Testing the moderating effects of toolkits and user communities in personalization: The case of social networking service

Yonggui Wang a,1, Dahui Li b,*

a Department of Marketing, Business School, University of International Business and Economics, Beijing, China
b Labovitz School of Business and Economics, University of Minnesota Duluth, Duluth, MN 55812-2496, United States

A R T I C L E   I N F O

Article history:
Received 15 January 2012
Received in revised form 27 August 2012
Accepted 9 December 2012
Available online 26 January 2013

Keywords:
Personalization
Social networking service
Leading edge status
Customization toolkits
Co-creation
User innovation

A B S T R A C T

Firms are increasingly seen to provide customization tools for customers to personalize products and service tailored to the customers’ specific needs. How to attract and empower customers into the personalization process and how to improve the effectiveness of personalization are important for firms. The current study examines the moderating effects of two popular enabling approaches implemented by firms, customization toolkits and user communities, on the relationship between the effectiveness of personalization and two innovative customer characteristics, of leading edge status and user knowledge. Using data collected from 308 Chinese customers who participate in the personalization of social networking service, we found that toolkits had a marginal but positive moderating effect, and user communities had no significant moderating effect on the relationship between leading edge status and personalization effectiveness. However, both toolkits and user communities had significant and positive moderating effects on the relationship between user knowledge and personalization effectiveness. The implications of the findings for research and practice are discussed.

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1. Introduction

The implementation of internet technologies, especially web 2.0, in customer–firm interactions has changed the roles played by customers in a firm’s production and innovation process [41,67]. Customers are increasingly seen as a firm’s co-producers and co-creators of products and services [25,44,46,54,67]. Firms usually provide tools for customers to customize and personalize individualized products and services in order to meet customers’ specific needs [57,58]. Previous studies have reported various practices of co-creation and co-design between customers and firms, as well as personalization and self-design by customers, such as snowboarding, mountain-biking, kite surfing, Apache software, scientific instruments, library systems, and petroleum processing equipment [16,23,24,30,32–34,39,53,60].

How to design and improve the co-creation and personalization process is important for both practitioners and researchers. Previous studies have found that co-creation and personalization are more likely to emerge among knowledgeable users who have the domain knowledge about the products and services to be used or consumed [32,51], as well as among lead users whose needs are not satisfied by the default products and services but expect to benefit from developing some solutions to change the products and services [15,39,40,49,53,56]. Lead users can be measured by leading edge status (LES), which refers to the degree to which a user exhibits lead user characteristics in terms of exploring new ways to solve problems and expecting benefits of new products ahead of other users [40]. Other studies have revealed that various resources and supports provided by a firm, such as developing advanced toolkits for customization and building communities among customers, are effective mechanisms for co-creation and user innovation [14,26,41,59,62]. A customization toolkit is a set of design tools provided by the firm for customers to play, after design and personalize products and services [59]. User communities work as central hubs for customers to share knowledge and experience and provide feedbacks for customized design and personalization [13,16,65].

Despite these findings, there is a lack of research in how these factors interact in the co-creation and personalization process, except for several studies [16,19,26]. For example, Franke et al. [16] find that integrating the feedbacks from peer users complements the role of customization toolkits in one’s own design of products. Füller et al. [19] find significant moderating effects of lead user characteristics on the relationship between task involvement and tool support, as well as that between perceived empowerment and the intention to participate in innovation. Jeppesen [26] finds that customer interactions in communities enhance the impact of firm’s supporting toolkits.
As far as these limited findings are concerned, the knowledge about the possible interactions of these factors is sparse. It is noteworthy that previous studies have noticed such ignorance. Previous literature suggests that the research on toolkits and that on user communities ‘should not be examined in isolation’ [16, p.555] and calls for research to investigate the interaction effects of toolkits and user communities. To our best knowledge, we have not seen any investigation in how user toolkits and user communities moderate the direct effects of LES and user knowledge on the outcome of co-creation and personalization. To fill these gaps, we develop an integrated research model based on the theories in the literature of user-centered innovation [60], lead user theory in particular [49,56], as well as the co-creation literature [67]. Our research question is: how do toolkits and user communities moderate the relationship between LES and effectiveness of customer personalization, as well as the relationship between user knowledge and the effectiveness?

We conducted an empirical study in the context of personalizing social networking service (SNS). There are three reasons to focus on this particular context. First, SNS shares the basic characteristics of conventional service, such as intangibility, heterogeneity, simultaneity, and variability [10]. It is a representative of online services in the web 2.0 era. Second, SNS is an emerging area where internet service providers recognize the heterogeneity of customer preferences and try to engage customers through personalization processes in order to obtain customer loyalty. Facebook, for example, provides Instant Personalization service for users to capture tailored information according to their preferences. Third, the market size of SNS is also significant. Gartner Corporation estimated that there were one billion social media users worldwide, and the total revenue from worldwide social media market reached $16.9 billion in 2012 [20]. The competition in the social media market has pushed providers to constantly introduce new forms of technologies and innovations [20]. Therefore, our examination of SNS has significant practical implications. The findings from this type of service may be applied to other services.

In addition, we collected data from China, which has the largest internet user population. China also is the biggest and most active market of SNS, which has been well developed in different platforms and regions [6]. While this market has some unique characteristics in terms of consumer behavior, site content, and service platforms, the strategy to gain competitive advantages in the Chinese SNS field is similar to that in the West [6]. The findings from such a context may be generalizable to other similar services in the West.

The contribution of the study is twofold. First, our study of how the four factors interact on the effectiveness of customer personalization responds to the recent research paradigm shift from the direct effects to the interaction effects [16,19,26]. Such a shift is able to unveil the complexity of co-creation and personalization, as well as uncover the synergetic issues in co-creation and personalization processes. This cannot be simply revealed in terms of the direct effects of the antecedent factors. Further, Zwass [67] calls for empirical research to evaluate the impacts of co-creation processes, and design research to develop coordination mechanisms to facilitate value co-creation. In response, our study seeks to evaluate how firms’ supporting toolkits and firm-sponsored communities interact with customer specific factors. The findings of this study may shed light on future research to develop specific methodologies and toolkits to support personalization.

