

HOW TO EXPLOIT THE USER BASE FOR ONLINE PRODUCTS: A PRODUCT INTEGRATION PERSPECTIVE

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ABSTRACT

When online vendors have gained a strong user base through a flagship product, the basic principles of competitive strategy dictate that they seek to extend their product lines. Taking advantage of existing traffic to introduce a new product presents a critical opportunity for these vendors. Since users increasingly emphasize cross-product integration, the integration of newly extended products with a flagship product is important in exploiting the user base. In contrast to the proliferation of cross-product integration worldwide, little is known about relationships between product integration and cognitive, behavioral, and decision measures of users. Drawing on the literature in learning efficacy and value transference, we assessed and compared the effects of three product integration formats currently used online (value-added integration, add-on module integration, and data-interface integration) on consumers' intention to use an extended product in a scenario-based experiment. The findings suggest that value-added integration is associated with higher levels of perceived diagnosticity and perceived entitativity than data-interface and add-on module integration. Perceived diagnosticity and perceived entitativity, in turn, have a significant effect on consumers' intention to use the extended product. This study contributes to both research and practice by advancing the overall understanding of how to exploit the online user base, as well as by providing important insights into online product design and promotion.

Keywords: User Base, Product Design, Product Integration, Product Understanding, Entitativity

1. Introduction

The key asset and indicator of the success of an online product is its user base [McIntyre & Subramaniam 2009]. Once online vendors have gained a strong user base through a flagship product, the basic principles of competitive strategy dictate that they seek to leverage into adjacent product spaces, exploiting the key assets that give them a unique ability to explore the potential of existing consumers in those spaces [Shapiro & Varian 1999; Verhoef et al. 2007; Zhu & Iansiti 2012]. For example, after having great success in the search engine market, Google launched email (Gmail), instant messenger (GTalk), and electronic payment (Google Checkout) services. After the success of its web portal, Yahoo launched an online instant messenger service (Yahoo messenger) to extend its product lines.

Undoubtedly, after launching such new products, online vendors try to induce the large number of users of their flagship products to use their newly extended products. However, due to the low entry barriers and easy imitation of product offerings, online merchants are challenged in new markets by other vendors' intense competition and struggle to extend their leadership from one market to the other [Zhang et al. 2011]. For example, as a late entrant,

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Gmail was challenged by the existing email service vendor, Yahoo, and failed to dominate the email service markets. Similar incidents occurred with Yahoo messenger in the competition with MSN in the instant messenger market. Given this growth in competition, taking advantage of existing traffic to introduce a new product presents a critical opportunity for firms.

Online product integration is defined as the assembling of different online products together to facilitate data sharing (such as information about a user profile or preference settings) to enhance the overall value to end users through products' mutual cooperation [Nambisan 2002; Sengupta 1998]. Since users are increasingly emphasizing cross-product integration, the integration of new products with focal products is important in leveraging the user base. As an important method of traffic sharing, online product integration has become more of a strategic necessity than a source of market advantage [Iansiti 1995; Cusumano & Yoffie 1998]. The present study poses the following questions that have thus far received little theoretical and empirical attention: (1) *To what extent does online product integration influence users' intention toward the newly extended product?* (2) *What is the underlying psychological process that explains the relationship between online product integration and intention toward the newly extended product?*

In contrast to the proliferation of cross-product integration worldwide, work by information systems researchers in this area is scant. Little theoretical work considers the relationships between product integration and the cognitive, behavioral, and decision measures of users. However, success in leveraging the user base through cross-product integration hinges on a clear understanding of its effectiveness. Research on product integration will help online providers develop a deeper understanding of the different product design approaches to extend leadership and maximize the benefits of entering new markets.

2. Research Background

In this study, we examined the effectiveness of different types of online product integration that are applied widely in online promotional environments. Two perspectives were used to examine consumers' responses to online product integration: learning efficacy and value transference. Learning efficacy refers to consumers' ability to learn effectively. Consumers are usually uncertain about extended product attributes. Through the integration of the focal and extended products, consumers can actively understand the features of the extended product. Since a learning efficacy perspective provides a systematic investigation of how consumers gain a clear understanding of an extended product, it is relevant to study consequences of online product integration. Consumers automatically treat integrated products as a group. Extensive research has shown that the degree of individual entities perceived as bonded together in a group is the indicator of value transference [Song et al. 2009; Stewart 2003]. Therefore, the perspective of value transference also contributes to understanding how consumers evaluate extended products.

2.1. Online Product Integration

There are two types of products in product integration: a focal product and a newly extended product (called the relevant product) that is being integrated. Online products do not work in isolation. They act in conjunction or couple with one another [Iansiti 1995]. As a kind of integration effort, product integration tries to ensure a sense of coupling between products [Tiwana 2010]. Product integration addresses two facets of coupling: the nature of coupling and the extent of coupling. The former refers to whether the integration is achieved outside or inside the focal product [Stevens et al. 1974], while the latter refers to whether the integration is comprehensive with additional value-added functionalities or a minimal level of functional integration across two products [Briand et al. 1999]. Based on these two facets of coupling, Nambisan [2002] identified three types of product integration: *value-added integration*, *add-on module integration*, and *data-interface integration*.

Value-added integration involves combining the focal product with a relevant product internally and merging the data and the functions of the two products in a seamless fashion [Hurst 1999]. Based on the coupling between the two products, this type of integration creates additional product features. Because of the comprehensive sharing of functions, developers must focus more cognitive resources on the internal workings of products and encourage greater specification to drive development of differentiated capabilities among products [Tiwana 2008]. This type of integration also progressively increases the distinctiveness of focal and relevant products and enhances the difficulty of imitation [Pil & Cohen 2006]. For example, through the coupling of Yahoo portal and Yahoo mailbox, Yahoo provides additional features that were previously unavailable. On the homepage of Yahoo.com, Yahoo email users can see their number of new messages, subjects, and sender names without having to log in to the inbox page.

In add-on module integration, the two products are combined through an external component or module that is distinct from the focal product itself. The external module is not an independent product, but rather an add-on function (e.g., the Skype add-on for Internet Explorer), a pop-up mini-site (e.g., Tencent QQ's mini-site), or a pop-up messenger (e.g., Real Messenger). Even though the integration is achieved externally, such add-on modules still provide the requisite support for a sharing of functions between products [Nambisan 2002]. The integration of

RealPlayer and film.com represents this type of integration. RealPlayer users can employ the add-on module, called Real Messenger, to view selected content from film.com.

