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TRUST IN ELECTRONIC-SERVICE PROVIDERS: A META-ANALYSIS OF ANTECEDENTS

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Abstract

Consumers' trust beliefs are considered amongst the most important psychological states influencing their online behaviour. Understanding the antecedents of consumer trust is thus of both academic and practical interest. Research into these antecedents has however been disconnected, and has not been integrated to provide an answer as to which are the most significant antecedents of trust. To address this problem, we synthesized the antecedents of trust in e-service through a meta-analysis of 59 previously published studies. The findings showed that structural assurance (STA), reputation (REP), and perceived usefulness (PU) demonstrate the strongest effect sizes on trust. Furthermore, vendor size (SIZ) and privacy protection (PRC) also affect trust, but to a lesser degree. We considered explanations for identified heterogeneity in effect sizes through moderator analysis. We found that cultural context of the study moderated all the effect sizes, and certain effect sizes were also moderated by factors such as the type of e-service and the use of student samples. Results are important to guiding future e-services research.

Keywords: Trust, Meta-analysis, Trust building, Trust antecedents, E-service, Electronic service.

1 INTRODUCTION

With the development of the Internet and mobile device technology, the delivery of services has changed from face-to-face to electronic exchange or e-service. E-service allows consumer to interact with service providers without the constraints of time and space (Beldad et al. 2010). Unfortunately, uncertainties still characterize the use of e-services and varying degrees of consumer adoption and engagement in the use of e-services has been noted (Featherman & Pavlou 2003; Kim et al. 2009a). The uncertainties arise because the technology mediated nature of e-service creates a temporal and physical distance between consumer and provider, which can lead to opportunistic behaviours (Gefen et al. 2003a; Dinev & Hart 2006). These uncertainties result in increased consumer perceptions of risk and elevate the need for trust in electronic exchange relationships (Pavlou 2003). Consumers' trust beliefs have therefore been considered amongst the most important psychological states influencing their online behaviours (Pavlou & Gefen 2002; Pavlou 2003; Kim et al. 2008). Past work has associated trust with adoption and use in e-service contexts such as e-commerce/e-shopping (Jarvenpaa et al. 2000; Corbitt et al. 2003; Gefen et al. 2003a; Pavlou 2003; Teo & Liu 2007; Kim et al. 2008; Zhu et al. 2011), e-banking (Yousafzai et al. 2009; Luo et al. 2010), online health care services (Egea & Gonzalez 2011; Zahedi & Song 2008), online legal services (Cho 2006), mobile payment services (Lu et al. 2011) and e-government (Horst et al. 2007; Bélanger & Carter 2008).

Without trust, consumers are less likely to engage in e-service usage and therefore the economic potential of e-services is lessened (Walczuch & Lundgren 2004). Moreover, the potential benefits of non-commercial e-services, such as e-government or consumer e-health services, are also likely to go unrealized (Bélanger & Carter 2008; Yi et al. 2013).

Given its importance to so many contexts, researchers have unsurprisingly turned their attention to examining the antecedents of trust beliefs (e.g., McKnight et al. 2002; Gefen et al. 2003a; Kim et al. 2008). These studies have highlighted the importance of antecedents such as perceived institution size and market share (Jarvenpaa et al. 2000; Teo & Liu 2007), perceived vendor or brand reputation (Jarvenpaa et al. 2000; Pavlou 2003; Teo & Liu 2007; Kim et al. 2008), individual propensity to trust (Pavlou & Gefen 2004; Nicolaou & McKnight 2006; Teo & Liu 2007; Kim et al. 2008) and the role of structural assurances (Chandra et al. 2010; Zhu et al. 2011). However, these efforts have been disconnected and have not been integrated so as to provide an answer as to which are the most important antecedents of trust. Previous studies on the antecedents of trust are mostly literature reviews (e.g., Grabner-Kräuter & Kaluscha 2003; Walczuch & Lundgren 2004; Wareham et al. 2005; Beatty et al. 2011), which have not addressed the contradictory nature of the antecedents of trust. Although some meta-analytic studies into trust have been carried out, those have mostly focus on the context of e-commerce (e.g., He 2011) rather than the broader domain of e-services that include both commercial and non-commercial contexts. Moreover, researchers examining the same factors sometimes present results that are contradictory. For example, familiarity has been found an important antecedent of trust in one study (Gefen 2000; Gefen et al. 2003a) whilst not significant in another (Cho et al. 2007). Moreover, privacy concern was significantly correlated with trust in Chiu et al. (2009) but not in Bansal et al. (2010). Explanations for such variations in previously reported effect sizes has not been adequately examined, thus failing to provide us insights into those antecedents that are universal across e-service contexts and those that might be relatively more or less important depending on the type of e-service. Other potential moderating effects are culture and population under study which can impact the relative effects of previously examined antecedents of trust. It is important to carry out a robustness test of the antecedents of trust to determine the presence of such moderators.

The purposes of this study is therefore to contribute to the e-service literature by comprehensively identifying and classifying the antecedents of trust in e-services, carrying out a meta-analysis to determine bare-bone effect sizes (corrected sampling error), true-score effect sizes (corrected measurement error) and thereafter identify which antecedents are important to form consumer trust. Because these may be sufficient differences in correlations across studies, it is also important to

determine the extent to which these effects are moderated by factors such as culture, type of e-service and sampling strategy. Specifically, we pose the following research questions:

RQ1: What are the key antecedents of trust in the e-service context?