Second, the findings of the interaction effects may assist business managers decision making. Understanding the differential effects of toolkits and user communities on different segments of users classified in terms of LES and user knowledge may help decision makers to better allocate firm resources to different groups of users and provide customized supporting resources for different segments. While business managers cannot manipulate the traits of innovative customers, such as LES and user knowledge, they can purposely leverage technological factors, such as toolkits and user communities, which may complement customers’ innovation and personalization abilities.

The structure of the paper is as follows. The next section provides a literature review of theoretical and empirical studies of user innovation and co-creation. The research model and relevant hypotheses are then developed. We then report an empirical study conducted in China, followed by data analysis. Finally, we draw some conclusions and implications.

2. Literature review

2.1. Two types of individualization of online services

Companies are increasingly engaged in developing virtual services and products to meet users’ heterogeneous requirements by means of individualizing webpages, virtual products, and services. One type of individualization is automatically conducted by personalization technologies that the company implements to analyze the data collected from users, such as user profile, preference, and online behavior. In such case, the company takes the active role in the individualization process, although the user may provide some personal data to complement the personalization process. Because most of the data for personalization are collected implicitly by the company without the user’s awareness, the user may have privacy concerns about this type of personalization [66].

Another type of individualization of online services is implemented with the user’s active participation in the personalization process. In the context of SNS, such as Facebook and MySpace, the company usually provides a default template of the virtual space for an individual user. In addition, the company also makes available a set of personalization tools to users, e.g., Instant Personalization by Facebook. Users can proactively personalize the designs of virtual spaces and products if they do not accept the default. In this case, users are not passive consumers but active creators of personalized contents, products, and services.

In the process of such self-design, users can not only utilize the existing features of the tools for customization but also enhance the features and functions of the toolkits [44,46]. In addition, the firm also provides various virtual communities and discussion forums for users to interact with peer users and expert users. These communities work as the platforms for firms to broadcast and market new designs of products and services developed by users.

It is noteworthy that such self-design and personalization are different from customization, which asks a user simply to choose from a set of available features of the products and services to define the user’s requirements [45,46]. Instead, the practice of personalization creates opportunities for customers to be actively involved in the process and experiment with the tools provided by the firm. Such interactions between the users and the firm are frequent rather than one time, active rather than passive. Personalization is, therefore, more about the experience of the co-creation of the content, rather than the outcomes of the co-creation process, which may include various types of products and services [46]. This personalized co-creation experience is believed to be “the source of unique value” [46, p.10].

2.2. Co-creation and user innovation

The research of user-centered innovation and users’ participation in value co-creation has gained growing attention from different academic areas [e.g., 18,41,44,46,54,67]. Because co-creation is related to user innovation, which has been studied extensively in the prior literature, we review these two streams of literature as the theoretical background for our study of the effectiveness of customer personalization.

Customers have become active participants in a firm’s production and innovation process [46,67]. Co-creation can be defined as activities in which customers are involved for the design and production of superior value they desire by utilizing their knowledge and other resources with either peer customers or firms that seek value creation [46,67]. The value achieved from such co-creation process shifts from a
firm-centric perspective, which emphasizes the quality of firm’s products and service, to personalized customer and consumer experiences [45,46]. Co-creation experiences are the basis for extracting economic values for the firms [46]. As Prahalad and Ramaswamy state, “what has emerged as the basis for unique value to consumers is their experience (which is contextual)” [46, p.9]. They also suggest that “high-quality interactions that enable an individual customer to co-create unique experiences with the company are the key to unlocking new sources of competitive advantage” [46, p.7].

In the case of co-creation between customers and firms, von Hippel and his colleagues [57,60] first introduce the term of ‘user innovation’ to describe the phenomenon where users, either consumer users or industrial users, work as the sources of a firm’s innovation in the development of new products in both consumer markets and industrial markets. One stream of the user innovation literature investigates user characteristics. Innovative user characteristics, such as lead users, LES, as well as customer or user knowledge, are found to be significantly related to user innovation [16,32,39,49,53]. Another stream of literature examines various firm supports and resources, such as toolkits, especially mass customization tools, to facilitate user innovation [59,62]. Firms also build various user communities, so that users with similar demands and interests are able to communicate, exchange information, assist one another in the innovation and co-creation process [13,16,27].

2.2.1. Lead user theory and leading edge status (LES)
Lead user theory [53,56] states that user innovation is more likely to emerge among lead users, who face needs and demands, which are not met by the providers of the product and service. Lead users also expect to benefit from obtaining solutions to these needs and demands. The productivity of new product development can be enhanced if lead users are involved [60]. Recently, scholars have introduced leading edge status (LES) to describe lead users [39,40]. LES refers to the extent to which a user applies innovative technology to solve problems and the degree to which the user expects the benefits from the innovation earlier than the rest of the users [40]. Users with high LES usually have strong interest in the development of products or services [60] and make significant contributions to the actual development [15,40]. These users are also capable of developing commercially attractive innovations [15,31].

2.2.2. User knowledge
User knowledge refers to the body of knowledge possessed by a user when the user needs to make decisions about using or buying a product and service [31,49]. It is another important factor for user-centered innovation and co-creation. Knowledgeable users have the potential to be involved in product or service development activities, because such knowledge is necessary for any innovative products [3]. Sternberg [50] states that a customer’s knowledge in a specific area is an indicator of the customer’s qualification to be involved in product development, as well as the likelihood of user innovations [28,32,47,50]. Lüthje [32] posits that innovative users can be discriminated from non-innovative users in terms of user knowledge. Franke et al. [15] find that a user’s technical expertise is able to predict the likelihood of user innovation. It is noteworthy that user knowledge and LES are different concepts. User knowledge is an antecedent of leader user characteristics, such as LES, and is a necessary but not sufficient predictor [32,40,49].

