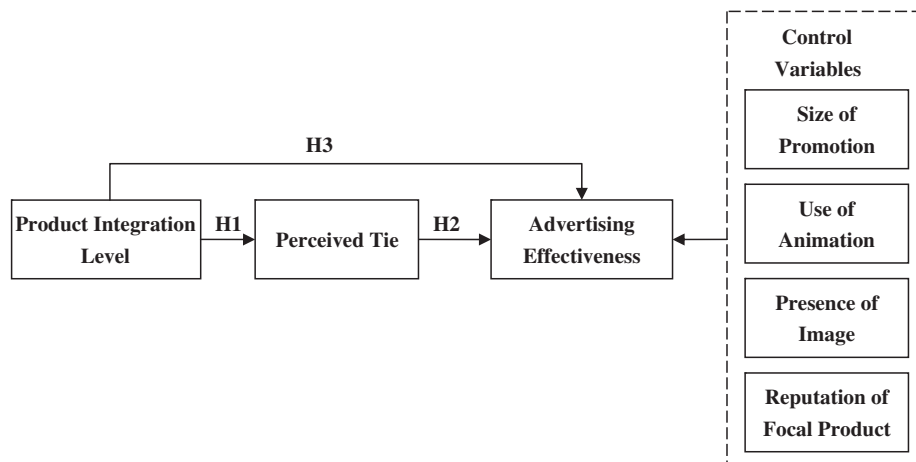

Fig. 2. Research model.

integration and presents the most advantageous learning curve to an end user. Learning the promoted product will be easy for users. Therefore, users are likely to have a better understanding of products and can make informed purchase and usage decisions (Jiang and Benbasat 2007a). This process may increase the persuasive power of the promotion.

When the level of integration level is low (in terms of data interface integration), the integration only facilitates the transfer of data across the two products. Facing the minimal level of functional integration, users will have more difficulty to learn the quality and performance of a promoted product. In this situation, consumers can only engage in learning through the transfer of data, which is hard to observe (Nambisan 2002a). Therefore, users may not adequately understand a promoted product. This may increase the uncertainty of the value of a promoted product and decrease the persuasive power of the promotion. Drawing on this argument, we propose the following hypothesis:

Hypothesis 3 (*The Direct Influence of Product Integration Hypothesis*). The product integration level between a focal product and a promoted product has a positive impact on online advertising effectiveness.

3.4. Other design elements as control variables

In addition to product integration, other design elements may also affect online advertising effectiveness. These variables are: the size used for promotion, use of animation, presence of image, and reputation of focal product. We treat these variables as control variables because of their potential impacts on online advertising effectiveness as suggested by the extant literature.

3.4.1. Size used for promotion

The effect of size on advertising effectiveness has been studied in traditional media, especially in print media. The logic is that size usually improves memory of the item. Since a large banner size occupies more screen space, they have better chances of grabbing users' attentions by being seen and remembered. When an advertisement draws an increased level of attention, users are more likely to carefully scrutinize a message and being persuaded by a promotion (Petty and Cacioppo 1986). When users do not have predetermined items in mind, an online advertisement with a larger size is more likely to be clicked and used. Studies on print advertising confirm this finding (Naccarato and Neuendorf 1998). Similarly, other studies have shown that advertisement size has a significant impact on the click-through rate (Cho 1999; Chandon et al., 2003). Given that the size used for promotion may have an impact on advertising effectiveness, we include the size used for promotion as a control variable in our study.

3.4.2. Use of animation

Many online vendors have begun to use animation to deliver progressive and sequential images. Compared with non-animated items, animated items have the advantage of grabbing users' initial attention. Although looking at an animated item does not necessarily guarantee that it will be clicked and used, animated items enhance user's attention, a condition that must be satisfied before clicking and usage behavior can be performed (Chandon et al. 2003). When users do not have predetermined items that they want, they are more likely to click on animated items because they may interpret animation as an indication of a special quality of the item or because they give more attention to the animated items and want to collect more information about them (Hong et al. 2007). Therefore, promotional campaigns that use animation will attract more attention and subsequently improve their effectiveness. The

influence of animation on advertising effectiveness has been shown in the existing literature (Lohtia et al. 2003). Li and Bukovac (1999) demonstrated that animation increases users' abilities to recall the content. Hong et al. (2007) also found that animation is more likely to attract clicking behavior. Based on this argument, the use of animation is an important control variable in our study.

3.4.3. Presence of image

The effect of image presence has been studied in the traditional media and online environments. Image presence is considered an important element of the vividness of the message (Jiang and Benbasat 2007b). Vivid presentations can portray products more concretely and convey more information cues than pallid presentation formats (Lim et al. 2000; Jiang and Benbasat 2007b). Hence, users have a better understanding of promoted products and can make more informed purchase and use decisions. This may increase the persuasive power of the promotion. In the context of traditional media, Finn (1988) found significant and positive relationships between image presence and comprehension. The improved formation of a memory relies on the fact that graphic information generates more mental codes than verbal information (Unnava and Burnkrant 1991). Within the context of the Internet, Chtourou and Chandon (2000) found positive effects of picture presence on memory and subsequent intention to use. Therefore, the presence of image takes into account for the variance of advertising effectiveness.

