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## **Impacts of Online Reviews on IT-enabled Service Adoption: A Preliminary Evidence from Mobile Data Services**

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### **Abstract**

*The advancement of social media technologies has enabled consumers to freely generate reviews online. These reviews are considered important in influencing consumer purchase decisions of various products. However, it is unclear how they affect the adoption of IT-enabled services. Further, service innovativeness is implied to affect service adoption. But, little research has examined the influence of innovativeness of IT-enabled services on their adoption. By drawing on service dominant logic, this paper examines the effects of service innovativeness and online reviews on IT-enabled services adoption. A preliminary test of the model was performed using initial data of mobile data service applications obtained from a platform. The results reveal that both service innovativeness and the volume of online reviews positively impact IT-enabled service acceptance. However, the valence of online reviews does not impact IT-enabled service adoption. The potential contributions and plans for further testing and enhancing the model are described.*

### **Keywords**

Social Media, Online Consumer Reviews, IT-enabled Service Adoption, Mobile Data Services

## **Introduction**

With the increasing use of Web 2.0 technologies and social media tools, online consumer reviews have gained growing popularity (Duan et al. 2008). Online consumer reviews refer to the content generated by consumers to reflect their consumption experience with the central product/service. These reviews include evaluation information about the quality of a product or service (Li and Hitt 2010) and reflect consumers' degree of satisfaction with the consumption experience (Zhu and Zhang 2010). These reviews are expected to be able to reduce uncertainty about the features and quality of a product or service that cannot be inspected before purchase (Li and Hitt 2010). Thus, researchers propose that online reviews are able to foster the sales of services or products through word of mouth effects (e.g., Duan et al. 2008; Zhu and Zhang 2010).

Previous research have examined the influences of online reviews on product sales (e.g., Chen et al. 2004; Chevalier and Mayzlin 2006; Duan et al. 2008). Few studies have investigated the influences of online reviews on service adoption. Service is highly experience-embedded and more uncertain in its quality and value than products (Vargo and Lusch 2004). The difference may induce consumers to refer more to previous consumers' experience and evaluation information for their purchase. Thus, the relationship between online reviews and service performance requires further investigation. In particular, there is little understanding of the impacts of online reviews on service performance in information systems (IS) context. With the interconnectivity and interactivity afforded through new Internet-based technologies, services are created, delivered, and experienced in new ways (Davis et al. 2011; Rai and Sambamurthy 2006). Unlike traditional service provisions, IT-enabled services can be updated, upgraded, and delivered to consumers simultaneous with the creation of service innovations. These innovations can be automatically installed or require consumers' agreement of upgrading. Moreover, IT-enabled services can be delivered with limit human touch (Rai and Sambamurthy 2006). These differences may affect consumers' willingness to adopt IT-enabled services (Davis et al. 2011; Wooder and Baker 2012). Service adoption refers to the usage of the central services. Thus, the relationship between online reviews and IT-enabled services adoption requires further investigation. Furthermore, IT-enabled services tend to frequently innovate, i.e., updating or upgrade to a newer version. Their innovativeness may also impact their adoption. However, there is limited understanding of the influence of innovativeness of IT-enabled services on their adoption.

Overall, gaps in our knowledge exist along two aspects. First, there is limited research and understanding of the relationships between online reviews and IT-enabled service adoption. Second, there is a lack of research exploring the relationship between service innovativeness on IT-enabled service adoption. Motivated thus, this paper aims to address these gaps by exploring the research question of whether service innovativeness and online reviews affect IT-enabled service performance. Drawing on the service dominant logic (SDL), we view service innovativeness and online reviews as operant resources and study their impacts on IT-enabled service adoption.

We tested the model in the context of mobile data service (MDS). MDS refer to wireless access to digitalized contents on the Internet via mobile devices (Kim et al. 2009). It includes IT-enabled services such as mobile banking, gaming, and data services (e.g., news, mapping and location-based information, and internet surfing) that can be accessed via mobile devices over a wide geographic area (Hong and Tam 2006). These services are among the fastest growing and generated revenues of USD 12 billion in 2012 and expect to generate revenue of USD 20.4 billion in 2013 (Market Research 2013).

