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2014

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Abstract

Firm-customer digital connectedness for effective sensing and responding is a strategic imperative for contemporary competitive firms. This research-in-progress paper conceptualizes and operationalizes the firm-customer mobile digital connectedness of a smart-mobile customer. The empirical investigation focuses on mobile app users and the impact of mobile apps on customer expectations. Based on pilot data collected from 127 customers, we tested hypotheses pertaining to firm-customer mobile digital connectedness and customer expectations. Our test analysis using linear and non-linear postulations reveals those customers raise their expectations as they increase their digital interactions with a firm.

Key words: Digital connectedness, Customer expectations, Mobile apps, Polynomial regression, Response surface methodology

1   INTRODUCTION

Business success during environmental turbulence increasingly hinges on firm's agility: ability to sense customers better and respond to them in timely with a tailored solution (Overby, Bharadwaj, & Sambamurthy, 2006; Roberts & Grover, 2012a, 2012b). In such environments gaining customer knowledge is being recognized as a significant element of attaining and sustaining advantage over competition. As a consequence firms today are striving towards constant and effective ubiquitous customer sensing through digital interactions through novel pervasive technologies – *mobile apps* being one of the prominent examples of this (Atapattu & Sedera, 2013b). A recent study of key information technology and management concerns by Luftman et al. (2012) declares, technological developments such as cloud computing, mobile and wireless applications, and virtualization are featuring in the top-ten contemporary management concerns. Meanwhile in Australia, the two major retailers (Woolworths with 41.1% of market share and $48.56 billion revenue, and Coles with 31% market share and $34.1 billion revenue in 2012) both launched mobile shopping apps in 2011 with the intent of sensing customer requirements better (Atapattu & Sedera, 2013a), by connecting ubiquitously to access their daily routines 24x7. Thus far, over 3 million customers (1.8 million Woolworths customers and over 1.5 million Coles customers) have downloaded the apps from Android® and Apple® markets which is about 14% of the Australian population. The aforementioned firm-customer ubiquitous digital engagements in contemporary fast moving consumer goods retail provide the background and the motivation for this study.

As the new generations of consumers are innately techno-savvy and allow ubiquitous technologies, networks, and associated systems to weave themselves into the very fabric of their everyday life (Vodanovich, Sundaram, & Myers, 2010) – allowing organizations with option of sensing customer needs by accessing their daily routings through digital interactions. Furthermore, new generations of customers too are responding well to the firm's innovative use of technology, as by nature they are eager to mimic their daily routines in appropriate digitized environments. Whilst firms set out multitude of digital customer touch points aiming to connect with their customers ubiquitously and pervasively, it is important for both research as well as for practice to understand the implications of such pervasive and ubiquitous, uninterrupted digital customer interactions. Mostly the extant research tends to focus on privacy and security related issues in such interactions (McColea, Ramseyb, & Williams, 2010). Some other research streams such as social media (A M Kaplan & Haenlein, 2010), product/service innovation (Sawhney, Verona, & Prandelli, 2005) and customer side service and process automation (Setia, Venkatesh, & Joglekar, 2013) have discussed about the benefits of having digital connections with customers. However, to the best of our knowledge none to date have conceptualized, operationalized or discussed the implications of firm-customer mobile digital connectedness beyond privacy or security related issues.

Connectedness in general, indicates the quality of a relationship, the connection between or how much being in touch (Townsend & McWhirter, 2005). Some researchers discussed connectedness to a technology based on how much a person attached to that technology or the degree of interactions/usage a person has with the particular technology. Whilst many forms of digital options and firms' deployment of them in multitude of customer focussed business activities have been in the academic debate for quite some time, pervasive and use of digital technologies to connect with customers has gained the momentum only recently – thus a conceptualization and operationalization of firm-customer mobile digital connectedness is warranted. This leads to following three research questions; (1) What is firm-customer mobile digital connectedness? (2) How does firm-customer mobile digital connectedness can be operationalized? (3) What are the implications of firm-customer ubiquitous mobile digital connectedness?

This research-in-progress paper has the following three objectives: (1) conceptualize firm-customer mobile digital connectedness through a review related prior research on connectedness in IS and psychology and technology use (2) define and develop measures to operationalize firm-customer mobile digital connectedness based, and (3) discuss implications of firm-customer mobile digital connectedness by empirically testing a model involving firm-customer mobile digital connectedness and customer expectations.

