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Demystifying the Communication-Driven Usefulness Hypothesis:
The Case of Healthcare Insurance Applications

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ABSTRACT

Healthcare insurance applications are increasingly vital to and have gained popularity with consumers. Previous information systems research featured perceived ease of use and perceived usefulness as key independent variables to explain behavioural intention impacting the use of information systems. In today's environment, however, many consumers already rely on websites and mobile applications as a key means of communication with healthcare insurance providers. Examining the data from 333 survey respondents, this study reports that perceived ease of use and perceived usefulness are strongly influenced by three communication content variables (information quality, interaction ease, and provider competence). Importantly, consumers may judge applications' ease of use based on the quality of communication contents. Once applications reach some maturity, the prominence of communication quality may drive their use more significantly than before.

KEYWORDS

Applications (HIAs), Communication-Driven Usefulness Hypothesis, Healthcare Insurance Perceived Ease of Use (PEOU), Perceived Usefulness (PU)

1. INTRODUCTION

Health expenditures in the United States (U.S.), according to Walker & Calderon (2018), are projected to be eighteen percent (18%) of its GDP with health consumers struggling to navigate through the numerous errands that various sectors of this industry have imposed on them. In particular, the health insurance sector, as a key part of the growing healthcare marketplace, is highly complex. Specifically, health insurance consumers are routinely tasked with the critical role to seek information relating to insurance policies and procedures, and more importantly, insurance coverage details. Often, these consumers are seeking for the most appropriate health insurance policy catering to their needs, the best healthcare provider they can afford based on the stipulated requirements or prerequisites for approval to obtain certain and specific medical procedure(s), and alternative medication payment schemes that may be activated. Today, such expanding role and responsibilities expected of these consumers are beginning to overwhelm, calling for the need and use of more user-friendly healthcare insurance applications (HIAs).

Accordingly, health insurance companies have implemented HIAs, which have become commonplace in the form of websites or mobile apps, to ease information seeking and transaction tasking for consumers. A 2016 survey reported that eighty-four percent (84%) of respondents prefer to interact digitally with health insurance providers (Shea & Ramachandran, 2016). These authors

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claim that "the quality, maturity and effectiveness of digital customer service capabilities are clearly important influencers on members as they shop for plans and interact with [those providers] …"

Importantly, a key lesson for developers of HIAs is to enable consumers to keep track of how much healthcare expenditures are covered by their health insurance. With the advent and increasing sophistication of websites and mobile phone apps in the last decade, noticeable improvements have been made with consumer-oriented healthcare applications as mobile phone use become increasingly pervasive (Mosa, Yoo, & Sheets, 2012, 2015). Given the current reality of consumer HIA preferences, use and satisfaction, and that there are few studies that focused on HIAs and the relationship between HIA's communication contents and usefulness, the primary research question being investigated here is:

1.1. What drives Perceived Ease of Use (PEOU), and Perceived Usefulness (PU) of HIAs?

This identified knowledge gap is termed here as "the communication-driven usefulness hypothesis." Specifically, the study presented here aims to investigate the key factors underlying the complexity in communication about health insurance matters. Three non-information technology (IT) constructs on communication quality that substantially influence the traditional IT constructs, PEOU and PU, of HIAs are posited. Hence, the study main focus is not to extend the Davis (1989) Technology Acceptance Model (TAM) nor the Venkatesh, Morris, Davis & Davis (2003) Unified Theory of Acceptance and Use of Technology (UTAUT), but to examine to what extent communication contents (non-IT artifacts) influence the PEOU and PU of HIAs (IT artifacts).

The remainder of the paper is structured as follows. Section 2 overviews the relevant extent literature to provide background to our theoretical model with details on the hypotheses. Section 3 describes the study method and results. Section 4 lays out the study implications from both a theoretical and a practical perspective. Section 5 then offers concluding remarks followed by brief discussions on limitations and future research opportunities.

2. BACKGROUND & HYPOTHESES

Today, the evolution of innovative technology such as the internet-of-things (IoT) has expanded opportunities even more widely and rapidly for both consumers and health providers (Datta, Bonnet, Gyrard, Da Costa, & Boudaoud, 2015; Rahmani, Thanigaivelan, Gia, Granados, Negash, Liljeberg, & Tenhunen, 2015). As technological innovations evolve, some scholars (Al-Janabi, Al-Shourbaji, Shojafar, & Shamshirband, 2017; Denecke, Bamidis, Bond, Gabarron, Househ, Lau, Mayer, Merolli, & Hansen, 2015) note challenges and issues associated with ethics, privacy and security while others highlight more opportunities with informatics (Marceglia, Fontelo, & Ackerman, 2015), RFID (Katz & Rice, 2009), wearables (Jovanov & Milenkovic, 2011) and specific domains of healthcare enhancement (Burke, Ma, Azar, Bennett, Peterson, Zheng, Riley, Stephens, Shah, & Suffoletto, 2015).