3.4.4. Reputation of focal product

We include the reputation of a focal product as a control variable because the reputation of a focal product may positively influence advertising effectiveness. Although a new product can derive enhanced product reputation and customer trust through its integration with other more reputable ones, a new product can also lose customer trust through its integration with untrustworthy products (Stewart 2003; Stewart 2006). Consequently, the reputation of a focal product may have a positive impact on the online advertising effectiveness.

4. Research methodology and data analysis

As discussed earlier, prior research has measured online advertising effectiveness either through attitudinal effects (Briggs and Hollis 1997; Ryu et al. 2007; Chen et al. 2009b) or through the click-through rate (Chandon et al. 2003; Tan and Wei 2006; Lohtia et al. 2007). Because of the complexity of users' responses to product integration, this study examines the influence of product integration on advertising effectiveness using both types of measurements in two separate empirical studies (see Table 1). We first conducted a quasi-experimental study (Study 1) to test the main hypotheses by using the attitude toward promotion and usage intention to measure online advertising effectiveness. A quasi-experimental design was adopted because it allows us to manipulate key variables and exercise control over extraneous variables.

A field study (Study 2) was conducted to examine the integration between portals and their promoted new services such as virtual community, blog and email services. In this field study, we measured online advertising effectiveness through the click-through rate. The field study complements the quasi-experiment study in three ways. First, it was designed to provide additional empirical evidence to strengthen our understanding of the direct impact of product integration on advertising effectiveness. Second, it allows us to investigate the influence of other design elements on advertising effectiveness. Finally, it can potentially address the limitations of scenario-based method in the quasi-experimental design (i.e., no real transaction to participants).

Table 1
Research design.

	Focal product	Promoted product	Measures of advertising effectiveness
Study 1: quasi-experiment	Search engine (baidu.com)	C2C website (youa.baidu.com)	• Attitude toward promotion • Usage intention
Study 2: field study	Search engine (baidu.com) Portals	Online encyclopedia (baike.baidu.com) Virtual community, blog and email services	• Click-through rate

4.1. Study 1: a quasi-experiment

This study was designed as a one-factorial experiment by manipulating product integration (represented by the data interface, the add-on module, and the extent of value-added integration). Participants were randomly assigned to one of the three product integration groups. A total of 134 students from a public university in China participated in the experiment. Prior to the study, the subjects were informed that they would each receive $5 reward for their participation. All the experimental sessions were conducted in a laboratory with sixty identical PCs connected to the Internet.

4.1.1. Manipulations

We operationalized information product integration by using a scenario-based method adopted in prior research (Parboteeah et al. 2009; Xu et al. 2010). Sheng et al. (2008) justified the appropriateness of scenario-based methods as "the use of scenarios makes it possible for researchers to study the emerging [. . .] phenomenon without being constrained by the timing of the study or the state-of-the-art of technology". We manipulated three types of integration using different scenarios. A popular Chinese search engine, Baidu, and its two new products, a C2C website and an online Chinese encyclopedia, were adapted in this study to yield different scenarios. There are several reasons for this choice. First, the search engine, C2C website, and online encyclopedia are the three most popular applications in the local market. This ensures the availability of participants and the relevance of our study to both practitioners and end users. Second, the use of a search engine, C2C website, and online encyclopedia are usually volitional. This ensures that there is no influence due to organizational mandate to confound user evaluations and behavior.

In the data interface integration scenario, one hyperlink to promote the new products (either the C2C website or the online encyclopedia) was supplied on the homepage of the search engine. If a user wanted to use the promoted product after logging onto the search engine, she needed to click the links (see Section 1 of Appendices A and B). In the add-on module integration scenario, a pop-up instant messenger was provided to promote the new products (see Section 2 of Appendices A and B). In the value-added integration scenario, vendors supplied additional features based on the coupling between products. In the case of the integration between search engine and C2C website, when a user searched for a product in the search engine, the linkages related to this product in the C2C website appeared as search suggestions. Therefore, without logging onto the C2C website, users could find the relevant products directly from the search results (see Section 3 of Appendix A). In the case of the integration between search engine and online encyclopedia, when a user conducted a search in the search engine, the relevant links in the online encyclopedia also emerged as the search suggestion. Hence, without logging onto the online encyclopedia, users could find the explanations of their search terms in the online encyclopedia directly from the search result (see Section 3 of Appendix B).

4.1.2. Procedure and measurement

All participants were told that instructions were provided online and that they were asked to read the instructions carefully and complete the study independently. Because two product evaluation tasks were involved in the experiment, the order by which subjects examined products was randomized. This was done such that half of the participants examined the integration of search engine and C2C web site followed by the integration of search engine and online encyclopedia. The other half examined the integration of search engine and online encyclopedia followed by the integration of search engine and C2C web site. As commonly used in marketing research, a cover story was provided to all participants after they log-onto our online system. In particular, participants were told that a new product (C2C website or online Chinese encyclopedia) was recently introduced to the market, and their feedback would be very important for the evaluation of the promotion strategy.