2.2.3. User toolkits
Besides the focus on user characteristics, firms also develop various toolkits for user innovations [59,62] and mass customization [16], so that firms can transfer certain design and development tasks to users. These tools are usually defined as a set of design tools that a user can play and interact with in order to individualize a product or service according to the user’s preference, such as the customization tools for Nike products and Dell computers [16]. There are five features of a typical toolkit [60]. First, a toolkit helps users to go through the development process by means of trial-and-error experimentation and observe the consequences of their design. Second, a toolkit usually includes a library of standard and commonly-used modules as the fundamental components of the products or services, and these modules are available to the user, so that the user can focus on the important and unique parts that are relevant to their needs. Third, the toolkit has an appropriate solution space, which includes a group of limiting factors but provides the flexibility for the provider to produce the desired results. Fourth, a toolkit is user-friendly, and it is easy for users to apply the skills and knowledge they already possess rather than having to learn different skills and languages. Fifth, the results of using a toolkit have to be easily created after the design is converted into the production. Using such a toolkit, users can design their own products to fit their individual needs, leading to greater satisfaction [14]. In addition, Prügl and Schreier [47] find that some innovations based on toolkits can not only satisfy an individual’s demands but also attract peer users.

2.2.4. User communities
Recently, firms have built various online communities to encourage users to participate in new product development. User communities are very helpful for knowledge sharing among existing users and information exchange with potential users who are outside of the community [13,60]. This contributing behavior is based on the anticipated benefits of collective actions [63]. Individuals are motivated to gain reputation in the community, as well as to enjoy the process of helping others [22,64]. In addition, they are embedded in a social network in the community or across many different communities, so that their participating behavior in the community may help maintain and gain their social capital [64]. As the size of the community and interrelationships among community users grow with increased communications, a critical mass may emerge [48]. User communities also facilitate users to provide assistance to peer users [27,29]. Generally, peer user interactions can facilitate problem-solving and create conditions for superior co-created value [16]. Franke et al. [16] suggest that providing peer-based feedback on preliminary design solutions will positively enhance user innovation. Wu and Fang [65] find a positive relationship between consumer-to-consumer interactions on idea generation.

3. Conceptual model and hypotheses
In this section, we develop a contingent research model to examine the effectiveness of customer personalization based on the theory and findings from prior user innovation and co-creation literature [16,32,33,39,49,53,60]. The research model shown in Fig. 1 describes personalization effectiveness as the outcome variable, as well as the relationships between effectiveness and the four variables of LES, user knowledge, toolkit support, and community support.

![Fig. 1. The conceptual model.](image-url)
3.1. The moderating effect of toolkit support on the relationship between LES and effectiveness

Toolkits are integrated sets of design, prototype, and testing tools intended for end users, so that a non-specialist user can be involved in product co-design [12,14,16,17,26,59,60,62]. Toolkits for custom design enable both firms and users to be more effective in the joint design process [14,17,25,58]. Firms proactively decompose the design process into different tasks and outsource requirement-collection tasks to users, so users can concentrate on need-related information and firms on solution-related information. Equipped with a toolkit featured with the five components mentioned above [57,58,60], users can apply a toolkit “in conjunction with their rich understanding of their own needs to create a preliminary design, simulate or prototype it, evaluate its functioning in their own use environment, and then iteratively improve it until they are satisfied” [60, p.148].

As mentioned above, the positive relationship between LES and the impact of user innovation has been reported in the prior literature [39,40,49]. We argue that this positive effect may increase when proper toolkits are introduced and utilized by lead users, because toolkits enable users to address the issues of both heterogeneity of customer preferences and sticky information in a much more successful manner.

Customers at the front of the market usually have plenty of real world experience with a need, and, therefore, they are in the best position to possess more accurate information about customer needs [23,53]. However, such information is difficult to encode, transfer, and decode between lead users and providers in joint product and service development [14,58]. Users may feel it is much easier to translate needs and demands formulated in their own language, rather than into the technical specifications in the languages of engineers from the firm side. Thus, they may actively and freely experience the self-creative process with the support of available toolkits. Therefore, toolkits can overcome the problem of information stickiness, enable users to focus more on product, and empower these users to create their own desired product features [26].

On the other hand, literature in the economics of innovation argues that the investment of any individual in innovation activities depends heavily on the estimate of its potential benefits [35]. Being ahead of the majority of the market enables lead users to expect significant benefits by obtaining a solution to those needs. Such expectation of benefits, which may be economic, psychological and social, constitutes a key factor discriminating innovative from non-innovative users [32]. It also drives lead users to invest much more time and effort in seeking and developing innovative solutions [19,33,35,53,56]. With the toolkits offered by a firm, lead users may be empowered to devote more resources and utilize these resources. The pre-existing capability and degree of freedom built into a given toolkit, such as standardized modules, enable lead users to freely produce a customized design by combining various logic elements and standard design modules until a satisfactory solution is reached [51,62]. Thus resource utilization might be improved as well, which enhances inevitably the positive effect of leading edge status on the effectiveness of personalization. At the same time, users may have considerable freedom to design possible solutions customized to meet their unique preferences in a precise and iterative manner. Therefore, we hypothesize

**H1.** Toolkit support positively moderates the relationship between LES and effectiveness.

3.2. The moderating effect of toolkit support on the relationship between user knowledge and effectiveness

Knowledgeable users are particularly capable of understanding sticky information, conceiving substantial new product solutions for future markets, and even matching an available solution to a problem at a lower cost [28]. As mentioned above, toolkits address the issue of stickiness of information. Customers with sophisticated knowledge about the unmet requirements and the potential solutions to address these requirements do not need to be involved in the tenuous process of transferring the knowledge to the firm side. Instead, these knowledgeable customers can be more focused on the development of creative solutions, and feel much more involved and empowered if a user toolkit for innovation is offered [26]. They may be stimulated to increase their inclination of innovating and seeking solutions to their unsatisfied needs accordingly, since the pre-existing capability and standardized modules built into a given toolkit might enable them to feel comfortable in achieving their personalized design. Therefore, the effects of user knowledge on personalization effectiveness can be enhanced by the availability of proper toolkits for co-creation.

