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NEGOTIATION, EMAIL, AND INTERNET REVERSE AUCTIONS: HOW SOURCING MECHANISMS DEPLOYED BY BUYERS AFFECT SUPPLIERS' TRUST

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Abstract

The Internet has made a wealth of new tools available to the industrial buyer. However, researchers have suggested that computer mediated interaction with suppliers may not be conducive to strong supplier relationships in general and to trust in particular. This paper compares two computer-mediated sourcing tools (email negotiation and Internet reverse auctions) with face-to-face negotiation. Information richness theory suggests that the different media will produce different impacts relating to sellers' trust in buyers. Data are generated with a simulation experiment using 117 subjects. We found that information richness affects seller-buyer trust: Sellers who used face-to-face negotiation, the richest medium in the study, always reported higher trust in their buyer counterparts than did sellers using Internet reverse auctions. There were also some trust advantages of face-to-face negotiation over email and limited advantages of email over reverse auctions. We also found that procurement complexity influences the relationship between information richness and trust. As hypothesized, when face-to-face negotiation is used, procurement complexity has no effect on seller trust. When reverse auctions are utilized, the greater the complexity of the purchase, the less the seller trust. However, when email is used, greater procurement complexity is associated with greater seller trust, and there are no differences in trust between the email and face-to-face channels. Finally, we found that sellers' trust in buyers is positively associated with sellers' desire for future dealings with the buyer.

Keywords: Supply chain management; Purchasing; Technology management; Experiments; Information richness theory

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NEGOTIATION, EMAIL, AND INTERNET REVERSE AUCTIONS: HOW SOURCING MECHANISMS DEPLOYED BY BUYERS AFFECT SUPPLIERS' TRUST

1. INTRODUCTION

The Internet is transforming many aspects of industrial procurement. In nearly all phases of the procurement process, buyers may choose among a variety of computer-mediated tools, such as electronic settlement, eRFQ (electronic requests for quotation), third party exchanges and Internet reverse auctions. In many companies, these digital tools have yielded savings in terms of purchase price reductions and improvements in the purchasing process. These “hard” impacts are often impressive. However, many companies and scholars have concerns about the less tangible “soft” impacts of these new tools and techniques — especially effects on the buyer-supplier relationship. As Handfield and Straight (2003, p. 63) observe, “Increasingly, these new channels have come under fire for causing strained relationships with suppliers, greater liability for the buying company and deteriorating supplier performance.”

The supply chain management literature makes clear the importance of the buyer-supplier relationship (Handfield and Nichols, 1999). Strong relationships enable collaboration in new product development (Primo and Amundson, 2002), in transaction and production process improvements (Walker and Poppo, 1991; Hartley and Choi, 1996; Dyer and Wujin, 2003), in quality improvement (Forker, 1997; Stanley and Wisner, 2001), and in joint planning and scheduling (Johnston et al., 2004). A critical factor in enabling cooperative buyer-supplier relationships is trust (Kumar, 1996; Carr and Pearson, 1999; Burt et al., 2003). For example, McCutcheon and Stuart (2000) use trust to determine the feasibility space for supplier alliance development. Handfield and Bechtel (2002) argue the important role of trust in improving

supply chain responsiveness. Johnston et al. (2004) and Petersen, Ragatz and Monzcka (2005) find that supplier trust increases cooperative buyer-supplier relationships.

Given the importance of trust and the potential negative impact of computer-mediated sourcing on trust, as suggested by recent purchasing literature (e.g. Beall et al. 2003; Emiliani & Stec 2004; Handfield & Straight 2003), it is imperative to further understand whether or not computer-mediated sourcing tools affect seller trust; and if so, why. We address these issues using Information Richness Theory: We assess the effect of several computer-mediated sourcing tools on sellers' trust in buyers during one phase of the sourcing process (the price determination phase, which we define in Section 2). Specifically, we compare two computer mediated tools (email negotiation and Internet reverse auctions) with face-to-face negotiation. Further, we examine this linkage between these sourcing tools and trust at varying levels of procurement complexity. Thus our two-part research question is, (1) *does the information richness of a sourcing channel affect seller-buyer trust* and (2) *does the complexity of the sourcing situation affect the relationship between information richness and trust?*

We investigate these questions using an experiment. Exploratory purchasing and supply chain research has generated numerous insights on supplier relationships and the factors that may impact them. More recently, researchers have published a number of high quality case studies on the impacts of reverse auctions. However, the scientific theory building process also requires studies that confirm relationships that have been suggested by exploratory work (Handfield & Melnyk 1998; Wacker 2004). Experimental research, which typically occurs late in the theory building process, comes the closest to demonstrating causality between variables-- by direct manipulation of the treatment variables and a high degree of control over extraneous factors

(Wacker, 1998). Thus experiments, although typically narrow in scope, afford a field a high degree of confidence in the validity of a particular theoretical relationship.

The remainder of the paper is organized as follows. Section 2 reviews the relevant literature, introduces the constructs of interest and presents the research hypotheses. Section 3 explains our methodology. Section 4 provides the analysis of our hypotheses and results. Our last section discusses the findings, their limitations and our conclusions.

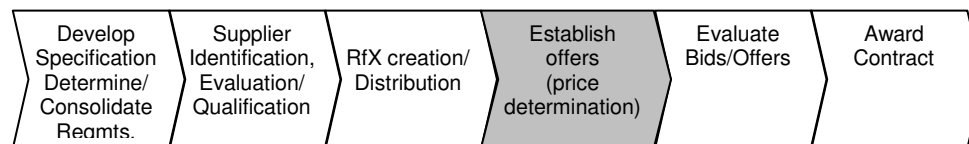
2. LITERATURE REVIEW AND RESEARCH HYPOTHESES

2.1 Matching Sourcing tools to the task

The Internet presents supply chain professionals with numerous tools that can be used throughout many of the steps in the sourcing process (although Internet tools are not appropriate to every situation). As indicated in Figure 1, we focus on one phase of the process: *price determination*, which involves establishing offers from one or more suppliers (Leenders et al., 2002; Johnson et al., 2005). Traditional and digital tools available to buyers in this particular phase include face-to-face negotiation, telephone negotiation, email negotiation, paper sealed bidding, electronic sealed bidding, electronic marketplaces and electronic reverse auctions (An Internet reverse auction is “an online, real-time dynamic auction between a buying organization and a group of suppliers who compete against each other to win the [buyer’s] business” (Beall et al., 2003)).

However, as Handfield and Straight (2003) caution, such tools are not perfect substitutes for one another. Different tools have different impacts, which may depend on the conditions under which they are used. Thus, buyers must match the characteristics of the tool(s) under consideration with the characteristics of the procurement situation (number of suppliers, strategic

importance of commodity, etc.) and with the relative importance of various outcomes desired (low cost, quality, design support, flexibility, etc.). A number of papers provide prescriptive algorithms for performing these matches (Handfield and Straight, 2003; Kaplan and Sawhney, 2000; Larson et al., 2005). These papers focus fairly widely—on a number of variables. By contrast we focus more narrowly on one characteristic (the information richness of the tools), on one situational variable (the complexity of the procurement), and on one outcome (seller-buyer trust).



Adapted from Wilson (2005); Leenders et al. (2002); Moai Technologies (2002); Balchin and Accenture (2001).