Next, the participants were randomly assigned to one of the three treatment scenarios. Our Web-based system generated the scenarios randomly so that each respondent had an equal and independent chance of being assigned to any of the three scenarios. The participants were asked to assume the role of potential users and were presented with the experimental scenarios, which took the form of the Web site to enhance realism. The participants were asked to read these materials to gain as much of the information provided as possible. The experimental system logged the accesses made by the participants to all the URLs to ensure that the participants had actually read the manipulated conditions. Finally, the participants were asked to complete a post-session questionnaire on their attitudes toward the promotion and intentions to use the promoted products. Five participants were dropped from the sample for the following reasons. Two participants failed to complete the questionnaires. Three participants reported inconsistent demographic information. Overall, we collected 129 valid responses, which gave us 258 (129 × 2) observations for the empirical analysis.

To the extent possible, we adapted constructs from measurement scales used in prior studies to fit our study context. Consistent with Briggs and Hollis (1997), we used two traditional measures of advertising effectiveness: attitude toward the promotion, and usage intention. We adapted the items dealing with the attitude toward the promotion from Zhang et al. (2008). Usage intention was assessed using measures from Wixom and Todd (2005). The strength of the perceived tie was measured using items adapted from Stewart (2006) and Song et al. (2009). For the manipulation check, we developed the measurement of product integration level based on its definition from Stevens et al. (1974) and Nambisan (2002a). All items were measured with a seven-point Likert scale (1 = strongly disagree, 7 = strongly agree). Appendix C presents the instrumental details.

4.1.3. Manipulation check

To ensure that the participants attended to their assigned product integration types, manipulation checks were included in the post-session questionnaire. An analysis of variance (ANOVA) was conducted with perceived integration level as the dependent variable and product integration types as the independent variable. Results revealed a significant effect of product integration types (F (2, 255) = 21.19, $p < .01$). Participants in the value-added integration scenario perceived significantly higher integration level (Mean = 5.51, SD = 0.68) than those in the add-on module

integration scenario (Mean = 5.04, SD = 0.55) and in the data interface integration scenario (Mean = 4.47, SD = 0.63). Also, participants in the add-on module integration scenario perceived higher integration level (Mean = 5.04, SD = 0.55) than those in the data interface integration scenario (Mean = 4.47, SD = 0.63). These results suggest that the manipulations of product integration types were successful.

4.1.4. Results

Our ANOVA analysis suggests that integration type significantly affects the strength of perceived tie. Results from a Scheffe *post hoc* test reveal that: (1) the value-added integration is associated with a strong perceived tie than the data interface integration and the add-on module integration; (2) the perceived tie in the add-on module integration is not stronger than that of the data interface integration, thus providing partial support for the Influence of Product Integration on Perceived Tie Hypothesis (H1). (see Table 2).

The proposed research model of the relationship between product integration and online advertising effectiveness was tested through the structural equation modeling (SEM) technique with PLS Graph Version 3.0. Tests of significance of all paths were performed using the bootstrap resampling procedure. Fig. 3 presents the results of the analysis with estimated standardized path coefficients.

As shown in Fig. 3, all of the hypothesized paths in the research model were found to be statistically significant. As predicted, a perceived tie had a significant influence on attitude toward promotion ($\beta = 0.364$), and usage intention toward the promoted product ($\beta = 0.401$). Product integration level had a significant influence on the perceived tie ($\beta = 0.502$), attitude toward promotion ($\beta = 0.520$), and usage intention ($\beta = 0.356$). Therefore, the Influence of Product Integration on Perceived Tie Hypothesis (H1), the Mediating Role of Perceived Tie Hypothesis (H2) and the Direct Influence of Product Integration Hypothesis (H3) were supported.

To increase the reliability of the results, the multi-group analysis was conducted to identify differences across products. Fig. 4 shows the standardized PLS solutions with splitting samples for the two promoted products. Since variances are not significantly different across groups ($p < 0.01$), a *t*-test can be applied to assess statistical differences for each pair of paths coefficients (Hsieh et al. 2008). As shown in Fig. 4, there is no significant path difference between the C2C website and the online encyclopedia samples. This indicates that the results remain robust for two different products.

4.2. Study 2: a field study

4.2.1. Design and measurement

In this study, the focal product is a portal and the promoted products are virtual community, blog and email services. We use the click-through rate from a focal product to a promoted product to measure online advertising effectiveness for two reasons. First,

the click-through rate records users' voluntary behaviors in the actual environment, which ensures that no outside influence (e.g., organizational mandates) could confound the effects of users' perceptions. Second, click-through rates are collected unobtrusively, and are free from researchers' bias (Chatterjee et al. 2003). Therefore, the click-through rate has become one of the most often used indicators to measure online advertising effectiveness (Chandon et al. 2003).