Knowledgeable users may be more aware of and skillful with the functions of the toolkits, and thus, have an even higher freedom to apply the modules in the toolkit to their own personalized design [51,59,62]. Because toolkits provide rapid and effective feedback and evaluation of the solutions provided by users, knowledgeable users may also find it easier to express their creative ideas and actively experience innovative solutions. Toolkits may, therefore, facilitate the application of user knowledge in a more effective manner to solve the product development task transferred to them.

**H2.** Toolkit support positively moderates the relationship between user knowledge and effectiveness.

3.3. The moderating effect of community support on the relationship between LES and effectiveness

In addition to toolkits, prior studies have shown that user communities represent a large pool of product know-how and information sharing [27]. Participants in such communities can also develop their social capital based on the sophisticated social network that these participants have built in the communities [64,65]. By means of establishing successful communities, firms can involve their customers in product innovation and provide feasible and cost-effective supporting activities [42,55]. This may enhance the positive effect of LES on personalization effectiveness.

Surrounded by the social network of peer users in a specific user community, lead users may have increased opportunities to understand and detect the heterogeneity of customer needs by means of interacting with peer users [48]. These customer needs cannot be captured by lead users if they are not embedded into the social network with other users. Understanding other customers’ needs also allows lead users to be more confident in how they are positioned in the market and how they can benefit significantly by innovating a solution to those needs [18,56]. Lead users may take some central positions in knowledge transfer and diffusion in the social network of these communities. Such positions may help lead users to understand the market. Therefore, they may be actively driven to solve the need. On the other hand, lead users may be less likely to innovate and refuse to devote their scarce resources to innovation activities when they think innovative tasks are difficult [61]. Within active user communities, the perception of technical difficulty in seeking and developing possible innovative solutions may be relatively lower. Therefore, user communities can enhance the relationship between LES and personalization effectiveness by reducing the subjective perception of technical difficulty and encouraging lead users to devote more resources to their own innovations.

Both social capital theory and social network theory suggest that community participants usually have a high level of engagement and loyalty toward the firm [2,13,16,63,64] because they can obtain such benefits as learning, social integrative, personal integrative, and hedonic benefits from the specific community [41,42]. Users may enjoy the process of joint innovations and obtain material or psychological rewards, and even reputation effects, in exchange for
assistance within a community [21]. These rewards may motivate them to devote more resources (tangible and intangible) to innovations of their own. In addition, the user community also strengthens the personalization effects and positive perceptions of the outcomes of co-creation [17]. Therefore, user communities may exert significant influence on the relationship between LES and personalization effectiveness.

H3. Community support positively moderates the relationship between LES and effectiveness.

3.4 The moderating effect of community support on the relationship between user knowledge and effectiveness

User communities can also positively enhance the effect of user knowledge on personalization effectiveness by improving the effectiveness and efficiency of knowledge acquisition and utilization. This can be accomplished by means of the social capital that an individual user establishes in the communities, which may increase knowledge contribution to personalization effectiveness. Knowledgeable customers usually get more recognition from peer customers, attract more external support, and thus, show stronger motivations for user innovation [13,47] because they may take some important positions in the social network. Customers with better knowledge also provide useful feedback, referrals, and help to other customers in the social network [2,5,36].

In the innovation process, knowledgeable customers can rely on the social capital and the social network to access and obtain resources and support from other users within a specific community [2,13,16,63,64]. One such resource is the knowledge from peer users, which may complement the knowledge possessed by a customer who is in the process of co-creation and personalization and developing an innovation. A customer’s participation in a community also provides the customer the opportunity to seek innovation-related assistance. For example, experts who are outside of the community may be referred to the customer by other community members through bridges of different social networks [21]. These expert users or lead users may provide more instructive and valuable knowledge for the successful creation of new design or solutions an individual user undertakes.

Prior studies have also explored different types of incentives for users to reveal their innovations in user communities, for instance, gaining reputation, recognition, and benefits derived from knowledge sharing [21,27,31,41,42,63]. The free sharing of innovation-related information refines and improves innovations by customers. Franke et al. [16] find that peer assistance from a community appears extremely useful in the formation of an initial idea, the evaluation of a preliminary design solution, and the iterative improvement of creative solutions. Jeppe sen and Laursen [28] also find that search and integration of knowledge from different external sources (for instance, user communities) can increase the knowledge contribution made by innovative users. Thus, we hypothesize

H4. Community support positively moderates the relationship between user knowledge and effectiveness.

4. Methodology

4.1 Data collection

We collected data from customers of Tencent, a major internet service provider in China. The company provides a variety of value-added services related to Internet and mobile phone, including social networks, portals, e-commerce, and online games. The most well-known product of the company is its instant messenger tool, i.e., QQ. In this study, we examined Qzone, which is Tencent’s multi-media SNS portal (http://qzone.qq.com/). Similar to Facebook and MySpace, Qzone enables users to customize their own spaces, define different color schemes, write blogs, post albums, and share music and video players, without paying any fee.

Different from Facebook and MySpace, the company segments Qzone users into different categories and levels. Certain levels of users, such as Canary Diamond Customers (http://qzonevip.qzone.qq.com/), must pay fees to the company to implement more enhanced features, functions, and designs by means of more advanced customization toolkits provided by the company, into their individualized Qzones. For example, Canary Diamond Customers can create their own customized templates for virtual spaces and design individualized avatars.

We selected several screenshots of the customization toolkits available at Qzone for customers to personalize their virtual spaces (Fig. 2). The first screenshot shows the layout of Qzone customization toolkits (‘Decoration’ is the term used by the company). A customer can choose any ‘General’ layout designed by the company, buy special decoration schemes from the ‘Mall’, change color, or perform more sophisticated personalization from the ‘Advanced’ setting. The second screenshot shows the available functions inside the ‘Advanced’ setting. There are many choices, such as ‘Choose template’, ‘Adjust layout’, ‘Add/Remove module’, or customizing other things such as ‘transparency’, ‘background’, ‘title’ and ‘navigation’. The third screenshot shows that if a customer uses the ‘Add/Remove module’, the customer can select ‘Basic module’ compiled by the company, or ‘Customized module’ where they can add their own modules into the design of their space. The typical module a customer can personalize includes pictures, text, flash, audio, and video.