RQ2: To what extent are these antecedents moderated by factors such as culture, type of e-service, and sampling strategy?

To answer these questions this study adopts a meta-analytic approach. We adopt a broad definition of e-services so as to include both commercial (e.g., e-shopping and e-banking) and non-commercial (e.g., e-health and e-government) e-services.

Our results will guide future trust-related e-service research. By comparing the intensity of effect size and moderation effects, our results will also reveal important factors on which e-service providers may wish to concentrate their trust building efforts.

In the next section, we discuss e-services and prior research on trust in e-services. We then develop a classification of the antecedents of trust and present a research model that underpins our meta-analytic investigation. Next, the methodology and approach to the meta-analysis are outlined. Results are presented and the paper concludes with a discussion and implications.

2 LITERATURE REVIEW AND RESEARCH MODEL

2.1 E-service

de Ruyter et al. (2001) provides an early definition of e-service as “an interactive content-centered and Internet-based customer service”. Later, Rowley (2006) defined e-service as any “deeds, efforts or performances whose delivery is mediated by information technology (including the Web, information kiosks and mobile devices)”. E-services not only facilitate provider-to-consumer interaction but also offer lower-cost of transaction and increase consumer choice (de Ruyter et al. 2001; Rowley 2006; Teo & Liu 2007). In this study, e-service is thus defined as any service whose delivery is enabled by Internet technologies, and incorporates a large self-service component i.e. where consumers co-produce the service outcome through their interaction with these technologies. Under this definition, e-services include forms of business-to-consumer e-commerce such as e-shopping, e-banking services (including both mobile and Internet banking), e-health services (e.g., online health information), e-government services such as online tax, online legal services, and mobile payment services amongst others. The emergence of e-services brings a number of benefits to e-service providers e.g., broadening their market reach and lowering of entry barriers to new markets (Lu 2001). For consumers, e-services offer convenience, lower cost of transacting and accessibility (de Ruyter et al. 2001; Boyer et al. 2002). Despite these various benefits, e-services are also associated with numerous uncertainties. The virtual environments within which e-services occur are prone to security and encryption problems (Vassilakis et al. 2005). Moreover, the technology mediated nature of e-service creates a temporal and physical distance between the service consumer and the service provider, which can lead to opportunistic behaviours such as misrepresentation, unfair pricing, conveying inaccurate information and violations of privacy (Gefen et al. 2003b; Dinev & Hart 2006; Kim et al. 2008). Consideration of these uncertainties has led past research to examine trust as an important factor facilitating the adoption of e-services by consumers (de Ruyter et al. 2001).

2.2 Trust

Trust plays an important role in exchange relationships between organizations and their customers (Corbitt et al. 2003; Teo & Liu 2007). Rotter (1967) defines interpersonal trust as “the belief that a party’s word or promise is reliable and a party will fulfil his/her obligations in an exchange relationship”. In the online context, researches have distinguished between trust in the website interface (e.g., Dinev & Hart 2006; Liao et al. 2011) and trust in the e-service provider (e.g., Gefen 2002; Pavlou & Gefen 2004; Nicolaou & McKnight 2006; Kim et al. 2008, 2009a). Trust in the website implies Internet websites are a secure and reliable environment from which to access the

service and exchange information with others (Liao et al. 2011). Trust in the e-service provider is defined as the consumer's belief in the integrity, ability and benevolence of the vendor (Rotter 1967; Morgan & Hunt 1994; Bhattacharjee 2002; Pavlou & Gefen 2002) and their willingness to be vulnerable to actions taken by the vendor based on their feelings of confidence and assurance (Gefen 2000). If e-vendors are not considered trustworthy, they will lose their customers (Zhu et al. 2011). One of the reasons trust becomes an issue is because consumers may have little prior experience with the e-vendor (McKnight et al. 2002) and e-service providers often collect customer's personal and/or financial information during transactions (Hagel & Rayport 1997). Past studies indicate that trust in the e-service provider is the more important (proximal) determinant of consumer acceptance of an e-service than trust in the website platform (Mou & Cohen 2013). Consequently, we focus here on the antecedent of trust in the e-service provider.

2.3 Antecedents of Trust in e-Service Provider

Past researchers have classified the antecedents of trust in a number of ways. Unfortunately, there is no generally agreed classification framework. However, there are some common categories that can be discerned which input into our framework. Initially, Gefen et al. (2003a) classified trust antecedents as calculative-based, institution-based (e.g., structural assurances and situational normality), and knowledge-based (e.g., familiarity). Later, Kim et al. (2008) classified the antecedents of trust in the e-commerce context as cognition-based, affect-based, experience-based and personality-oriented. He (2011) systematically reviewed the antecedents of trust in e-commerce and classified them as: personal characteristics-based, knowledge-based, deterrence-based, social influence-based, technological attributes-based, vendor image-based and institution-based.

Common to all these previous classifications are a focus on the inclusion of vendor related factors, technology related factors, individual consumer, and knowledge or experience related factors. Consequently, we classify the identified antecedents into four categories, which we label as vendor and institution-based antecedents, technological-based antecedents, knowledge-based antecedents, and consumer characteristics-based.