The remainder of this paper proceeds as follows. We first conceptualize the firm-customer mobile digital connectedness in the context of Smartmobile shopping app use by customers referring to the previous conceptualizations of connectedness. Then we briefly discuss the extant IS research on technology / system use and the measures operationalized therein to define and develop measures for firm-customer mobile digital connectedness for this research context. Following which we introduce a simple conceptual model to discuss the implications of firm-customer mobile digital connectedness. Then we test the model empirically and report the initial insights from the first phase of the two-staged research approach before introducing the second phase of the study. We then conclude the paper with a summary and a research outlook.

2 DEVELOPING A CONCEPTUAL FRAMEWORK FOR FIRM-CUSTOMER MOBILE DIGITAL CONNECTEDNESS

Connectedness, in abstract, refers to the collective association (Pavlovich & Krahnke, 2012), where it reflects how well two things interact or the amount of interaction that supports a coalition or connection. Some have defined connectedness as the interdependence (Stoll, Edwards, & Foot, 2012), whilst for others connectedness indicates the quality of the relationship, cohesiveness, the connection between (Dutton & Heaphy, 2003), or the degree of immersion in an affiliation. For example, as per DeSanctis (2013) digital connected implies how much a person glued or attached to a [digital] technology. In other words, mobile digital connectedness refers to the degree of engagement that a person maintains over a period of time in a mobile digital environment. In this research our focus is to understand a customer's connectedness to a firm through a mobile shopping app. In order to initiate or maintain connectedness between a firm and a customer, firm should sense customer's requirement through his/her use of the mobile shopping app. Hence, the firm-customer mobile digital connectedness is not a simple reflection of a customer's 'use' of a firm's customer focused digital technology, rather a customer's use of the digital technology that allows a deeper, closer and intimate relationship between the customer and the firm in a longer run.

Technology use by individuals has been in IS discussion for the past several decades. For example, use has been extensively discussed in past studies in IS success (DeLone & McLean, 1992, 2003; Petter & McLean, 2009), technology acceptance (S. A. Brown, Venkatesh, & Goyal, 2012; Davis, Bagozzi, & Warshaw, 1989; Venkatesh, Brown, Maruping, & Bala, 2008; Venkatesh & Davis, 2000; Venkatesh, Morris, Davis, & Davis, 2003; Venkatesh, Thong, & Xu, 2012) during last two decades. The different measures of system use too, has been in the discussion for quite some time (Burton-Jones & Gallivan, 2007; Burton-Jones & Straub, 2006). Extended use (Po-An Hsieh, Rai, & Xin Xu, 2011) and effective use (Burton-Jones & Grange, 2013) has seen in the recent discussions of system use.

However, our focus in this discussion is not just to understand an individual's use of a smart mobile shopping application; rather our focus is about the Smart mobile app usage that connects an individual to a firm. In other words we understand the firm-customer mobile digital connectedness based on a customer's use of mobile shopping apps. Use here refers to deep use as per Burton-Jones and Straub (2006), where as an example, a customer uses functionalities such as online shopping, browsing products or creating shopping lists will provide ample amount of rich customer insights for the firm to form a relationship with the individual. Also, a customer's frequent utilization of such functionalities to perform tasks that allow a firm to sense their requirements, would provide more chances for the firm to sense those customers' requirements. Hence, the usage measures that are relevant to the construct mobile digital connectedness herein should capture what functionalities of the app he/she used, tasks performed by an individual, and at what frequency. So, such measures reflect the degree to which a customer is mimicking his/her daily shopping related routines in a firm's customer focused mobile app. Hence, in this research we capture the regularity which an individual's employment of one or more features of a mobile app to perform tasks that supports a firm to acquire meaningful insights about the user.

Two approaches helped us form the measures. First, we consider Burton-Jones and Straub (2006), who suggested that one could conceive a system usage using any combination of three elements: (1)

subject using the system (i.e. user) (2) Object being used (i.e. system) and (3) the function being performed (i.e. task). Second, we employ the two-staged approach of Burton-Jones and Straub (2006) to develop content valid, contextualized usage measures to understand firm-customer mobile digital connectedness in the context of mobile shopping apps.