In addition, the company also develops a large set of virtual products such as farms, houses, avatars, clothing, accessories, skin, floatages, and ornaments, which can be purchased from the ‘Mall’ by the users to integrate into the decoration of their online spaces. The users purchase these virtual products using a particular currency developed by the company. In addition, competent users, such as some Canary Diamond Customers who know how to program, can also develop their own products and programming codes based on some built-in functions and modules. The company also provides its own virtual community and authorizes various third-party virtual communities (e.g., http://qzone.net.cn/) for these users to exchange their ideas and broadcast their product design. The company also markets top designs from these users in its own communities (http://qzone.qq.com/).

We obtained a commercial list of active Canary Diamond Customers, from which we randomly identified and invited 1000 customers to join our study. To motivate participation, we offered a prepaid rechargeable cellphone card with the value of 20-yuan to each successful response. The questionnaire, which was in Chinese, was sent to customers via email. In preparation of the final survey, two Chinese scholars who were fluent in English translated all the scales, which were originally developed in English to Chinese. Two other Chinese scholars who were also fluent in English were asked to translate the Chinese version of the scales back to English. These two scholars were also asked to translate the scale of toolkit support, which was developed in Chinese in this study, to English. Discrepancies in the translations processes were discussed and amended among the scholars.

A total of 361 responses were received, 37 of which were removed because of lack of experience in designing their own Qzones or lack of knowledge of Qzone code. Sixteen were excluded from data analysis because of missing data. A total of 308 valid responses were kept in the final sample (response rate = 30.8%). We show the profile of these respondents in Table 1. In order to address non-response bias, we categorized respondents as early responses and late responses and did not find significant differences between the two groups [4].

4.2 Measures

We adapted existing scales to measure some of the research constructs if the scales were available in English. We also conducted interviews with three experts and 30 experienced Qzone customers in the development and refinement of the scale of toolkit support in
Choose template
Adjust layout
Add/Remove module
Advanced
Decoration
General
Mall
Color
Advanced
Current

Fig. 2. Selected screenshots of customization toolkits.
Chinese. We used a five-point Likert scale for all the scales with 1 representing “strongly disagree” and 5 representing “strongly agree,” respectively. The measures, as well as the sources of these measures, are shown in Table 2.

We measured personalization effectiveness as the extent to which a customer effectively reveals and describes their own lifestyle, photos, and virtual spaces with the supporting tools from the firm. Personalization effectiveness can be explored and measured by either the firm or the customer. We followed the perspective of customers and adopted four items in the previous literature [16,31,38,52] to measure effectiveness, because the respondents were involved in the personalization experience, or more specifically, in the self-design process of personalized Qzone spaces.

Besides, among the valid responses, we obtained 31 URLs of the respondents’ Qzone spaces. We then asked several Qzone experts to evaluate these online spaces in terms of originality and novelty and as a good model for creativity. We found significant correlation between expert-evaluated and self-reported personalization effectiveness. This suggested that the scale of personalization effectiveness perceived and reported by users was consistent with the objective measure of personalization effectiveness by external experts, and therefore, we were confident in the self-reported results of users. Given research budget constraints, we did not collect the rest of the URLs and did not ask our experts to evaluate the rest of the responses.

To measure LES, we used three items adapted from prior research [14,15,40,47,57]. User knowledge was measured using three items adapted from prior studies [15,32,37,43]. We adopted four items from previous studies [13,15,26,27] to measure community support.

The scale to measure toolkit support was not available when we conducted the study. Therefore, we developed a scale in Chinese following the standard scale development process. In this study, we focus on toolkits for user personalization and define them as a set of user friendly design tools that allow a trial-and-error experimentation process and deliver immediate simulated feedback on the outcomes of design ideas in an interactive manner [14,16,47,51,59,62]. The toolkit enables users to come up with new ideas through trial and error. In total, six items were identified as the initial pool from an in-depth review of the toolkit literature [12,14,16,26,47,51,59,62], as well as interviews with experts and customers. We then ran a pilot test with 60 Qzone users, which were not included in the final sample. After running an exploratory factor analysis on the six items, three items were retained, with the eigenvalue greater than 1.0. The three items explained 66.78% of the total variance. Furthermore, we examined nomological validity based on well-grounded theoretical reasons to expect a positive association between toolkit support and outcomes of user innovation [14,26,47,59,62]. We found that toolkit support was positively correlated with personalization effectiveness (correlation coefficient was 0.45 and regression coefficient was 0.25, p > 0.01).

In addition, we also included several control variables, of gender, education, and age of responding, customers, as well as their reliance on the before Internet.

5. Data analysis and results

5.1. Scale validation

We ran a confirmatory factor analysis on the scales. The results are shown in Tables 2 and 3. In order to evaluate construct reliability, we
checked composite reliability. The results show that composite reliability of the scales ranged from 0.81 to 0.89 (Table 2), which were all above the recommended minimum value of 0.7 in the literature [11]. For convergent validity, both factor loadings and average variances extracted (AVE) were examined. Table 2 shows that, except for two items, standardized factor loadings were more than 0.70. In addition, AVE ranged from 0.57 to 0.68, above the recommended value of 0.50. Therefore, good convergent validity was achieved in the study [11]. Finally, we evaluated discriminant validity by comparing the square root of AVE of each construct and the correlations of this construct with other constructs [11]. Table 3 shows that the values of the square roots of AVE were higher than the correlations, which are good indicators of discriminant validity.

We also examined the issue of common method bias. Our analysis of the one-factor test found that five factors explained 35.07% of the variance with no single factor explaining more than 20% of the variance. This implies that the potential problem of common method variance was not significant in the current study.