2.3.1 Vendor and Institution-based Antecedents

In the field of e-commerce, past works have identified vendor and institution-based factors as important determinants of trust for new consumers (He 2011; Koufaris & Hampton-Sosa 2004). Amongst these, vendor size, vendor reputation, and vendor's ability for customization, along with institutional influences such as perceived privacy protection, perceived security protection, perceived structural assurances, situational normality, and perceived risk have been subject to the most attention.

Vendor reputation refers to the consumer's belief that the vendor's website, or e-service provider, or brand has a good public image, and it is popular for consumers. Good reputation can create trust in e-commerce and increase consumers' beliefs about vendor competence, benevolence, and integrity (McKnight et al. 2002). Kim et al. (2008) found that vendor reputation positively affected trust in online shopping.

Perceived size of the vendor refers to consumers' perception of physical size of the vendor e.g., number of employees or market share (Kim & Park 2013). Perceived size can influence trust because larger institutions are considered more capable of reliably facilitating online transactions (Kim & Park 2013). Past studies have therefore considered perceived size as an antecedent of trust (e.g., Koufaris & Hampton-Sosa 2004; Teo & Liu 2007; Kim & Park 2013).

Customization refers to the e-service provider's ability to implement a strategy to supply personalized services or products to their consumers (Srinivasan et al. 2002; Komiak & Benbasat 2006). Some researchers (Koufaris & Hampton-Sosa 2004; Komiak & Benbasat 2006) considered that such customization offerings can promote trust. This is because the perception of a provider's willingness to customize a service offering provides a basis for a belief in the provider's competence and integrity.

For trust to materialize, a consumer should have a strong perception that security controls have been implemented by the vendor to ensure a safe online transaction environment (Kim et al. 2008).

Moreover, loss of privacy is one of the major concerns in online transacting (Malhotra et al. 2004). If an e-vendor can protect consumer's privacy, this can also improve consumer trust.

Perceived structural assurances refer to a consumer's assessment that transaction success is likely due to the existence of safety nets such as legal recourse, guarantees, and regulations that exist to protect the consumer (Gefen et al. 2003a). According to this view, if a website or e-service transaction platform is considered to be underpinned by such assurances then trust is more likely.

Situational normality refers to consumers' perception of the e-service transaction process as being normal (i.e. akin to a real world encounter) (Gefen et al. 2003a). If consumer perceives the transaction as being normal, they will feel more comfortable engaging in the transaction and hence demonstrate increased trust beliefs (Walczuch & Lundgren 2004).

Trust and perceived risk are also intuitively related to one another. One view is that risk perceptions are antecedent to trust because if the uncertainties and risk of loss are perceived to be low then there is less need to form trust perceptions (Dinev & Hart 2006). Similarly, higher levels of risk perception will increase a consumer's need to trust (Corbitt et al. 2003).

2.3.2 *Technological-based Antecedents*

Based on past trust research (Gefen et al. 2003a; Pavlou 2003; Zhou 2011), this study identified five technological-based antecedents. These are: perceived usefulness, perceived ease of use, information quality, system quality and service quality.

Perceived usefulness (PU) refers to the degree to which a consumer believes that using the e-service would enhance his/her performance or effectiveness. Perceived ease of use (PEOU) refers to consumers' perceptions on whether the e-service is easy/difficult or flexible to use and interact with. When online consumers think e-service interaction media is easy to use and useful, they are more likely to trust the e-service provider (Koufaris & Hampton-Sosa 2004). Moreover, Chen and Barnes (2007) argue that useful and easily understood information on web sites can lift the degree of online trust. Prior empirical studies support a link between PU, PEOU and trust (Gefen et al. 2003a; Pavlou 2003; Wang & Benbasat 2005). Therefore, we expect that PU and PEOU would impact on trust beliefs.

Information quality, system quality and service quality are major components of the IS Success model (Delone & McLean 2003). Beldad et al. (2010) argue that accurate, current and complete information can increase consumers' trust beliefs when they are transacting online. McKnight et al. (2002) argue that in initial trust building stage, high quality web site can lead consumers' towards high trusting beliefs. In a similar vein, when consumers interact with e-service provider, high service quality also can increase consumer trust (Zhou 2011).

2.3.3 *Consumer Characteristics-based antecedents*

Individual characteristics as antecedents of technology usage behaviours have been widely studied in the field of information systems (e.g., Chang & Fang 2013). Amongst these, a consumer's disposition to trust (DTT) is considered to play an important role when a consumer is interacting with an unfamiliar party (e.g. the e-service vendor) and it also can provide a necessary background for the formation of trust-building (Gefen 2000). Disposition to trust will be important to how consumers build interpersonal relationships (McKnight et al. 2004).

2.3.4 *Knowledge-based Antecedents*

Based on previous research, knowledge-based antecedents have been mainly identified as personal familiarity with the provider (e.g., Gefen et al. 2003a; He 2011). Familiarity created through interactive process where consumers and providers can get to know each other so as to better predict each other's behaviours (Lu et al. 2011). Familiarity can reduce uncertainty and simplify interpersonal relationships (Gefen 2000). Consumers learn to use particular interfaces and transact through the website or similar platforms, and they use these interactions to accumulate knowledge of the provider.

This increased familiarity with both the e-service platform and the e-service provider can increase trust beliefs (Gefen et al. 2003a).