Not surprisingly, then, HIA users are facing a set of very different circumstances than what users of the business information systems (BIS) were decades ago. First, HIA users want and need to use them. Second, technical advancement is making consumers' IT/IS use even more pervasive and accessible than before. In 2017, Smith observed that about three-quarters of Americans now own a smartphone, and 88% of them had access to the internet (Smith, 2017). Third, consumers are already being exposed to, are familiar with and/or are experienced app users. A recent survey shows that 64% of patients use a digital device, including mobile apps, to manage their health (McCarthy, 2017). Notwithstanding, the Shea-Ramachandran 2016 survey notes that "approximately one-third of respondents were somewhat or not at all satisfied with their plans' communications, claims handling operations and customer support" while about 40% of them do not give a perfect score on the HIA technology (Shea & Ramachandran, 2016, p. 4). Clearly, consumers still feel the need for improvements in the message (communication) and the messenger (technology) though they are already using HIAs as a vital means of their communication channel with health insurance providers.

Much of the prevalent research focus might not be the best fit for an application type such as HIAs. For example, acceptance and use were key concerns for BIS, especially in their formative years. Yet, a recurring topic of IS studies has been to identify factors that lead to more system use and continuing use. In the past two decades, we have seen the evolution of theoretical models guiding those studies, ranging from Theory of Reasoned Action/TRA (Ajzen & Fishbein, 1973; Fishbein & Ajzen, 1975) and Theory of Planned Behavior/TPB (Ajzen, 1991) to TAM (Davis, 1989), its extended version, TAM2 (Venkatesh & Davis, 2000) leading up to UTAUT (Venkatesh, Morris, Davis, & Davis, 2003; Venkatesh, Thong, & Xu, 2016). These models focus on behavioral intention and use behavior, frequently incorporating ease of use (effort expectancy) and usefulness (performance expectancy) of business and consumer applications as explanatory variables.

The IS studies using TAM typically hone on two constructs of IT design outcomes: PEOU and PU. PEOU is defined as "the degree to which a person believes that using a particular system would be free of effort" whereas PU is "the degree to which a person believes that using a particular system would enhance his or her job performance" (Davis, 1989, p. 320). Mortenson and Vidgen (2016) identified three thousand three hundred eighty-six (3,386) TAM-related studies. Even so, a few understudied aspects have surfaced. For example, most TAM studies do not focus on health insurance apps and/or websites. More importantly, PEOU and PU are treated as key independent variables (IVs) in the TAM studies to predict use intention and eventual usage behavior. Literature reviews (e.g., King & He, 2006; Marangunić & Granić, 2015) do not indicate that PEOU and PU are the primary interest in the TAM studies.

2.1. Ease of Use & Usefulness of HIAs

The belief on how useful an application (app), or PU, is a fundamental motivator for the app use. Legris, Ingham, and Collerette (2003) reviewed TAM studies published between 1980 and 2001. Of the twenty-eight (28) empirical TAM/TAM2 models that were tested, the authors found twenty-one (21) had the significant positive relation between PEOU and PU while five (5) had non-significant relation and two (2) were not tested. In UTAUT, Venkatesh et al. (2003) incorporated PEOU as part of performance expectancy (PE), defining PE as "the degree to which an individual believes that using the system will help him or her to attain gains in job performance" (p. 447). Similarly, these authors embedded PU in effort expectancy (EE), or "the degree of ease associated with the use of the system" (p. 450). PE and EE are more recent constructs than PEOU and PU.

In this study, we adopt the use of PEOU and PU constructs for two reasons. First, by including job-oriented items, the PE and EE constructs are composite. Second, recent studies still use PEOU and PU as key variables, which offer a broad base of references for the purpose of our study. In fact, recent studies that have applied TAM on non-business IS, including e-portfolios (Abdullah, Ward, & Ahmed, 2016), advanced driver assistance systems (ADAS) (Rahman, Lesch, Horrey, & Strawderman, 2017), learning management systems (LMS) (Binyamin, Rutter, & Smith, 2017) and mobile shopping sites (Agrebi & Jallais, 2015), still reported a significant positive relation between PEOU and PU. The argument for PEOU to have a significant impact on PU stems from the fact that if technology is easy to use, it is more likely to be used in the first place. Similarly, the intended output is more likely to be attained and that it will be beneficial. This brings us to state the first hypothesis (H1) based on our review of the extant literature (Legris et al., 2003):

H1: The higher the PEOU, the higher the PU

2.2. Impact of Information Quality (IQ)

A literature review of TAM between 1986 and 2013 by Marangunić and Granić (2015) noted a number of factors that possibly influence PEOU and PU to include: system characteristics, user training, user participation design, the nature of the implementation process, personality traits, demographic

characteristics, computer self-efficacy, technology anxiety, and prior usage and experience. In the design and development phase, consumer healthcare apps should certainly follow the guidelines popularly advanced by the human-computer interaction community; that is, providers should develop right "use cases" and identify relevant functional content and features (Schnall, Rojas, Bakken, Brown, Carballo-Dieguez, Carry, Gelaude, Mosley, & Travers, 2016).