5.2. Hypotheses testing

After the satisfactory validation of our scales, we followed the guidelines to conduct a moderated multiple regression analysis to test the research hypotheses [7] with all the independent variables and moderating variables standardized to minimize multicollinearity before creating interaction terms [11]. We also checked VIF in all estimated models, which were below 3, suggesting that multicollinearity was not an issue in our analyses. Results are shown in Tables 4 and 5, respectively.

Table 4 shows the results of several regression models with toolkit support as the moderator. Following the prior procedure [1], we found that the $R^2$ differences in Model III ($\Delta R^2 = 0.011$, p $< 0.05$), Model IV ($\Delta R^2 = 0.033$, p $< 0.01$), and Model V ($\Delta R^2 = 0.035$, p $< 0.01$), compared with the base Model II without any interaction terms, were statistically significant, respectively. We then examined the significance of the interaction terms in the three models. Model III reveals a positive interaction effect between LES and toolkit support ($\beta = 0.107$, p $< 0.05$). However, the interaction term was insignificant in Model V. Therefore, H1 was partially supported. In Model IV, the interaction effect between user knowledge and toolkit support was significant ($\beta = 0.199$, p $< 0.001$). In Model V, the same interaction effect was also significant ($\beta = 0.245$, p $< 0.001$). Therefore, H2 was supported.

To better understand the significant moderating effects, we plotted Fig. 3 based on Model III and Model IV. As the plot suggests, the relationship between LES and personalization effectiveness was much stronger at high level of toolkit support while it became weaker at low level of toolkit support. The relationship between user knowledge and personalization effectiveness was much stronger at high level of toolkit support than that at low level of toolkit support.

Similarly, Table 5 shows the results of the moderating effects of user community support. We found that the $R^2$ increase in Model III, compared with base Model II, was not statistically significant. However, the $R^2$ increases in Model IV ($\Delta R^2 = 0.013$, p $< 0.01$) and Model V ($\Delta R^2 = 0.013$, p $< 0.05$) were significant. Model III and Model V revealed that the interaction effect between LES and user community support was not significant. Therefore, H3 was not supported. However, the interaction effect between user knowledge and user community support was significant in both Model IV and Model V (p $< 0.05$). Therefore, H4 was supported. A plot (Fig. 4) was drawn to show the interaction effect.

6. Discussions

To our best knowledge, this study is one of the first to empirically examine the moderating effects of both toolkit support and user community support on customer personalization. However, we have only found marginal support for the moderating effect of toolkit support on the relationship between LES and personalization effectiveness. The moderating effect was significant in Model III but insignificant in Model V, when the interaction effect of user knowledge and toolkit support was considered. In other words, the effect of LES on personalization effectiveness was not improved when user knowledge was established or only marginally enhanced when toolkit support was introduced. In addition, the moderating effect of user community support on the relationship between LES on personalization effectiveness was not supported. The possible explanations may be as follows. In a study of experiential creation, Dahl and Moreau [8] found that when a target outcome is dictated or controlled, consumer’s perceived autonomy, perceived competence, and overall task enjoyment may be relatively low. Accordingly, intrinsic motivation and its effect on users may be low, as well. The componential theory of individual creativity [3] also explains that extrinsic motivations from social environments play significant roles in creativity and innovation besides

| Table 3 |
| Correlation matrix and descriptive statistics of variables. |

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Std</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Leading edge status</td>
<td>2.56</td>
<td>0.69</td>
<td>0.81</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. User knowledge</td>
<td>3.07</td>
<td>0.71</td>
<td>0.55</td>
<td>0.77</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Toolkit support</td>
<td>3.34</td>
<td>0.60</td>
<td>0.40</td>
<td>0.41</td>
<td>0.62</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Community support</td>
<td>3.32</td>
<td>0.63</td>
<td>0.33</td>
<td>0.39</td>
<td>0.42</td>
<td>0.75</td>
<td></td>
</tr>
<tr>
<td>5. Personalization effectiveness</td>
<td>3.13</td>
<td>0.67</td>
<td>0.58</td>
<td>0.48</td>
<td>0.45</td>
<td>0.49</td>
<td>0.81</td>
</tr>
</tbody>
</table>

Note: p $< 0.01$; square root of average variance extracted (AVE) is on the diagonal.

To our best knowledge, this study is one of the first to empirically examine the moderating effects of both toolkit support and user community support on customer personalization. However, we have only found marginal support for the moderating effect of toolkit support on the relationship between LES and personalization effectiveness. The moderating effect was significant in Model III but insignificant in Model V, when the interaction effect of user knowledge and toolkit support was considered. In other words, the effect of LES on personalization effectiveness was not improved when user knowledge was established or only marginally enhanced when toolkit support was introduced. In addition, the moderating effect of user community support on the relationship between LES on personalization effectiveness was not supported. The possible explanations may be as follows. In a study of experiential creation, Dahl and Moreau [8] found that when a target outcome is dictated or controlled, consumer’s perceived autonomy, perceived competence, and overall task enjoyment may be relatively low. Accordingly, intrinsic motivation and its effect on users may be low, as well. The componential theory of individual creativity [3] also explains that extrinsic motivations from social environments play significant roles in creativity and innovation besides

| Table 4 |
| Hierarchical regression analysis results. |

<table>
<thead>
<tr>
<th></th>
<th>Personalization effectiveness</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Model I</td>
</tr>
<tr>
<td></td>
<td>$\beta$</td>
</tr>
<tr>
<td>Reliance on network</td>
<td>$-0.004$</td>
</tr>
<tr>
<td>Gender</td>
<td>$-0.112$</td>
</tr>
<tr>
<td>Education</td>
<td>$-0.049$</td>
</tr>
<tr>
<td>Age</td>
<td>$0.103$</td>
</tr>
<tr>
<td>LES</td>
<td>$0.352$</td>
</tr>
<tr>
<td>User knowledge</td>
<td>$0.203$</td>
</tr>
<tr>
<td>Toolkit support</td>
<td>$0.225$</td>
</tr>
<tr>
<td>LES $\times$ Toolkit support</td>
<td>$0.107$</td>
</tr>
<tr>
<td>User knowledge $\times$ Toolkit support</td>
<td>$0.199$</td>
</tr>
</tbody>
</table>

| R square | 0.025 | 0.386 | 0.397 |
| Adjusted R square | 0.01 | 0.369 | 0.377 |
| $\Delta$R-square | 0.361 | 0.011 | 0.033 | 0.035 |
the intrinsic motivation that resides in one’s own personality. In some contexts, when extrinsic motivation for an activity increases, intrinsic motivation may decrease [9].