We first viewed the global top 1000 Web sites ranked by Alexa.com, a large third-party data company that tracks daily traffic of various Web sites. We chose those portals that later introduced at least one of the following services: email, blog, and virtual community. We found 202 portals that fit this condition. Next, we collected product integration types and other promotional related data. Finally, Internet traffic data was obtained for each of the portals. According to the data from Alexa.com, the traffic details of each portal contained information about where people went within the Web site (e.g., the click-through rate from the portal to other services). The final sample comprised of 298 online information product promotion cases (101 for virtual community, 125 for blog, and 72 for email). The sample demographic is shown in Table 3. All of the variables examined are defined below.

4.2.2. Dependent variable

The dependent variable is *ln(CTR)* (*Click-through Rate*). Click-through rate is the ratio of the number of times an online advertising is clicked to the number of advertising impressions. The click-through rate was skewed, with few advertisements obtaining high click-through rates. As a result, we transformed the click-through rate by taking logarithms, a common remedial measure for non-normal errors in econometrics (Greene 2000).

4.2.3. Independent variables

The independent variables are *INTL* (*Integration type*). The integration type is coded using a dummy variable: (1) identifies the data interface integration; (2) means the add-on module integration; (3) identifies the value-added integration. Table 4 shows the criteria used to code the integration level between a portal and its associated service. We classified the portals and associated services based on the following five criteria: additional function, functional sharing, external module, data transfer, and dependency.

4.2.4. Control variables

We used several control variables, as follows:

- *SIZEP* (*Size of Promotions*). This variable represents the size used in a promotion. It is coded by multiplying the height and width of a banner used for promotion as presented on the standard 14-in. screen.
- *ANIM* (*Animation*). Use of animation is coded using a dummy variable: 1 means that the promotion used animation; 0 means that the promotion did not use animation.

Table 2
Results on the Influence of Product Integration on Perceived Tie.

(I) group	(J) group	Mean difference (I–J)	Std. error	Sig.	95% Confidence interval	
					Lower bound	Upper bound
1 Data interface (mean = 4.95)	2	−0.06	0.12	0.83	−0.29	0.17
	3	−0.39(*)	0.12	0.03	−0.62	−0.16
2 Add on module (mean = 5.01)	1	0.06	0.12	0.83	−0.17	0.29
	3	−0.33(*)	0.12	0.05	−0.56	−0.10
3 Value added (mean = 5.34)	1	0.39(*)	0.12	0.03	0.16	0.62
	2	0.33(*)	0.12	0.05	0.10	0.56

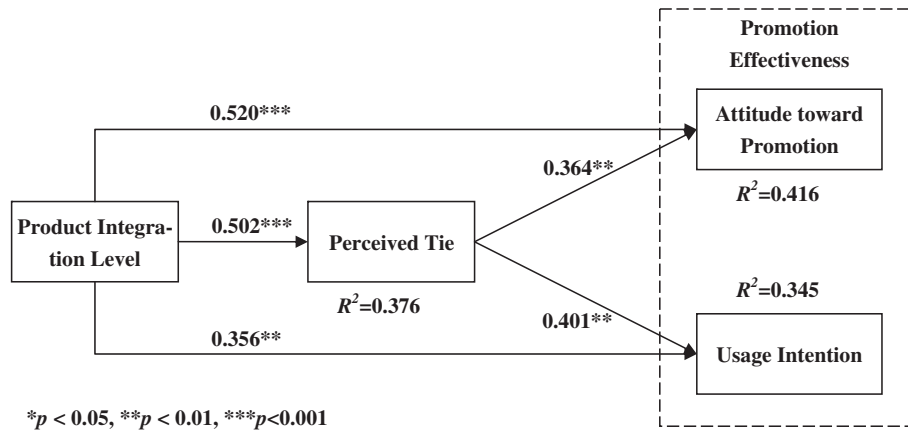* Means the difference is significant at $p < 0.05$ level.
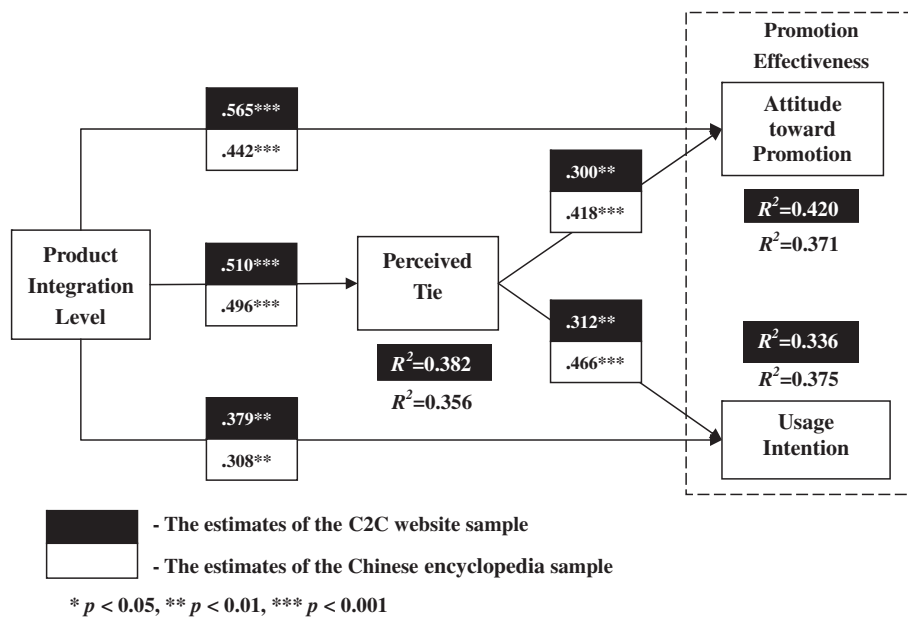
Fig. 3. Standardized PLS results.