The third type of product integration, data-interface integration, refers to the external integration of the focal product with a relevant product by defining the technical interface needed to facilitate the transfer of data [Sengupta 1998]. On the basis of describing how the focal and relevant products exchange information, such product interface specifications represent only a minimal level of functional integration [Katz & Shapiro 1994]. Because of pervasive interface standardization in software development, the focal product can easily interact with the newly extended product using stable, well-documented, and predefined standards (e.g., by use of application programming interfaces) [Tiwana et al. 2010]. The integration of Gmail and Google Calendar represents such integration. To promote Google Calendar, Google added a hyperlink between Gmail and Google Calendar to facilitate data exchange, such as user profile information and preference settings. Except for simple connectivity between the two products, changes made in Gmail do not create a ripple effect in the behavior of Google calendar.

While there is considerable practice of online product integration, little is known about the effectiveness of this design and the underlying process it exert on users. On one hand, as early as the 1970s, researchers in software engineering proposed the concept of coupling to measure the strength of associations established by a connection from one module to another [Stevens et al. 1974]. Later scholars in software engineering have generally focused on the measurement of coupling in different contexts and from different perspectives [Briand 1999]. On the other hand, in the innovation management field, researchers generally pay significant attention to the antecedents of product integration and the influence of integration on product development performance [Iansiti 1995; Nambisan 2002; Stock & Tatikonda 2008; Narasimhan et al. 2010]. However, little is known about individuals' responses to the cross-product integration. To fill this gap in the literature, this study intends to identify a cognitive process related to how product integration can affect consumers' intentions to use newly extended products.

2.2. Learning Efficacy

Product presentations are designed to introduce a product to consumers, help them understand it, and impress them with its attractive features and its superiority to competing products [Hoch & Deighton 1989; Yi et al. 2011]. Online product integration is simply introducing an extended product by referring to its focal product. Today, most online product presentations are pictorial or image-based. Their creators attempt to use vivid visual effects to facilitate consumers' understanding of how a product performs by showing what the product looks like and describing how it works in various circumstances. To compensate for the Internet's inherent limitations in presenting detailed product information, many online firms have experimented with various information technology (IT)-based tools to enrich their presentations through means such as video clips and even virtual reality [Jiang & Benbasat 2007b]. According to Vessey and Galletta [1991], a number of presentation formats can significantly influence learning efficacy. This effectiveness can be explained by the cue-summation theory, which posits that learning becomes more effective as the number of available cues or stimuli increases [Moore et al. 1996; Severin 1967].

Several recent studies in education and electronic commerce have shown that product presentations can facilitate effective learning [Carroll & Mack 1999; Mayer et al. 2003]. For example, in their study of consumers' experience of online products, Jiang and Benbasat [2005] used the term "perceived diagnosticity" to label the perception of a channel's capability to convey product information that can help a consumer understand and evaluate the quality and performance of the products promoted online. Because enhancing consumers' abilities to evaluate products is a prominent goal driving improvement in the design of product presentations, perceived diagnosticity is a particularly important concept for the present study [O'Keefe & McEachern 1998].

2.3. Value Transference

A group is a collection of two or more entities that are related to one another, either weakly or strongly [Lickel et al. 2000]. Consumers automatically treat integrated focal and extended products as a group. Entitativity is the degree to which a collection of individual entities is perceived as bonded together in a coherent group [Campbell 1958]. The existence of entitativity has received theoretical and empirical support though research in information systems [Song et al. 2009; Stewart 2003]. The degree of entitativity determines how online users form impressions about a product, and thereby how they process these impressions cognitively [Hamilton & Sherman 1996; McConnell et al. 1997]. Entitativity can be used to explain both online product integration and value transference.

According to the principle of entitativity, individuals invoke information processing mechanisms when perceived entitativity is low, and they invoke memory-based information processing mechanisms when perceived entitativity is high [McConnell et al. 1994]. In terms of online information processing, a low entitative group is an aggregate of individual entities that tend to be treated separately. That is, no general characterization or stereotype is formed, making transference of the traits between group members more difficult [Crawford et al. 2002]. In contrast, when perceived entitativity is high, users engage in memory-based information processing that involves the abstraction of a stereotype of the group and the transfer of that stereotype across all the entities. Thus, highly

entitative groups are perceived as constituting a coherent unit in which the entities are bonded together. As a result, the transference of a value judgment from one entity to other entities is more efficient for groups with high perceived entitativity.

3. Research Hypotheses

3.1. Effect of Online Product Integration on Perceived Diagnosticity

Consumers' perception of a channel's capability to help them learn about a product is likely determined by their perceptions of the richness of the interfaces because richer media are typically considered more capable of conveying rich information unambiguously [Daft & Wiginton 1979; Daft et al. 1987]. Value-added integration offers additional product features based on the coupling of the two products [Nambisan 2002]. The number of cues or stimuli available for learning about the quality and performance of the extended product is greater with value-added integration than with other integration types. As the number of available cues increases, learning becomes more effective [Moore et al. 1996; Severin 1967]; thus, consumers' understanding of the product will be enhanced. Take the integration between Picasa and Gmail as an example. Picasa users can directly log on to Gmail and easily attach pictures, which they can send out, along with text, by email. Thus, consumers learn about the performance of Gmail through these two additional exercises: logging on to Gmail and attaching pictures through Picasa. Therefore, through the integration of Gmail and Picasa, consumers can gain a better understanding of Gmail. Thus, for the information exposed to consumers, presentations in the value-added integration format are perceived as the richest among these three integration formats.