Once HIAs are developed and released, however, it becomes intuitively clear that what drives PEOU is primarily the quality of information (IQ). Information is essential to the usefulness of IT/IS. Consequently, the usefulness of these systems is related to IQ, the quality of the information. When IQ is enhanced, users will find the output information to be more helpful and are likely to be more willing to use the IT/IS more frequently. Therefore, it would appear reasonable that IQ would impact the PU of HIAs.

The DeLone-McLean IS Success Model (DeLone & McLean, 1992; DeLone & McLean, 2003) posits that three key drivers of IS success are IQ, system quality, and service quality. Health insurance is a complex financial product that requires consumers to manage intricate tradeoffs over a range of variables (Nadash & Day, 2014). Consumers often have to grapple with "complex contracts and hard-to-decipher benefits designs" (Kingsdale, 2014, p. 394). That is, if we assume that the quality of HIAs within a range where consumers will still use HIAs, then such factors as IQ, interaction ease with the insurance provider, and provider competence are likely to play critical roles for HIA use. This is the very basis for our "communication-driven usefulness hypothesis" for HIAs.

Concerning IQ impact, Ghasemaghaei and Hassanein (2016) conducted a comprehensive review of 452 articles. Of twelve (12) studies testing the IQ impact on PEOU, eight (8) reported significant positive impact while four reported IQ impact to be non-significant. Interestingly, the positive impact of IQ on PEOU is also found for using online retail websites, where consumers search and compare multiple purchase options (Ahn, Ryu, & Han, 2007). Additionally, IQ influence PEOU of community municipal portals that facilitate the delivery of information, services, and resources (Detlor, Hupfer, Ruhi, & Zhao, 2013). Putting aside these twelve (12) studies, Kuo and Lee (2009) reported that IQ also significantly impacts PEOU in knowledge management systems (KMS), where the complexity of task knowledge may be wanting. We therefore hypothesize the relation between IQ and PEOU as:

H2a: The higher the IQ, the higher the PEOU

Further, of twenty (20) studies examining the IQ impact on PU, Ghasemaghaei and Hassanein (2016) reported only three (3) exceptions that did not find it significant. Briefly, eighty-five percent (85%) of the studies did find IQ to be a significant positive factor for PU. Beyond this, Wang (2016) reported that IQ positively impacts the PU of online group buying websites (e.g., Groupon, LivingSocial). IQ is also found to be a significant positive factor for the PU of online consumer reviews posted at Amazon.com and Booking.com (Matute, Polo-Redondo, & Utrillas, 2016). Erkan and Evans (2016) found the same relation between IQ and PU for social media websites. Thus, we posit that:

H2b: The higher the IQ, the higher the PU

2.3. Impact of Interaction Ease and Provider Competency

When using HIAs, consumers typically navigate, search and have to comprehend their healthcare coverage and expenses for each medical situation. The quality of how services is delivered via HIAs may resemble that of retailer websites, which Ahn et al. (2007) defined as the "availability of communication mechanisms for accepting consumer complaints and timely resolution of them with responsiveness, assurance, and follow up services" (p. 264). Notably, the service context of health insurance is relatively different from that of online consumer retailing. Effectively, health insurance customers need to engage complexly in multiple iterations of communication (and interaction) with

the provider to resolve any issues beyond just obtaining online information readily. For instance, providers often "do not completely reimburse the expenses despite their contractual obligations" (Khademolqorani & Hamadani, 2015, p. 44).

From the perspective of health insurance customers, communication mechanism fundamentally consists of two elements: interaction ease or how easily such complex communication is handled with and by their provider, and provider competency regarding how easily insurance issues and problems are resolved as well as how and what relevant information is provided in a timely manner.

Interaction ease is critical for HIAs, because customers often encounter communication difficulty comparable to obfuscation where consumers experience cognitive limitations due to the interaction complexity associated with difficult-to-comprehend information and price structure presented during their search efforts (Choi, Kwon, & Shin, 2017). Obfuscation could be relieved or aggravated by superior or inferior HIA designs - as Mick and Fournier (1998) characterized as one of the central paradoxes of technological products; in this case, HIAs.