Fig. 4. Standardized PLS results with splitting samples.

Table 3
Sample demographics.

Demographic variables	Category	Frequency (percentage)
Web site languages	English	66 (32.7%)
	Chinese	60 (29.7%)
	French	8 (4.0%)
	Spanish	10 (5.0%)
	Portuguese	9 (4.5%)
	Japanese	10 (5.0%)
	Others	39 (19.1%)
Web site ranking	100 or lower	26 (12.9%)
	101–400	84 (41.6%)
	401–700	55 (27.2%)
	701–1000	37 (18.3%)
Click-through rate	1% or lower	108 (36.2%)
	2–5%	86 (28.9%)
	6–10%	45 (15.1%)
	11% or above	59 (19.8%)

- IMA (*Presence of Image*). Presence of image is coded using a dummy variable: 1 means that the promotion used an image; 0 means that the promotion did not use an image.

- ln(RANK). The rank of portal is used as a proxy for the reputation of the focal product and was log-transformed to reduce data variation. Note that a lower value means that a focal product has a higher reputation.

A summary of the relevant statistics and correlation matrix are shown in Table 5.

4.2.5. Results of hypothesis testing

Multivariate regression analysis was used to investigate the relationship between the click-through rate and the independent variables, controlling for other design elements. The following regression equation was used to test the hypotheses:

$$ln(CTR) = \beta_0 + \beta_1 INTL + \beta_2 SIZEP + \beta_3 ANIM + \beta_4 IMA + \beta_5 ln(RANK) \qquad (1)$$

The results are shown in Table 6. Using different data sets (virtual community, blog, and email services), Columns (1), (3) and (5) in Table 6 include the control variables without the product integration variables. Among the control variables, promotion had a positive impact on the click-through rate for these three different

Table 4
Criteria to classify product integration types: an example of a portal and virtual community's integration.

Feature	Value-added integration	Add-on module integration	Data interface integration	Reference
1. Additional function	Portal users can directly view latest topics discussed in the forum. While reading news articles, a user can access the virtual community's discussion using one click in a browser.	No additional function	No additional function	Nambisan (2002a) Hurst (1999)
2. Functional sharing	Comprehensive, sharing some community contents to the portal	Comprehensive, sharing community contents through an external module	Minimal, only sharing URL	
3. External module	No external module	One external module, such as an instant messenger	No external module	Stevens et al. (1974)
4. Data Transfer	Transfer the title, writer's name and timing of newly discussion topics to portal	Transfer some community contents to an external module	Only transfer virtual community's URL	Sengupta (1998)
5. Dependency	High. changing the way community works will lead to changing the portal	Medium. changing the virtual community will lead to the external module's change.	Low. changing the virtual community won't lead to any changes to a portal	Myers (1978) Briand et al. (1999)

Table 5
Summary statistics and correlation matrix.

	Mean	SD	Correlation matrix					
			(1)	(2)	(3)	(4)	(5)	(6)
(1) $ln(CTR)$	0.65	1.79	1					
(2) INTL	1.50	0.83	0.57**	1				
(3) SIZEP	8.14	13.32	0.49**	0.51**	1			
(4) ANIM	0.07	0.25	0.33*	0.32*	0.44**	1		
(5) IMA	0.28	0.45	0.40*	0.27*	0.45**	0.30*	1	
(6) $ln(RANK)$	5.63	1.08	−0.07	−0.13	0.04	−0.07*	−0.02	1

* $p < 0.05$.
** $p < 0.01$.

services. The coefficient of ANIM was not significant, suggesting that the use of animation had no significant impact on the click-through rate. As expected, the presence of image had a positive impact on the click-through rate. In addition, $ln(RANK)$ had significant coefficients in all of the regression models. This result makes sense because a promoted product should derive some benefits from a focal product that has a good reputation. As predicted, the integration level (INTL) had significant influences on a click-through rate. (See Columns (2), (4) and (6) in Table 6.) The results support the Direct Influence of Product Integration Hypothesis (H3) regarding the effects of product integration on online advertising effectiveness. Column (7) in Table 6 presents the full model with pooled samples that includes all variables. Note that most of the hypothesized relationships in that model were statistically significant.