Data-interface integration facilitates only the dissemination of data across the two products. This minimal level of functional integration makes it more difficult for consumers to learn about the quality and performance of the extended product because the transfer of data is difficult to observe and does not contribute to a learning experience. Thus, we would expect consumers' perceptions of the capability of the focal product to convey useful information about the extended product to be lowest with a data-interface format. Add-on module integration facilitates consumers' understanding of how the extended product performs under integrated working conditions. Although add-on module integration presents a flatter learning curve than data-interface integration, this type of integration cannot provide additional cues or stimuli for learning about the extended product. Therefore, the degree of perceived diagnosticity in the add-on module format falls somewhere between the value-added and data-interface integration formats. Hence, we have proposed the following hypotheses:

H1a: *Product integration in a value-added format leads to greater perceived diagnosticity than product integration in an add-on module format.*

H1b: *Product integration using an add-on module format leads to higher perceived diagnosticity than product integration using a data-interface format.*

3.2. Effects of Perceived Diagnosticity

Perceived diagnosticity refers to consumers' cognitive beliefs that a channel facilitates their product understanding [Jiang & Benbasat 2005]. For the newly extended product, consumers are usually uncertain about product attributes because of the information asymmetry. When the level of perceived diagnosticity is high, consumers are more capable of acquiring full knowledge of product performance and can make more informed decisions. The reduced uncertainty and information asymmetry lower risk perceptions of consumers and increase their expected utility and evaluation of the product [Lu & Lin 2012]. In contrast, when the level of perceived diagnosticity is low, uncertainty about product attributes does not decrease and product evaluation will be harmed because of the high risk perception. Therefore, the impact of perceived diagnosticity on the evaluation of an extended product is positive.

Prior research has indicated that consumers' evaluations of products are positively associated with confidence in their evaluations of product attributes [Kempf & Smith 1998; Smith 1993]. It follows that a high level of perceived diagnosticity will enable the consumer to understand the newly extended product more thoroughly, thereby leading to a more confident evaluation [Jiang & Benbasat 2007a]. Hence, extended product evaluations will benefit from this increase in consumers' confidence. Empirical studies have generally supported the positive relationship between perceived diagnosticity and product evaluations [Jiang & Benbasat 2007b].

Consistent with the literature, the user evaluation was conceptualized in our study as a multi-dimensional construct, capturing three correlated but distinct dimensions – utilitarian value, hedonic value, and social value. In our study, utilitarian value refers to the added effectiveness and efficiency that result from using IT [Mathwick et al. 2001]. Hedonic value relates to the fun or pleasure one experiences from using IT [Davis et al. 1992]. Social value refers to the enhancement of users' social image (i.e., how others view them) through their use of IT [Venkatesh et al. 2003; Shen 2012]. Based on these definitions, user evaluations can summarize a broad set of factors that affect product usage decision-making. This analysis resulted in the following hypotheses:

H2a: *Perceived diagnosticity positively influences utilitarian value of an extended product.*

H2b: *Perceived diagnosticity positively influences hedonic value of an extended product.*

H2c: *Perceived diagnosticity positively influences social value of an extended product.*

3.3. Effect of Online Product Integration on Perceived Entitativity

The extent of the interactions among members of a group is a key variable contributing to the perception of group entitativity [Lickel et al. 2000]. For value-added integration, the level of functional sharing becomes so great that the extended product either modifies or relies on the internal workings of the focal product. Future changes in how the extended product functions require additional changes in the focal product itself [Briand et al. 1999]. When online users see extensive interactions between a focal and an extended product, they perceive the highest degree of entitativity. In data-interface integration, the products share data through parameters or a public interface [Briand et al. 1999; Stevens et al. 1974], and the products are independent. In this case, online users are likely to perceive the lowest degree of entitativity between the focal and extended products. Consequently, these products will be perceived as aggregates of individual products. Although add-on module integration supports comprehensive sharing between products, this integration is achieved externally. Therefore, the degree of perceived entitativity in the add-on module format falls somewhere between the degree perceived in the other two integration formats. Hence, we hypothesized as follows:

H3a: *Product integration in a value-added format leads to higher perceived entitativity than product integration in an add-on module format.*

H3b: *Product integration in an add-on module format leads to higher perceived entitativity than product integration in a data-interface format.*

3.4. Effects of Perceived Entitativity

When perceived entitativity is high, focal and newly extended products are considered to be bonded together in a coherent group. Users may then begin to focus on the similarities among group members rather than on individual attributes. As a result, transference of traits from one group member to another is likely to occur. The values associated with the focal product (e.g., utilitarian, hedonic, social) will be transferred to the newly extended product [Crawford et al. 2002]. Conversely, when perceived entitativity is low, the focal and extended products are perceived as an aggregate of individual units. Therefore, each product will be treated separately and the transfer of values from the focal product to the newly extended product will be more difficult and will increase uncertainty about the values assigned to the extended product. Empirical studies have generally supported a positive relationship between perceived entitativity and trait transference between online products [Song et al. 2009; Stewart 2003]. For example, Stewart [2003] reported that a perceived relationship positively influences trust transfer between a linker and a linked. Song et al. [2009] found that perceived interaction positively affected the perceived useful transference between products sharing the same brand. The above analysis resulted in the following hypotheses:

H4a: *Perceived entitativity positively influences the utilitarian value of an extended product.*

H4b: *Perceived entitativity positively influences the hedonic value of an extended product.*

H4c: *Perceived entitativity positively influences the social value of an extended product.*

3.5. Evaluations and Usage Intention

According to the theory of reasoned action (TRA) [Ajzen 1991], evaluations, viewed as the antecedent belief, are expected to affect a person's attitude toward an entity, which in turn influences the person's behavioral intention toward the entity [Jarvenpaa et al. 2000]. In general, favorable evaluations of a product lead to a greater intention to use the product simply because consumers can perceive the benefits of using it [Fishbein & Ajzen 1975; Lu et al. 2012]. Of course, according to TRA, other variables, in addition to the three evaluations, such as subjective norms and attitude, may also emerge as important factors, depending on the research context [Sun & Spears 2012; Venkatesh et al. 2003]. However, this study examined only the essential set of user evaluations and focused on its core topic; that is, influence of product integration on intention to use the extended product. Empirical studies of online services have generally supported the hypothesis of a positive relationship between evaluation and behavioral intention [Kim et al. 2005]. Accordingly, we expect that the same logic applies in the present context. Thus, we have proffered the following hypotheses:

H5: *The utilitarian value of an extended product has a positive effect on the intention to use the extended product.*

H6: *The hedonic value of an extended product has a positive effect on the intention to use the extended product.*

H7: *The social value of an extended product has a positive effect on the intention to use the extended product.*

3.6. Control Variables

To avoid the high risk of failure in introducing a new product, some online firms have attempted to take advantage of consumers' recognition of previously introduced brands to facilitate the entrance of new products into the market [Aaker & Keller 1990; Czellar 2003]. Therefore, to fully account for the differences among brands and

product categories, we included two control variables representing, respectively, attitude toward the brand and perceived fit of the extended product with the focal product. The entire research model is shown in Figure 1.