Figure 1 Overview of Sourcing Process

2.2 Dependent Variable: Trust

Seller trust in the buyer (the dependent variable in this study) is one of the important outcomes of the sourcing process. Examination of a number of influential studies indicates a paradox between the widespread agreement on the importance of trust and the lack of a universally accepted definition (Blois, 1999; Johnston et al., 2004; Terpend, 2005). Sako (1992) argues trust is a multi-tiered construct. He refers to trust at the contractual, competency and goodwill levels. Cummings and Bromiley (1996) define trust as the expectation that another individual or group will (1) make a good faith effort to behave in accordance with any commitments, both explicit or implicit; (2) be honest in whatever negotiations preceded those commitments; and (3) not take excessive advantage of others when the opportunity is available.

Doney and Cannon (1997) define trust as “the perceived credibility and the benevolence of a target of trust” (p.36).

Despite this diversity, most definitions converge on two main dimensions: first, the idea of a belief in the other party being honest, dependable or reliable and, second, the belief that the other party would not take advantage of an opportunity to gain at the other party's expense, given the chance. The first dimension is referred to as “perceived credibility” by Doney and Cannon (1997), as “integrity” by McKnight et al. (2002), as “honesty and dependability” by Kumar (1996), as “confident expectations” by Ring and Van de Ven (1994), and as “honesty” by Kwon and Suh (2004). We refer to this dimension as *honesty trust*.

The second dimension describes trust as the “willingness to be vulnerable” (Rousseau et al., 1998), confidence in another party's goodwill (Ring and Van De Ven, 1994), and belief that the other party will not take advantage, even when the opportunity to do so exists (Cummings and Bromiley, 1996). It is referred to as “forbearance of opportunism” by Smith and Barclay (1997). Other researchers also label this dimension as goodwill, benevolence (Doney and Cannon, 1997; McKnight et al., 2002; Johnston et al., 2004; Kwon and Taewon, 2004), and “leap of faith” (Kumar, 1996). We label this dimension *benevolence trust*.

Our study will examine both the honesty and the benevolence dimensions of trust. However, based on the trust literature, we expect that both of our dependent variables (both dimensions of trust) will be affected in the same way—i.e. honesty and benevolence trust will have parallel responses to the independent variables. Although much of the trust literature argues theoretically or establishes empirically two (or more) dimensions of trust, the preponderance of the literature demonstrating the determinants of trust (e.g. Kwon & Suh 2004; McCutcheon & Stuart 2000; Naquin & Paulson, 2003; Parker & Russell 2004; Pullins, Reid, & Plank, 200) does

not establish separate antecedents for different dimensions of trust (Dirks & Ferrin, 2002). One influential study on the antecedents of trust states “Although credibility [which the present study labels honesty] and benevolence could be conceptually distinct, in business relationships such as those studied here, they may be so intertwined that in practice they are operationally inseparable” (Doney and Cannon, 1997, p. 43). Therefore, we present a single set of hypotheses, which are meant to apply equally to honesty trust and benevolence trust.

2.3 Control Variables

To assess the relationships between trust, richness and complexity, our model controls for two additional variables: price and pre-treatment trust. We expect that sellers' evaluations of buyers' trustworthiness will be positively affected by the prices sellers receive or expect to receive from the buyers: *ceteris paribus*, a seller who receives a “better deal” from a buyer is likely to view that buyer more favorably. However, our objective is to understand whether communication medium affects trust independent of price and other objective outcomes. Therefore we control for the price outcome of the negotiation or auction. As a practical consideration, we also control for seller trust in the buyer before the buyer and seller engage in the negotiation or reverse auction (we call this *pre-treatment trust*). Controlling for pre-treatment trust allows us to separate the effect of the treatment (i.e. participation in a face-to-face negotiation, email negotiation or reverse auction) from any reputation effects or previous interaction with the other party.

2.4 Information richness theory

In picking a tool for sourcing, the buyer implicitly chooses a communication medium for exchanging information with the seller. Information Richness Theory (IRT) (also known as media richness theory) can be used to understand how communication media affect trust. IRT

states that media differ on a number of characteristics: 1. *feedback immediacy* (the time that elapses between sending a message and receiving a feedback response from the recipient), 2. the ability to convey *multiple social cues* (body language, eye contact, tone of voice, etc.), 3. the *variety of language* accommodated (text, voice, graphics, etc.), and 4. *personalization* (the ability to customize the communication to the receiver's personal circumstance--e.g. bulletin vs. personal letter) (Daft and Lengel, 1986; Huber and Daft, 1987). The more a communication medium exhibits or possesses these characteristics, the *richer* the medium. The theory posits that favorable outcomes (for example decision quality, team performance, managerial effectiveness, customer loyalty) result from matching the ambiguity or uncertainty of the situation with an appropriately rich communication medium—i.e. using rich media in high-uncertainty situations and leaner media for more routine situations (Daft et al. 1987).

2.4.1 Information Richness Affects Trust

Because developing trust involves overcoming uncertainty and ambiguity about the other party, richer media can be expected to facilitate trust-building more than leaner media. This difference is attributable to disparities between rich and lean media in social cues, language variety, personalization and feedback immediacy—the media richness factors enumerated above. Due to the abundance of *social cues* in face-to-face communication, face-to-face communicators find it more difficult to lie, and they actually do so with less frequency (Valley et al., 1998; Bazerman et al., 1998). By the same token, because of a lack of social cues, individuals using computer-mediated communication have less confidence in judging the true interests of their counterparts (Arunachalam and Dilla, 1995).

Moreover, trust-building is affected by a communication medium's level of *personalization* (one-to-one communication, rather than one-to-many communication) and by a

medium's *language variety* (in this case, the ability to transmit text or verbal language, rather than quantitative symbols only). These characteristics enable the parties to “schmooze” (to carry-on a dialog about personal interests or other topics not related to the negotiation at hand), which has been shown to build trust in face-to-face and computer-mediated situations (Morris, et al., 2000). Finally, *feedback immediacy* is needed for establishing patterns of “coordinated responsive expression” (Morris et al., 2000, p. 9)—a process where communicators develop a cadence and patterns of turn taking, which in turn help develop trust between communicators (Drolet & Morris, 2000; Morris & Keltner, 2000).

These findings suggest that richness matters when it comes to trust. Table 1 summarizes the information richness characteristics we have discussed, and it applies them to the media in our study. Face-to-face communication is equivalent to email in personalization and similar to email in language variety, although email lacks the ability to convey the spoken word. However, face-to-face is richer than email when it comes to social cues and to feedback immediacy (under most circumstances). With reverse auctions, sellers typically receive instantaneous feedback from the reverse auction program as to their rank or bid relative to other sellers; however, communication with the *buyer* occurs after the auction rather than during, and thus there is a considerable feedback lag. Moreover, reverse auctions have a one-to-many format (one buyer, multiple sellers) and the ability to convey only quantitative data (i.e. price) under most circumstances. Thus reverse auctions are leaner than face-to-face and email negotiations.

Because face-to-face negotiation is the richest medium in our study (i.e. it has the greatest feedback immediacy, social cues, language variety and personalization), we would expect sellers who have used face-to-face to have the highest level of trust in buyers. By the same token,

sellers who have used the leanest medium—reverse auctions--should have the lowest trust.

Stated as a series of pairwise comparisons:

H1: Communication medium (face-to-face, email, reverse auction) affects sellers' post-treatment trust in buyers. Controlling for pre-treatment trust and for price outcome, sellers' post-treatment trust is ...

- a. higher for *face-to-face* negotiation than for *email* at any level of procurement complexity.
- b. higher for *face-to-face* negotiation than for *reverse auctions* at any level of procurement complexity.
- c. higher for *email* negotiation than for *reverse auctions* at any level of procurement complexity.