4.2.6. Regression diagnostics

We assessed the regression assumption that the error terms follow a normal distribution (Greene 2000). According to the Jarque–Bera test (Judge et al. 1988), our sample distribution does not violate the normality assumption. We assessed the influence of multicollinearity by examining the Belsley–Kuh–Welsch (BKW) index (Greene 2000). In each of the models in Table 5, the BKW index was below 4, suggesting no harmful multicollinearity. We also performed a *post hoc* statistical power analysis. Following the procedure described by Cohen (1988) and using 0.05 as the cutoff for type I error, the statistical power in all of our models in Table 6 was higher than the conventional recommended cutoff of 0.8 (Baroudi and Orlikowski 1989). We used heteroscedasticity-robust variance estimators to establish all of our regression results.

We conducted F tests on the regression results to identify the contribution of the integration level to R^2. For the virtual community data set, the F tests comparing the R^2 values found the increase in explanatory power to be statistically significant at the $p < 0.05$ level. However, for the blog and email service data set, the increase in explanatory power was not statistically significant. This is due to relatively high correlations between the control variables and the integration level. (Refer to Table 5.) These control variables may confound the real impacts of integration level on online advertising effectiveness (Greene 2000). In spite of this limitation, the quasi-experimental study (Study 1) still provides complementary explanatory evidence for the contribution of integration level to online advertising effectiveness.

4.2.7. Alternative measures and model specification

Table 7 presents the results of a robustness check for the full regression model. Column (1) in Table 7 used the ranking of portal within the domestic market as an alternative proxy for the reputation of a focal product. We also estimated another model specification to account for the potential lagged effects on click-through rate. Two weeks after the initial survey, we collected a second wave of click-through data. Column (2) used the second wave click-through rate data as the new dependent variable. The results in Table 7 suggest that using a different proxy variable to measure a focal product's reputation and a different model specification yields consistent coefficient estimates. We conclude that the results are robust in the face of alternative measures and other model specifications.

Online advertisements are usually valued and sold based on the quantity and quality of impressions they generate. Although a larger size advertisement has a better chance of grabbing the users' attention by being seen and remembered, its price is also relatively higher. To investigate whether increased integration level can save on banner size, we assessed the moderating effect between integration level and banner size. We also assessed the moderating effect between the integration types and the size. After adding the interaction term, the significant levels of all of the coefficients in Column (3) were consistent with the results in Column (1). Thus, we conclude that the empirical results appear to be robust in this respect also. Finally, Column (4) and (5) in Table 7 include service dummies and language to support an additional test of robustness. The results did not change in sign or in significance for any of the relationships that were specified in the model.

Table 6
Regression results.

DV = ln(CTR)	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Virtual community		Blog		Email		Pooled samples
	β (t-stat)	β (t-stat)	β (t-stat)	β (t-stat)	β (t-stat)	β (t-stat)	β (t-stat)
Integration level							
INTL		0.87** (0.14)		0.58* (0.21)		0.81** (0.25)	0.91** (0.12)
Control variables							
SIZEP	0.03* (0.01)	0.02* (0.01)	0.07** (0.01)	0.05** (0.01)	0.10* (0.02)	0.07* (0.02)	0.02* (0.01)
ANIM	0.13 (0.63)	0.29 (0.53)	0.29 (0.63)	0.12 (0.62)	0.61 (0.56)	0.27 (0.59)	0.23 (0.37)
IMA	1.00* (0.34)	1.03* (0.28)	1.11* (0.30)	1.01* (0.30)	0.60* (0.62)	0.96* (0.40)	0.82* (0.20)
ln(RANK)	−0.31* (0.14)	−0.30* (0.12)	−0.31* (0.14)	−0.27* (0.13)	−0.26* (0.11)	−0.28* (0.11)	−0.21* (0.07)
N	101	101	125	125	72	72	298
R^2	0.39	0.57	0.44	0.47	0.37	0.46	0.42
Adjusted R^2	0.36	0.55	0.42	0.45	0.34	0.42	0.41
F	15.00**	25.19**	18.43**	21.41**	9.92**	11.15**	41.65**

Heteroscedasticity-robust variance estimator is used. All regressions contain constant values.
** $p < 0.01$.
* $p < 0.05$.

Table 7
Robustness checks.

DV = ln(CTR)	(1)	(2)	(3)	(4)	(5)
	β (t-stat)	β (t-stat)	β (t-stat)	β (t-stat)	β (t-stat)
INTL	0.91* (0.12)	0.90* (0.15)	1.08** (0.11)	0.91* (0.17)	0.73* (0.10)
SIZEP	0.02* (0.01)	0.03* (0.01)	0.12** (0.02)	0.03* (0.01)	0.02* (0.01)
INTL × SIZEP			−0.04** (0.01)		
ANIM	0.23 (0.37)	0.31 (0.21)	0.29 (0.31)	0.28 (0.31)	0.27 (0.32)
IMA	0.82** (0.20)	0.82** (0.20)	0.87** (0.15)	0.81* (0.14)	0.80** (0.25)
ln(RANK)	−0.03* (0.01)	−0.23* (0.08)	0.23* (0.06)	0.25* (0.06)	0.23* (0.07)
Service dummies				Included	
Language dummies					Included
N	298	298	298	298	298
R^2	0.40	0.44	0.48	0.47	0.47
Adjusted R^2	0.39	0.42	0.43	0.42	0.45
F	43.12**	42.53**	45.41**	43.62**	45.34**

Heteroscedasticity-robust variance estimators are used. All regressions contain constant values.
* $p < 0.05$.
** $p < 0.01$.