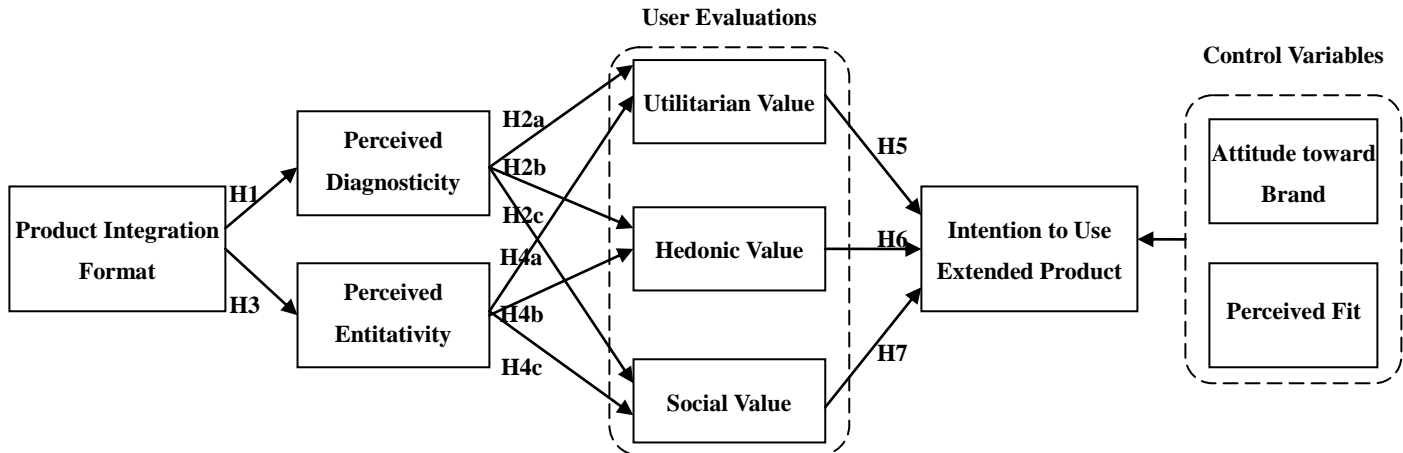


Figure 1: Research Model

4. Research Method

We conducted a quasi-experiment to test the preceding hypotheses. This design was adopted because it allowed us to manipulate key variables and control extraneous variables. We used a 3-level (data-interface integration, add-on module integration, value-added integration) between-subjects full-factorial design. A total of 190 students from a public university participated in the experiment. Specific demographic information is given in Appendix A. Prior to the study, the participants were informed that they would each receive a \$5 reward for their participation.

4.1. Manipulations and Measures

We used a scenario-based method to operationalize technology-product integration. This method is often used in information systems research [Parboteeah et al. 2009; Xu et al. 2010]. We manipulated the three integration formats (data-interface, add-on module, and value-added) through different scenarios. A search engine (www.baidu.com) and two of the newly extended products (an online encyclopedia and an ecommerce website) were adapted to create the different scenarios.

In the *data-interface integration scenario*, the vendor uses only one hyperlink to promote the new products. If users want to use the extended products after logging onto the search engine, they must click on the links (see section 1 of Appendix B for illustration). In the *add-on module integration scenario*, a popup messenger was provided to promote the new products. If users want to use the promoted products, they must click on the links listed in the messenger (see section 2 of Appendix B). In the *value-added integration scenario*, the vendors supply additional features based on the coupling of the products. For the integration between search engine and online encyclopedia, when users conduct a search through the search engine, links to the online encyclopedia again emerge as search suggestions. Hence, users can find an explanation of the searched term in the online encyclopedia directly, without visiting the online encyclopedia webpage (see Section 3 of Appendix B). For the integration between search engine and ecommerce website, when users search for a product through the search engine, the links associated with the product on the ecommerce website appear as search suggestions. Therefore, users can find the product on the ecommerce website directly, without logging on to the homepage of ecommerce website.

The theoretical constructs were operationalized using validated items from prior research. Minor wording changes were made to adapt the measures to the current investigation. All questionnaires used a seven-point Likert scale. The specific items employed are presented in Appendix C.

4.2. Procedure and Tasks

Participants were told that complete instructions were provided online and that they should read these instructions carefully and complete the task independently. Because there were two product evaluation tasks, the order in which the participants examined the products was randomized, such that half examined the search engine and ecommerce website integration first, whereas the other half examined the search engine and online encyclopedia integration first. After participants logged on to our online system, a cover story was provided. This is a commonly used procedure in marketing research. The participants were asked to assume the role of potential user. For the search engine and ecommerce website integration, participants were told that they needed to navigate through the

search engine to find and log into the ecommerce website and then to browse the digital camera at their own pace. For the search engine and Chinese encyclopedia integration, participants were told to navigate through the search engine and log into the Chinese encyclopedia and then find the descriptions about subprime mortgage crisis at their own pace. Next, they were introduced to the integration used for the promotion, which was presented in the form of a website to enhance realism. 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 computer program logged the participants' access clicks to all the URLs to ensure that they had actually read the instructions for their assigned condition. Finally, the participants were asked to complete the post-session questionnaire, which consisted of the measures described above. After testing was completed, 185 questionnaires are valid, yielding 370 (185×2) observations for analysis.

5. Data Analysis and Results

5.1. Manipulation Checks

To ensure that the participants attended to the product integration formats, a manipulation check by an analysis of variance (ANOVA) was conducted in the post-session questionnaire, with product integration format as the independent variable and perceived integration level as the dependent variable. The analysis revealed a significant effect of integration format on perceived integration level ($F(2, 367) = 6.35, p < .01$), with value-added integration ($Mean = 5.11, S.D. = 1.19$) significantly superior ($p < .01$) to add-on module integration ($Mean = 4.67, S.D. = 1.26$) and data-interface integration ($Mean = 4.38, S.D. = 1.20$). These results show that the manipulation of product integration format was successful. To further test the learning effect due to the order by which subjects examined products, we used t-tests to compare the different respondent orders based on their perceived integration level, and found no significant differences between the two groups. A Mann-Whitney test also revealed no significant difference in their perceived integration level.