This context is appropriate to test our model for several reasons. First, an MDS application is a mechanism for mobile data service delivery according to the Service-Dominant Logic (e.g., Lusch et al. 2007; Vargo and Lusch 2004). Moreover, MDS applications satisfy the characteristics of services in that they are intangible and provide information flow to serve consumers (Lovelock and Gummesson 2004). Second, consumers actively participate in generating online reviews such as rating MDS applications and service providers need to generate a continuous stream of new services to satisfy consumers. Thus, both innovativeness and online reviews of MDS applications vary in MDS innovation platforms allowing us to study their effects. The study is expected to contribute to research and practice in the area of online reviews and IT enabled service adoption.

## **Conceptual Background and Hypotheses Development**

The service-dominant logic (SDL) (Vargo and Lusch 2004, 2006) is widely recognized as a suitable lens for researchers to study service innovation (Michel et al. 2008) and performance (Ordanini and Parasuraman 2011). This is because it goes beyond traditional product-based concepts and nests both services and goods into an integrated, overarching service view (Vargo and Lusch 2006). It also allows researchers to integrate literatures from various research streams to investigate service innovation and increase the generalizability of research findings (Ordanini and Parasuraman 2011). In our case, the two relevant streams of literature to be integrated are the service innovativeness and online reviews literature as described below.

### ***Service-Dominant Logic***

The service-dominant logic (SDL) provides an overarching approach for analyzing economic exchanges. Fundamentally, it argues that service is the basis for all exchange (Vargo et al. 2010), where the exchange between parties is proposed to be between service and service (Vargo and Lusch 2004, 2006). The exchange is usually reciprocal and mutually beneficial (Vargo et al. 2008). The direct service-and-service exchange is typically intermediated by goods, money, or institutions (Vargo and Lusch 2004; Vargo et al. 2008). Thus, SDL focuses on service as the central process for value creation and treats goods as a vehicle for service provision (Vargo and Lusch 2004, 2006).

According to SDL, a service is defined as the process of applying specialized competences (knowledge and skills) to benefit another entity and the entity itself (Vargo and Lusch 2004). The process of competence application is co-produced with consumers and partners and can be provided directly through intangible services or indirectly through tangible artefacts i.e., goods (Vargo and Lusch 2006). Following this logic, service innovation has been defined as an offering not previously available to the consumers - either an addition to the current service mix or a change in the service delivery process - that requires modifications in the sets of competences applied by service providers and consumers (Ordanini and Parasuraman 2011). The nature and magnitude of change in competences determine the extent of service innovation, i.e., innovativeness (Michel et al. 2008).

The SDL argues that operant resources (resources that act upon other resources to create benefits e.g., knowledge and capabilities) are the fundamental source of competitive advantage (Vargo and Lusch 2004). Past research argued that innovativeness is the capability for innovation or the ability to innovate (Wang and Ahmed 2004) and a key organizational capability (Das and Joshi 2012). Following the logic, this paper argues service innovativeness as developers' capability to innovate and can be viewed as operant resources for competitive advantage.

Furthermore, past research argues that consumers' knowledge and skills can be served as important inputs to the service provision and innovation (Alam 2002; Ordanini and Parasuraman 2011). Specifically,

consumers' knowledge and effort input in service innovation are thought to be able to increase the use value of new services (Lusch et al. 2007). Experimental studies noted that consumers are able to provide more original and valuable, but less feasible ideas and opinions regarding product design (e.g., Magnusson et al. 2003; Matthing et al. 2004). Consumer inputs have also been considered as important resources for innovation and performance (Ordanini and Parasuraman 2011). These inputs could include providing information and feedback on specific issues and extensive consultation with potential consumers by means of interviews (Alam 2002) or posting reviews online (Li and Hitt 2010). In this sense, online reviews can be considered as consumer inputs to the process of service provision, since potential consumers can obtain information regarding service consumption experience and service quality. Following previous literature, this paper takes online reviews as consumer inputs (e.g., information feedback and recommendation) to the process of service provision and innovation and hence the operant resource for performance.