3 MEASURES DEVELOPMENT: APPLICATION OF TWO STAGED APPROACH

In order to develop measures that capture the most relevant system usage content for the firm-customer mobile digital connectedness construct, first, we need to select the elements of usage (i.e. the user, system, and/or task). Then, the formation of content valid, contextualized measures for the selected elements of usage is done by selecting measures that tie closely to the other construct/s in the nomological network. So we define the structure based on the relevance of three elements; user, system and task, in light of the study context; firm-customer mobile digital connectedness. As the firms' objective of firm-customer connectedness here is to sense its customer's shifting requirements, the usage measures we are interested here are not the ones simply symbolizes presence of use but the usage that reflect a complex assortment of activities. In other words, a customer's use of the mobile shopping app that we incorporate into the measures here should facilitate firm's customer sensing hence the connection between the firm and the customer. To capture the usage activities that assist transfer of affluent and unique information about the user we consider all three key elements of usage – user, system and task in our measures.

As prescribed in Burton-Jones and Straub (2006), next we select the measures for the chosen elements that relate theoretically to the other construct in its nomological network. Our concern here is on the affiliation of two constructs, system usage and connectedness. Hence, we select measures that are most suitable to capture context specific usage behaviour by chaining backwards from connectedness measures to usage measures. As connectedness herein refers to the degree of digitized association between a customer and a firm in usage refers to the customers mimicking of his/her shopping related behavior (i.e. customer's use of the shopping app). When a customer uses the app more to mimic his/her shopping related activities (more digitally connected), the firm has more chances to understand his/her unique requirements better. However, a customer's shopping app usage behaviour should send information signals about his/her unique requirements to the respective firm in order for a firm to form /maintain the alliance. In other words, in order for a firm to capture individual customer's unique shopping requirements through the smarter functions of the shopping app, customer's should perform activities that leave valid and unique information footprints on his/her shopping preferences. The strength of connectedness will depend on the tasks performed, functionalities used and the frequency or the consistency which a customer performs tasks using such functionalities, as the validity, quality and uniqueness of information that a customer leave as footprints on the app would depends on the tasks that customer performs, functionalities that the customer has used, as well as the extent to which he/she performs such activities using the mobile app. As such, all such activities in combination will define the degree of an individual's mobile digital connectedness. Hence, we incorporate the usage component (i.e. frequency/extent of use) alone with three elements of usage into the measures, as it is not only the tasks a user performs using a system but the frequency, consistency and the extent to which a user employs the system also matters to the measures.

4 APPLICATION OF MOBILE DIGITAL CONNECTEDNESS

We take the example of employment of smart mobile applications in FMCG retail to connect with customers ubiquitously to discuss the notion mobile digital connectedness and one of its implications – raising customer expectations. Whilst contemporary retailers are increasingly attentive in sensing their customer's shifting requirements, Smart functions of smart-mobile apps provide substantial opportunity for them to sense their customer requirements ubiquitously (Chi, Ravichandran, & Andrevski, 2010). As it has now become the norm for people to use carry smart devices such as mobile phones, personal digital assistants (PDA's) and laptop computers almost everywhere they go, and use digitized tools for multitude of professional as well as personal activities (Vodanovich et al.,

2010) such as everyday shopping, now firm's has the potential to sense the user's needs and expectations through their use of the shopping app. As customers mimic their daily shopping routines using mobile apps, they leave information footprints as a by-product (Chen et al. 2010), which includes not only customers' personal information, but also all the data relating to their unique shopping requirements. As such, firms have the potential to derive unique intelligence on each customer, which can then be used for providing a tailor-made shopping experience for each customer. The amount of sensing that a firm can carry out depends upon the quality and the amount of such interactions a customer performs digitally, as the quality interactions have the potential to provide richer customer insights compared to the poorer interactions, amount of digital interactions leave more information footprints compared to the lesser ones. In other words the degree of digital engagement through a mobile app; "mobile digital connectedness", would defines the amount of customer sensing that a firm can achieve.