As an example, (Armentano, Abalde, Schiaffino, & Amandi, 2014) examined the users of recommender systems. Their perception was such that the ease of interaction correlates with the ease of use at a high level of 0.677. While "providers" of recommender systems are their data and the systems themselves, the providers of HIAs are health insurance organizations that communicate with customers through their HIAs. On the one hand, better HIA designs cannot overcome the lack of interaction ease and provider competency; on the other, customers may perceive greater interaction ease as the sign of better HIA designs. The model tested by Ahn et al. (2007) showed service quality to be directly influencing PEOU of retailers' website. Their construct of service quality includes the items, "Anticipates and responds promptly to user needs and request," "Understands and adapts to the user's specific needs," and "Provides follow-up service to users." These items imply an interaction between users and providers. Altogether, we posit that:

H3: The greater the interaction ease, the higher the PEOU

Service provider competency is one of the significant provider-related factors that influence the quality of healthcare service (Mosadeghrad, 2014). It also relates significantly to positive and negative sentiments toward service encounters (Price, Arnould, & Deibler, 1995). We thus rationalize provider competence to lead to a higher PU, which in turn increases positive sentiment. This sort of reasoning is consistent with the findings of earlier studies (Ahn et al., 2007; Saeed, Hwang, & Mun, 2003). As well, (Featherman, Miyazaki, & Sprott, 2010) found that PU is positively impacted by e-service provider trust worthiness and expertise. Therefore, we hypothesize that:

H4: The higher the provider competence, the higher the PU

3. METHOD & RESULTS

To validate hypotheses H1to H4, data were collected from an online survey. Before developing the survey questionnaire, telephone interviews were first conducted with three (3) health insurance executives to obtain insights into the current consumer health insurance market. Each had more than 15 years of health insurance industry experience. They shared information regarding the current industry technology trends as well as health insurance market segmentation in terms of plan type, purchase source and customer demographics. We then developed the survey questionnaire based on the insights gained from those interviews and refined it by referencing the findings from previous studies (Boonen, Laske-Aldershof, & Schut, 2016; Handel & Kolstad, 2015).

3.1. Survey Administration

We collected the data in the spring of 2017 from Amazon Mechanical Turk (MTurk) via an online survey platform for two reasons. First, a recent study (Mortensen & Hughes, 2018) finds that MTurk is a feasible data collection source in the context of health and medical research. Second, MTurk has been shown to be useful for gathering quality data economically and quickly, and where data obtained are at least as reliable as those acquired through traditional means (Buhrmester, Kwang, & Gosling, 2011; Germine, Nakayama, Duchaine, Chabris, Chatterjee, & Wilmer, 2012; Holden, Dennie, & Hicks, 2013).

Five hundred twenty-two (522) observations were collected. Respondents were given a recruiting statement on MTurk that explained the nature of the voluntary and anonymous survey before consenting to participate. After screening for responses with duplicate IP addresses, incomplete surveys, and surveys completed from outside of the U.S., four hundred twenty-five (425) observations remained. Of these, ninety-two (92) respondents (21.6%) never used HIAs. Among the ninety-two (92) respondents who did not use HIAs, 72.8% were older than forty (40) years old. Removing their data, three hundred thirty-three (333) observations (78.4%) were used to test the hypotheses of this study.

To entice participation and full completion of the online survey, $1.25 was offered to all respondents who voluntarily completed the survey. So as to lessen the likelihood of duplicates (including partially completed surveys and/or responses provided from outside of the U.S.), all potential respondents were notified prior to their consenting to participate in the survey that to receive payment, the survey must be completed in full and that responses entered from the same IP address or outside of the U.S. would not qualify. Gentle warnings have been shown to increase attentiveness without creating ill will among survey respondents, particularly online participants (Huang, Bowling, Liu, & Li, 2015).

3.2. Sampling & Respondent Profile

Table 1 profiles the three hundred thirty-three (333) respondents and provides summary statistics of collected responses from these participants. Among the qualified respondents, 58.9% obtained insurance through their employer, 27.0% obtained their insurance through the U.S. health insurance marketplace (healthcare.gov) an intermediary service, and 12.3% obtained their insurance directly from an insurance company. A majority of the remaining respondents is younger than forty (40) years old, while gender happen to be evenly divided in our sample.

3.3. Constructs of Latent Variables & the PLS-SEM Model

A summary of the latent variable constructs is given in Table 2. Each item was measured on a five-point Likert scale anchored by 1 representing "strongly disagree" and 5 representing "strongly agree." 1. PLS-SEM is an accepted technique for examining complex causal relationships (Henseler, Ringle, & Sinkovics, 2009). It is less restrictive in its assumptions for sample sizes, measurement scales, and residual distribution (Chin, 1998), and less likely to lead to estimation problems (Goh & Sun, 2014).

PEOU and PU constructs are derived from those used by Davis (1989). IQ construct is based on the DeLone-McLean work (DeLone & McLean, 2003). Interaction Ease (IE) construct is informed by applying the constructs for the "complexity" of personal computers (Thompson, Higgins, & Howell, 1991) and the "efficiency" of service delivery performance on websites (Parasuraman, Zeithaml, & Malhotra, 2005). Provider Competency (PC) construct is adopted from consultation with the "expertise" (Dagger, Sweeney, & Johnson, 2007) in term of health services quality.