In the context of our study, service innovation is conceptualized as the new service applications designed by iPhone or Android developers i.e., MDS innovations. We characterize new MDS application development as service innovation since, as per SDL, it can be considered as the mechanism for new MDS provision. During the process of new MDS application design, developers use their specialized knowledge and skills to maintain innovativeness. Further, developers will leverage other consumer feedback, i.e., online reviews, to improve MDS applications. Therefore, innovativeness and online consumer reviews are included in the model.

### **Online Consumer Reviews**

With the popularity of online consumer reviews, researchers have empirically investigated the causal link between online consumer reviews and product sales (e.g., Chen et al. 2004; Chevalier and Mayzlin 2006; Duan et al. 2008). Two aspects of online reviews have been largely investigated in past literature, i.e., volume and valence. The first aspect of interest is the volume of reviews, which refers to the number of online reviews. It is argued that more discussions from consumers is likely to increase the public awareness of the central product and hence the purchase (Chevalier and Mayzlin 2006). This is referred as awareness effect, which indicates that reviews arouse consumers' awareness of the product and thereby their consideration of putting it in the choice set (Duan et al. 2008). The relationship between volume of online reviews and product sales has been empirically tested in various contexts. Researchers have found a positive relationship between the volume of online reviews and the sales of products such as books (Chevalier and Mayzlin 2006) and movies (Duan et al. 2008; Liu 2004).

Past literature have indicated that new IT has transformed how services are produced, traded, and delivered (Rai and Sambamurthy 2006). One of the ways is through IT enabling greater co-creation of new services with consumers (Matthing et al. 2006). In the context of this study, online reviews are generated by consumers regarding MDS applications and could be counted as an approach towards the co-creation of new services since developers will update the MDS applications according to the feedback from the market (Boudreau 2012). Following the logic discussed above, this study expects that the volume of online reviews will arouse public awareness of the existence of a MDS application and foster consumers' adoption of the MDS application.

*H1: The volume of online reviews that a MDS application receives is positively related to its adoption*

The second aspect of interest of online reviews is the valence, which refers to the average rating of online reviews. It is argued that the valence of online reviews can provide evaluation information about the quality of a product or service (Li and Hitt 2010) and reflect consumers' satisfaction with the consumption experience (Zhu and Zhang 2010). This is referred as the persuasive effect that the evaluation and recommendation information of reviews serves to shape consumers' attitudes and evaluations towards to the product and hence influence their purchase decision (Duan et al. 2008). Previous research examining the influences of the valence of online reviews on product sales has received mixed results. Some researchers have found a significant influence of the valence of online reviews in the context of book sales (Chevalier and Mayzlin 2006) and beer sales (Clemons et al. 2006) while other researchers have not (Chen et al. 2004; Duan et al. 2008; Liu 2004).

In the context of this study, the ratings of online reviews may be perceived to convey the quality information of MDS applications. However, the quality of MDS applications may be dynamic as a newer version publishes. Consumers may need more information to reduce the uncertainty and make purchase decision. Therefore, the ratings could have a strong influence for consumers in guiding the adoption of MDS applications. Therefore, in this context, this study expects that the valence of online reviews may be relied on by consumers to obtain more information about the quality of a MDS application and hence influence their adoption and adoption.

*H2: The valence of online reviews that a MDS application receives is positively related to its adoption*

## ***Service Innovativeness***

Service innovativeness refers to the degree of change in the new service as compared to existing services (Michel et al. 2008). While the importance of service innovation for the survival and success of organizations is well recognized (Davis et al. 2011), it is not clear if greater innovativeness leads to better outcomes.

Previous research exploring the performance of new services has received mixed results. For example, Gounaris et al. (2003) reported that service innovativeness positively moderates the influences of idea generation and screening, technical development, and testing activities on the success of new financial services but does not moderate the influences of business analysis and marketing strategy and launching activities on their success. Similarly, through surveying 132 new financial services in Greece (80 successes and 52 failures), Avlonitis et al. (2001) identified 6 service innovativeness patterns and suggested a non-linear relationship between service innovativeness and financial performance of new services. However, through surveying 102 Spanish service firms, Carbonell et al. (2009) found that service innovativeness (technological novelty of new services) are positively related to new service performance in terms of competitive superiority of new services but not for technical quality (service quality) and sales performance. The mixed results have created confusion around the question of how service innovativeness affects IT-enabled service performance.

