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Winter 12-4-2016

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### **Recommended Citation**

Jia, Qiong; Guo, Yue; and Barnes, Stuart J., "E2.0 Post-Adoption: Extending the IS Continuance Model Based on the Technology-Organization-Environment Framework" (2016). *ICEB 2016 Proceedings*. 3. <https://aisel.aisnet.org/iceb2016/3>

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## **E2.0 Post-Adoption: Extending the IS Continuance Model Based on the Technology-Organization-Environment Framework**

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### **ABSTRACT**

This paper extends the IS continuance model to improve our understanding of the determinants of E2.0 post-adoption. Our proposed research model incorporates four constructs into the IS continuance model: firm size, firm scope, subjective norms and competitive pressure based on the TOE framework. Results from a survey of customers of a leading E2.0 in China supported our model. We find that organizational and environmental context factors including subjective norms and competitive pressure significantly influence enterprises' intention to renew their E2.0 service. Perceived usefulness and satisfaction are no longer the strongest predictors of continuance usage in the context of enterprise system.

*Keywords:* Post-adoption intention; Enterprise 2.0; TOE; IS continuance; Subjective norms; PLSPM.

### **INSTRUCTIONS**

In recent years, Web 2.0, one of the most significant information technology innovations in the Internet Age – spearheaded by such applications as Facebook, LinkedIn, and Twitter – has rapidly permeated people's lives [1][11][14][15][17][36][64]. A growing number of business companies have begun to apply various Web 2.0 applications to support regular business operations, such as internal communication, team collaboration, project management and information sharing. However, consumer-market, individual-based Web 2.0 applications are not well suited to the enterprise context, due to such problems: compatibility, security, scalability and functionality [20][46]. Correspondingly, Enterprise-level 2.0 applications (E2.0) have been designed and developed by adapting the technologies and philosophies of individual-level Web 2.0 applications to specific business requirements (e.g., Yammer, Jive, Socialcast of Chatter and Mingdao)[35]. In this research, Enterprise 2.0 applications are defined as a set of online applications, built on the cloud computing Web 2.0 infrastructure, to help firms to improve business performance. Examples of benefits of the applications of E2.0 include rapid and agile online collaborations [8], knowledge management [52][67] and emergency response capabilities [45][46].

Compared to Web 2.0 usage in consumer markets, companies usually bear the monetary cost of E2.0 use. To leverage fully the considerable role of E2.0 in improving competitive advantages, an organization should insist on long-term use. However, a large number of E2.0 platforms still face difficult challenges in survival, owing to a low free-to-paid conversion rate [43]. There is currently little understanding of the factors influencing E2.0 post-adoption. In this study, we focus on the research question of why some companies continue renewing E2.0 (i.e., E2.0 continuance usage) while others do not. While prior studies on Web 2.0 continuance usage (e.g. [11][66]) can contribute to understanding the continuance of E2.0 to some degree, there is still a need for a systematic investigation and theorizing of the salient factors that influence E2.0 continuance from an enterprise rather than individual context. Compared to the continued adoption of Web 2.0 that is mainly determined by factors related to individuals' cognitive beliefs (e.g., subjective norms) and experience-specific affect (e.g., satisfaction), we argue that the continuance adoption of E2.0 may be viewed as an enterprise-level economic decision and should be determined by enterprise-related (e.g., firm size) as well as individual-based factors. Moreover, the significance of these individual-based factors in determining enterprise system continuance usage (i.e. E2.0 in this case) may change due to the differences between enterprise system and consumer software. For instance, the continued adoption of Web 2.0 has no financial cost to individual users while firms that use E2.0 pay a monthly or yearly enterprise license fee based on the number of users. Moreover, the implementation of E2.0 is likely to significantly influence business performance and employees' working styles from different perspectives such as communication and project management. Thus, the adoption and implementation of an enterprise system is mainly determined by the management team of a firm, particularly in small-and-medium-sized enterprises (SMEs). Our study is arguably one of the first attempts to explore E2.0 post-adoption. With the development of cloud-based platform infrastructures, the utilization of E2.0 as a catalyst for strengthening businesses' competitive advantages has received notable attention from both academia and practitioners. According to TechNavio's analysts, the compound annual growth rate (CAGR) of E2.0 market reaches 31 percent over the period 2012-2016 and firms increase their business developmental activities through implementing E2.0 infrastructures [55].

However, existing E2.0 studies predominantly focus on describing the implementation strategy [5], E2.0 functions [52][67], functions of knowledge management[5][9], and challenges and risks [33][46]. Only a few studies have empirically examined initial adoption behavior toward E2.0 (e.g., [64][40]). Lin et al. [40] develop a value-based adoption model (VAM) and show that perceived benefits and perceived costs can significantly influence the value perceived by managers of adopting E2.0. However, the respondents for the study were 80 part-time MBA students rather than real E2.0 users. Wang et al. [64] apply UTAUT to propose a research model that incorporates context-specific variables for enhancing the prediction of individuals' adoption

intentions toward enterprise 2.0 applications. A professional E2.0 platform, Clearvale was used as the research context, and employees of seven companies that use the platform's trial version were invited to participate in a paper-based questionnaire. Their research findings suggest that some general information system (IS) adoption factors are still significant in the E2.0 initial adoption context including perceived usefulness and perceived ease to use.