Customers, on the other hand seem to be well aware of firms' sensing abilities through mobile apps (Gao, Sultan, & Rohm, 2010; Andreas M. Kaplan, 2012; Lamarre, Galarneau, & Boeck, 2012; Rohm, Gao, Sultan, & Pagani, 2012; Shankar, Venkatesh, Hofacker, & Naik, 2010). Thus, in exchange of their daily routines being captured through mobile apps, consumers expect better, tailor-made, unique and swift responsiveness from firms to meet their unique requirements. In other words firm-customer's mobile digital connectedness raises customers' expectations; hence the customers who are connected with the firm digitally expect greater responsiveness from the firm (See figure 1).
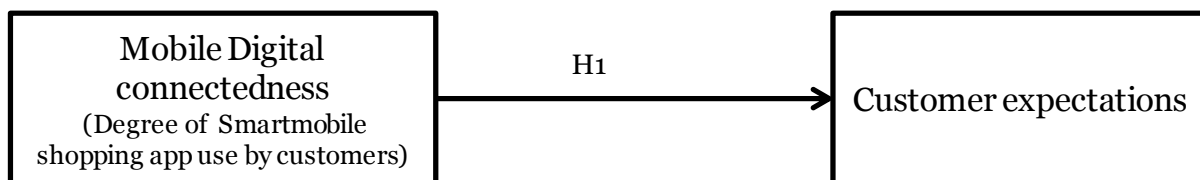

Figure 1.   *Conceptual Model: Degree of firm-customer mobile digital connectedness, customer expectations*

Failure to provide the customers a unique experience through tailor-made responses could possibly lead to lower customer satisfaction, and eventually the disengagement (S. A. Brown et al., 2012; Choi & Mattila, 2008) since customers now seek immediate gratifications (McMahon & Pospisil, 2005). Thus, a firm's digital customer connectedness via mobile apps, though easy to deploy, must be carefully managed. As firms have more customer sensing opportunities when the firm-customer mobile digital connectedness is more, customers with greater digital interactions would expect more responsiveness on their unique expectations from the firm opposed to the customers with greater digital interactions. Thus, we hypothesize:

H1: *The degree of firm-customer mobile digital connectedness is positively associated with the customer's expectations, such that customers with higher degree of mobile digital connectedness expect firms to respond with highly personalized responses their unique needs.*

5   MEASURES DEVELOPMENT

We followed the guidelines proposed by Churchill (1979) and Burton-Jones and Straub (2006) for developing the measures for the constructs in our research model. Following our conceptualization, definition and measures development procedure on firm-customer mobile digital connectedness earlier in this discussion, we first developed the measurement items for firm-customer mobile digital connectedness based on previous 'system use' related literature (Barki, Titah, & Boffo, 2007; Burton-Jones & Grange, 2013; Burton-Jones & Straub, 2006; Venkatesh et al., 2008; Venkatesh et al., 2003). Next we developed measurement items for customer expectations based on previous validated measures of similar constructs from ECT literature (Bhattacherjee, 2001; S. A. Brown et al., 2012; S.A. Brown, venkatesh, Kuruzovich, & Massey, 2008). Where possible, the existing measures of

constructs were adapted to the context of this study. For new measures and those that required significant changes, we followed the standard scale development procedures stipulated in Burton-Jones and Straub (2006) and Mackenzie, Podsakoff, and Podsakoff (2011). Following the development of measurement items, we conducted a pre-test and pilot study to assess the reliability and validity of our measures. Our pre-test comprising 30 respondents and subsequent follow-up discussion with a subset of respondents created sufficient confidence in the scales to proceed with the pilot survey administration. Table 1. below lists the sources and measurement items for the two constructs firm-customer mobile digital connectedness and customer expectations.

Construct	Items a	Measure sources
Firm-Customer mobile digital connectedness (Customer's use of Smartmobile app)	I frequently use this mobile app to....... - find products - prepare my regular grocery shopping list - place orders - provide comments and feedback - find a store more convenient	(Barki et al., 2007; Burton-Jones & Straub, 2006; Venkatesh et al., 2008; Venkatesh et al., 2003)
Customer expectations (What customer's expect from the firm)	I expect [retailer] to…. - provide information about discounts and promotions based on my specific requirements - be responsive to my changing needs and wants - provide personalized offers based on products that I purchase regularly	(S. A. Brown, Venkatesh, & Goyal, 2011; S.A. Brown et al., 2008)

Table1.   Constructs, measurement items and measure sources

6   RESULTS – PILOT TEST

6.1   Sampling frame and characteristics

We administered an anonymous pilot surveys both online and off-line seeking a customer sample of the two main retailers (Coles Supermarkets and Woolworths) in Australia, who have launched mobile apps offering on-line shopping, shop locators, recipes, preparation of shopping lists and special offers to their customers. As such the pilot survey instrument was posted on social media community pages of the two retailers in addition to the paper-based survey were administered at a main shopping mall. Our data collection yielded a total of 129 respondents. Subsequent screening for missing data left us with 127 usable respondents, with 2 of the responses omitted due to missing values.