5.2. Measurement Model

To ensure the validity of our measures, we followed the recommendation of Anderson & Gerbing [1988] by preceding the hypothesis tests with a test of the measurement model for all multi-item constructs. First, a confirmatory factor analysis (CFA) was conducted to test the convergent and discriminant validity of items. The results for the tests of convergent validity are presented in Table 1, where it is shown that the criteria suggested by Anderson & Gerbing [1988] were met. The standardized factor loadings were statistically significant, the composite factor reliability (CFR) and Cronbach's alpha exceeded 0.7, and the average variance extracted (AVE) exceeded 0.5 for each factor. Thus, the convergent validity of our measures was confirmed.

Table 1: Convergent Validity

Construct	Item	Std. Loadings	CFR	Alpha	AVE
Perceived Diagnosticity	DIA 1	0.849	0.906	0.843	0.764
	DIA 2	0.857			
	ENT 1	0.916			
Perceived Entitativity	ENT 2	0.631	0.813	0.717	0.598
	ENT 3	0.747			
	UV 1	0.851			
Utilitarian Value	UV 2	0.869	0.871	0.856	0.819
	UV 3	0.864			
	HV 1	0.843			
Hedonic Value	HV 2	0.865	0.869	0.857	0.887
	HV 3	0.846			
	HV 4	0.858			
Social Value	SV 1	0.862	0.858	0.834	0.884
	SV 2	0.866			
	SV 3	0.802			
Intention to Use	INTU 1	0.866	0.860	0.817	0.823
	INTU 2	0.868			

We used the method proposed by Lastovicka & Thamadaran [1991] to cross-check discriminant validity. They suggested the use of the Average Variance Extracted (AVE), which provides information about the amount of variance in items that are explained by the construct. For every construct, if the square root of its AVE is greater than its correlation with other constructs, discriminant validity is established [Fornell & Larcker 1981]. The results listed

in Table 2 show that the square roots of the AVEs, reproduced on the diagonal, meet this criterion.

Table 2: Construct Correlations

	DIA	ENT	UV	HV	SV	INTU
Perceived Diagnosticity (DIA)	0.874					
Perceived Entitativity (ENT)	0.444	0.773				
Utilitarian Value (UV)	0.512	0.413	0.905			
Hedonic Value (HV)	0.579	0.349	0.548	0.942		
Social Value (SV)	0.383	0.225	0.497	0.517	0.940	
Intention to Use (INTU)	0.569	0.339	0.676	0.703	0.469	0.907

Diagonal elements are the square roots of the average variance extracted (AVE)

The correlations of intention to use with utilitarian value (0.676) and hedonic value (0.703) are relatively high. As both dependent and independent variable data were collected from the same participants, common method variance is a potential problem. Following Podsakoff & Organ [1986], we used Harman's one-factor test to examine the extent of this bias. The results of the principle component analysis indicate common method variance is not a problem, because several factors with eigenvalues greater than 1 were identified and no single factor accounted for a large chunk of the variance.

5.3. Impacts on Perceived Diagnosticity and Perceived Entitativity

The results of the ANOVA show that integration format significantly affected perceived diagnosticity. Post-hoc Scheffé tests (see Table 3) revealed: (1) value-added integration is associated with higher level of perceived diagnosticity than data-interface integration and add-on module integration; (2) add-on module integration is not associated with higher level of perceived diagnosticity than is data-interface integration. Thus, H1 is partially supported.

Table 3: Results on Perceived Diagnosticity

(I) group	(J) group	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower bound	Upper bound
1 Data-Interface (mean = 5.02)	2	-0.15	0.17	0.82	-0.60	0.30
	3	-0.58(*)	0.17	0.00	-1.03	-0.13
2 Add-on Module (mean = 5.17)	1	0.15	0.17	0.82	-0.30	0.60
	3	-0.43(*)	0.17	0.05	-0.88	0.02
3 Value-Added (mean = 5.60)	1	0.58(*)	0.17	0.00	0.13	1.03
	2	0.43(*)	0.17	0.05	-0.02	0.88

* p < 0.05.

Results of the repeated-measures ANOVA on perceived entitativity further suggest that integration formats significantly affected perceived entitativity. Post-hoc Scheffé tests (see Table 4) further revealed that: (1) value-added integration is associated with higher level perceived entitativity than data-interface integration and add-on module integration; (2) perceived entitativity in the add-on module integration is not higher than that of the data-interface integration. Thus, H3 is partially supported.

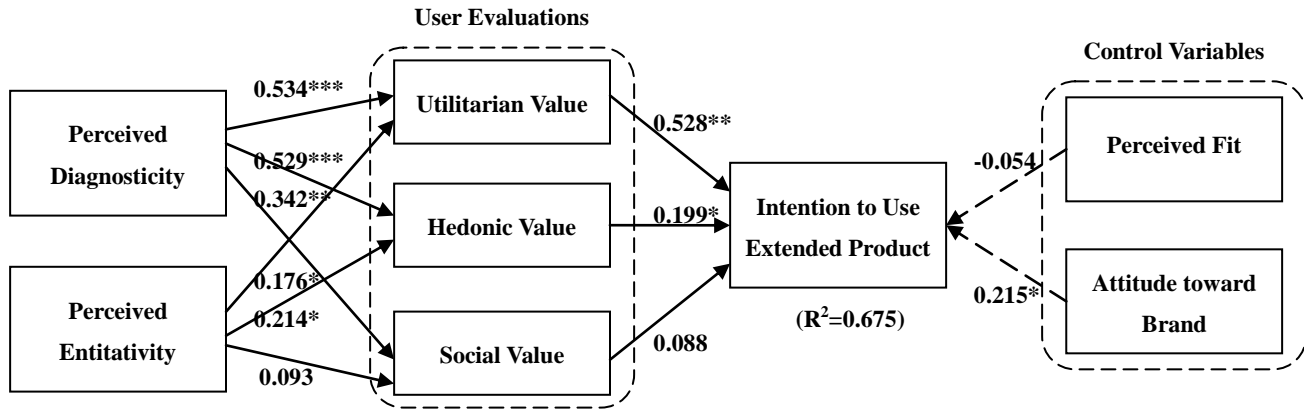
Table 4: Results on Perceived Entitativity