5. Discussions and implications

This study was motivated by the scant prior research on the efficacy of product integration in the online advertising context. A noteworthy feature of our study is that we conceptualized and operationalized online advertising effectiveness with different measurements instead of simply using the click-through rate. This approach is consistent with the emerging theory of online advertising effectiveness in the marketing field (Chandon et al. 2003).

Our study is one of the first to examine new product advertising effectiveness from both the variance and process perspectives. Drawing on the stimulus-organism-response paradigm, we first developed a conceptual explanation of the role of a perceived tie in explaining the underlying relationship between product integration and advertising effectiveness in an online environment. We also offered empirical evidence from an experimental study and a field study. The results provide support for the proposed model that a perceived tie is the key explanatory mechanism that links product integration level to advertising effectiveness in the online environment.

5.1. Discussion of findings

First, this study demonstrates the significant positive relationship between product integration and promotion effectiveness characterized by the Direct Influence of Product Integration Hypothesis (H3) in Studies 1 and 2. This result is robust across different measurements for online advertising effectiveness. This includes attitude toward promotion and usage intention in Study 1, and click-through rate in Study 2. The high path coefficient between product integration level and advertising effectiveness implies that value-added integration is a useful strategy to increase online advertising effectiveness.

Second, our results show that a perceived tie plays a partial mediating role between product integration level and online advertising effectiveness. Our model details a process whereby internal coupling and comprehensive function sharing between the focal and promoted products can lead to better online advertising effectiveness. We predict that the nature and extent of coupling are important for advertising effectiveness because they partially facilitate a perceived tie between focal and promoted products. The Influence of Product Integration on Perceived Tie Hypothesis (H1) and the Mediating Role of Perceived Tie Hypothesis (H2) support this logic. The Direct Influence of Product Integration Hypothesis (H3) further confirms the partial mediation effect of a perceived tie.

Third, this study shows how other design elements, including banner size, use of animation, and presence of image, influence advertising effectiveness. Since the estimated coefficients of these variables are relatively weaker than the estimated coefficient of

integration level, we interpret this finding to mean that product integration level is a primary value driver in a new product promotion design and product presentation is a secondary value driver that needs to be considered after companies making a decision on the integration level. In other words, significant value is derived from careful product integration design. The significant negative interaction effect between the integration level and banner size indicates that integration level can substitute for the value provided by banner size.

Contrary to our expectation, a perceived tie in the add-on module integration is not higher than that of the data interface integration. Thus, the Influence of Product Integration on Perceived Tie Hypothesis (H1) was only partially supported. This may be due to the fact that the data interface integration and add-on integration shares a similar interface design, except the pop-up window and the hyperlinks. Vendors may have limited choices to enhance the overall value to end users. Therefore, in these two types of integration, the functional sharing between focal and promoted products is relatively low. Facing the loosely interaction between products, online users are likely to perceive a low degree of tie.

Among the control variables, we did not find support for the influence of animation on advertising effectiveness. Our finding is consistent with Lohitia et al.'s (2003) conclusion and can be explained by the elaboration likelihood model. According to the elaboration likelihood model, attitude change may be caused by two routes of influence: a central route and a peripheral route (Petty and Cacioppo 1986). The central route requires a person to carefully scrutinize relevant arguments prior to forming a judgment. The peripheral route involves less cognitive effort in attitude formation. However, email, blog and virtual community services are usually used in high-involvement situations, which tend to be processed through a central route. Since animation is usually not actively processed, it is more likely to be processed through a peripheral route (Cho 1999; Petty and Cacioppo 1986). According to the different processing route argument, the relationship between animation and advertising effectiveness is likely to be weaker in high-involvement situations.

5.2. Theoretical implications

The theoretical implications of this study are several. First, it offers a new explanation for the overlapping usage of two or more related information products, a topic that has not yet been fully explored in the IS literature. The notion of IT usage has played a central role in IS research though (Burton-Jones and Straub 2006). Several researchers have suggested that technology innovations should not be studied in isolation; instead, innovation adoption decisions are highly influenced by previous or anticipated adoptions (Lee 1994; Rogers 2003; Adomavicius et al. 2007). However, few studies have scrutinized the overlapping usage behavior from a product integration perspective. We believe that this study represents an effort to investigate interrelated technologies and users' acceptance, which is the first step towards usage.

Second, our findings can also be used to explain consumers' responses to product bundling within the online environment. Product bundling is the sale of two or more products in a single package (Bakos and Brynjolfsson 1999). Bundling research has primarily focused on price bundling and product bundling. Product bundling is the integration and sale of two or more separate products or services at any price (Stremersch and Tellis 2002). The primary goal of product bundling is to provide value-added benefits to users such as compactness (integrated stereo systems), seamless interaction (PC systems), non-duplicating coverage (one-stop insurance), and reduced risks (mutual funds) (Stremersch and Tellis 2002). From the product integration perspective, product bundling in an online environment can increase the click-through rate between products and enhance the intention to use the new product. Consequently, multi-product vendors can make use of the product bundling strategy through cross-product integration to increase the overlapping usage population and gain additional profits.