In our study, toolkit support may be perceived more as a controlling, rather than an enabling, extrinsic motivator to lead users. Although toolkits include some commonly-used modules, which provide a certain level of flexibility for users, these toolkits are designed with a certain level of functionalities and tailored for a specific purpose [60]. The toolkits developed by the firm may not reach the expectations perceived by lead users [47], although these toolkits may be helpful to other user groups. The built-in procedures and directions mandated by the toolkits, or some commonly-used modules of toolkits, may be perceived as constraints or limitations by lead users. Therefore, toolkit support may become less important for lead users than for ordinary users. As previous literature suggests, the design freedom provided by toolkits may not be of interest to all users, and the toolkit’s capability may simply stay unused unless a user has sufficient incentive to evoke and employ the toolkits [60]. Therefore, a lead user’s sense of self determination may be undermined [9].

Similarly, user communities may also incur some constraints on lead users. Although lead users can obtain more information, knowledge, and even ideas from user communities, these external resources may limit their capability to maximize their imagination. Extrinsic incentive such as the reward, recognition, and feedback from the user communities may distract lead users from focusing on creativity and innovations. These users may perceive some constraints or pressure from peer users. The reputation and respect they earn from user communities may signify some attempts to control their behaviors. After interacting with other community users, lead users may observe opportunistic and free riding behaviors. They may be reluctant to devote their scarce resources to innovation activities.

In addition, the componential theory of individual creativity [3] also provides two more explanations. First, according to the theory, negative effects may emerge when intrinsic motivation is relatively weak, vague or ambiguous. In our study, customization and personalization of the virtual space may not be challenging enough to engage lead users in the customization process. Such weak intrinsic motivation may lead to

Table 5
Hierarchical regression analysis results.

<table>
<thead>
<tr>
<th></th>
<th>Model I</th>
<th>Model II</th>
<th>Model III</th>
<th>Model IV</th>
<th>Model V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reliance on network</td>
<td>−0.044</td>
<td>−0.054</td>
<td>0.088</td>
<td>0.096</td>
<td>0.099</td>
</tr>
<tr>
<td></td>
<td>1.389</td>
<td>1.501</td>
<td>0.114</td>
<td>0.113</td>
<td>1.766</td>
</tr>
<tr>
<td>Gender</td>
<td>−0.112</td>
<td>−1.725</td>
<td>−0.002</td>
<td>−0.007</td>
<td>−0.019</td>
</tr>
<tr>
<td></td>
<td>−0.033</td>
<td>−0.131</td>
<td>−0.019</td>
<td>−0.367</td>
<td>−0.018</td>
</tr>
<tr>
<td></td>
<td>−0.771</td>
<td>−0.346</td>
<td>−0.049</td>
<td>−0.794</td>
<td>−0.771</td>
</tr>
<tr>
<td>Education</td>
<td>0.103</td>
<td>1.205</td>
<td>0.034</td>
<td>0.04</td>
<td>0.049</td>
</tr>
<tr>
<td></td>
<td>0.506</td>
<td>0.586</td>
<td>0.729</td>
<td>0.698</td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>0.363</td>
<td>6.386</td>
<td>0.351</td>
<td>6.002</td>
<td>0.349</td>
</tr>
<tr>
<td></td>
<td>6.157</td>
<td>6.136</td>
<td>0.356</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LES</td>
<td>0.162</td>
<td>2.656</td>
<td>0.154</td>
<td>2.483</td>
<td>0.15</td>
</tr>
<tr>
<td></td>
<td>2.474</td>
<td>1.56</td>
<td>0.156</td>
<td>5.502</td>
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<tr>
<td>User knowledge</td>
<td>0.319</td>
<td>5.840</td>
<td>0.328</td>
<td>5.899</td>
<td>0.316</td>
</tr>
<tr>
<td></td>
<td>5.828</td>
<td>0.308</td>
<td>0.356</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Community support</td>
<td>0.046</td>
<td>0.872</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>−0.039</td>
<td>−0.062</td>
</tr>
<tr>
<td>LES × Community support</td>
<td>0.117</td>
<td>2.319</td>
<td>0.139</td>
<td>2.226</td>
<td></td>
</tr>
<tr>
<td>User knowledge × Community support</td>
<td>0.025</td>
<td>0.427</td>
<td>0.042</td>
<td>0.44</td>
<td>0.44</td>
</tr>
<tr>
<td>Adjusted R square</td>
<td>0.01</td>
<td>0.411</td>
<td>0.41</td>
<td>0.421</td>
<td>0.42</td>
</tr>
<tr>
<td>ΔR-square</td>
<td>0.402</td>
<td>0.002</td>
<td>0.013</td>
<td>0.013</td>
<td></td>
</tr>
</tbody>
</table>

Fig. 3. (a) Moderating effect of toolkit support on LES and effectiveness. (b) Moderating effect of toolkit support on user knowledge and effectiveness.

Fig. 4. Moderating effect of community support on user knowledge and effectiveness.
some negative effects, which will counteract the positive effects of toolkit support or user community support. Second, extrinsic motivators, compared with intrinsic motivation, are most useful at certain stages of the innovation process, which has high degree of appropriateness [3], such as gathering background information or validating a chosen solution. In comparison, at stages such as initial problem formulation or the generation of ideas which require greater novelty, it may be wise to reduce extrinsic motivators since intrinsic motivators usually play the most important role [3]. The current study is focused on the stage where personalization occurs, which requires greater novelty and intrinsic motivation.

7. Implications

It is important to develop an efficient co-creation and personalization environment and to organize, coordinate, and direct the co-creation process. Following the call of Zwass [67], we take an initiative to investigate the roles of toolkits and user community support, both of which are technology-enabled factors and can be implemented from the perspective of customer personalization.