2.4 Moderators of the Links between Trust and its Antecedents

Variation in the size of the effects between the above discussed antecedents and trust is observed in past studies. Understanding the causes of such variation (or lack of homogeneity in effect sizes) is important to any meta-analysis. Past meta-analyses of technology acceptance model and IS continuance model (Schepers & Wetzels 2007; Islam & Mäntymäki 2011) have considered the culture (Western vs Eastern) and population under study (student sample vs non-student sample) as potentially important moderators. For example, in Eastern cultures people may rely more on familiarity when building trust whilst in Western cultures people may rely more on privacy protection and risk perceptions when building trust.

Moreover, Mou and Cohen's (2013) study considered the type of e-service as an important moderator between consumer trust and acceptance of e-service. Trust was found to more strongly influence commercial e-service contexts. E-services are both commercial and non-commercial in nature, and factors such as risk, security, reputation etc. may have greater salience in contexts where financial loss may occur. Perceived usefulness, system quality and information quality may have greater importance to trust in other e-service contexts such as where performance and time loss may occur. Moreover, in contexts with a single provider (e.g. e-government) then trust may have less to do with certain vendor/provider related factors.

Numerous e-service studies have been carried out using student samples. A question that often arises in the use of such convenience samples is whether results are biased upward or downward and whether conclusions are generalizable back to a broader consumer population. Although some studies argue that when general theories are under examination, the use of student samples is valid and appropriate (Compeau et al. 2012), it remains an empirical question as to whether differences in average observed effects sizes exists across student and non-student consumer samples.

2.5 Research Model

Based on above discussion, the antecedents of trust that will be investigated in this meta-analysis are presented in Figure 1 together with the potential moderators of their links with trust.

3 RESEARCH METHODOLOGY

Meta-analysis is defined as “the statistical analysis of a large collection of analysis results for the purpose of integrating the findings” (Glass 1976). Through synthesize prior empirical findings, allows us to understand which antecedents of trust are most important in e-service (research question 1). Meta-analytic techniques can identify heterogeneity in effect sizes across studies. This allows for subsequent examination of the influence of moderators that may account for observed inconsistencies in the effect sizes reported by prior studies. Accounting for any observed heterogeneity through examination of moderators addresses our second research question. In the following sections we discuss our data sources and our criteria for inclusion of studies in the meta-analysis. We then discuss our procedures for data coding and analysis before presenting our results.

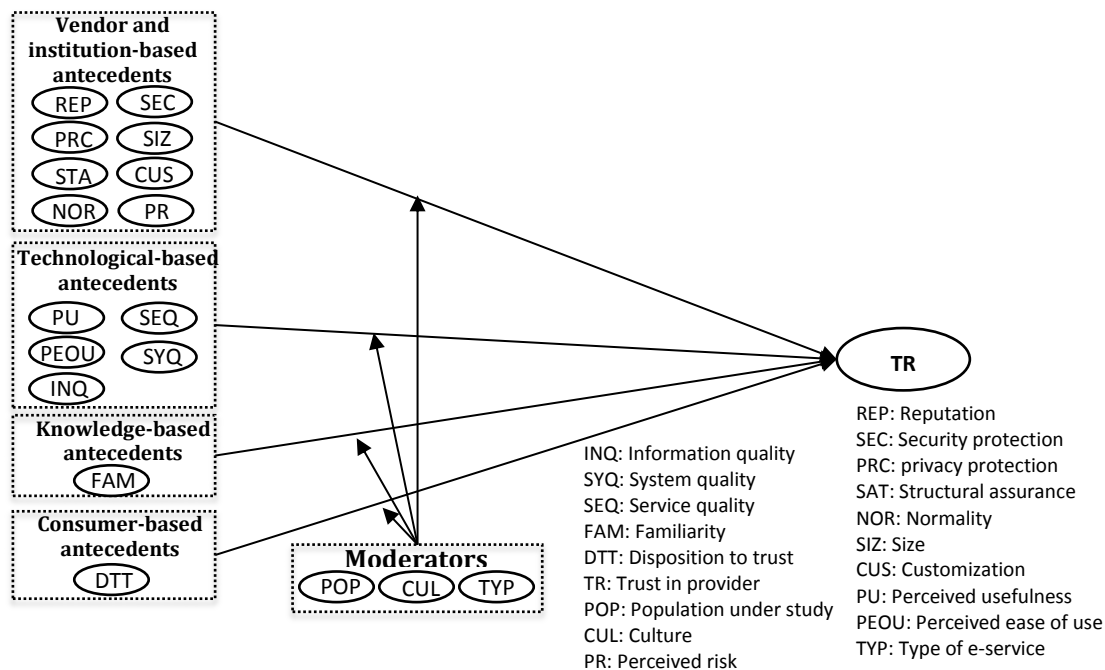


Figure 1. Research model

3.1 Identifying the Studies

To ensure the validity of the meta-analysis, this study sought to include as many studies as possible. Based on our definition of e-service, we considered B2C, C2C electronic commerce, electronic banking, online health services, e-government, online financial advisory service, and mobile payment services, amongst others as the context of this study.