The path analytic model is shown in Figure 1, indicating the hypothesized relationships among the different studied variables. Note that realizing PEOU and PU might also be influenced by multiple contextual factors such as age, gender, income, insurance purchase source, claim count, and so forth, which we have grouped and defined as control variables in the figure below.

As multiple paths, comprising simultaneous equations, exist between some variables, this study used partial least squares – structural equation modeling (PLS-SEM) to validate the hypotheses posited and to estimate the model's path coefficients. Previous research has used PLS-SEM modeling to

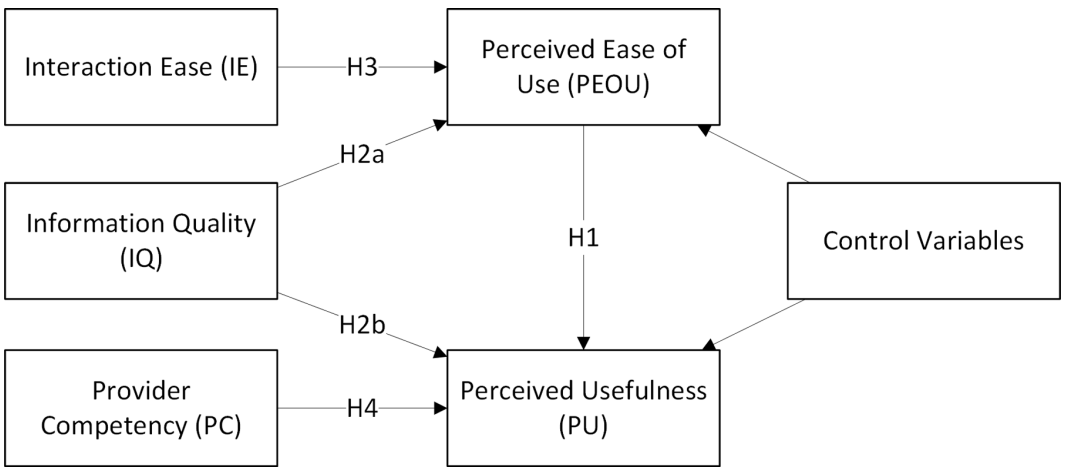
Table 1. Profile of respondents

Variables	Frequency (%)	Variables	Frequency (%)
Age		Claim Count	
18-19	1 (0.3)	0	54 (16.2)
20-29	91 (27.3)	1-5	198 (59.5)
30-39	152 (45.6)	6-10	40 (12.0)
40-49	44 (13.2)	More than 10	41 (12.3)
50-59	23 (6.9)	Premium	
60-69	16 (4.8)	$200 or less	158 (47.4)
70 or above	6 (1.8)	$201-$500	119 (35.7)
Gender		$501-$1,000	31 (9.3)
Female	176 (52.9)	$1,001 or more	9 (2.7)
Male	157 (47.1)	I don't know	16 (4.8)
Income		Deductible	
Less than $25,000	42 (12.6)	Less than $1,500	114 (34.2)
$25,001 - $45,000	75 (22.5)	$1,501-$2,500	68 (20.4)
$45,001 - $65,000	73 (21.9)	$2,501-$4,500	61 (18.3)
$65,001 - $80,000	46 (13.8)	$4,501-$7,500	48 (14.4)
$80,001 - $100,000	38 (11.4)	$7,501-$10,000	5 (1.5)
$100,001 - $125,000	30 (9.0)	More than $10,000	2 (0.6)
$125,001 - $150,000	15 (4.5)	I don't know	35 (10.5)
$150,001 - $200,000	10 (3.0)	Out of Pocket Expenses	
More than $200,000	4 (1.2)	Less than $1,500	191 (57.4)
Purchase Source		$1,501-$2,500	61 (18.3)
Employer	196 (58.9)	$2,501-$4,500	28 (8.4)
Marketplace	90 (27.0)	$4,501-$7,500	19 (5.7)
Insurance Company	41 (12.3)	$7,501-$10,000	4 (1.2)
Broker	5 (1.5)	More than $10,000	1 (0.2)
Other	1 (0.3)	I don't know	29 (8.7)
Plan Type		Tools Provided to Estimate Out of Pocket Expenses	
Individual	192 (57.7)	No	45 (13.5)
Family	141 (42.3)	Yes	234 (70.3)
Preferred Comm. Medium		I don't know	54 (16.2)
Phone	69 (16.2)		
Email	151 (35.5)		
Chat/text	170 (40.0)		