While the returns from more innovative services in general are thought to be higher (Berry et al. 2006; Davis et al. 2011), this requires further investigation particularly in the context of IT-enabled services. This is because the interconnectivity and interactivity afforded through new Internet-based technologies have transformed how services are created, delivered, and experienced (Rai and Sambamurthy 2006). These changes may affect consumers' willingness to adopt and pay for innovative IT-enabled services (Davis et al. 2011; Wooder and Baker 2012). Apart from a few studies examining the influence of IT capability on service innovation (e.g., Shang and Chen 2010; Chen et al. 2009; Ordanini and Rubera 2010), the understanding of the impacts of service innovativeness on new service performance has remained relatively underdeveloped in IS research (Rai and Sambamurthy 2006). This study will explore the influence of innovativeness of IT-enabled services.

Past literature found that low innovative services may not receive much attention or adoption from consumers (Das and Joshi 2012). Consumers will perceive low innovative services less valuable (Ordanini and Parasuraman 2011), resulting in lower service performance. Conversely, high innovative services which offer new functions or experience and are difficult to quickly compete with, can gain first mover advantage, and earn significant market share (Berry et al. 2006). These services may present moderate value perception challenges for consumers that arouse consumers' curiosity and interest (Avlonitis et al. 2001). Such challenges and interest may motivate consumers to learn new skills in order to realize the value of highly novel services (Csikszentmihalyi 2002). After they have learnt the necessary skills or knowledge, consumers will feel a sense of achievement. They can then perceive both the hedonic as well as the utilitarian value of the new service, and hence adopt it (Hong et al. 2008). Similarly, in the context of our study, innovative MDS applications may stimulate consumers' curiosity and expectations of a novel experience and hence attract them to download the MDS application. The innovativeness can represent the innovation capability of developers and the potential quality of the central application. Therefore, this study expects that

*H3: The innovativeness of a MDS application is positively related to its adoption*

## **Methodology**

### ***Research Setting***

Our study context is the mobile data service industry; in particular, the MDS applications on the Appzoom platform<sup>1</sup>. We chose the Android applications due to the accessibility of data (not all data for iPhone applications is publicly available). Further, Android not only allows consumers to participate by providing comments on applications but also allows service producers to update their applications through the platform. Both consumer participation by posting comments and service innovativeness through updating vary in the platform, allowing us to study their effects.

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<sup>1</sup> www.appzoom.com

## Data Collection and Operationalization

The sampling frame consisted of all 24 categories applications on the platform for Android applications. The sampling frame consisted of all 24 categories of 129870 applications on the Android platform (as of April 1, 2013). For our initial validation, we randomly selected 200 applications from each category, resulting in 4800 applications in total. After removing those applications that are no longer available for download, 4213 applications remained (including both free and paid applications).

We operationalized *service innovativeness* as the *number of versions* that a MDS application has updated. The underlying assumption for this measure is that each new version of an application represents a degree of innovativeness and change. Within a time period, the more versions a MDS application has, the more innovative it is. For example, for game applications, service producers may generate a new version of the application by adding more levels to the game or changing the substantive game-play. We measured *the volume of online consumer reviews* as the number of comments that consumers have posted to the application and *the valence of online consumer reviews* as the average ratings an application received from consumers.

For the dependent variable i.e., *IT-enabled service adoption*, we coded the number of times that the application had been downloaded. This measure is appropriate because downloading a MDS application can represent consumers' adoption of the current application and can serve as a measure of its adoption. Since the Android platform displayed the number of downloads of each application in an ordinal way (column 1 of Table 1), we followed established data coding principles (de Vaus 2002) to code the number of downloads using the schema shown in Table 1. Such non-linear coding schemas have been found useful for assessing number of downloads in previous literature (e.g., Fershtman and Gandal 2011).