(I) group	(J) group	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower bound	Upper bound
1 Data-interface (mean = 4.96)	2	-0.06	0.12	0.83	-0.29	0.17
	3	-0.40(*)	0.12	0.03	-0.62	-0.16
2 Add-on module (mean = 5.02)	1	0.06	0.12	0.83	-0.17	0.29
	3	-0.34(*)	0.12	0.05	-0.56	-0.10
3 Value-added (mean = 5.36)	1	0.40(*)	0.12	0.03	0.16	0.62
	2	0.34(*)	0.12	0.05	0.10	0.56

* p < 0.05.

5.4. Effects of Perceived Diagnosticity and Perceived Entitativity

The confirmation of the measurement model allowed us to proceed to an assessment of the structural model, which was tested by structural equations modeling (SEM) using PLS Graph Version 3.0. Figure 2 presents the estimated standardized path coefficients. As shown in Figure 2, most of the hypothesized paths in the research model were found to be statistically significant. As predicted, perceived diagnosticity has a significant influence on the perceived utilitarian value (0.534), hedonic value (0.529), and social value (0.342) of the new extended product. Perceived entitativity had a significant influence on utilitarian value (0.176) and the perceived hedonic value (0.214) of the extended product. Thus, Hypotheses 2a, 2b, 2c, 4a, 4b are supported. Utilitarian value (0.528) and hedonic value (0.199) both had a significant influence on intention to use the extended product. Thus, Hypotheses 5 and 6 are supported.



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

Figure 2: Standardized PLS Solutions

Among the control variables, attitude toward brand yielded a significant coefficient for all the paths. We speculatively attribute this finding to the fact that, when the extended product is launched, consumers evaluate it based on their attitude toward the brand. If the brand is associated with a favorable attitude, the extended product should benefit. The R^2 values show that perceived utilitarian value, perceived hedonic value, and attitude toward brand explain 67.5% of the variance in intention to use the extended product.

To further demonstrate the reliability of the results, a multi-group analysis for differences across products was conducted. Because the variances do not differ significantly across groups, t -tests were applied to assess the differences for each pair of path coefficients. Results show that there is no significant path difference between the e-commerce website and the online encyclopedia samples. This finding indicates that the main results remain robust across different subsamples.

6. Discussion and Conclusions

6.1. Discussion of Findings

First, our results indicate that the paths from perceived entitativity to utilitarian value (0.176) and hedonic value (0.214) are significant, suggesting that value transference is critical to consumer evaluations of an extended product. However, the larger coefficients for the paths from perceived diagnosticity to utilitarian value (0.534) and hedonic value (0.529) imply that, compared with value transference, learning efficacy has a more pronounced effect on consumer evaluations. Previous studies have investigated various web-based presentation formats on consumers' learning and understanding [Jiang & Benbasat 2005; Jiang & Benbasat 2007a]. For example, Jiang and Benbasat (2007b) investigated online product presentations and found that both vividness and interactivity can increase perceived diagnosticity. However, few substantial empirical studies have examined the consequences of online product integration. Compared with online product presentation, at least two distinct characteristics exist for online product integration. First, online product presentation usually focuses on providing detailed information for a physical product in an e-commerce website, while online product integration tries to ensure a sense of coupling between online information products. Because of the different aims and different types of products, the formats of online product integration differ from those of online product presentation. Second, online product presentation mainly triggers consumers' learning process. However, for online product integration, except for learning the

integrated product through the coupling of information products, consumers may naturally treat the focal and integrated products as a coherent group. This may also trigger the value transference process. These distinctions frame our contributions by combining three different types of product integration in one comparison set and by integrating learning efficacy and value transference perspectives to explain product integration's impact on consumers' evaluations of the extended product.

Second, among the three evaluation criteria, we did not find support for the influence of social value on intention to use the extended product, a finding consistent with Kim et al. [2005]. Research has shown that the salience of utilitarian, hedonic, and social value varies according to the research context [Venkatesh & Brown 2001]. For example, based on user evaluations of two online news websites, Kim et al. [2005] found that social value had little impact on the intention to use news sites. Given that the three types of value are not all expected to be relevant in a given context, this result is not surprising. Since the estimated path from utilitarian value to usage intention (0.528) is relatively stronger than the estimated path for hedonic value (0.199), we interpret this finding to mean that utilitarian value is a primary value driver in new product usage intention and hedonic value is a secondary value driver that needs to be considered.

Finally, contrary to our prediction, we did not find that add-on module integration was better than data-interface integration in facilitating learning efficacy and value transference. Thus, H1b and H3b were not supported. A possible reason for these null results may be that, in our controlled context, data interface integration and add-on integration shared a similar interface design, except for the pop-up window and hyperlinks. Vendors may have limited choices to enhance the overall value and provide additional features to end users; therefore, in these two types of integration, the functional sharing between focal and promoted products is relatively low. They also offered no additional features that might help users understand how the extended product works in the integrated context. Facing this loose interaction between products and limited additional features, online users are likely to perceive no significant differences between the effects of the two integration conditions on learning efficacy and value transference.

6.2. Implications for Research

The theoretical implications of this study are multifold. First, by revealing the linkage among product integration design, user cognitive processes, and behavioral intention, this study offers a new mechanism for exploiting the user base. Due to low entry barriers and easy imitation of product offerings, online firms often focus on building a user base as quickly as possible. Prior research has focused on several specific strategic initiatives used to create a user base, such as entry timing, pricing, management of expectations, and enhanced product quality [Schilling 2002]. Although the focal product with the larger user base offers a larger potential pool of adopters for newly extended products, user base size may be an insufficient predictor of future growth for a newly extended product [McIntyre & Subramaniam 2009]. Few studies have investigated how to achieve the synergy from product line extension and extend leadership from one product to the other. Little is known about the role of cross-product design in taking advantage of existing traffic. Our study represents an effort to investigate the role of product integration design in exploiting the user base through learning efficacy and the value transference perspective.