We conducted a computerized search of the following electronic databases: EBSCO Business Source Premier, Science Direct, Jstor, Emerald and ABI/INFORM Global. Our search terms included “consumer” or “customer” or “user” or “citizen” or “individual”; “use” or “adoption” or “acceptance” or “behavioural intention”; and “trust”; and variations of “e-service” or “e-commerce” or “e-banking” or “e-government” or “e-health” or “mobile payment” or “online”. The inclusion of search terms such as “use” and “adoption” was because of the importance of trust to consumer adoption and use of e-services, and we wanted to ensure identification of papers with a focus on trust in the context of e-service use and adoption. We further restricted the time frame to articles published (or in press) between January 2000 to December 2013. Prior to 2000 research on consumer behaviours was mostly focused on off-line transactions. To avoid the concerns of publication bias with meta-analysis (King & He 2005), we also considered conference publications via a manual search of IEEE Xplore and the AIS e-library.

All the studies had to be accessible to the authors through their university’s library system and its comprehensive electronic database subscription. In order to select the studies for this meta-analysis, we followed the following inclusion and exclusion criteria. First, the articles must focus on e-service (e.g., e-banking service, e-government service, etc). Second, the articles must focus on online environment. Third, the articles must be an empirical study. Fourth, the articles must reported correlations matrix and sample size. At last, the studies must include variables reflecting “trust” or “trust belief” and one or more of the antecedents of trust reflected in Figure 1 (e.g., familiarity, disposition to trust, etc). Based on our inclusion and exclusion, we therefore excluded articles not reporting on results of an empirical study or papers that did not report correlations (e.g., Kim et al. 2009b). Furthermore, we also excluded papers where we were not able to resolve queries regarding the reported correlation matrix prior to submission. In total, 59 published studies that were extracted

via the database researches met our inclusion/exclusion criteria and were therefore identified for inclusion in the meta-analysis.

3.2 Coding the studies

Each article was examined to extract data required for the meta-analysis. We independently coded the studies and discussions were held to resolve any disagreement. We collected information on each study's sample size, inter-construct correlations and construct reliability coefficients. We identified that 34 studies were published in the last decade. 25 studies were published in the current decade. We classified articles based on the type of e-service under examination (e.g., commercial vs non-commercial). Based on the different culture dimensions (e.g., collectivism vs individualism) as identified in Hofstede and Hofstede (2005), we classified studies into Western or Eastern culture groups. Western culture groups were considered those high on individualism, whilst Eastern culture were high in collectivism. High power-distance countries were Eastern and low power-distance are classified as Western. In classifying the culture dimensions, reference was made to Shao et al. (2013). Furthermore, we identified whether studies employed convenience sampling through the use of student samples. Journal, authors and published date of the articles were also recoded. The studies are summarized in Table 1.

Years	Last decade: 2000 (1); 2001 (1); 2002 (2); 2003 (3); 2004 (3); 2005 (3); 2006 (4); 2007 (6); 2008 (3); 2009 (8). Current decade: 2013 (6); 2012 (4); 2011 (7); 2010 (8).	
Publication types	Publication	No of articles
	Decision Support Systems	5
	MIS Quarterly	3
	Online Information Review	2
	Information Systems Research	2
	Managing Service Quality	2
	Asia Pacific Journal of Marketing and Logistics	2
	e-Service Journal	2
	European Journal of Information Systems	2
	Journal of Management Information Systems	2
	Journal of the Association for Information Systems	2
	OMEGA	2
	Other journals	24
	Conference Proceedings	8
Unpublished Manuscript	1	
E-service intervention	Commercial based e-services: e-commerce (32); e-banking (7); social commerce (2); mobile commerce (2) e-customer service (1); e-return service (1); web-based recommendation agents (1). Non-commercial based e-services: e-government (1); Internet (1); peer-to-peer sharing (1); location-based services (2); e-health (4); social networking (2); wi-fi hotspots (1); new technology (1).	
Culture*	Western: USA (31); UK (4); Australia (1); Canada (2); New Zealand (2); The Spain (1); Greece (1); Italy (1); Germany (1); Ireland (1); European (1); Qatar (1). Eastern: China (8); Taiwan (6); Singapore (3); India (1); Malaysia (3); Korea (7). Mixed: Malaysia and Qatar (1).	
* > 59 due to some studies examining more than one consumer population		

Table 1. Summary of Studies Included in Meta-Analysis

We considered conceptual and operational definitions to confirm consistency between the constructs employed in the study and our definitions of trust in e-service provider and the definitions of the antecedents of trust. Variables were coded as trust if they reflected a consumer's willingness to depend on the e-service provider based on a belief or confidence in the competence, ability, integrity, benevolence, credibility and/or reliability of the e-service provider.

The authors independently coded each study's reported effect sizes (i.e., the correlations). These were then cross-checked for agreement. In certain cases, where only inter-item correlations were reported (e.g., Bhattacharjee 2002), we calculated the inter-construct correlations as the average of the respective inter-item correlations. We reversed the direction of correlations in those cases where measurement items were phrased in the negative e.g. to reflect privacy concerns and security concerns as opposed to perceived privacy protection and perceived security protection.

In addition to the effect sizes, we coded the reliabilities of each study's variables using the reported Cronbach's alpha coefficient or if not available the reported composite reliability or internal consistency scores. Based on the reported reliabilities across all the studies, we calculated an average reliability score for each variable for use in subsequent analysis.

3.3 Meta-Analytic Approach

This study followed the methods of Hunter and Schmidt's (2004) random effects models to estimate effect sizes. First, to correct for sampling error, we calculated weighted mean effect size (r_+). This approach weights each study's correlation by the number of observations in that study according to the formula:

$$r_+ = \frac{\sum_{i=1}^k N_i r_i}{\sum_{i=1}^k N_i}$$

Where N_i is the sample size of each study and r_i is the observed correlation value of each study.