We used the wave analysis (Armstrong & Overton, 1977) to assess the impact of non-respondent bias, whereby the respondents were grouped into early and late respondents, online and off-line respondents and comparisons were made according to the respondents' age and gender. Our analysis revealed no significant differences between early and late respondents or between the other combinations. Based on our findings, non-response bias did not appear to impact on our pilot study.

6.2   Reliability tests

Following Barclay, Higgins, and Thompson (1995) we examined our simple conceptual model for, a) individual item reliability, b) internal consistency, and c) discriminant validity, using the partial least square (PLS) technique of structural equation modelling in SmartPLS 2.0 (Ringle, Marc/Wende, & Sven/Will, 2005) software. Our test of individual item reliability and discriminant validly confirmed the validity and reliability (Barclay et al., 1995; Chin, 1998) of all of the measurement items (See Table 2). In addition, whilst Average Variance Extracted (AVE) and communalities both support the discriminant and convergent validity, the composite reliability and Cronbach's alpha for each construct also supported the internal consistency of the constructs (Fornell & Larcker, 1981) (See...Table 3). Both confirmatory and exploratory factor analysis procedures have confirmed sufficient reliability.

	Firm-Customer digital connectedness	Customer Expectations
Firm-Customer digital connectedness-1	**0.9455**	0.3414
Firm-Customer digital connectedness-2	**0.8978**	0.2442
Firm-Customer digital connectedness-3	**0.8098**	0.1581
Firm-Customer digital connectedness-4	**0.7652**	0.1057
Firm-Customer digital connectedness-5	**0.8927**	0.3105
Customer Expectations-1	0.2964	**0.9525**
Customer Expectations-2	0.2877	**0.9488**
Customer Expectations-3	0.2689	**0.9427**

Table 2.   *Loading and cross-loading measures for Firm-Customer mobile digital connectedness and customer expectations*

	AVE	Composite Reliability	Cronbachs Alpha	Communality	Redundancy
Customers' expectations	0.8987	0.9638	0.9437	0.8987	0.0809
Firm-Customer digital connectedness	0.7476	0.9364	0.9204	0.7476	0

Table 3.   *Average Variance Extracted (AVE), composite reliability and Cronbach's alpha*

6.3   Testing hypothesis

To test our hypothesized relationship, degree of firm-customer mobile digital connectedness and customer expectations, we tested the correlation between firm-customer mobile digital connectedness and customer expectations with linearity assumptions as well as with non-linear quadratic postulations using standard procedures of using SPSS (Figure 2). Our assumptions of non-linearity influenced by the underlying non-linearity assumptions inherent to the expectation-confirmation theory (S. A. Brown et al., 2012).
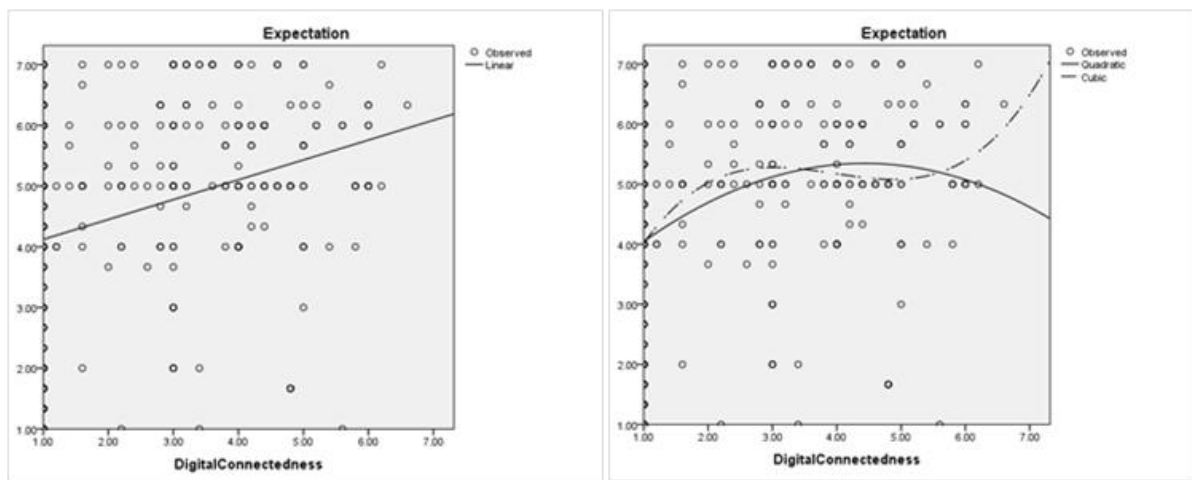