Table 2. Construct of latent variables

Latent Variable	Construct	Reference
Perceived Ease of Use (PEOU) 3 items	I find that my insurance company's technology is easy to use. I find that my insurance company's technology is easy to learn. Interacting with my insurance company's technology does not require a lot of mental effort.	Davis (1989)
Perceived Usefulness (PU) 4 items	I find that my insurance company's technology is useful. Using my insurance company's technology increases my productivity. Using my insurance company's technology is convenient. Using my insurance company's technology saves me time.	Davis (1989)
Information Quality (IQ) 5 items	Generally, I can find the information that I want from my health insurance company. My health insurance company provides relevant information. My health insurance company provides accurate information. My health insurance company provides timely information. My health insurance company provides up-to-date information.	DeLone and McLean (2003)
Interaction Ease (IE) 3 items	My health insurance company is easy to work with. Dealing with my health insurance company is hassle free. Interactions with my health insurance company are not complex.	Parasuraman et al. (2005), Thompson et al. (1991)
Provider Competence (PC) 3 items	The employees at my health insurance company have the required knowledge to solve problems. I believe the insurance company employees have the ability to answer all questions accurately. The behavior of employees at my health insurance company instills confidence in customers.	Dagger et al. (2007)

Figure 1. Hypothesized path analytic model



identify key relationships among multiple structured variables; as such, PLS-SEM is an accepted data analytic technique for examining complex causal relationships (Henseler et al., 2009). Specifically, SmartPLS 3 (Ringle, Wende, & Becker, 2015) was used to validate our model. Loadings for all the variables were found to be statistically significant ($p < 0.001$).

Table 3 shows that Cronbach's alpha values exceed 0.7 for all constructs investigated, implying consistently high reliability among items measured for the various constructs (Petter, Straub, & Rai, 2007). Additionally, we conducted convergent and discriminant validity tests based on the average

variance extracted (AVE) value for each construct reported (Yoo & Alavi, 2001). As provided in Table 3, the square root values of these AVEs on the diagonal are larger than the correlations with other constructs, which essentially implies that all questions used to measure the different constructs investigated in the model have high discriminant and convergent validities.

3.4. Study Results

Figure 2 shows the results of PLS path analysis. At 0.412 and 0.683, respectively, the values of R2 for PEOU and PU are relatively high. Clearly, Figure 2 analysis results also depict H1 to be strongly supported ($\beta = 0.625$, $p = 0.000$).

As shown, each of PEOU and PU has three significant control variables. For PEOU, age ($\beta = -0.121$, $p = 0.001$), deductible ($\beta = -0.109$, $p = 0.003$), and insurance premium ($\beta = 0.129$, $p = 0.001$) are statistically significant; that is, PEOU is higher when the insured are younger, pay less in deductibles, and pay more in insurance premiums. For PU, it is perceived to be higher when claim count is higher ($\beta = 0.109$, $p = 0.000$), the preferred communication medium is not phone ($\beta = -0.089$, $p = 0.001$), and the tool to estimate out-of-pocket (OOP) expenses is provided ($\beta = -0.084$, $p = 0.035$).

The impact of IQ is positive on both PEOU and PU. However, IQ has much stronger impact on PEOU ($\beta = 0.494$, $p = 0.000$) than PU ($\beta = 0.092$, $p = 0.068$). The results affirm H2a, but only marginally significant for H2b. The path from interaction ease (IE) to PEOU is also significant ($\beta = 0.182$, $p = 0.002$), which confirms H3. Finally, H4 is supported since the path from provider competency (PC) to PU is significant ($\beta = 0.163$, $p = 0.002$).

4. IMPLICATIONS

Based on the PLS-SEM analysis, a key implication is that communication content artifacts (IQ, IE and PC) influence IT artifacts (PEOU and PU). Evidence shows that IT artifacts are intermingled with non-IT artifacts. In the consumers' eyes, these two types of artifacts are perhaps inseparable. Given that consumers would want, need and/or are expected to use HIAs, the focus on the three elements of communication content artifacts is vital, unless the technical HIA interface quality fails to meet their expectation, thereby encouraging consumers to opt out of HIAs use in sought of other means.