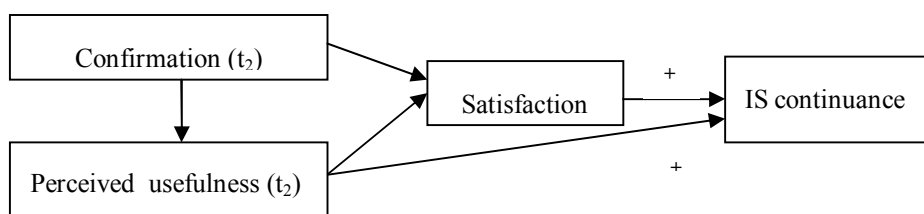
To fill this research gap, we develop a conceptual model by extending Bhattacharjee's [7] IS continuance model to the E2.0 post-adoption context based on the Technology–Organization–Environment (TOE) framework [61], which was originally developed for understanding enterprise-level information technology (IT) innovation adoption. This is in line with our research purpose. The TOE framework has been extensively used as a theoretical framework in prior studies of enterprise-level IS innovation, including material requirement planning (MRP) [16], electronic data interchange (EDI) [32], open systems [10] e-commerce adoption [27][29][59][68], e-procurement [58], enterprise resource planning (ERP) [50], knowledge management systems (KMS) [34][38] and software-as-a-service (SaaS)[65]. We believe that the TOE framework is an appropriate theoretical base for us to extend the IS continuance model through introducing specific context factors that are noteworthy for understanding E2.0 post-adoption.

The paper is organized as follows. We first present the theoretical background to our study, including the conceptual model of E2.0 post-adoption, its theoretical foundation and hypotheses. The methodology is then discussed, followed by the results of testing the theoretical model. Finally, the paper rounds off with a discussion of major findings, limitations and practical implications.

## THEORETICAL BACKGROUND

### IS Continuance Model

Bhattacharjee[7] developed an IS continuance usage model adapted from the Expectation-confirmation theory (ECT) [48] that has been widely used in the marketing discipline to examine the influence of consumers' satisfaction on their intention to continue using an adopted technology [13][41]. In the IS continuance model, IS continuance behavior is determined by two post-consumption variables including perceived usefulness and satisfaction. In order to adapt ECT to the IS continuance, Bhattacharjee [7] makes several theoretical adaptations. First, two pre-consumption antecedents of confirmation including perceived performance and expectation are removed because Bhattacharjee [7] proposes that their effects are captured within the confirmation and satisfaction constructs. Second, Bhattacharjee [7] added an ex post expectation variable, perceived usefulness, because ex post expectation is especially important for IS products or services, where initial expectations often change with time. Following prior studies on IS initial adoption (e.g., [19][31]), Bhattacharjee [7] argued that it is plausible that perceived usefulness had a constant influence on subsequent IS continuance usage decisions and thus theorizes perceived usefulness as an additional determinant of satisfaction. Third, the IS continuance model proposes that the usefulness-intention relationship originally developed by the technology acceptance model (TAM) [19], in the initial adoption context is also likely to exist in the continuance context because human continuance intention can be viewed as a series of usage decisions that are independent of timing or behavioral stages [56]. Thus, perceived usefulness should directly influence IS continuance intention in addition to having an indirect effect on IS continuance intention via satisfaction.



Note:  $t_2$  = post-consumption variable

Figure 1. An expectation-confirmation model of is continuance [7]

### The Technology–Organization–Environment (TOE) Framework

The TOE framework proposes that factors determining enterprise system adoption behavior can be broadly divided into three contextual categories including technology, organizational and environment contexts although it provides no information on what these specific factors are. First, the impact of the technological context upon enterprise system adoption behavior refers to technology-related factors that influence a firm's adoption of an innovative IS [49]. Second, the organizational context emphasizes the impact of a firm's profile characteristics, resources, internal social network on its' IS adoption behavior, firm size and scope, formal and informal linking structures, internal communication, peer influence, organizational culture, the quality of human resource and so on. Third, the environmental context emphasizes that a firm's IS adoption is also significantly influenced by many external factors beyond a firm's control, such as government policies, competitors and trading partners [61]. Based on the TOE framework, we can effectively recognize key factors that could be neglected by prior studies on consumer software, such

as external circumstance-related factors [10]

**THE EXTENSION OF IS CONTINUANCE: IDENTIFYING CONSTRUCTS TO INCORPORATE INTO THE IS CONTINUANCE MODEL**

This section examines how we extend the IS continuance model to the organization-level IS post-adoption context for explaining E2.0 continuance usage behavior. Building on our discussion in the introduction, here, we present an overview of the four constructs we add to the IS continuance model and discuss the details of the four constructs. We adopt an approach that complements the current constructs in the IS continuance model. The IS continuance model focuses on individual continuance acceptance of technology, whereas this research focuses on IS continuance usage at the organizational level. An important difference between the organizational continuance usage setting and an individual continuance usage setting and, where the IS continuance model was developed, is that firms' innovation adoption decisions usually are not only influenced by technological factors related to individuals' beliefs (e.g., perceived usefulness) but also can be determined by organizational factors and external survival context factors (i.e., environmental factors), according to the TOE framework. Within the technological context, perceived usefulness has been frequently proposed to be the most salient technology-related factor influencing IS post-adoption behavior in the IS continuance model and subsequent studies using it as a baseline model (e.g., [60]). As a consequence, prominent factors in an organization-level continuance, usage context particularly from the perspective of organizational and environment settings should be supplemented.