Finally, although the concept of a perceived tie has been considered important in online promotion, there has been limited empirical evidence to evaluate such relationship (Stewart 2003, 2006). Our study offers novel insights because it identifies an important mechanism through which a user's information processing and product value transfer translate into her behavioral response in the online promotion environment (Parboteeah et al. 2009). This finding cautions managers who merely considering value transfer in new product promotion that it is not sufficient to gain users' favorable attitudes and clicking behaviors. We encourage Internet firms to seamlessly merge the data and functions of the two products and rethink their perspective on the benefits associated with improvements in user information processing efficiency (Malone et al. 1987). This can be an effective way to increase the perceived tie, and to induce the adoption of the extended product.

5.3. Practical implications

These results have important promotion design implications for online product managers. First, value transfer from an existing product will help a promoted product gain an enhanced product reputation, and rapidly increase its market reach and accelerate the product growth (Alvarez and Meyer 1999). Therefore, it is critical for companies to consider the transfer of value in the first step of their new product promotion design. Second, to ensure product competitiveness in a dynamic and evolving market, it is imperative for Internet firms to integrate their products with as many different complementary products as possible. The initial design and development of a product should be flexible enough so that a firm can rapidly integrate its products with new products to respond to changing environments (Nambisan 2002b). Third, since value-added integration calls for extensive sharing of product and technical knowledge, as well as modification of the focal product, online product managers need to evaluate the use of product integration in relation to its strategic importance. For new products that are strategic, online vendors may want to use value-added integration in their promotion efforts. On the other hand, data interface integration may be more appropriate for new products that are not strategic.

Finally, our product integration model can be used to help online multi-product providers to explore the value of existing customers. Recently, managers have acknowledged that retaining customers is not sufficient to be successful. Instead, many are seeking to enhance the value of their customers (Verhoef et al. 2007). The value of a customer of a multi-product provider depends on: (1) the duration of the provider–customer relationship (length of relationship), (2) the usage level of the consumed products (depth of the relationship), and (3) the number of different products bought from the same provider (breadth of the relationship) (Verhoef et al. 2001). This research confirms the influence of product integration on consumers' intention to use the extended products in the online promotion environment. Hence, this study proposes a new mechanism for online providers to meet the goal of customer value creation: the idea that online multi-product providers can use product integration to increase the breadth of the customer-provider relationship.

5.4. Limitations and future research

This study has several limitations. First, it examines selected online information products in a field study based on an integration

of portal and its associated email, blog, and virtual community services. Our quasi-experiment is based on the integration between a search engine and its associated C2C website and an online encyclopedia. As a result, caution is required in generalizing the findings to other information products. The characteristics of the tasks or other contextual factors also may play a role in determining online advertising effectiveness. So the replication of this study in other contexts is necessary before the results can be generalized to other types of products and settings.

Also, in some cases, users may be subject to external influence on their decision to adopt promoted products. For example, though users may have freedom to use or not use Internet Explorer, a Windows user is more likely to use Internet Explorer because it is set as the default browser in the Windows environment. Hence, this limitation of user choice may confound the influence of product integration on promotion effectiveness. Researchers should investigate the influence of bonded choice through product bundling on user adoption behavior in future product integration studies. Finally, consumer experience with technology can be captured by con-

structs such as enjoyment, flow and loyalty, and these have been suggested as being important to assess online consumer behavior (Novak et al. 2000; Chen et al. 2009a,b). Future research should also examine the influence of online product integration on users' subjective enjoyment of their interactions with online information products.

Acknowledgements

Appendix A. Screenshots of the Integration between Search Engine and C2C Website

(1) Data interface integration

(2) Add on module integration

(3) Value added integration

Appendix B

Screenshots of the integration between search engine and on-line encyclopedia

(1) Data interface integration

(2) Add on module integration

(3) Value added integration

Appendix C. Measurement Items

C.1. Usage intention to the promoted product

1. I intend to use the promoted product at every opportunity in the future.
2. I plan to increase my use of the promoted product in the future.

   Source: Wixom and Todd (2005)

C.2. Attitude toward the promotion

1. I think this promotion is desirable.
2. I like this kind of promotion.
3. In general, I am positive about this kind of promotion.
4. In general, this kind of promotion is good.

   Source: Zhang et al. (2008)

C.3. Perceived tie

1. These two products have a strong relationship with each other.
2. Existing main product is not connected to newly launched products.
3. Existing main product is likely to recommend new launched products to individuals.

   Source: Stewart (2006) and Song et al. (2009)

C.4. Product integration level

1. The strength of the dependency between products is high.
2. The extent of coupling between products is high.
3. In general, these two technology products depend on each other.

   Source: Self-developed

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