7.1. Implications for research

This study extends prior lead-user studies, which follow primarily the person-centered approach to explore the role of a firm’s innovation environment. As mentioned earlier, lead user theory [53,56] tends to follow the conventional wisdom of creativity, which believes that user innovation is more likely to emerge among lead users rather than ordinary users. Therefore, most empirical studies are focused predominantly on the major characteristics of innovative users [32,39,40,53,56]. Our research model, however, considers both personal characteristics (LES and user knowledge) and innovation environment features (toolkits and user communities).

Second, although previous studies have proposed that there may be moderating effects of customization toolkits and user communities on co-creation or personalization [59,60], the moderating effects have not been analyzed empirically. We believe that this paper fills a research gap. In particular, we have found that the moderating models (Model V in Tables 4 and 5) had satisfactory explanation powers of the variances in personalization effectiveness, which were significantly higher than those models without the moderating effects respectively (Model II in Tables 4 and 5, respectively). This suggests that our research model with the moderators explained some level of variances, which were not observed by the direct-effect models in the extant literature. Our proposed research model is therefore more powerful than the models, which only examine direct effects. Although a few exceptional studies have begun to combine different research streams of user innovation [26,27], the focus is not on the interaction effects of user features and firm factors. We posit that it is useful to explore these moderating effects in order to reveal the complex relationships among these determinant factors in co-creation.

7.2. Implications for practice

Prior person-centered approach offers limited implications for managers who are concerned with helping users to become more innovative in the user innovation and co-creation and personalization process [14,25,42,55,57,60,64]. The findings of this study demonstrate that toolkits and user communities are two important mechanisms for the practice of co-creation and personalization.

We suggest that managers improve the design of firm-supported toolkits. They need to be aware that the default toolkits provided by firms may not be effective for different groups of users. Different users may need to have different types of toolkits, which match with their level of knowledge about co-creation and personalization. The toolkits constructed by firms seem to be more useful for customers with a certain level of knowledge in the innovation process than for other customers whose knowledge is above or below the level of the functions and features of the tools. Customers with better knowledge of co-creation and personalization may expect more sophisticated toolkits. In agreement with Prügl and Schreier [47], we suggest that firms make different types of toolkits available to different user groups. In particular, firms should provide sophisticated toolkits to lead users and provide lead users the freedom to develop their own toolkits. At the same time, relatively higher toolkit support should be provided and ready to use for knowledgeable users.

Similarly, user communities have different impacts on different user groups. User communities seem to be more useful for customers with a certain level of knowledge of co-creation and personalization. For novice customers of co-creation, strong user community supports may negatively affect their participation in the community and the effectiveness of personalization. On the other hand, if experienced customers can actively participate in user communities, they may learn more from other community members whose advice and suggestions may contribute considerably to co-creation and personalization. Therefore, firms need to develop different strategies to encourage customers with certain knowledge of co-creation and personalization to be involved in user communities.

In addition, we suggest that firms pay attention to those customers with innovative characteristics. Some customers who are not lead users currently may have the potential to contribute to superior co-creation and personalization, as long as they have sufficient knowledge. Managers may even take some action, by means of designing and optimizing toolkits and user communities, to educate potential users and to make it possible for them to accumulate and update sufficient user knowledge in their innovation process. When developing their strategy to identify lead users, firms may expand the scope to identify potential knowledgeable customers as innovators.

Finally, managers should be aware that co-creation and personalization are a complex system. The successful identification of innovative users, no matter whether the user is a lead user or ordinary user with sufficient knowledge, represents only the first important step in co-creation and personalization management. Managers also need to achieve synergy between users and the innovation environment. It is unrealistic to develop a highly creative pool of users simply by initiating the same level of toolkit and community support without considering leading edge status and user knowledge. Managers can actively provide users with sufficient firm resources to stimulate and facilitate the creative process, such as the development and refinement of toolkits and user communities.

7.3. Limitations

The following limitations should be considered when interpreting and applying the research findings. First, we tested the contingent research model in the case of SNS. Although SNS shares the common features of service with other conventional services, it is not clear how the contingent model explains personalization effectiveness in other service contexts, such as traditional offline services. It is not clear whether the model can be applied to the context of products. However, the core constructs in the research model are all based on the prior user-innovation literature, which has investigated a variety of products and services. Future studies can address the issue in other contexts. Secondly, our data were collected from Chinese users of Qzone. These users may be different from users in other countries and those who use other SNS, given different cultural orientations and backgrounds. Future studies can examine how cultural factors, both national level and individual level, can be tied into the research model. Other popular SNS sites could also be examined. Third, we relied on a user’s subjective self-report to measure the research constructs and did not adopt objective measures. A potential limitation may be related to the issue of common method variance. However, our examination of the one-factor
analyzed suggested that common method bias was not present in the current study. Future studies can consider and improve the research design by means of collecting data from multiple sources and apply objective measures of personalization effectiveness to explore possible differences. Finally, future studies can continue to investigate the weak moderating effect of LES in the research model from both conceptual and empirical perspectives. We also suggest that contemporary analysis tools such as SMARTPLS, which is capable of analysis of the moderating effects, may be applied in future data analysis.

References

Yonggui Wang is a professor of marketing at the University of International Business and Economics in Beijing. He received his Ph.D. in service marketing from City University of Hong Kong. His current research is on service management, value co-creation, and customer relationship management. He has published papers in *Psychology and Marketing*, **Information Systems Frontiers**, **Journal of Engineering and Technology Management**, and so on.

Dahui Li (dli@d.umn.edu) is a professor of MIS at the University of Minnesota Duluth. He received his Ph.D. in MIS from Texas Tech University. His current research focuses on business-to-consumer relationships, online communities, and the diffusion of innovation. He has had papers published in the *Journal of the Association for Information Systems*, **Communications of the ACM**, **Decision Sciences**, **Decision Support Systems**, **International Journal of Electronic Commerce**, and elsewhere.