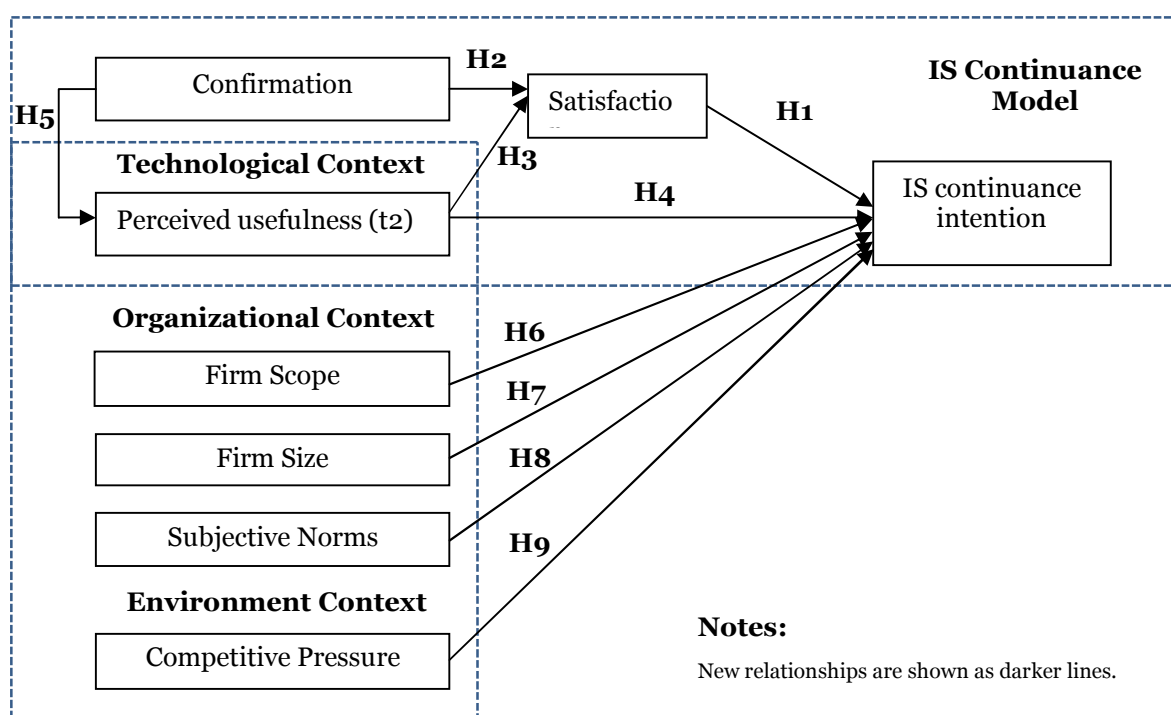


Figure 2. Research Model

With regard to organizational factors, organizational structure is one of the most commonly studied organizational aspects in the innovation or IS adoption literature (see [18] for a detailed meta-analysis) and it specifies how business activities, such as task allocation, coordination and supervision are directed toward the achievement of organizational business purposes. Moreover, how information flows between levels within an organization is also determined by organization structure. We therefore believe that a firm with a complicated organizational structure is likely to have a higher willingness to improve current business activities and information flows and thus to adopt E2.0. The complexity of an organizational structure usually involves two dimensions, firm scope (i.e., the breadth) and firm size (i.e., the depth). Thus we add firm scope and firm size as two predictors of firm intention to renew E2.0 to capture the influence of organization characteristic factors. In addition, subjective norms refer to the perceived expectation from an individual's key referents to perform the behavior of interest [3][4]. A large number of studies on individual-level behavior have found support for the significant impact of subjective norms on IS initial adoption [37][63]. An individual's behavior is considerably influenced by others' opinions on intended behavior, particularly when referents are important to the individual (e.g., family members and intimate friends). We propose that such a communication

influence resulting from key referents is still prevalent in the E2.0 post-adoption context. We note that key partners or collaborators are also important people to the focal firm and the construct, subjective norms, can be regarded as an environmental context factor sometimes. However, this paper focuses on E2.0 applications that are principally designed and developed for internal organizational communications and collaborations between teams and departments, which is little relevant to external communications, such as, business partners. As a result, we only consider subject norms as an organizational context factor in this research.

Second, environmental context relates to facilitating and inhibiting factors resulting from external circumstances and significant factors include competitive pressure, trading partners' readiness and government policies [68]. Consistent with these prior studies, competitive pressure is included into our conceptual model. With the rise of fierce market competition, firms actively look for effective approaches to increase sustainable competitive advantage, such as reducing business costs, improving customer service, and employing knowledge management. As a result, IT innovation (i.e., E2.0 continuance usage in this case) is viewed as an important channel to help firms to achieve the above purposes. As discussed above, E2.0 applications are lightweight and agile software and mainly work for team communication and collaboration within an organization and the implementation and usage of E2.0 don't involve trading partners and government departments. Therefore, trading partners' readiness and government policies seem to be unrelated to this research context and purpose. Based on the above gaps in the IS continuance model, and the associated theoretical explanation provided, we integrate firm size, firm scope, subjective norms, and competitive pressure, into the IS continuance model in order to tailor it to the E2.0 continuance use context, as shown in Figure 2.

### HYPOTHESIS DEVELOPMENT

In this section, we present the hypotheses that we incorporate to extend the IS continuance model to the E2.0 continuance use context. Figure 2 shows the original Bhattacharjee's [7] model and our proposed extensions. Similar to the relationships between perceived usefulness and confirmation, satisfaction and continuance intention developed by Bhattacharjee [7] in the consumer system acceptance context, we propose that the relationships further apply to the context of enterprise system continuance usage. Hence, we posit:

H1: A firm's level of satisfaction with initial E2.0 use is positively associated with the firm's E2.0 continuance intention.