Table 1. Information Richness

	Face-to-Face Negotiation	E-mail Negotiation	Reverse Auction
Feedback immediacy*	High	Medium	Low
Number of social cues	High	Low	Low
Language variety (text, #'s, diagrams, etc.)	Highest	High	Low
Personalization (1to 1 vs. 1to many)	High	High	Low
Richer ←-----→ Leaner			

* This dimension refers to the immediacy of feedback between buyer and seller. Email is asynchronous; however, the precise lag between email communications depends on the users.

Existing research provides some support for the richness-trust relationship proposed in H1. Markus (1994) found that managers opt for face-to-face communication when relationship building is their objective. Trevino et al. (1987) found that managers favored face-to-face communication when they wished to signal desire for teamwork, build trust or convey emotion. In a procurement-specific context, Vigoroso, (1998) and Larson and Kulchitsky, (2000) find that buyers utilize information technology-based communication (EDI, email) for tactical matters while they select richer modes (phone, face-to-face) for communication on less routine issues.

In part because they limit communication to price and other easily quantifiable factors, reverse auctions have been found to decrease seller trust and increase seller suspicions of buyer opportunism (Beall et al., 2003; Jap, 2003; Emiliani and Stec, 2004).

2.4.2 Procurement Complexity Interacts with Communication Medium

Hypothesis one proposed a direct relationship between richness and outcomes; however, the literature suggests that situational factors may interact with media choices to influence results (Galbraith, 1973; Galbraith, 1977). In purchasing, the complexity of the procurement situation (Kaufmann and Michel, 2005; Olsen and Ellram, 1997; Kraljic, 1983) contributes to uncertainty. We define *procurement complexity* as the number of variables which must be considered and the level of ambiguity about those variables. As the uncertainty surrounding a supply management task increases, individuals and organizations require tools and structures with greater information processing capabilities (Bensaou and Venkatraman, 1995; Shah et al., 2002).

Viewed once more through the IRT lens, email and face-to-face communication possess substantial *language variety*. They allow communication of a great number of variables—both quantitative and qualitative. This facilitates the resolution of misunderstandings, planning for contingencies, and so on. Therefore we expect face-to-face and email negotiation to be well suited to both high and low complexity situations. By contrast, Internet reverse auctions communicate one or a few codifiable variables—typically just item price. Therefore, we expect reverse auctions to be a reasonable fit in low complexity situations, but not in high complexity situations. In fact, purchasing authorities (Burt et al., 2003; Leenders et al., 2002) counsel buyers to avoid competitive bidding when situational complexity is high. Other scholars (Beall et al., 2003) give similar advice regarding reverse auctions specifically. Seller-buyer trust might be one of those outcomes that suffer when reverse auctions are employed in complex situations.

Thus H2 states that the procurement complexity will not affect the trust outcome of face-to-face and email negotiations, but it will negatively influence the trust outcome of Internet reverse auctions.

H2: Controlling for differences in pre-treatment trust and price outcome, sellers' post-treatment trust is...

- a. not significantly different in low complexity situations and high complexity situations when face-to-face negotiations are used.
- b. not significantly different in low complexity situations and high complexity situations when email negotiations are used.
- c. significantly greater in low complexity situations than in high complexity situations when reverse auctions are used.

2.5 Linking Trust to Longer Term Relationships

Trust is an important asset to buyers. One way that this might manifest itself is by trust affecting the seller's desire to do business with the buyer again in the future. For example, Oliver et al., (1994) found that a negotiator's satisfaction with negotiations is positively related to their willingness to negotiate with that same partner again. Following this logic, hypothesis three states:

H3: A seller's post-treatment trust in the buyer is positively associated with sellers' desire for future dealings with the buyer.

3. METHODOLOGY

To test the hypotheses, this study compares the three communication media at two levels of procurement complexity, which creates a 2x3 research design. This results in six conditions (i.e. six combinations of communication medium and procurement complexity) as depicted in Figure 2. We compare sellers' trust in buyers (our dependent variable) after sellers are exposed to one of these six conditions (or *treatments*).

		Communication Medium		
Procurement Complexity	Face-to-face	Email	Reverse Auction	
	Hi Complexity	Hi Complexity	Hi Complexity	
	Face-to-face	Email	Reverse Auction	
	Lo Complexity	Lo Complexity	Lo Complexity	

<p>Covariates: Offer Price, Seller's Pre-treatment trust in buyer</p> <p>Dependent Variable: Seller's Post-treatment trust in buyer</p>

Figure 2: 2x3 research design (6 treatments with 2 covariates)

3.1 Experiment Methodology

Our study can be best described as *experimental simulation*, which McGrath (1982) describes as lying between a field experiment and a lab experiment. Two strengths of our experimental methodology are the random assignment of subjects to treatments and the control over confounding factors. Both of these strengths increase the internal validity of our study (Cook and Campbell, 1979). The first strength (random assignment) prevents individual differences among subjects from systematically affecting the results. This problem might occur in a quasi-experiment or survey if, for example, buyers and sellers who gravitate toward email have a relatively low natural propensity to distrust. The second strength (control over confounding factors) rules out numerous potential threats to validity. For example, in a field study, numerous differences among auctions (number of bidders, level of price/rank transparency, duration, etc. (Millet et al., 2004)) could impact their trust outcomes and thus mask the

relationship between communication medium, complexity and trust. By contrast, in our experiment we hold auction format constant. Similarly, by defining one fictitious commodity common to all buyer-seller pairs, we also hold commodity and market characteristics constant. Such tight control yields a high degree of confidence that observed differences in the outcome variable are actually due to differences in our independent variables.

However, a disadvantage of a pure *lab study* is the lack of contextual realism. Therefore we opted for a *simulation experiment* (McGrath 1982) and allowed subjects to negotiate outside of the lab. McGrath (1982) refers to this as “realism of content,” rather than “realism of context” (p. 75). In particular, we wanted to avoid forcing email negotiators into an artificially compressed time frame. A key feature of email is the absence of feedback immediacy (as discussed in section 2.4). Therefore (as we describe in more depth below) instead of using a pure lab study methodology (for example, with email negotiators using a real-time email chat utility during a lab session), we chose to let the email and face-to-face negotiations occur outside of the lab.

Thus, using the experimental simulation method, we were able to achieve precision with regard to the testing of causal relationships between treatments and trust outcomes, while maintaining a moderate level of realism. In the following sections, we explain the methodology in depth.

3.2 Subjects

Consistent with a large body of research that examines the effect of communication media in bargaining situations (e.g., Naquin and Paulson, 2003), this study used student subjects, who were recruited from four sections of one undergraduate business course. As business majors, these students are representative of individuals who will work as buyers and sales

representatives in the near future. As an incentive to participate, all subjects were awarded course extra credit. To motivate conscientious efforts, participants were entered into a drawing for \$10 gift certificates. As we informed the subjects, their probability of winning a gift certificate increased with the quality of their outcomes.

3.3 Treatments

Testing our hypotheses requires two experimental factors: communication medium and procurement complexity (see Figure 2). Levels of communication medium are: face-to-face negotiation, email negotiation and reverse auction. There are two levels of procurement complexity: high and low. As with much bargaining research, buyers and sellers were given written scenarios with some common and some asymmetric information. We operationalized procurement complexity by creating a high complexity version and a low complexity version of both the buyer and seller scenarios. In the low level of procurement complexity, price is the only important variable. In the high level of procurement complexity, all of the following are important issues to the buyer and/or seller: price, quality, delivery, and co-branding opportunities. The scenarios are available upon request from the authors.