Second, to correct for measurement error, we calculated the true-score correlation (r_c) by using the following formula:

$$r_c = \frac{r_{xy}}{\sqrt{r_{xx} r_{yy}}}$$

Where r_{xy} is the average observed correlation across the studies, r_{xx} is the average of the reported reliability estimates for the independent variable, and r_{yy} is the average of the reported reliability estimates for the dependent variable.

Third, following Hedges and Olkin's (1994) recommendation, we also carried out homogeneity tests to determine whether there is any heterogeneity in the underlying correlations. To do homogeneity test, we first did the Fisher Z transformation by using the formula:

$$Z_{r_i} = \frac{1}{2} \log_e \left(\frac{1+r_i}{1-r_i} \right)$$

Then we calculated Homogeneity Q by using the formula:

$$Q = \sum_{i=1}^k (w_i)(\bar{z}_r)^2$$

Where

$$\bar{z}_r = \frac{\sum_{i=1}^k w_i z_{r_i}}{\sum_{i=1}^k w_i} = \frac{\sum_{i=1}^k (N_i - 3) z_{r_i}}{\sum_{i=1}^k (N_i - 3)}$$

If Q exceeds the critical value, moderating effects should be suspected (Schepers & Wetzels 2007).

3.4 Criticism of Meta-analysis

Meta-analysis has been criticized in number of ways (King & He 2005). Published articles mostly report only on statistically significant findings i.e. there is a bias towards publication of studies that might confirm rather than refute established theory. To avoid this problem, we carried out a manual

search that focused on conference proceeding papers and unpublished work e.g. dissertations. We also did a fail-safe N test to provide for an indication of publication bias (see further below). Meta-analyses have also been criticized for mixing “apples” and “oranges”. This is because a meta-analytic study may mix studies with different characteristics. To avoid this problem, two authors of this study separately coded all of the 59 studies to ensure correspondence with the definitions of e-service and the conceptualization of the variables under study and any disagreements were resolved with discussion. Moreover, we attempted to account for some of the contextual differences across studies through our moderator analysis.

4 RESULTS

RQ1: What are the key antecedents of trust in the e-service context?

The descriptive statistics and meta-analysis results are presented in Tables 2 through 5. For each antecedent, we report the total number of studies, the total number of observed correlations, and range of correlation, average correlation, and range of sample size, the total sample size and the average of sample size. Because some publications reported results from tests on more than one sample under examination, the number of available pair-wise correlations could exceed the number of publications. Then, we calculated r_+ , r_c , the variance of r_+ and r_c , standard deviation of r_c , and 95% confidence and credibility interval of r_+ . We also did a fail-safe N test to further evaluate the significance of each antecedent of trust. To do the fail-safe N test, we first transformed r to Cohen’s d value, and then we adopted Orwin’s formula to calculate the fail-safe N.

		REP	SEC	PRC	STA	NOR	SIZ	CUS	PR
No of studies		9	10	18	14	8	3	5	22
No of correlations		13	12	20	19	10	5	6	26
Total sample size		5780	3580	6956	6297	3884	3589	1265	10230
Average sample size		445	298	348	331	388	718	211	393
Range of sample size	Lower	52	52	52	76	76	305	100	52
	Upper	1381	452	889	910	910	1381	357	1381
Correlations	Lower	0.250	0.110	0.010	0.200	0.180	0.100	0.158	-0.080
	Upper	0.691	0.689	0.700	0.872	0.815	0.370	0.520	-0.810
	Average	0.512	0.407	0.293	0.534	0.442	0.279	0.375	-0.374
r_+		0.586	0.372	0.238	0.577	0.472	0.305	0.361	-0.401
r_c		0.584	0.462	0.334	0.597	0.519	0.332	0.434	-0.425
Var r_+		0.020	0.029	0.053	0.040	0.033	0.009	0.021	0.041
Var r_c		0.024	0.034	0.066	0.051	0.043	0.011	0.024	0.050
SD(r_c)		0.156	0.184	0.256	0.225	0.206	0.105	0.155	0.022
95% Confidence interval (r_+)	Lower limit	0.508	0.276	0.133	0.384	0.331	0.239	0.241	-0.478
	Upper limit	0.665	0.468	0.343	0.635	0.614	0.371	0.482	-0.324
95% Credibility interval (r_+)	Lower limit	0.311	0.054	-0.222	0.166	0.032	0.174	0.090	-0.781
	Upper limit	0.862	0.670	0.698	0.853	0.912	0.436	0.632	-0.021
Fail-safe N (0.05)		297	202	225	461	187	53	87	393
Result		sig	sig	sig	sig	sig	sig	sig	sig

Table 2. Vendor and institution-based antecedents of trust (sig: significant).