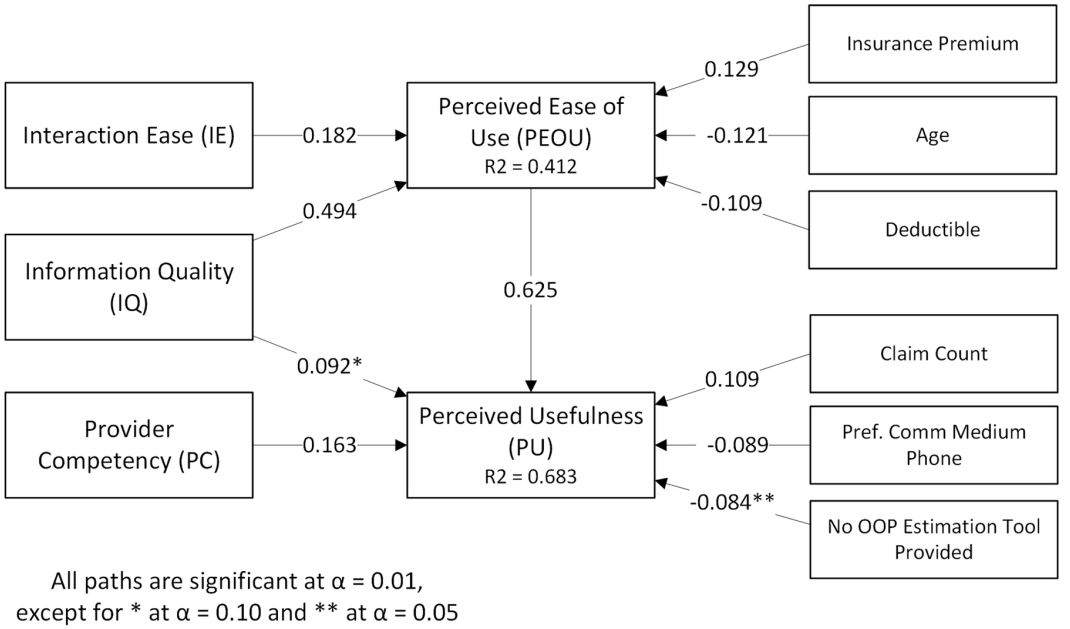
The main thread of HIA usefulness, judging from the resulting analytics, starts with IQ and IE. Specifically, IQ constitutes relevancy, accuracy, timeliness, currency and accessibility of health insurance information to minimize the occurrence of obfuscation during the consumer-provider communication process. Higher IQ simply enhances the ease of HIAs use; in fact, the power of IQ comes from its ability to influence the ease of HIA use. IQ's direct impact on PU is only 25% of its influence on PEOU. This is somewhat different from the findings alluded in Ahn et al. (2007); however, their study examined online shopping websites and not HIAs. The complexity of shopping

Table 3. Variable reliability and correlations

	Cronbach's Alpha	Composite Reliability	IE	IQ	PEOU	PU	PC
IE	0.922	0.950	0.930				
IQ	0.936	0.951	0.694	0.892			
PEOU	0.916	0.947	0.520	0.602	0.925		
PU	0.903	0.932	0.577	0.600	0.785	0.881	
PC	0.931	0.956	0.815	0.709	0.492	0.552	0.937

IE: interaction ease, IQ: information quality, PEOU: perceived ease of use, PU: perceived usefulness PC: provider competency

Figure 2. Results of PLS path analysis



common retail information on goods and services is generally lower than that of health insurance programs and services.

Another notable finding is the impact IE has on the ease of HIA use (not directly into the PU of HIAs) whereas provider competency directly impacts PU (but not directly impact the ease of HIA use). These results imply that the manners of communication drive the PEOU of HIAs while the PU of HIAs hinges largely on the ability of health insurance providers to resolve any insurance issues.

In today's digital transformation environment, health insurance providers are expected to offer superior HIAs to their current and prospective customers. Among the four hundred twenty-five (425) respondents of this study, 78.4% of them use a website or a mobile app so that they can communicate with, or get relevant information from, their health insurance providers[1]. A recent survey (UnitedHealthcare, 2017) reports that 32% of consumers comparison-shopped healthcare procedures, treatments and services. Interestingly, this is a higher figure than those purported to comparison-shop vacation packages and/or car purchases in the same survey.

The PLS model also highlighted six significant control variables. For example, PEOU is significantly higher when the insured are younger and have to pay more in premiums but less in deductibles. First, this observation makes intuitive sense in that younger customers are likely to be more familiar with computing devices and their uses in general. Second, a higher premium and lower deductible will better incentivize these younger consumers to seek greater HIA usability so they can also check for claims and covered reimbursement status easily and quickly.

For PU, a higher claim count makes customers appreciate more features that demonstrate the usefulness of HIAs. If no estimation tool is provided for out-of-pocket expenses, HIAs can give customers an alternative tool to know how much their health insurance providers will reimburse them after healthcare service use. Those tendencies are greater for customers with the communication preference for email or chat/texting capabilities compared to over-the-phone support. The preference is also logical because those customers often want to avoid phone calls that can have a significant wait time.

4.1. Implications for Theoretical Contributions

The first implication for theoretical contributions is our attempt to answer the question: What drives PEOU and PU? As noted earlier, PEOU and PU have mostly been treated as independent variables for use intention of IS in TAM/UTAUT studies (e.g., Legris et al. (2003) Mortenson and Vidgen (2016). To date, many websites and mobile apps have evolved and are being used regardless if their designs are impeccable or not. While continuous design improvement is important, examinations of communication content artifacts (IQ, IE, and PC) should be given higher priority than before. Therefore, this reported study filled a much needed knowledge gap.