Each subject was randomly assigned to one communication medium. Subjects in the same medium were randomly assigned to be buyers or sellers. We then randomly matched buyers and sellers. In the face-to-face and email conditions, buyers and sellers were paired. For reverse auctions, we grouped three sellers to each buyer. Each buyer-seller pair or group was randomly assigned to a level of procurement complexity.

3.4 Procedure

Cook and Campbell (1979) argued using standard procedures can reduce the error variance, increase the chance of obtaining true differences and increase statistical validity. Our

experiment was implemented following pre-specified standard procedures. For instance, the same researcher visited all four sections and read the written scripts each time when providing instructions.

In the treatment sessions, each subject was given a sheet listing his or her assigned communication medium (face-to-face negotiation, email negotiation, reverse auction) and role (buyer, seller) and the name of the opposing subject (e.g. the buyer if the subject was a seller). Subjects were then asked to read their scenario. Next we administered a pre-test to assess pre-treatment trust in the other party (buyer or seller). Dyads in the face-to-face condition were instructed to meet for approximately 20 minutes some time during the next week to conduct their negotiation. Email dyads were instructed to negotiate using email over the next week with the first email occurring within 24 hours. Reverse auction sellers were instructed to attend one of several reverse auction sessions scheduled over the next week.

In the reverse auction sessions, sellers were assigned a computer terminal and told that they were bidding against other sellers. In fact, sellers actually used an auction simulator (which we created using Visual Basic) to bid against the computer, rather than actually competing against other subjects. Using a simulator eliminates the possibility of an important confound: differences in dynamics from auction to auction. The simulator has the look and feel of a real online auction, and the computerized logic mimics the behavior of competing bidders. Appendix B describes the simulator program.

During all the treatment sessions, sellers were told that their objective was to establish their *best offer* with the buyer: a price and other terms that would allow them to make a profit that they considered acceptable and that would give them a good chance of being awarded the business by the buyer. (In this paper, we use the term *price* to denote this offer amount). Sellers

in the face-to-face and email negotiation sessions were told to assume that the buyer would negotiate with other potential suppliers and subsequently pick the offer that they considered most attractive. Similarly, reverse auction sellers were told that the buyer would consider the low bid of each seller in his/her auction and then award the business to one seller. As with negotiation, reverse auction sellers were instructed that their last bid should be a price that would allow them to make a profit that they considered acceptable and that they believed would give them a good chance of being awarded the buyer's business.

At the conclusion of the negotiations and reverse auctions (seven days after the pretest), participants were emailed an on-line questionnaire instrument to measure post-treatment trust and to collect the terms of their negotiated offer or low bid. While we collected data from both buyers and sellers, our hypotheses focus on the sellers; we do not use the buyer data.

3.5 Measure Development and Validation

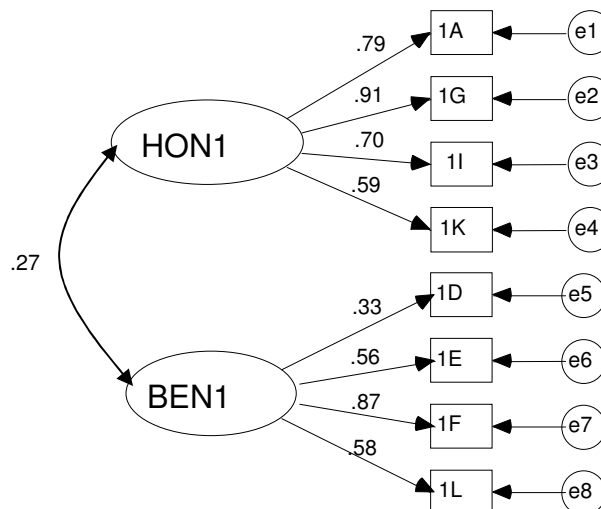
As discussed in Section 2, we consider two dimensions of trust: honesty and benevolence. To operationalize these constructs, we used dimensions two and three of the short form Organizational Trust Inventory of Cummings and Bromiley (1996) to measure pre and post treatment trust. With the exception of verb tense the pre and post test scales are identical. The scales (Appendix A) were fully validated by Cummings and Bromiley (1996); however, we performed measurement analysis using our data.

3.5.1 Convergent Validity and Unidimensionality

We assessed convergent validity and unidimensionality with two confirmatory factor analysis (CFA) models: one for pre-treatment trust (Figure 3) and the other for post-treatment trust (Figure 4). Marsh et al. (1998) recommend using Non-normed Fit Index (NNFI) and

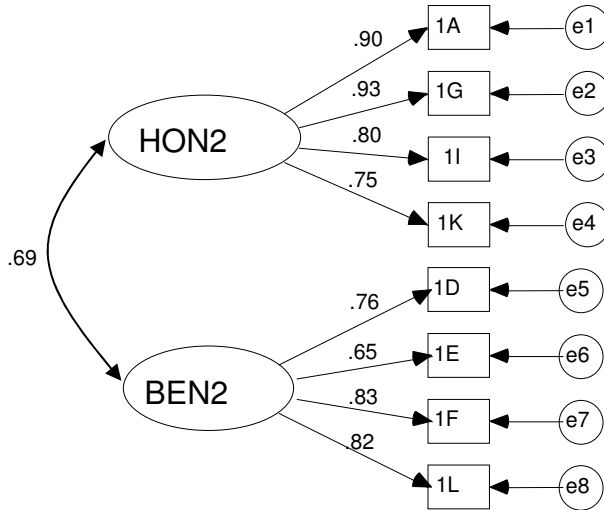
Comparative Fix Index (CFI) together in assessing model fit due to their desirable characteristics with respect to the sample size effect, appropriate penalties for model complexity and the sample fluctuation effect. The recommended cutoff values for NNFI and CFI are 0.90 and 0.95, respectively (Hu and Bentler, 1999; Bentler and Bonnet, 1980). By these criteria, both models have good fit (i.e., NNFI and CFI for both models are larger than 0.95). In addition, Chi-square and RMSEA suggested good fit as well.

There is no significant evidence of items cross-loading on factors that they are not intended to measure since all large modifications indices are associated with expected parameter changes of less than $|\ .30 |$. Item loadings for both models have the expected signs, and are significant at the 0.01 level indicating that convergent validity of the scales is supported (Bagozzi et al., 1991). The convergence of items to the factors they are purported to measure, lack of evidence for unwarranted cross-loadings, and overall model fit provide support for the unidimensionality of each scale.



NNFI=0.95, CFI=0.99, RMSEA=0.01
Chi-sq= 17.301, df=19, $p=0.569$

Figure 3 Confirmatory Factor Analysis Results for Pre-treatment Trust Scales



NNFI=0.97, CFI=0.99, RMSEA=0.037
Chi-sq= 22.573, df =19, $p=0.257$

Figure 4. Confirmatory Factor Analysis Results for Post-treatment Trust Scales

3.5.2 Discriminant Validity

Average variance extracted (AVE) by each factor was computed to assess discriminant validity. The AVE for HON2 (post-treatment honesty trust) and BEN2 (post-treatment benevolence trust) are .72 and .59 respectively, and both are greater than their squared correlation, which is .48. Hence, discriminant validity for the two dimensions of post-treatment trust is supported (Fornell and Larcker, 1981). The AVE for HON1 (pre-treatment honesty trust) and BEN1 (pre-treatment benevolence trust) are .57 and .38 respectively, and both are greater than their squared correlation, which is .07. Hence, discriminant validity for the two dimensions of pre-treatment trust is also supported (Fornell and Larcker, 1981).