H2: A firm's extent of confirmation is positively associated with the firm's satisfaction with E2.0 use.

H3: A firm's perceived usefulness of E2.0 use is positively associated with the firm's satisfaction with E2.0 use.

H4: A firm's IS continuance intention is positively associated with the firm's perceived usefulness of E2.0 use.

H5: A firm's extent of confirmation is positively associated with the firm's perceived usefulness of E2.0 use.

#### Firm Scope and Firm Size

Firm scope emphasizes the horizontal extent of a firm in terms of business operations [68] and in this research it is defined as the degree of geographical dispersion of a firm's business activities. Owing to the high heterogeneity of market knowledge, many firms struggle to integrate and exchange market knowledge at a more abstract level, particularly those with multiple business operations departments [25]. The more branches a firm has, the more likely the firm is to confront complex difficulties in exchanging market knowledge and best practice between its branches. Prior studies have identified that one of the competitive advantages of using E2.0 is the significant improvement of the effectiveness and efficiency of team collaborations across different regions [46]. For instance, employees can effortlessly and safely exchange and share business data between multiple locations through a Web-based application programming interface (API) of E2.0. We believe that such perceptions of usefulness of E2.0 for increasing competitive advantages are more likely to achieve by a company that uses E2.0 applications in a wider scope of cross-department activities. Consequently, we posit:

H6: Firm scope is positively associated with a firm's intention to renew E2.0

In addition to firm scope, firm size (i.e., the number of employees) is another important aspect of an organizational structure that significantly determines an enterprise's business performance, such as innovation awareness, resource availability, communication costs, and flexibility [22]. Following the logic outlined above, we believe that the major functions of E2.0 (e.g., reducing internal communications, facilitating project management and motivating information sharing) will be more usefulness for a large-scale firm that has a complex hierarchical structure, owing to the high communication costs and poor efficiency of team collaboration across various departments. Zhu and Kraemer [69] argue that "size is often associated with inertia; that is, large firms tend to be less agile and less flexible than small firms. The possible structural inertia associated with large firms may slow down organizational usage [of e-business]" (p. 65). This leads to the following hypothesis: H7: Firm size is positively associated with a firm's intention to renew E2.0.

### Subjective Norms

Enterprise 2.0 represents an important IT innovation in contemporary firms for improving information flow, which usually involves several aspects including business procedures, employees' work habits and horizontal organizational structures. Such radical improvements are usually accompanied by high failure rates [51]. An organization's decision-making on IT innovation essentially represents key organizational members' decisions as a whole (e.g., president and CEO). As a rule of thumb, it is a common strategy that members of the management team are likely to acquire important opinions from key referents regarding a significant organizational decision. Key referents may include both internal and external entities, such as shareholders, employees, customers, partners, suppliers, distributors, competitors, government, community, consultants, creditors and investors [57]. In this case, we believe that an organization's management team will typically reach an agreement on renewing their E2.0 service. In other words, each senior management member and related managers (e.g., IT managers) will cautiously consider others' opinions on renewing their E2.0 service before making a final decision on supporting or opposing the renewal of E2.0. Thus, we propose that subjective norms should influence an organization's behavioral intention to renew E2.0: H8: Subjective norms are positively associated with a firm's intention to renew E2.0.

### Competitive Pressure

In the innovation context, competitive pressure mainly refers to peer pressure to use an innovative technology [26]. In this research, we use the construct of competitive pressure to refer to the pressure perceived by a firm's leaders that competitors have achieved substantial competitive advantage by using E2.0 (for example, in terms of communication effectiveness and product development processes) [39]. The more competitive pressure a firm has realized, the more likely the firm is to strengthen competitive advantage by continuing using E2.0. Thus, we posit: H9 Competitive pressure is positively associated with a firm's intention to renew E2.0.

## STUDY DESIGN AND METHODOLOGY

### Data Collection

Our target population is current users (i.e., companies) of Mingdao ([www.Mingdao.com](http://www.Mingdao.com)) --a leading enterprise 2.0 platform in China. The rationale for selecting Mingdao for the research is as follows. First, reports show that China has become the most promising market for the proliferation of E2.0 technologies [54][64]. More and more enterprises in China have high expectations to increase competitive advantage by improving team collaboration and knowledge sharing. Consequently, there are several emerging E2.0 platforms available in China, e.g., Mingdao, Kingdee ([www.kdweibo.com](http://www.kdweibo.com)) and Tita ([www.tita.com](http://www.tita.com)). Second, Mingdao offers a 30-day trial period for new customers to access all E2.0 applications without any functional limitations, such as cloud computing-based customer relationship management system (CRM) and an e-procedure management system. As a startup company, Mingdao aggressively launches a series of marketing promotion campaigns to invite potential enterprises to use and assess its E2.0 applications. Through several years of development, Mingdao has become one of the most influential E2.0 platforms in China. Third, a 30-day trial account with all E2.0 applications enables senior managers to assess fully the benefits of E2.0 to their enterprises before deciding to pay license fees to continue using the E2.0 service after the trial accounts expire.