**Table 1. Coding for IT-enabled Service Adoption**

The Number of Downloads	Service Performance Coded
<50	1
50-100	2
100-500	3
500-1000	4
1000-5000	5
5000-10000	6
10000-50000	7
50000-250000	8
>250000	9

## Control Variables

We also included control variables that may affect the number of downloads of the MDS application, i.e., *price* of the application, *size* of the application, *duration* of the application, *application category*, and *past experience* of the developer. *Price* of application refers to the cost per download for a consumer. *Size* of application is the digital space that the application will take up in the consumer's handphone, measured in kilobytes. *Application category* refers to the category that an application belongs to. We used dummy variables to represent the 24 application categories. *Past experience* of the developer is measured by the number of applications that the developer has created before. The *duration* of application availability is the interval between the date of an application's first launch and the date when the data was collected, measured by the number of days elapsed. Descriptive information about all variables is listed in Table 2.

**Table 2. Variables Description**

	Description	Number	Mi			
			Mean	SD	n	Max
Downloads	The number of downloads by consumers	4213	3.799	1.379	1	9
Innovativeness	The number of versions that each application has launched	4213	3.431	5.702	0	377
Volume	The number of comments that each application has received	4213	15.139	33.141	0	377
Valence	The average rating of the application	4213	4.562	0.644	1	5
Size	The digital space of the application (in KB)	4213	2210.426	4921.488	6	95980
Past Experience	The number of applications developed by the author	4213	38.240	105.16	1	839
Price	The amount of money charged for downloading the application (in US dollars)	4213	2.140	7.344	0	159.95
Duration	The interval between the date of an application's first launch	4213	160.470	136.899	1	809

	and the date when the data was collected				
Dum0	Application type: adult	183	-	-	-
Dum1	Application type: books and references	177	-	-	-
Dum2	Application type: business	186	-	-	-
Dum3	Application type: comics	170	-	-	-
Dum4	Application type: communication	165	-	-	-
Dum5	Application type: education	184	-	-	-
Dum6	Application type: entertainment	175	-	-	-
Dum7	Application type: finance	169	-	-	-
Dum8	Application type: health and fitness	177	-	-	-
Dum9	Application type: libraries and demo	185	-	-	-
Dum10	Application type: lifestyle	176	-	-	-
Dum11	Application type: media and video	160	-	-	-
Dum12	Application type: medical	179	-	-	-
Dum13	Application type: music and audio	186	-	-	-
Dum14	Application type: news and magazines	175	-	-	-
Dum15	Application type: photography	185	-	-	-
Dum16	Application type: productivity	172	-	-	-
Dum17	Application type: shopping	176	-	-	-
Dum18	Application type: social	179	-	-	-
Dum19	Application type: sports	186	-	-	-
Dum20	Application type: tools	162	-	-	-
Dum21	Application type: transportation	174	-	-	-
Dum22	Application type: travel and local	161	-	-	-
Dum23	Application type: weather	170	-	-	-

### Model Specification

We tested the hypotheses with one regression model. In model 1, we tested for main effects.

$$\text{Model 1: Downloads} = \beta_1 \text{Innovativeness} + \beta_2 \text{Volume} + \beta_3 \text{Valence} + \beta_4 \text{size} + \beta_5 \text{No. of applications} + \beta_6 \text{duration} + \beta_7 \text{Price} + \beta_8 \text{Application category} + \xi$$

Where *Downloads* is the number of times that an application has been downloaded since its launch; *Size* is the size of applications measured in kilobytes; *No. of applications* is the total number of applications that the developer has developed; *Valence* is the average rating score of applications that the developer has developed; *Price* is the cost per download of the application in US dollars; *Application category* is a dummy variable to indicate the type of each application; *Innovativeness* is the number of versions that the application has; *Volume* is the number of comments that the application received from consumers.  $\xi$  is the error term.

### Data Analysis and Results

We performed natural log-transformations on all variables (except valence) to reduce skewness. We used the software SAS 9.2 to perform the ordered logistic regression analysis. The correlation values among the variables are shown in Table 2. With the preliminary data collected from Appszoom, the the model was tested with the results summarized in Table 3. The application category dummy variables were found to be significant in the regression results but are not shown in Table 3 due to space constraints.