3.5.3 Reliability

We assessed the scale reliability using composite reliability. Composite reliabilities for all four scales are greater than .60 (i.e., composite reliability for HON2 and BEN2 equal .91 and .85, and for HON1 and BEN1 are .84 and .69.) Hence, construct reliability is supported. (Bagozzi and Yi, 1988).

4. MODEL ANALYSIS AND RESULTS

Our analysis began with data from the 139 sellers who participated in the project. Of those, 12 sellers did not report agreements with their buyer. Since our model controls for price, we could not use these 12 points in our tests. Additionally, we detected 10 infeasible data points and omitted them. These ten subjects reported results that were beyond the reasonable range of price given the facts of the scenario we provided. A problem in research using human subjects is some participants neglecting to do their tasks conscientiously. This appears to have been the case with these 10 data points. Omitting the unusable data points leaves 117 observations for our hypothesis tests. Table 2 reports the cell counts. Sample sizes in each cell vary from 18 to 22, which are approximately 20 per cell, and are adequate for our design (Hair et al., 1998).

We used the Multivariate Analysis of Covariance (MANCOVA) model to analyze H1 and H2. Analysis of Covariance (ANCOVA) is a technique that combines features of analysis of variance and regression. It evaluates whether the population means of the dependent variable differ across levels of factors adjusted for differences on the covariates. An extension of ANCOVA, MANCOVA allows multiple dependent variables to be considered simultaneously.

Table 2 Cell for Counts Treatments

		Communication Medium			Total
		Face-to-face	Email	Rev. Auction	
Procurement Complexity	High	20	19	22	61
	Low	18	19	19	56

Total	38	38	41	117
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The MANCOVA model to evaluate H1 and H2 includes two factors (communication medium and procurement complexity) and three covariates (pre-treatment honesty trust, pre-treatment benevolence trust, and price), which are continuous variables. The two dependent variables are the two dimensions of post-treatment trust: post-treatment honesty trust (HON2) and post-treatment benevolence trust (BEN2).

Before analyzing our research model, we evaluated our MANCOVA model to determine if assumptions of normality, linearity, equal error variances, independence of error terms, and equality of slopes of the different treatment regression lines (Neter et al. 1996) are satisfied. Normal probability plots of residuals show points that cluster close to a straight line with a 45 degree inclination. There is no significant evidence that the condition of linearity is violated. The modified Levene test provides support for constant error variance. There is no substantial collinearity since all variance inflation factor (VIF) values are less than 2.00. To test for parallel slopes, we introduced the interaction terms between covariates and factors (e.g., price*communication medium, price*procurement complexity, pre-treatment honesty trust *communication medium, pre-treatment honesty trust *procurement complexity, pre-treatment benevolence trust *communication medium, pre-treatment benevolence trust *procurement complexity) to allow for different slopes for the treatments. The *p*-values for each covariate-factor interaction terms are not significant. Hence, the requirement of equal treatment slopes is met (Neter et al 1996).

Table 3 reports the multivariate tests of our model. As the table shows, the multivariate tests indicate a significant interaction effect between communication medium and complexity with a $p < .01$ for Pillai's Trace. The univariate tests reported in Table 4 confirm that this finding

holds for each trust dimension separately ($p = .001$ for honesty trust and a $p = .038$ for benevolence trust).

Table 3. Results from Multivariate Tests (N=117)

Effect		Value	F	Df	Sig.
MEDIA*COMPLEX.	Pillai's Trace	0.12	3.44	4	0.009
MEDIA	Pillai's Trace	0.23	7.09	4	0.000
COMPLEXITY	Pillai's Trace	0.01	0.76	2	0.472
Zprice	Pillai's Trace	0.01	6.11	2	0.003
HON1	Pillai's Trace	0.19	12.81	2	0.000
BEN1	Pillai's Trace	0.16	10.17	2	0.000

Note: We conducted the four standard multivariate tests recommended for MANCOVA (Pillai's Trace, Wilks' lambda, Hotelling's Trace and Roy's Largest Root). All four tests were essentially equivalent, with Pillai's Trace being most conservative (i.e., the p-values for other statistics are lower). For the sake of simplicity, we report only Pillai's Trace.

Table 4. Results from Univariate Tests (N=117)

Source	Dependent variable	Sum of Squares	df	Mean Square	F	Sig.
Medium*Complexity	HON2	17.45	2	8.73	7.08	.001
	BEN2	7.88	2	3.94	3.36	.038
Medium	HON2	24.02	2	12.01	9.75	.000
	BEN2	25.28	2	12.64	10.78	.000
Complexity	HON2	1.39	1	1.39	1.12	.291
	BEN2	1.41	1	1.41	1.20	.276
Z-price	HON2	14.64	1	14.64	11.88	.001
	BEN2	6.62	1	6.62	5.64	.019
HON1	HON2	30.99	1	30.99	25.15	.000
	BEN2	4.25	1	4.25	3.63	.060
BEN1	HON2	.25	1	.25	.21	.651
	BEN2	19.50	1	19.50	16.63	.000

HON and **BEN** refer to the honesty and benevolence dimensions of trust respectively. The suffix **1** refers to the pre-treatment measure (pre-test), **2** refers to the post-treatment measure. **Medium** is communication medium (face-to-face, email, reverse auction). **Complexity** refers to procurement complexity (simple vs. complex scenario). **ZPRICE** is standardized final offer amount.

4.1 Hypothesis One

Hypothesis one states that, not only does communication medium affect trust, but the media follow a distinct hierarchy in terms of their impact on trust: We hypothesize that post-

treatment trust is highest for sellers who participated in face-to-face negotiation, followed by email, and then reverse auction. As indicated by the significant interaction effect shown in Tables 3 and 4, the impact of each communication medium on post-treatment trust depends upon the level of procurement complexity. Therefore, in order to test H1, we must analyze the effect of medium at *each level of complexity* separately. To do so, we constructed separate parallel MANCOVA models for each level of complexity (Neter et al., 1996). We used these models to conduct Bonferroni multiple pairwise comparisons of average post-treatment trust at each level of procurement complexity, controlling for pre-treatment trust and final price outcome.

Tables C1 through C4 in Appendix C detail the results. Table 5 summarizes these Bonferroni adjusted comparisons from Appendix C. The value in Table 5 is the difference in the mean level trust between the two media listed in the first column. Grayscale indicates a significant mean difference. H1a proposed that post-treatment trust for sellers who participated in face-to-face negotiations would be higher than for sellers using email, regardless of the level of procurement complexity. As the first row of results in Table 5 shows, when the procurement complexity is low, trust (honesty and benevolence) from face-to-face negotiation is significantly higher than trust from email negotiation; however when complexity is high, the trust outcomes of face to face and email negotiations do not differ significantly. Thus H1a is partially supported (supported when complexity is low, but not when it is high). Similarly, H1b stated that post treatment trust for sellers in face-to-face negotiations would be higher than for sellers in reverse auctions. The second row in Table 5 shows that this is always the case--regardless of the level of complexity or the type of trust considered (honesty trust or benevolence trust). Thus H1b is fully supported. Similarly, H1c stated that seller trust outcome of an email negotiation would be higher than trust outcome of an internet reverse auction. As the last row in Table 5 shows, email

outperforms reverse auctions for benevolence trust when procurement complexity is high, but not for honesty trust. Thus H1c is partially supported.