To obtain data for our research, an online survey was carried out through the integrated online survey platform of Mingdao. The URL of our questionnaire was authorized and then sent to all Mingdao's free enterprise customers. The respondents that we focus in the survey were limited to a firm's senior management team and IT managers, who are considered as decision makers for renewing enterprise 2.0 in the firm. Specifically, a firm's senior management team and IT managers received a private message from Mingdao's customer manager soliciting their participation in a survey of their intention to consider renewing Mingdao services after their trial accounts expire. The message described our research purpose, provided the URL of the questionnaire. Invalid or suspicious data were removed (e.g., duplicate IP addresses or unreasonable survey completion times). In all, 228 completed responses from 44 firms were received. After 22 invalid responses were deleted, 206 qualified responses were obtained for quantitative analysis. The gender of respondents was broadly even (54.6% male) and educated (75.9% with a degree) (see Table 1). Most of the respondents were 40 years of age or less. Moreover, 38.3% of respondents are from IT-related industries, with a large number from the wholesale and retail trade industries (16.7%). The median annual revenue of respondent organizations was \$787,000-\$1,570,000. More than 95% enterprises that the respondents work for are SMEs with fewer than 500 employees. To test for nonresponse bias, we compared the demographic characteristics of the respondents in early and late waves of data collection and found no significant differences. Different response formats were used in an effort to control common method bias including semantic differential scales, Likert scales, and reversed statements.

Table 1. Descriptive statistics of respondent and organizations

Gender		Age	
Male	54.6%	18-30	52.5%
Female	45.4%	31-40	40.3%

41-50	6.4%
50+yrs	0.8%
<b>Positions</b>	
CEO, General manager	24.3%
CIO, CTO, VP of Information system	11.2%
IS manager, IS planner	6.3%
Other administrators in IS department	14.7%
COO	5.8%
CFO	8.6%
Other administrators in an	29.1%
<b>Education Level</b>	
High school (non-graduate) or below	1.7%
College diploma graduate or	22.4%
Bachelor's degree or equivalent	58.3%
Master's degree or equivalent	13.4%
Doctoral degree or equivalent	4.2%
<b>Annual Revenue of Organizations (\$)</b>	
<=31,500	23.2%
31,500-78,700	9.4%
78,700- 157,000	8.2%
157,000 -787,000	18.7%
787,000-1,570,000	17.4%
>=1,570,000	23.1%

<b>Industry</b>	
Information transmission, software	38.3%
Wholesale and retail trade	16.7%
Manufacturing	8.9%
Financial industry	6.5%
Culture, sports and entertainment	6.4%
Education	5.2%
Leasing and business services	4.3%
Accommodation and catering	3.3%
Building industry	2.3%
Others	8.1%
<b>Firm Size (the number of employees)</b>	
1-49	54.4%
50-99	21.3%
100-199	12.2%
200-499	7.3%
>=500	4.8%
<b>Firm Scope (the number of branches)</b>	
1-5	72.6%
6-10	16.4%
11-15	5.4%
16-20	2.6%
>20	3.0%

**Measurement**

In our research, multi-item scale measurement was employed. Most items in the research model were adapted from prior studies. The final version of the questionnaire contained 21 questions (2 general items and 19 scale items) (see Appendix A). Measurements for the original IS continuance constructs were adapted from Bhattacharjee [7] including a reverse-coded item. Following prior studies, firm size is measured based on the number of employees, while firm scope refers to the number of branches that a company has established [27][68][69]. Competitive pressure includes three items that were adapted from [70] To measure subjective norms, three items were adopted from [64], but modified for our context. Satisfaction was measured using 7-point semantic differential items. All other scale items were scored on a 7-point Likert scale with a score of 7 indicating 'strongly agree' and a score of 1 indicating 'strongly disagree'. We conducted several tasks to address the potential threat of common method bias. First, we performed Harman's one-factor test by entering all of the principal constructs into a principal components factor analysis [53]. Four factors were produced, the first accounted for 38% of the variance. This suggests that there is unlikely to be significant common method bias. Next, following the recommendation of [53] we performed a single-method factor test in PLS by using indicators that measured both their theoretical constructs and a common method latent construct, and by re-running the structural model. The results did not change, again suggesting that common method bias was not an issue in our data.

**DATA ANALYSIS AND RESULTS**

**Convergent Validity and Reliability**

For multiple item scales, three metrics were used to test convergent validity and reliability: average variance extracted (AVE), Cronbach's alpha and composite reliability (CR). As shown in Table 2, all of the AVE and CR values for constructs were satisfactory, with composite reliabilities at 0.889 or more and AVE values at 0.727 and above [12]. Further, as suggested by [47], Cronbach's alpha values are higher than 0.70. Thus, the measurement items that we used converged on the same latent construct and demonstrated internal consistency.

Table 2. Convergent validity and reliability measurement

Construct	AVE	Composite reliability	Cronbach's alpha
Intention to renew E2.0 (IN)	0.858	0.948	0.917
Satisfaction (S)	0.874	0.965	0.952
Confirmation(C)	0.842	0.941	0.906
Perceived usefulness (PU)	0.908	0.967	0.949
Subjective norms (SN)	0.820	0.932	0.891
Competitive pressure (CP)	0.727	0.889	0.812

### Discriminant Validity

To assess discriminant validity, we used the techniques of [24][12] and [30]. First, we developed a matrix of correlations between constructs with reflective measures. We replaced the diagonal with the square root of the AVE (see Table 3 below) and found that the square-root of AVE for each construct was higher than the elements off the diagonal. Second, we assessed discriminant validity by making a comparison between the loadings of items for an associated construct and their cross-loading on other constructs. For our model, all items loaded on their corresponding constructs more strongly than on other constructs (as seen in Table 4 below). Third, the heterotrait-monotrait ratio of correlations (HTMT), a new approach to assessing discriminant validity in variance-based SEM suggested by Henseler [30] was used. We found that all HTMT values were below the 0.90 threshold (see Table 5). To further test for multicollinearity, we computed variance inflation factors (VIFs). All VIFs were found to be less than the conservative threshold of 5, suggesting that multicollinearity is not a major issue in our data. Overall, there is strong empirical support for the discriminant validity of the constructs in our research model.