**Table 2. Correlations**

	Downloads	Innovativeness	Volume	Size	Past Experience	Valence	Price
Downloads	1						
Innovativeness	0.379***	1					
Volume	0.625***	0.536***	1				
Size	0.042***	-0.047**	-0.021	1			
Past Experience	-0.067	-0.121***	-0.109	-0.031*	1		
Valence	-0.184	-0.206	-0.069**	-0.181	-0.353***	1	
Price	0.041***	-0.123	0.059**	-0.058**	0.178*	-0.132**	1

Note: Application category dummies ( $\beta_8$ ) have been included in the analysis but not shown in the table.  
Significance level: \*p < 0.05; \*\*p < 0.01; \*\*\*p < 0.001.



**Table 3. Results of Model Testing**

Variables	$\beta$	Base model	Ordered Logistic Regression
Ln (Innovativeness+1)	$\beta_1$		0.125**
Ln (Volume+1)	$\beta_2$		1.113***
Valence	$\beta_3$		0.027
Ln (Size)	$\beta_4$	0.117***	0.084***
Ln ( Past Experience )	$\beta_5$	-0.001	0.156***
Ln (Duration)	$\beta_6$	0.614***	0.234***
Ln (Price+1)	$\beta_7$	-0.078*	-0.957***
R <sup>2</sup>		0.101	0.217
Number of observations		4213	4213

Note: Application category dummies ( $\beta_8$ ) have been included in the analysis but not shown in the table.

\*p <0.05; \*\*p <0.01; \*\*\*p <0.001.

As per Table 3, the ordered logistic regression results of Model 1 show that service innovativeness and the volume of online reviews positively affect IT-enabled service adoption. Thus, H1 and H3 are both supported. However, valence of online reviews did not impact IT-enabled service adoption (H2 not supported). This finding is consistent with previous literature (e.g., Chen et al. 2004; Duan et al. 2008; Liu 2004). This could be due to the fact that consumers are less likely to be persuaded by online reviews regarding the quality of applications. In particular, individual consumers would have different preferences on the features of a MDS application. All control variables other than No. of applications were found to be significant.

## Discussion and Future Plans

With the development of Web 2.0 and social media tools, it is growingly popular to utilize the Internet to publicize feedback and recommendation regarding products and services (Duan et al. 2008). A great body of empirical research has been conducted to test the casual links between online reviews and sales with mixed results. However, no study, to our best knowledge, has investigated the link between online reviews and the adoption of IT-enabled services. The context of IT-enabled services is different from previously studied contexts in that these services can be updated and delivered simultaneously with the creation of service innovations and the innovativeness or quality of such services is changing across time. Besides, developers can change the applications to reflect the feedback and evaluations received from online reviews. These dynamics require researchers' further investigation of the link between online reviews and IT-enabled services. Based on service dominant logic, service innovation, and online reviews literature, this study examined the influences of online reviews and service innovativeness on IT-enabled service adoption. It was observed that the volume of online reviews and service innovativeness positively impact the IT-enabled service adoption.

As a research in progress, the model and findings of this study need further validation. First, future study will attempt to use the complete set of MDS applications data instead of sampling from each category. This can reduce potential sampling bias and help improve the validity of the results. Second, panel data from the entire MDS data on the platform will be collected to rule out the endogeneity problem. For example, an instrument variable should be identified to account for the potential endogeneity problem existing in the relationships between independent variables and dependent variable. Also, this study will use panel data to account for the influences of omitted variables. Third, the possibility of an interactive relationship between innovativeness, online reviews, and service adoption could be explored further.

Theoretically, the study aims to extend and empirically test the applicability of the service dominant logic in the context of IT-enabled service e.g., MDS applications. Further, it attempts to enrich our understanding of the influence of service innovativeness on IT-enabled service adoption (the downloading of both free and paid MDS applications) through using objective data. Also, this paper aims to contribute to the service innovation literature by examining the effects of online reviews in fostering the adoption of IT-enabled services. Moreover, this study intends to contribute new knowledge to the extant literature of online reviews and explore their effectiveness on predicting the adoption of services whose innovativeness will be changing. Practically, this study intends to provide guidelines to management on what determines the adoption of IT-enabled services. Specifically, it suggests the importance of innovativeness of IT-enabled services and the volume of online

reviews in stimulating IT-enabled service adoption. Thus, firms should engage in practices that improve the innovativeness of IT-enabled services and include consumers in the process and encourage them to post their feedback and opinions regarding their consumption experience.

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