Table 5. Summary of Bonferroni Pair-wise Comparisons Between Communication Media (Hypothesis 1)

	Low complexity (SIMPLE)		High complexity (COMPLEX)	
	Honesty (HON2)	Benevolence (BEN2)	Honesty (HON2)	Benevolence (BEN2)
Face-to-face over email	1.99***	1.24**	0.11	0.00
Face-to-face over RA	1.28**	1.29**	0.87*	1.05**
Email over RA	-0.71	0.00	0.76	1.00*

***p<.001

** p<.01

* p<.05

The body of the table lists mean differences (on a 1 to 7 scale) in trust between the pairs of communication media. For example, when procurement complexity was low, the mean level of post-treatment honesty trust for sellers using face-to-face negotiation was 2 points above the mean for sellers using email.

Significant differences are gray scaled. See Appendix C Tables C1 through C4 for the detailed results of each of these pair-wise comparisons.

4.2 Hypothesis Two

Hypothesis two states that the trust outcomes of reverse auctions decline as procurement complexity increases, but the trust outcomes of face-to-face and email negotiations do not. In other words, H2 posits an interaction between procurement complexity and communication medium. As described above, the overall MANCOVA (Tables 3 and 4) shows that this interaction is significant, indicating that the impact of procurement complexity differs across at least two of the three communication media. In order to understand whether these differences are in the form hypothesized, we need to perform further analysis. As with H1, we must compare cell-level mean differences in post-treatment trust. Whereas H1 concerned cell-by-cell comparisons across the communication media, H2 concerns cell-by-cell comparisons across levels of procurement complexity. Therefore, we constructed three separate MANCOVA models

in order to compare cell means—one model for each communication medium controlling for the pre-treatment trust and final price outcome (Neter et al., 1996). Table 6 summarizes the results. Tables C5 and C6 in Appendix C detail the comparisons.

The left-hand two columns of Table 6 show that when face-to-face negotiation is used, the level of procurement complexity has no significant effect either dimension of trust. Thus H2a is supported.

Table 6 Summary of Pair-wise Comparisons between Levels of Procurement Complexity (Hypothesis 2)

Comm. Medium:	Face-to-face		Email		Reverse Auction	
Dimension of Trust:	Honesty (HON2)	Benevolence (BEN2)	Honesty (HON2)	Benevolence (BEN2)	Honesty (HON2)	Benevolence (BEN2)
Difference in mean trust score (low minus high complexity)	0.43 n.s.	0.18 n.s.	-1.38 ***	-1.11 ***	.42*.	0.19 n.s.

***p<.001

** p<.01

* p<.05

For each communication medium, the body of the table lists mean differences (on a 1 to 7 scale) in trust between low procurement complexity and high procurement complexity. For example, when a reverse auction was used (rightmost 2 columns), the mean level of post-treatment honesty trust for sellers assigned to the low complexity scenario was .42 points higher than for sellers assigned to the high complexity scenario. Significant differences are grayscale. See Appendix C Tables C5 and C6 for the detailed results of each of these pair-wise comparisons.

Parallel to H2a, H2b posited that when email was used, the level of procurement complexity would not affect trust. The data show a much different result. The negative significant differences in the table indicate that, when email is used, trust (both honesty and benevolence) is actually greater in the high complexity scenario, rather than the low complexity scenario. For example, honesty trust for email sellers negotiating the high complexity scenario was 1.38 points higher than for those negotiating the low complexity scenario. Thus H2b is not

supported, even though the analysis does reveal some interesting and significant differences. We return to this in the discussion.

H2c states that as procurement complexity increases, the trust outcomes of reverse auctions will worsen (decrease). As the two right-hand columns in Table 6 indicate, we see the predicted effect for honesty trust, but not for benevolence trust. In other words, when complexity is low, mean post-treatment honesty trust is .42 points higher than when complexity is high. On the other hand, benevolence trust did not vary significantly with complexity. Thus H2c is partially supported.

4.3 Hypothesis Three

Hypothesis three stated that the seller's desire for future interaction with the buyer would be influenced by the seller's trust in the buyer. We tested H3 using ordinary multiple regression with two explanatory variables: post-treatment honesty trust and post-treatment benevolence trust. The results are reported in Table 7. The overall model is highly significant and it explains a high portion (32.9 percent) of the variation in sellers' desire for future interaction. Thus Hypothesis three is supported. As Table 7 shows, honesty trust is a significant predictor of desire for future interaction ($p < .001$), while benevolence trust is not. (Although honesty trust and benevolence trust are two dimensions of trust, Variance Inflation Factor (VIF) of 1.655 suggests no substantial collinearity between these two predictors.)

Table 7. Results from Simple Regression Model (n=117)

Dependent variable: desire for future interaction with buyer

Model	Standardized Coefficients	T	Sig	VIF
HON2	.52	5.22	.000	1.655
BEN2	.09	.88	.379	1.655
F=28.0 (p=.00) R ² =.33				

5. DISCUSSION AND CONCLUSION

5.1 Discussion

The purpose of this research is to increase the field's understanding of (i) whether or not computer-mediated sourcing tools affect seller trust; and if so, (ii) why. Table 8 summarizes the tests of hypotheses. Based on the empirical results, several key insights emerge.

5.1.1 Communication Medium

In the introduction we suggested that, the buyer's choice between computer-mediated and non-mediated communication will affect seller trust. By controlling for price, our research shows that relationship-related impacts are due to more than just the tools' price outcomes: communication medium itself affects seller trust in the buyer. Moreover, we suggested that, due to differences in their information richness, the media would follow a particular rank order with regard to their trust outcomes. Our results confirm this relationship: face-to-face negotiation generally is associated with the highest level of seller trust in buyers —followed by email negotiation and then internet reverse auctions.

5.1.2 Procurement Complexity

We also suggested that the particular effect of communication medium depends on the level of procurement complexity. Our data support this notion. When procurement complexity is high face-to-face negotiation and email negotiation have no significant trust differences from one another, but they do differ when complexity is low.

Furthermore, the “complexity effect” (Table 6) differs across communication media. Complexity does not affect the trust outcome when face-to-face communication is used. This finding is consistent with the notion in the communication literature that face-to-face communication performs well under conditions of both high and low complexity.

Table 8. Summary of Tests of Hypotheses

Hypothesis		Supported when dependent variable is:	
		Honesty trust	Benevolence trust
1	Communication medium (face-to-face, email, reverse auction) affects sellers' post-treatment trust in buyers: Controlling for pre-treatment trust and for price outcome, sellers' post-treatment trust is ...		
A	higher for <i>face-to-face</i> negotiation than for <i>email</i> at any level of procurement complexity.	Partial [†]	Partial
B	higher for <i>face-to-face</i> negotiation than for <i>reverse auctions</i> at any level of procurement complexity.	Yes	Yes
C	higher for <i>email</i> negotiation than for <i>reverse auctions</i> at any level of procurement complexity.	Partial	Partial
2	Controlling for differences in pre-treatment trust and price outcome, sellers' post-treatment trust is ...		
A	not significantly different at high and low levels of <i>procurement complexity</i> when <i>face-to-face</i> negotiations are used.	Yes	Yes
B	not significantly different at high and low levels of <i>procurement complexity</i> when <i>email</i> negotiations are used.	No ^{††}	No ^{††}
C	greater at low levels of <i>procurement complexity</i> than at high levels of procurement complexity when <i>reverse auctions</i> are used.	Yes	No
3	Sellers' post-treatment trust in buyers is positively associated with sellers' desire for future dealings with the buyer ^{†††}	Yes	No

[†] *Partial* means that hypothesis is supported for one of the two levels of procurement complexity, but results were non-significant for the other level.