The meta-analysis results for the vendor and institution-based antecedents (Table 2) indicate that none of the 95% confidence intervals contain zero, hence, all the antecedents have a significant correlation with trust. This indicates that all of the vendor and institution-based antecedents are important to consumer trust in e-services context. Among them, REP ($r_+=0.586$) has the strongest effects size on trust. STA and NOR also showed high correlations with trust in provider in e-service context. PRC has the weakest effects size on trust. We calculated 95% credibility intervals (Hunter & Schmidt 2004). If the intervals are sufficiently large then the presence of moderators should be expected. All of seven antecedents have a large credibility interval. So, this requires further moderator analysis, which we present below. Finally, the fail-safe test is used to test the robustness of the findings by estimating

the number of non-significant results or non-published studies that would be required to reduce an obtained mean effect size to a trivial level (Rosenthal 1979). A general rule of thumb is that the fail safe N value should exceed $5k+10$ (where k is the number of observed correlations). All the antecedents passed the fail-safe N test (fail safe N value should exceed $5k+10$), this indicates the number of additional studies with non-significant findings that would be required before the average effect size could be considered non-significant. The values reported here provide additional confidence in the overall significance of these effect sizes.

		PU	PEOU	INQ	SYQ	SEQ	FAM	DTT
No of studies		17	22	7	7	6	11	15
No of correlations		22	27	10	9	6	18	20
Total sample size		7028	8318	3575	3511	1498	7975	5837
Average sample size		319	308	358	390	250	443	292
Range of sample size	Lower	52	52	215	158	160	122	76
	Upper	910	910	452	910	360	1381	910
Correlations	Lower	0.090	0.064	0.100	0.180	0.189	0.14	0.100
	Upper	0.738	0.704	0.820	0.682	0.760	0.567	0.690
	Average	0.496	0.445	0.430	0.480	0.489	0.369	0.344
r_+		0.532	0.487	0.409	0.491	0.506	0.372	0.351
r_e		0.562	0.507	0.507	0.544	0.554	0.399	0.400
Var r_+		0.030	0.034	0.039	0.032	0.050	0.022	0.015
Var r_e		0.036	0.041	0.050	0.038	0.060	0.025	0.017
SD(r_e)		0.190	0.202	0.224	0.195	0.246	0.158	0.130
95% Confidence interval (r_+)	Lower limit	0.461	0.421	0.294	0.363	0.329	0.271	0.314
	Upper limit	0.603	0.554	0.525	0.619	0.683	0.431	0.431
95% Credibility interval (r_+)	Lower limit	0.209	0.152	0.055	0.114	0.083	0.008	0.139
	Upper limit	0.855	0.822	0.764	0.868	0.930	0.694	0.606
Fail-safe N (0.05)		481	510	181	188	129	273	268
Result		sig	sig	sig	sig	sig	sig	sig

Table 3. Technological, knowledge and consumer-based antecedents of trust

The meta-analysis results of technological-based antecedents (PU, PEOU, INQ, SYQ SEQ) (Table 3) indicate that all of five antecedents have significant and strong effects on trust. Among them, we obtained 27 correlations between PEOU and TR, 22 correlations between PU and TR. However, we only obtained 6 correlations between SEQ and TR. All the true-score correlations are larger than 0.4. However, comparing the lower and upper correlation reveals large difference in the correlations across studies. The large credibility intervals indicate that potential moderators may exist. This finding suggests that trust has important inter-relationships with the TAM and IS Success models and suggest they are usefully examined together in the e-service context.

Knowledge-based antecedent (FAM) and consumer-based antecedent (DTT) (Table 3) are also confirmed as having significant correlations with trust in the e-service context. Both FAM and DTT have similar effect sizes on trust. For FAM, the true-score correlation is 0.399, and for DTT, the true score-correlation is 0.4. Our results indicated that both FAM and DTT are important to trust beliefs in the e-services context. But credibility intervals suggest they may be relatively more important in some contexts than in others. We consequently explore moderating effects next.

RQ2: To what extent are these antecedents moderated by factors such as culture, type of e-service, and sampling strategy?

The results of testing for moderation effects are reported in Table 4. In addition to the large credibility intervals (Table 2-3), Table 4 shows that Q values exceed the critical value for all antecedents, confirming the need for moderators to be examined. We considered three moderators for their potential moderating effects, namely culture of sample, student versus non-student sample, and type of e-service. In one study (Kassim & Abdullah 2010), two different cultures sample were pooled in one data set and, hence, we excluded it from moderator analysis. Where no studies existed in certain

cases (e.g., no non-commercial e-service contexts examining correlations between vendor size and trust), we do not report moderator effects.

	Q	Critical Value	Sampling Strategy			Culture			Type of E-service		
			S	NS	Z	W	E	Z	C	NC	Z
REP	173.0	21.03	0.592	0.384	9.002	0.486	0.571	-4.490	0.555	0.369	6.007
SEC	145.4	19.68	0.393	0.437	-1.532	0.359	0.494	-4.333	0.382	0.689	-5.556
PRC	554.6	30.14	0.288	0.301	-0.583	0.263	0.461	-6.039	0.265	0.344	-2.788
STA	1052.6	28.87	0.444	0.728	-17.58	0.376	0.649	-14.51	0.558	0.441	4.744
NOR	472.1	16.92	0.428	0.498	-2.661	0.408	0.464	-2.112	0.460	0.400	1.98
SIZ	20.1	9.49	0.309	0.235	1.87	0.193	0.337	-3.947	0.279	-	-
CUS	226.1	11.07	0.500	0.312	2.926	0.346	-	-	0.375	-	-
PR	705.7	37.65	-0.377	-0.374	-0.161	-0.358	-0.401	2.571	-0.393	-0.345	-2.337
PU	218.0	39.67	0.503	0.488	0.826	0.393	0.599	-10.83	0.535	0.250	6.954
PEOU	392.6	38.89	0.455	0.435	1.09	0.341	0.538	-10.23	0.474	0.08	7.205
INQ	251.4	16.92	0.369	0.490	-4.406	0.298	0.601	-10.42	0.386	0.820	-12.37
SYQ	223.9	15.51	0.400	0.641	-9.837	0.406	0.573	-6.544	0.469	0.574	-1.761
SEQ	151.3	11.07	0.587	0.470	1.932	0.352	0.755	-10.38	0.489	-	-
FAM	167.0	27.59	0.339	0.364	-0.961	0.272	0.452	-7.931	0.332	0.571	-2.580
DTT	317.8	30.14	0.358	0.387	-1.466	0.327	0.455	-6.760	0.380	0.317	1.897