Second, this research advances our understanding of consumer responses to two-sided markets, an important information product design strategy widely discussed in recent economic and marketing literature. The key assumption behind such two-sided markets is the existence of cross-product elasticity, which means that the evaluations of two products are correlated [Parker & Van Alstyne 2005]. However, few studies have focused on antecedents of cross-product elasticity. According to the findings of our research, product integration can facilitate the value transference from a focal product to a newly extended product and enhance evaluations of the newly extended product. Thus, value-added integration can increase cross-product elasticity effectively. Consequently, multi-product vendors can increase cross-product elasticity via product integration, thus increasing the overlapping usage population, and gain additional profits.

Finally, this study suggests a way to contribute to brand extension research from the product design perspective. Over the past decade, brand extension has become a subject of increasing interest and scholarly investigation for marketing researchers; however, many previous studies have failed to take into account important background factors that could significantly impact the generalizability of the findings [Czellar 2003, Song et al. 2010]. After controlling the differences among brands and product categories, our research identifies a cognitive process for the effects of product integration on consumer intentions to use newly extended products. Thus, in viewing product integration as one important design element, this study enhances the existing literature by developing formal conceptualizations for design factors that pertain to online brand extensions.

6.3. Implications for Practice

Our study also has important implications for business practices. First, this research argues that cross-product integration enables a newly extended product to reach the focal product's user base faster and more effectively.

Compared with other integration formats, value-added integration increases the coordination costs between products and calls for extensive sharing of technical knowledge and careful modification of the focal product. Therefore, initial design and development of the focal product should be flexible enough that firms can rapidly integrate their newly extended products with the focal product to respond to changing environments [Ceccagnoli et al. 2012]. Among the different architectures for product design, a modular architecture is characterized by its standardized interfaces between components. Modular architecture offers an effective way to reduce complexity and to increase flexibility in design by decomposing a product into components interconnected through prespecified interfaces [Tiwana 2008]. Hence, product designers can choose the modular architecture to ensure the flexibility of the focal product and free up cognitive resources to focus on providing value-added features.

Second, with the fast development of multimedia and Internet technologies, developers have an increasing collection of tools through which to offer additional product features. For example, recent Internet-based virtual reality (VR) technologies have made it possible for consumers to feel, touch, and try physical products on commercial websites. Our results show that, compared with value transference, learning efficacy has a more pronounced effect on consumer evaluations of newly extended products. Therefore, it is critical for product managers to consider learning efficacy in the first step of cross-product promotion design. Developers need to focus on providing additional features that can facilitate consumers' product understanding and decrease the level of difficulty in evaluating products.

Finally, this study suggests a way to maximize the value of a company's consumer base from the product design perspective. In recent years, customer value management has been one of the most heavily researched themes within marketing science [Verhoef et al. 2007]. Generally, the value of a multi-product customer depends on (1) the duration of the vendor-customer relationship (length of relationship), (2) the usage level of consumed products (depth of the relationship), and (3) the number of different products bought from the same provider (breadth of the relationship). Most models in the customer value management literature, however, do not consider product design. Product design clearly affects consumer behavior. This research confirms the influence of product integration on consumer intentions to use newly extended products. Hence, this study prompts a new mechanism for online providers to explore the potential value of existing consumers: the idea that online multi-product providers can make use of a value-added integration approach to promote newly extended products effectively and increase the breadth of the vendor-customer relationship.

6.4. Limitations and Future Research

Our study has several limitations. First, it was a quasi-experiment based on a search engine, an e-commerce website, and an online encyclopedia. As a result, caution is required in generalizing these findings to other technology products. Other factors, such as the characteristics of the experimental tasks and the background environment, can play a role in determining the intention to use an extended product. Therefore, replication of this study in other contexts is necessary before the results can be generalized to other types of technology products and settings. Second, as with recent research on location-based services, a scenario-based approach is appropriate at the initial adoption stage for information products and services [Xu et al. 2010]. However, we believe that such an approach cannot trigger a real transaction for participants and simplifies what goes on in real online promotions, once again limiting the generalizability of our results. Using a longitudinal field study to complement the limitations of a scenario-based method would produce more reliable and meaningful results. Finally, in the last few years, the holistic experience of technology, as captured by constructs such as enjoyment and flow, has been studied in computer-mediated environments. These experiences have been recommended as an important metric for assessing online consumer behavior [Hoffman & Novak 1996]. Future research should examine the influence of online product integration on consumers' enjoyment of technology products that interact with each other (i.e., the state of flow).

6.5. Conclusion

In contrast to the proliferation of cross-product integration worldwide, little is known about relationships between product integration and the cognitive and behavioral measures of users. This study has focused on the effects of three product integration formats currently used online to address consumers' intention to use an extended product. Drawing on the perspectives of learning efficacy and value transference, we have proposed a research model and validated it in a scenario-based experiment. We hope that more researchers will examine this underexplored area of cross-product integration and that our theoretical framework will serve as a useful conceptual tool for their endeavors.

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Appendix A: Participant Profile (n = 185)