Table 3. Correlations between constructs (square root of AVE on diagonal)

	IN	S	C	PU	SN	CP
IN	<b>0.926</b>					
S	0.449	<b>0.935</b>				
C	0.211	0.486	<b>0.917</b>			
PU	0.481	0.484	0.463	<b>0.953</b>		
SN	0.424	0.243	0.160	0.276	<b>0.906</b>	
CP	0.375	0.183	0.059	0.243	0.192	<b>0.853</b>

Table 4. Loadings and cross-loadings

	IN	S	C	PU	SN	CP
IN1	<b>0.942</b>	0.436	0.201	0.458	0.362	0.330
IN2	<b>0.936</b>	0.407	0.203	0.465	0.355	0.354
IN3	<b>0.899</b>	0.403	0.183	0.414	0.460	0.358
S1	0.397	<b>0.916</b>	0.42	0.442	0.234	0.165
S2	0.396	<b>0.946</b>	0.495	0.463	0.209	0.162
S3	0.456	<b>0.939</b>	0.469	0.457	0.226	0.210
S4	0.426	<b>0.938</b>	0.427	0.446	0.241	0.146
C1	0.142	0.422	<b>0.924</b>	0.416	0.097	0.061
C2	0.183	0.456	<b>0.917</b>	0.409	0.163	0.050
C3	0.252	0.457	<b>0.912</b>	0.446	0.177	0.052
PU1	0.391	0.411	0.455	<b>0.941</b>	0.262	0.197
PU2	0.483	0.471	0.425	<b>0.956</b>	0.227	0.250
PU3	0.494	0.496	0.444	<b>0.962</b>	0.299	0.244
SN1	0.372	0.198	0.109	0.190	<b>0.903</b>	0.142
SN2	0.407	0.190	0.122	0.254	<b>0.908</b>	0.201
SN3	0.372	0.276	0.206	0.306	<b>0.906</b>	0.178
CP1	0.345	0.165	0.039	0.207	0.180	<b>0.882</b>
CP2	0.319	0.135	0.063	0.240	0.212	<b>0.876</b>
CP3	0.293	0.170	0.051	0.173	0.094	<b>0.797</b>

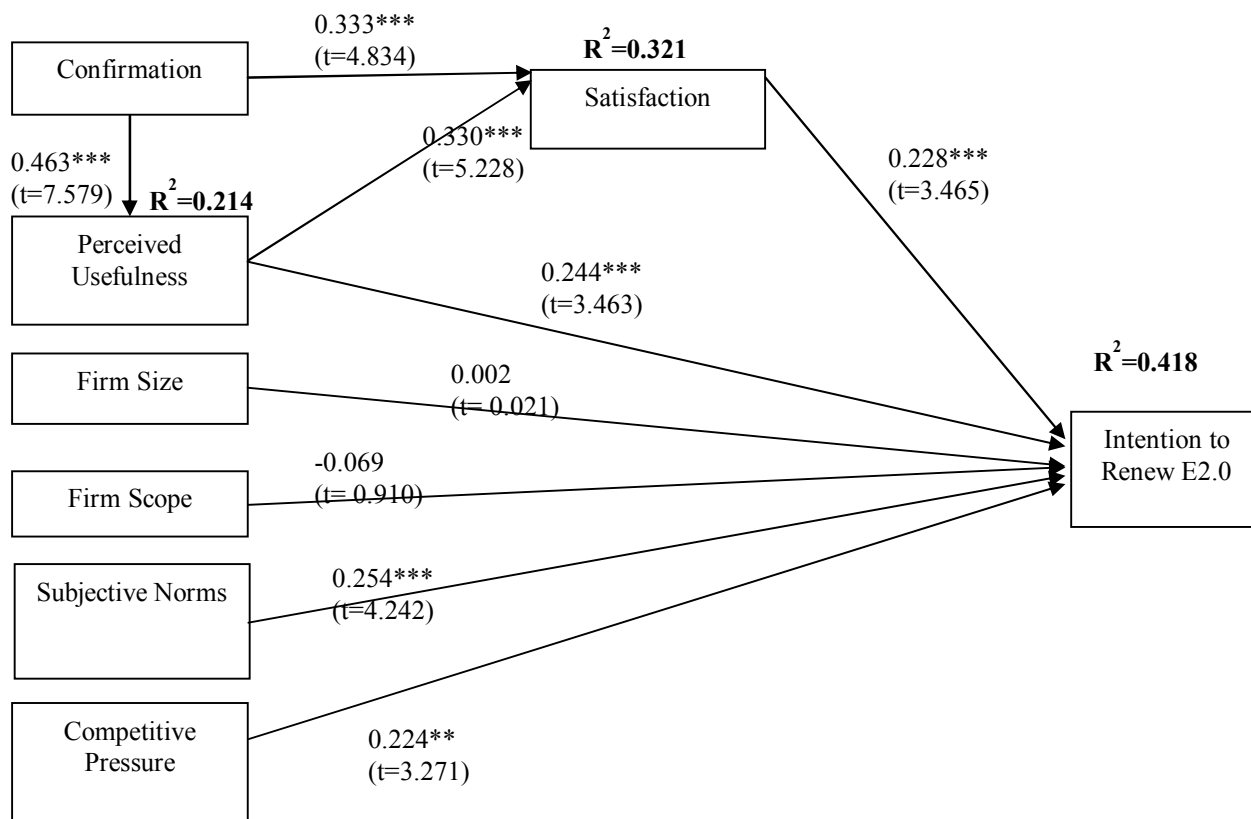


Table 5. Heterotrait-monotrait ratio (HTMT)