A second key theoretical implication of this study is the possibility of structuration between communication practice and HIAs as communication conduit/structure. Such a perspective may be examined over time by looking through a lens of adaptive structuration theory (DeSanctis & Poole, 1994) or the technology-duality perspective (Orlikowski, 1992). Other potential extensions of this study may fall into one of the eight areas that Jones and Karsten (2008) proposed for future IS studies, namely, "[s]tudies that explore how technological artefacts [sic] can be addressed from a structurational perspective, without abandoning its central claims" (p. 148).

4.2. Implications for Managerial Practices

Provided the current HIA designs are not deficient, health insurance providers must continuously improve their communication capabilities. Their customers view HIAs as a vital communication channel where the quality of information strongly drives the ease of use and usefulness of HIAs. If those customers do, in fact, not find HIAs useful, they may well view HIAs as the reflection of their healthcare insurance providers.

Besides IQ, two other important aspects, IE and PC, are found to be significant drivers for consumer perceptions of HIA's usability and usefulness as depicted in Figure 2. Health insurance providers should therefore periodically conduct online surveys by adopting the constructs of IQ, IE and PC used in this study to enhance managerial practices in term of HIA use and usefulness. For application designers, the usability and usefulness of HIAs should probably be regarded as a glass window through which customers communicate with their health insurance providers. Unless the designs and functionality of an HIA are particularly unsatisfactory, consumers may judge its usability v. usefulness mainly based on IQ, IE, and PC.

5. CONCLUSION

HIAs play significant roles for both consumers and health insurance providers to mutually communicate so that they can collaborate in navigating through complex healthcare circumstances. From a practical perspective, the ease of use and usefulness of HIAs are critical factors in order to maintain accurate, timely and relevant communication between both parties. While technical improvements have been made in recent decades, past research has not examined the link between communication content artifacts (information quality, interaction ease, and provider competence) and key IT artifacts (PEOU and PU) of HIAs.

In term of theories, past studies focused on PEOU and PU as key factors to enhance the behavioral intention of BIS use and conceptual rationalization for such uses. Such an approach was well warranted given the adoption of BIS faced challenges, especially during their formative years of implementation. Yet, notable technical advancements have enabled the use of the internet, computers, mobile devices and their associated applications, all of which are now commonplace. It is not so much a concern if or not consumers and health insurance providers can and are empowered to use HIAs. Instead, we must consider how effectively HIAs can serve both parties. For this reason, the question of what drives PEOU and PU of HIAs is timely and important; in particular, this study examined how three communication content artifacts (information quality, interaction ease, and provider competence)

influence two crucial IT artifacts (PEOU and PU) of HIAs. Thus, this study essentially tests what we call the communication-driven usefulness hypothesis because non-IT artifacts may influence the effectiveness of IT artifacts.

The results of the PLS-based path analysis affirm this hypothesis. Most notably, the influence of IQ is the most significant in that IQ strongly impacts PEOU of HIAs, and then PU through PEOU. PEOU is driven by a number of factors including, interaction ease, insurance premiums, age, and deductible amounts. PU is very strongly impacted by PEOU. Other factors that impact PU are provider competency, claim count, preferred communication medium, and the availability of out-of-pocket expense estimation tool.

5.1. Limitations

While the results provide interesting insights into the findings on the communication-driven usefulness hypothesis, a few key limitations to this study should be noted.

First, our research model does not include user assessment of refined design and usability dimensions such as navigation, information search, aesthetics, site/app response speed, and more (e.g., Baharuddin, Singh, & Razali, 2013; Hoehle & Venkatesh, 2015). The assessment of those HIA details may show some moderation effect on the relation between the non-IT artifacts and IT artifacts.

Second, the study results may not be comparable with those of past studies that used SERVQUAL (e.g., Büyüközkan, Çifçi, & Güleryüz, 2011; Parasuraman et al., 2005). Specifically, future studies incorporating the five dimensions of SERVQUAL, namely reliability, assurance, tangibles, empathy, and responsiveness, would potentially offer new insights.

Third, the findings are based on the data collected from U.S. health insurance customers. The external validity should be examined in the non-U.S. healthcare context.

5.2. Future Research Agenda

While there are limitations to this study as noted above, these limitations further point us to a few major future research opportunities. One, as noted, future studies can examine the validity of the communication-driven usefulness hypothesis on HIAs in a non-U.S. healthcare context. Two, future studies can also extend the communication-driven usefulness hypothesis with various modified HIA design details and SERVEQUAL dimensions. As well, future researchers may want to attempt to develop new theoretical perspectives on the relation between IT artifacts and non-IT artifacts.

Finally, future studies may want to investigate the communication-driven usefulness hypothesis over time by taking a structural perspective. For example, the advancement of devices and software can increase the number of older HIA users who rely on health insurance more than younger ones. Such advancement might well enhance the validity of the communication-driven usefulness hypothesis.

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ENDNOTES

[1] Seventy-eight-point four percent (78.4%) of respondents, or three hundred thirty-three (333) of them, were the ones this study used for the hypothesis testing.

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