^{††} A statistically significant *positive* relationship was found between complexity and trust. We hypothesized a null relationship.

^{†††} In H3, trust is the independent variable, rather than the dependent variable.

By contrast, Table 6 shows a strong positive relationship between procurement complexity and trust outcomes when email is used. Although our hypothesis did not predict this positive relationship, the result makes sense. Email creates its own record of the agreement and the steps that lead up to the agreement. This type of documentation may not add much trust-related value in simple situations, but it may contribute greatly to trust in complex situations—

when negotiators must keep track of offers, counter-offers and final positions on numerous issues. Additionally, with a communication medium that has a paucity of social cues (e.g. no body language) there might be a relationship simply between the *number of* communications and the level of trust. Presumably, negotiating in a more complex situation requires more offers and counter-offers than in a simple scenario. If this is the case, we would see higher trust outcomes in the high complexity case. This merits further research.

Continuing the consideration of complexity, the consensus in the exploratory reverse auction literature is that the fit-to-task of reverse auctions declines as ambiguity about future requirements (cost, design changes, etc.) increases (e.g. Emiliani and Stec, 2002; Jap, 2002; Carter, 2004). This type of misfit might create numerous difficulties, including quality problems, unplanned requests for price increases and so on. We predicted that one such problem would be a decrease in seller trust in the buyer. Our results provide support for this notion: When reverse auctions are used, honesty trust in the high complexity situation is significantly lower than in the low complexity situation (see Table 6).

5.1.3 The impact of price

Although our model utilizes price only as a control variable, our data analysis provides some interesting insights on the impact of price. First, our MANCOVA model (table 4) shows that price has a significant impact on both honesty trust ($p=.001$) and benevolence trust ($p=.019$). The correlations between price and honesty trust and between price and benevolence trust are 0.248 and 0.167 respectively, which demonstrates a positive impact. As we discussed in section 4.0, the equal slopes assumption for MANCOVA was met. This indicates that the impact of price on trust does not differ across communication media or across levels of procurement complexity.

5.2 Contributions

5.2.1 Contributions to Practice

Competitive pricing has been long identified as an important reason why sellers dislike reverse auctions. Especially when prices fall below levels that sellers perceive to be “fair,” the effect on sellers’ margins may negatively impact the trust-related outcomes of the auction-integrated supplier selection process. However, our study shows that price pressure *is only part of the story*. By controlling for price differences across sourcing channels, we isolate the effect of communication medium on trust outcomes, net of price. In doing so, we find that the communication medium itself does indeed affect seller trust toward the buyer. Further, we find that trust is linked to the seller’s desire for future interaction with the buyer.

Kaufmann and Carter (2000, p. 23) state, “Electronic procurement auctions will belong to a buyer’s standard toolset in the future. Purchasing managers should therefore learn about the specific differences between auction-integrated sourcing processes and traditional face-to-face negotiations.” Except for Jap’s work (2002, 2003), our study is the first to empirically compare internet reverse auctions to other tools. Our analysis suggests that the choice of a communication tool during the sourcing process should be based upon the relative importance of various outcome variables. When trust-building is a critical outcome, there is no substitute for face-to-face communication. If the buyer wishes to use digitally mediated tools when trust is an important outcome, buyers need to find alternative ways to establish trust, particularly in new relationships. In other situations, seller trust may be less important than other outcomes, such as lowest price or maximum efficiency during the sourcing process. These outcomes might be maximized by use of a digital tool. By linking various tools to their trust results, our results can help buyers make trade offs between outcomes.

Another contribution to practice comes from our demonstrating an interaction between email outcomes and procurement complexity. Buyers tend to use email for simple, routine matters. However, our results suggest that employing email to resolve complex scenarios may be more advantageous than using it in simple ones. In complicated negotiations, practitioners might be wise to consider combining email in tandem with face-to-face communication, although we did not test this combination in the study.

5.2.2 Contributions to Academe

We have made two major contributions to Academe. First, our study is one of the few studies that investigate the impact of technology on trust in the purchasing environment. Only two of fifty articles identified in recent supply chain-focused review of the trust literature (Terpend, 2005) dealt with the relationship between trust and technology. One of the uninvestigated research areas that the Terpend paper identifies is comparisons of traditional and electronically mediated communication with respect to buyer-seller relationships. Our paper brings to light a number of important contrasts in this area.

Second, we have tested an important theory – Information Richness Theory. Cutting across numerous disciplines, IRT has been used extensively to explain behavior and predict its effectiveness. Although it is an important lens, IRT has been criticized for a number of reasons. Perhaps the most significant objection comes from IRT revisionists, who state that having been developed before the widespread use of the internet, the theory may not account for ways in which computer mediated communication may be “rich” —i.e. internet-enabled communication may have attributes that give it unique advantages for communicating or discerning meaning (Markus, 1994; Ngwenyama and Lee, 1997). Researchers have cited this as an explanation for the observation that IRT has failed to predict well in a number of studies (Dennis & Kinney

1998; Culnan & Markus 1987; El-shinnawy & Markus 1992; Lee 1994; Rice 1992; Sproull & Kiesler 1986). By contrast, “classic” IRT (as articulated by Daft and colleagues) predicted our results very well. Building trust in a new party is an endeavor that involves overcoming ambiguity and thus requires rich information (Markus, 1994). Therefore one would expect to see that greater information richness is associated with greater trust. Indeed, classified using the classic information richness criteria articulated by Daft and Lengel (1986) and Huber and Daft (1987), the richest medium in our study (face-to-face negotiation) generally had the best post treatment trust; while leanest medium (internet reverse auctions) had the lowest.

On the other hand, our data does provide limited support for the revisionist view (Dennis & Kinney 1998; Markus, 1994; Ngwenyama and Lee, 1997) of IRT. We hypothesized that there would be more trust after face-to-face negotiations than after email negotiations because face-to-face communication is richer than email, according to IRT. However, in our results, email trust equaled face-to-face trust when procurement complexity was high. Existing research provides some possible explanations: Email automatically generates a written copy of the agreement and how it was reached (Sproull, 1991); and email increases a negotiator's ability to structure complex multi-variable offers and present all the details of a single offer simultaneously (Valacich et al., 1992). These characteristics might provide email with some trust-related advantages over face-to-face negotiation—even though a traditional IRT view considers face-to-face negotiation to be richer than email.

5.3 Limitations and Future Research

Finally, it is important to recognize the scope and limitations of this study and define logical extensions to this research. We used student subjects, rather than experienced buyers and

sellers; and we did not administer our study in the field. This may limit generalizability to professional buyers and sellers in real companies. However, the research objective necessitated trading off some generalizability in order to gain experimental control. Using an experimental design under controlled conditions allowed us to hold constant commodity and market characteristics and to control price outcomes. Furthermore, using undergraduates, who lack preconceptions about the suitability of various communication media in the procurement context, avoids the influence of buyer and seller prejudices and past experience. All of these design elements increase the confidence that the observed differences in the response variables are actually due to our experimental manipulations.

Second, our research investigated the use of a single communication medium during the price determination process. But as we discussed earlier, when trust-building is important, using digitally mediated sourcing tools alone is not enough. An effective approach—one that some companies use—might be to conduct pre-event, face-to-face meetings to establish trust prior to an email negotiation or reverse auction. Hence, a valuable future research direction is to study the impact of various combinations of communication media—perhaps at different points in the sourcing process—on trust outcomes.