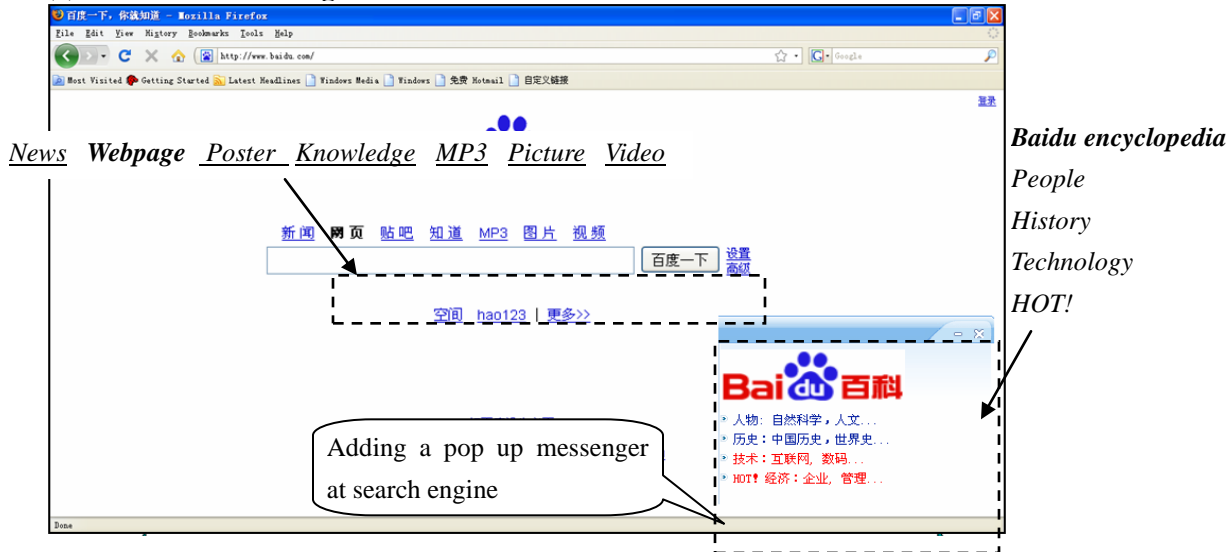
Demographic Variables	Category	Frequency (Percent)
Gender	Male	97 (52.4%)
	Female	88 (47.6%)
Education	Bachelor	124 (67.0%)
	Master and Higher	61 (33.0%)
Age	18 and below	4 (2.2%)
	18-24	115 (62.2%)
	25-30	50 (27.0%)
	31 and higher	16 (8.6%)
Internet Experience	Less than 3 years	23 (12.4%)
	3-5 years	71 (38.4%)
	6-8 years	60 (32.4%)
	More than 9 years	31 (16.8%)
Internet Usage (Each Day)	Less than one hour	24 (13.0%)
	One to three hours	112 (60.5%)
	More than three hours	49 (26.5%)

Appendix B: Screenshot of the search engine and online encyclopedia integration

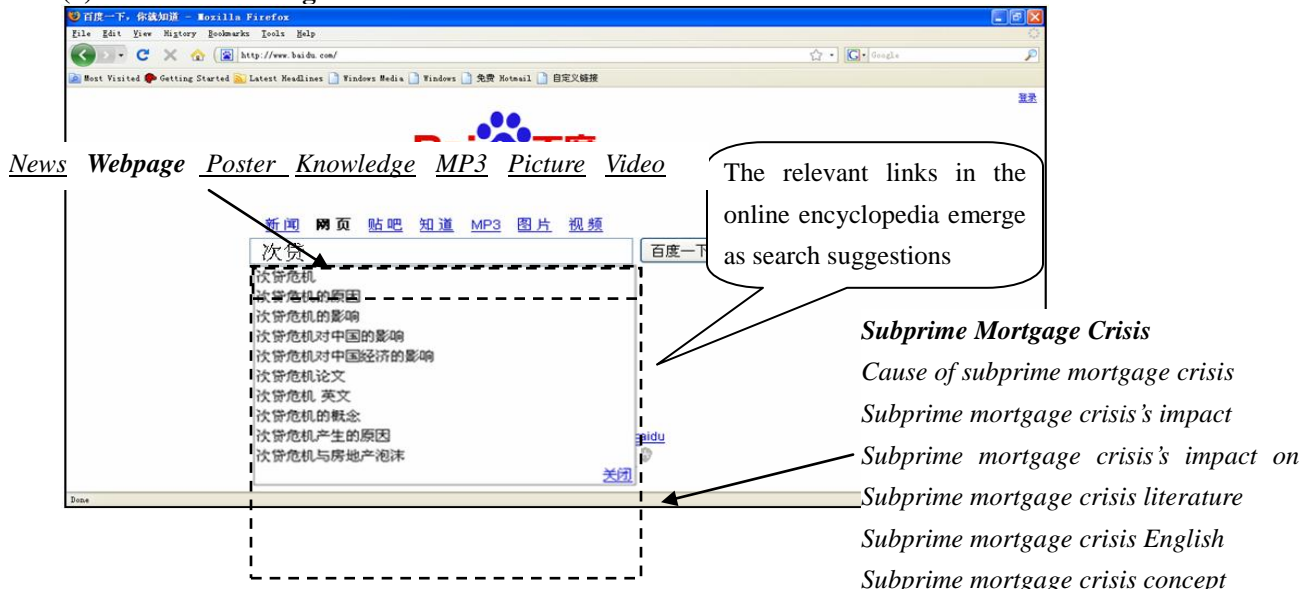
(1) Data-interface integration



(2) Add-on module integration



(3) Value-added integration



Appendix C: Measurement items

Intention to Use the Extended Product Source: Wixom & Todd [2005]

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

Perceived Diagnosticity Source: Jiang & Benbasat [2007a]

1. The existing product is helpful for me to evaluate the extended product.
2. The existing product is helpful in familiarizing me with the extended product.
3. The existing product is helpful for me to understand the performance of extended product.

Perceived Entitativity Source: Stewart [2003] and Song et al. [2009]

1. These two products have a strong relationship with each other.
2. The existing main product is not connected to newly launched products. (Reverse coded)
3. The existing main product is likely to recommend newly launched products to individuals.

Utilitarian Value Source: Mathwick et al. [2001], Kim et al. [2005]

1. All things considered, this extended product would provide very good value.
2. Using this extended product would be worth my time and effort.
3. It would be of value for me to use this extended product.

Hedonic Value Source: Davis et al. [1992], Kim et al. [2005]

1. Using this extended product is fun.
2. Using this extended product is a joy to me.
3. Using this extended product is enjoyable.
4. Using this extended product is very entertaining.

Social Value Source: Perse [1990], Kim et al. [2005]

1. Using this extended product makes people hold me in high regard.
2. Using this extended product enhances the image which others would have of me.
3. Using this extended product helps me to show others who I am.

Attitude toward the Brand Source: Crites et al. [1994]; Zhang et al. [2008]

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

Perceived Fit Source: Aaker & Keller [1990]

1. Global similarity between the parent brand and the extended product.
2. Would the people, facilities, and skills used in making the original product be helpful if the online service provider were to supply the extended product?
3. Extent to which parent-brand-specific associations are relevant in the extension category.