Figure 2:   *linear and non-linear representations of the relationships between mobile digital connectedness versus customer expectation*

Both linear and non-linear representations demonstrate that customers raise their expectations with the heightened levels of digital interactions with the firm (firm-customer mobile digital connectedness) lending support to our hypothesized relationship. However, whilst the linear assumption shows a continuous upward relationship, the non-linear assumption portrays an upward curvilinear relationship, level of expectation peaking as firm-customer mobile digital connectedness reaches moderate levels. As shown in the curvilinear graph in Figure 2 the level of expectations reduces when the firm-customer mobile digital connectedness increases ($R^2 = 0.090$).

7 RESEARCH OUTLOOK AND CONCLUSION

This research-in-progress paper sought to conceptualize measure and then apply the notion of mobile digital connectedness to study the implications of ubiquitous, pervasive and uninterrupted firm-customer digital interactions. Whilst there are many forms of firm-customer digital interactions are apparent (e.g. online customer communities, social media sites, e-mail, online shopping sites, Smart apps, automated service & help desks), we conceptualized firm-customer mobile digital connectedness based on a customer's use of mobile shopping app, in the context deployment of ubiquitous Smartmobile shopping apps in consumer retail. Our choice of using Smartmobile shopping app in consumer retail was primarily influenced by the recent rise of smart app market (e.g. iOS, Android and Windows) and the increased deployment by the retailers (e.g. Tesco South Korea, Coles and Woolworths Australia), popularity and penetration of Smart devices and Smart apps, ubiquity and pervasiveness of such apps, their ability to maintain uninterrupted real-time interactions with customers and the possible implications associated with them. Following our conceptualization, we then developed measures for firm-customer mobile digital connectedness using Smartmobile shopping app as an example. Then we applied our measures to test our hypothesized relationship between firm-customer mobile digital connectedness and customer expectations in a field setting. We analysed the pilot data with linear as well as non-linear quadratic postulations using SPSS. Both results divulged that customers raise their expectations as their digital interactions with the firm increases, highlighting the importance of managing digital interactions and customer experiences for firm success.

As our pilot results suggest it is important for both research and practice to understand the consequences of firm-customer ubiquitous, pervasive real-time connectedness. Hence the second phase of this research investigates the relationships between firm-customer mobile digital connectedness, customer expectations, customer experiences and customer satisfaction using Expectation Confirmation Theory (ECT) (Oliver, 1977, 1980) as our theoretical lens. As our pilot results show the non-linear postulations has the potential to predict non-linear and asymmetric propositions and relationships and reveal richer insights on the relationships, we intend to use polynomial regression together with response surface methodology (Edwards, 2001; Khuri & Cornell, 1987) in our main analysis. Further, the polynomial regression and response surface methodology together would allow us to interpret the complex three-dimensional relationship between two independent variables (firm-customer mobile digital connectedness and customer expectations) and one outcome variable (customer satisfaction).

This study is currently progressing at the second phase data collection. This research is expected to make several contributions to both research and practice upon its completion. First, this research provides a logical, systematic theory guided framework to conceptualize mobile digital connectedness for ubiquitous firm-customer digital engagements through Smartmobile shopping apps. Next, this study introduces new measures of system usage for firm-customer mobile digital connectedness using two step approach suggested by Burton-Jones and Straub (2006). As such, this discussion also contributes to the cumulative progress of measuring system / technology usage. Further, non-linear assumptions and application of polynomial regression and response surface methodology in this study also contributes to the research methodology as not many in IS has used these techniques. That would help future IS researchers to uncover complex interactions between the constructs in research models. For practice, this research would highlight the criticality of firm-customer ubiquitous relationships and customer expectations management and has the potential to provide a benchmark for firms to track their customer focused digital strategic initiatives on check.

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