	IN	S	C	PU	SN	CP
IN						
S	<b>0.480</b>					
C	0.230	<b>0.521</b>				
PU	0.514	0.507	<b>0.499</b>			
SN	0.468	0.266	0.178	<b>0.300</b>		
CP	0.434	0.209	0.07	0.275	<b>0.222</b>	

**Hypotheses Testing**

Our proposed model and the hypothesized relationships among constructs were evaluated by using SEM-PLS modeling in SmartPLS 3.0M because the goal of this paper is to identify key constructs that influence the continuance usage of E2.0 rather than to carry out theory testing, theory confirmation, or the comparison of alternative theories. Moreover, our sample did not fully follow a multivariate normal distribution, which is required by covariance-based SEM (CBSEM) methods, as exemplified by software such as LISREL, AMOS, and EQS [28].



Note: \* denotes p<0.05 \*\* denotes p<0.01 and \*\*\* denotes p<0.001

Figure 3. Research model with empirical results

Overall, the results support seven of the nine hypotheses posited. Figure 2 shows the standardized path coefficients and path significances as reported by SmartPLS. We computed t-statistics and path significance levels for each of the hypothesized relationships using the bootstrapping method. Path coefficients and R2 values were obtained by running the PLS algorithm to assess the predictive performance of the structural model. The construct for intention had an R2 value of 0.418, indicating that more than 41% of the intention to renew E2.0 services was explained by the respondents' perceptions of benefits, subjective norms, and leaders' support. Overall, the empirical results strongly supported the explanatory power of our research model for enterprises' intentions to renew E2.0. Let us consider the individual hypotheses in turn. Specifically, despite a slight decrease in path coefficients, the relationships of the IS continuance model are still significant at the 0.1% level (i.e., H1-H5). Two firm characteristics, firm size and firm scope, showed little impact on intention to renew E2.0 services (H6 and H7 were not supported), and the path between subjective norms and intention to renew E2.0 was strongly supported ( $\beta = 0.254, t=4.242$ ), as proposed by H8. Furthermore, our data did support the path between competitive pressure and continuance intention (i.e., H9 is supported). It appears that an enterprise's intention to renew E2.0 services is significantly driven by external pressure, which is

consistent with prior studies on general IS adoption, including those on e-business adoption and assimilation [59]. An organization is more likely to continue using E2.0 in case the organization recognizes that more and more competitors in the same industry have increased competitive advantages and developed marketing dynamic capabilities through the continuance usage of E2.0 [21][58].

## DISCUSSIONS AND CONCLUSIONS

The results of our analysis provide valuable findings for theory and practice. Our study is arguably one of the first attempts to develop a theoretical model of E2.0 continuance usage. We have found that more than 41% of the variance in an organization's intention to renew E2.0 services can be explained through our theoretical model. Overall, the statistical tests provided good support for our research model. Let us further examine the theoretical and practical contributions of the research, along with possible limitations.

### Theoretical Contributions

Our first major theoretical contribution is in modifying the IS continuance for the enterprise-level technology continuance use context. By doing so, we extend the generalizability of prior studies on social network from an individual-level IS usage (e.g., Web 2.0) to an organization-level IS context (i.e., E2.0 in this case). Prior social network studies on initial [15] and continuance usage (e.g., [11]) have investigated the phenomenon in the personal usage context (e.g., Facebook, Blog and Twitter) where satisfaction and perceived usefulness are the main drivers of individuals' technology continuance use intention. In the case of firms' continuance adoption of technology, other drivers come to the fore. Two such drivers included in our research model are subjective norms and competitive pressure.

Subjective norms was found to be a more important driver than satisfaction and perceived usefulness in non-individual IS continuance usage contexts. Unlike personal decision-making on IS continuance usage (e.g., Facebook), a firm's decision-making on enterprise system continuance usage has a considerable impact on the firm performance and survival and thus represents the final decision of management team as a whole. Such a final decision is not only influenced by individuals' cognitive beliefs and affect (e.g., CEO's perception of usefulness and satisfaction), but also more importantly is determined by a majority opinion expressing the view shared by more than half of management team members. Our research findings suggest that if most senior managers of a firm are likely to continue using E2.0, CEO normally respect their opinions on renewing E2.0 service even though he or she doesn't fully realize the usefulness of E2.0 during a trial period. Thus, the significance of subjective norms in the enterprise system continuance usage context is highlighted.

We integrate competitive pressure into the IS continuance model to capture the influence of competitors that have used emerging IS in the enterprise system continuance usage context. While the extant literature has examined the role of competitive pressure in initial adoption of firm-level IS (e.g., [38][39][50]), we extend it to continued use. Future research may build on our study to further examine how different pricing strategies can influence firm intention to continue using the focal E2.0 software, such as decoy pricing vs. freemium. Another major theoretical contribution of this work is the empirical investigation of the role of leaders in determining firm-level IS continuance. 206 managers from 44 firms offer valuable opinions to our research. More and more contemporary companies are trying to build a "flat" organizational structure with few hierarchical levels and looser boundaries through E2.0 platforms. However, the free-to-paid user conversion rate of E2.0 platforms is still low. Even for the biggest Enterprise 2.0 platform, Yammer, the average conversion rate from free trials to paid users is only 15%. IS researchers should pay particular attention to examining factors that influence E2.0 continuance usage from the perspective of a company's management team. This hitherto under-researched form of leaders' support, peer influence and their subjective assessment of the benefits of paid E2.0 continuance usage could result in important research contributions. In sum, in contrast to prior social network studies that mainly focus on examining factors relating to a user's subjective evaluation of the expectation-performance discrepancy introduced from the ECT [48] and its derived theories (e.g., [7]), this study introduced three organizational context factors and one external environment factor to explain behavior. Our research findings show that subjective norms and competitive pressure have a significant impact on IS continuance behavior in the enterprise system context. Our study helps to enrich the IS post-adoption literature in an enterprise-level purchase setting, particularly from the perspective of enterprise leaders. Such a theoretical contribution is of great significance given the fact that most E2.0 platforms are facing a significant challenge in improving their free-to-paid user conversion rate. We provide a complementary perspective to current theoretical models of IS continuance to provide a better understanding of enterprise-level IS purchase behavior.