Table 4. Moderator analysis (S: Student; NS: Non-student; Z: Z-value; W: Western; E: Eastern; C: Commercial-based e-service; NC: Non-commercial-based e-service.)

Table 4 shows that culture was found to moderate all the effect sizes. This finding confirms the important influence of culture in e-services research (Benbasat et al. 2008). In all cases, studies classified as having been carried out in Eastern cultures reported stronger effect sizes than those carried out in Western cultures. The moderation effects of sampling strategy (student sample vs. non-student sample) was significant for REP, STA, NOR, CUS, INQ and SYQ. Type of e-service (commercial vs non-commercial) moderated all the effect sizes except for SYQ and DTT with certain antecedents more important to trust in commercial and others more important in non-commercial contexts. Specifically, REP, STA, PU and PEOU are important to trust in commercial contexts, while SEC, PRC, INQ, and FAM are more important to trust in non-commercial contexts.

5 DISCUSSION AND CONCLUSION

This study aimed to synthesize past empirical findings of the antecedents of trust in e-service context through a meta-analysis of 59 empirical studies. The antecedents of trust were classified as: vendor and institution-based; technological-based; knowledge-based and consumer-based. The study also attempted to identify the potential moderators that may influence the effects sizes across studies. Sampling strategy (student sample vs non-student sample), culture (Western vs Eastern) and e-service intervention (commercial e-service vs non-commercial e-service) were considered.

The meta-analysis results indicated that all of the antecedents are significantly related to consumer trust in the e-service context. Among them, structural assurance, vendor reputation, and perceived usefulness of the e-service have the strongest effects (around 0.5) on trust. Vendor size and privacy protection were relatively less significant at effect sizes around 0.3. Overall, both vendor and technology based antecedents have been found important to trust. Interestingly, trust has strong links with all the TAM and IS Success model variables suggesting that trust can be usefully integrated into those theories in future explanations of e-service use and satisfaction. Our classification of antecedents of trust into vendor and institution-based; technological-based; knowledge-based and consumer-based should also provide a useful framework for future research.

Interestingly, most of the effect sizes had large credibility intervals. This indicated that potential moderators existed. Through our moderator analysis, we found culture moderated all of the antecedents of trust. This finding confirms that the antecedents of trust are probably influenced by culture (Benbasat et al. 2008). Trust building may be especially difficult in Eastern contexts where

reputation and familiarity are important alongside issues of security, privacy and technology factors. Type of e-service moderated all of the vendor and institution-based antecedents where the salience in commercial e-service contexts was most important. Antecedents such as familiarity, information quality and privacy were however mostly important for non-commercial contexts. Thus consideration of the e-service context is important to study design and the relative importance of certain variables in the e-service context under study must be considered.

Based on our findings, future research should recognize that trust has a number of antecedents. Those are vendor and institution-based, technological-based, knowledge-based and consumer-based. Moreover, the specific selection of antecedents should take the culture context into account, and classify the commercial and non-commercial nature of the e-service. Based on their classification determine which antecedents are most important for inclusion.

Results are also important for practitioners. This study provided insights into the relative importance of different antecedents of trust which can be useful for guiding practitioners to focus on trust-building mechanisms. With this understanding, practitioners will be better positioned to establish their online service offerings. In particular, the importance of factors such as system, information and service quality was confirmed, as well as those such as vendor reputation, security, privacy protection, and situational normality. All of these factors are within the vendor's control and can be manipulated through interventions so as to improve consumer trust.

Some important limitations to the study are recognized. First, only studies that reported correlations and sample sizes can be included in the analysis. Second, the focus on quantitative studies results in the exclusion of qualitative studies that may provide useful insights into trust building amongst consumers. Third, although several research databases were reviewed for relevant studies, resource constraints limit the number of research databases that can be covered and that are accessible to the researcher. Fourth, by aggregating findings from across studies, meta-analytic work loses information about the original study contexts (Mou & Cohen 2013). Fifth, we considered e-services are both commercial and non-commercial, future research may draw on other typologies to organize the e-service context. Sixth, the studies included in our meta-analysis were carried out in many disciplines e.g., information systems and marketing. These results in a rich sample set, which on the one hand provides the opportunity to contribute a synthesized analysis, but on the other hand lose the context information which may weaken the credibility of findings.

Our moderator analysis provides only a partially contextualized view of the relationships under study. Due to the lack of sufficient studies exploring correlations between trust and other variables, we could not include all possible antecedents, such as third party seals, past experience, and self-efficacy. A meta-analysis of the relationships between consumer trust and these variables deserve further consideration in our future research once a sufficient number of correlations has been observed.

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* References marked with an asterisk refer to studies included in the Meta-analysis

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