Third, our study focuses on inherent characteristics of media. However, Social Definition Theorists suggest that individuals' media usage patterns (or "appropriation") also affect a medium's ability to convey meaning (Markus, 1987; Allen, 1988). However, we did not study differences in usage patterns within a communication medium—for example, whether there were outcome differences between email negotiators who responded to messages promptly and those who did not. Investigating potential trust effects of such differences in usage patterns is a natural direction for future research.

Fourth, based on the literature, we hypothesized that honesty trust and benevolence trust would behave in a parallel fashion in our model—i.e. both would respond in the same way to the antecedent variables and both would have the same effect on the dependent variable. The data largely supported this expectation (see table 8), except for three cases. With respect to H1, when procurement complexity is high, we found that email outperforms reverse auction in benevolence trust, but not in honesty trust. This difference could be due to two characteristics of reverse auctions: transparency and competitiveness. In many reverse auctions, including those in our study, sellers can see each others' bids. Bid transparency may influence sellers' perceptions that the buyer is honest—i.e. the buyer is not misrepresenting the level of price competition. This advantage of reverse auctions may compensate for other honesty-related disadvantages of reverse auctions compared to email, thus resulting in the non-difference in honesty trust. On the other hand, by compelling the seller to participate in a reverse auction, rather than in an email negotiation, the buyer puts the reverse auction seller in an environment that is highly competitive (one with real-time dynamic bidding). Sellers may associate this with being taken advantage of—an attitude that is reflected by benevolence trust. Thus reverse auction sellers' benevolence trust is lower than that of email sellers. Moreover, if the extreme competitiveness of reverse auctions is indeed driving benevolence perceptions of reverse auction sellers, then this might also account the lack of change in benevolence trust between sellers in the high and low complexity scenarios (H2c), which was the other difference between antecedents of honesty and benevolence in our findings.

Moving to when the seller's desire for future interaction with the buyer is the *dependent* variable (H3), only honesty trust, but not benevolence trust, appears to have an effect. Benevolence trust captures the seller's belief about actions that the buyer may take *if* he or she

has the opportunity—i.e. buyer opportunism— whereas honesty trust reflects the seller's beliefs about fundamental buyer behaviors that are relevant in *any* bargaining situation. Since our desire for future interaction variable does not give any specifics about the nature of the future situation (e.g. whether the seller is vulnerable), perhaps only the more universally applicable honesty dimension matters.

Of course, all of the foregoing discussion of the limited differences between honesty and benevolence in our results is quite speculative. This supports Dirks and Ferrin's (2002) call for more empirical work examining differences in the antecedents and consequences of different dimensions of trust. With regard to the relationship between trust and communication media, our findings provide several potentially fruitful starting points for a more systematic (*a priori*) investigation of differences among dimensions.

5.4 Conclusion

We conducted empirical experimental research to investigate the causal relationship between communication medium and seller's trust in the buyer during the price discovery stage of the purchasing process. Using an experimental design enabled us to isolate the impact of communication medium from other potential contaminating factors and make the causal inference with a high degree of certainty. In particular, we find that communication medium (internet enabled versus the traditional face-to-face channel) affects seller trust. Furthermore, some of the effects of communication medium depend on the level of procurement complexity. Devising a sourcing strategy for a particular commodity entails choosing from a variety of communication tools based on the relative importance of numerous outcome variables. We show that, when trust is an important outcome, buyers must pay heed to the information richness of the

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tools under consideration.

APPENDIX A

Questionnaire Items

Trust. Pre-treatment and post-treatment scales are parallel, except for the verb tense on many items. Items below are in post-treatment format, with any differences in pre-treatment wording indicated with parentheses. Items D, E & L were reverse scored. Likert Scale: 1 “strongly disagree”, 7 “strongly agree”.

Honesty Trust: *Pre-treatment reliability .84; Post-treatment reliability .91*

- A. I feel that the other party tells (will tell) the truth in business dealings
- G. I feel that the other party dealt (will deal) with me honestly
- K. I feel that the other party handled (will handle) joint expectations fairly
- I. I think that the other party has not misled (will not mislead) me

Benevolence Trust: *Pre-treatment reliability .69; Post-treatment reliability .85*

- D. I think that the other party succeeds by stepping on other people
- E. I feel that the other party tries to (will try to) get the upper hand
- F. I think that the other party took (will take) advantage of my problems
- L. I feel that the other party takes (will take) advantage of people who are vulnerable

Future Interaction. Likert Scale: 1 “not satisfied at all”, 5 “very satisfied”.

Based on your experience in this negotiation [auction], to what degree are you willing to have future dealings with this buyer?

APPENDIX B

On-Line Reverse Auction Simulator

As the paper describes, subjects in the reverse auction seller condition were told that they were participating in reverse auction against other sellers. Unbeknownst to them, participants really used a reverse auction simulator designed by the authors. To the participant, bids placed by the simulator appeared to be placed by other bidders in the auction. To imitate typical auction behavior, the simulator was programmed to decrease the time between simulated bids and the bid decrement (difference between previous and current bid) as the time remaining elapsed.

In keeping with industry practice, each auction has a reserve price—the maximum acceptable bid. Our reserve price was \$90. Auctions lasted 3 minutes. However, if there was a bid within the last 15 seconds of the auction, the time was automatically extended an additional 30 seconds. The simulator was programmed not to bid below a pre-set target price. Based on pilot testing, the researchers determined the distribution of bids in the face-to-face and email conditions. Because the research design called for controlling for price, the researchers set target prices that were consistent with this distribution.

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APPENDIX C Detailed Tables

Table C1 Bonferroni Pair-wise Comparisons between Communication Media

Dependent variable: Honesty Trust (HON2); Procurement Complexity: Low

(I) COMM	(J) COMM	Mean Difference (I-J)	Std. Error	Sig.
F2F	Email	1.994	.367	.000
F2F	RA	1.284	.381	.002
Email	RA	-.710	.364	.085

Table C2 Bonferroni Pair-wise Comparisons between Communication Media

Dependent variable: Benevolence Trust (BEN2); Procurement Complexity: Low

(I) COMM	(J) COMM	Mean Difference (I-J)	Std. Error	Sig.
F2F	Email	1.242	.351	.0015
F2F	RA	1.288	.365	.0015
Email	RA	4.624E-02	.348	.50

Table C3 Bonferroni Pair-wise Comparisons between Communication Media

Dependent variable: Honesty Trust (HON2); Procurement Complexity: High

(I) COMM	(J) COMM	Mean Difference (I-J)	Std. Error	Sig.
F2F	Email	.109	.361	.50
F2F	RA	.869	.357	.0275
Email	RA	.760	.363	.0615

Table C4 Bonferroni Pair-wise Comparisons between Communication Media

Dependent variable: Benevolence Trust (BEN2); Procurement Complexity: High

(I) COMM	(J) COMM	Mean Difference (I-J)	Std. Error	Sig.
F2F	Email	4.925E-02	.367	.500
F2F	RA	1.050	.363	.008
Email	RA	1	.369	.0135

Table 5 Pair-wise Comparison between Low Procurement Complexity and High Procurement Complexity

Dependent variable: Honesty Trust (HON2)

Medium	Mean Difference between low complexity and high complexity (L-H)	Std. Error	Sig.
Face to Face	.434	.513	.403
Email	-1.380	.373	.001
RA	.422	.211	.053

Table 6 Pair-wise Comparison between Low Procurement Complexity and High Procurement Complexity

Dependent variable: Benevolence Trust (BEN2)

Medium	Mean Difference between low complexity and high complexity (L-H)	Std. Error	Sig.
Face to Face	.176	.477	.715
Email	-1.108	.297	.001
RA	.192	.303	.531

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