### Practical Implications

Practitioners who develop E2.0 platforms for contemporary companies should be aware of the importance of management team as a whole in facilitating the implementation of E2.0, particularly in the SME context. Particularly, our study suggests that subjective norms over perceived usefulness of IT applications can influence E2.0 continuance use. As a consequence, E2.0 developers should actively demonstrate and promote successful E2.0 usage cases as a way to enhance enterprise leaders' recognition of the benefits of E2.0 services. In addition, a series of E2.0 training courses should be freely available, which will help company leaders to understand how to utilize effectively E2.0 applications for improving their business activities. The findings show that perceived usefulness is important for E2.0 continuance usage. Perceived usefulness are of course one of the

fundamental objectives of enterprises when they consider purchasing E2.0 services. We suggest that E2.0 developers should consider this in attempts to demonstrate explicitly the advantages of E2.0. For example, one idea is to develop some measurable indices of business performance, such as office automation efficiency or reduction in communication costs that help enterprises to compare their business performance between pre- and post-E2.0 implementation.

### Limitations

Our study is not without its limitations. The first is about the generalizability of our findings. The target respondents in our investigation are users of Mingdao, which mainly comprises of SMEs. We believe that the results may be somewhat different if data is collected from an E2.0 platform where the majority of users are large companies. Second, leaders' opinions in this study are only collected from a single, leading, Chinese E2.0 platform – Mingdao. Generalizing our research findings to other E2.0 platforms should consider the different characteristics of such platforms. Third, related to the points mentioned previously and the nature of the customer base, an examination of the influence of firm characteristics may be considered limited, thus limiting the effect of an examination of firm size and scope. Finally, the study was conducted in China and our findings must be considered in that context: a “high-context” culture in which communicators are likely to carry out implicit communication in organizations, which may limit the formation of the habit of using E2.0. Our research findings may not apply to other countries with a different (“low-context”) culture. Future research should be encouraged to build on our study by examining the influence of habit on E2.0 continuance usage in different regions and countries.

### ACKNOWLEDGEMENTS

This work was supported by Fundamental Research Funds for the Central Universities [grant numbers 2014B18914, 2014B01414]; Jiangsu Provincial Natural Science Foundation of China [grant number BK20150823], the youth project of National Social Science Fund (Project no. 14CGL020) and The Humanities and Social Sciences Foundation of the Ministry of Education in China (Project No. 16YJC630028)

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## APPENDIX

Construct	Items	Sources
Intention to renew E2.0	<p><b>(1=Strongly Disagree to 7=Strongly Agree)</b>            IN1: I intend to continue using Mingdao rather than discontinue its use after the trial account expires.            IN2: My intention is to continue using Mingdao rather than use any alternative means.            IN3: If I could, I would like to discontinue our use of Mingdao after the trial account expires  <b>(reverse coded).</b></p>	[7]
Firm Size	What is the number of employees in your organization?	[68]
Firm Scope	What is the number of establishments (branches) where your organization develops business activities?	[68]
Subjective Norms	<p><b>(1=Strongly Disagree to 7=Strongly Agree)</b>            SN1: In our firm, people who are important to me think that I should support the continuance use of Mingdao.            SN2: In our firm, people who influence me think that I should support the continuance use of Mingdao.            SN3: In our firm, colleagues whose opinions I value think that I should support the continuance use of Mingdao.</p>	[62]
Perceived Usefulness	<p><b>(1=Strongly Disagree to 7=Strongly Agree)</b>            PU1: Through using Mingdao, I facilitate collaboration and communication.            PU2: Through using Mingdao, I improve operational efficiency.            PU3: Through using Mingdao, I improve organizational structures.</p>	[7]
Satisfaction	<p><b>How do you feel about your overall experience of Mingdao use to the present time:</b>            S1 Very dissatisfied (1) - Very satisfied (7)            S2 Very displeased (1) - Very pleased (7)            S3 Very frustrated (1) - Very contented (7)            S4 Absolutely terrible (1) - Absolutely delighted (7).</p>	[7]
Confirmation	<p><b>(1=Strongly Disagree to 7=Strongly Agree)</b>            C1: My experience with using Mingdao was better than what I expected.            C2: The benefits with using Mingdao were better than I expected.            C3: Overall, most of my expectations from using Mingdao were confirmed.</p>	[7]
Competitive Pressure	<p><b>(1=Strongly Disagree to 7=Strongly Agree)</b>            CP1. More and more competitors in your industry have conducted team collaboration and communication through E2.0            CP2. More and more competitors in your industry have conducted knowledge management and sharing through E2.0            CP3. More and more competitors in your industry have conducted project management through E2.0</p>	[70]