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ANTECEDENTS AND CONTINGENCIES AFFECTING UNCERTAINTY IN ELECTRONIC MARKETS: AN EMPIRICAL STUDY

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Abstract

The rise of E-commerce came with the promise of disintermediation. However, the e-commerce scenario today is flooded by an increasing number of intermediaries, e.g. Amazon, Verisign and Thawte. Economics of intermediation suggests that intermediaries arise when consumers are unsure of the market in general. The question then is: what market conditions prompt such consumer perceptions of uncertainty? This paper tries to address this very issue by empirically testing antecedent and contingent conditions to consumer uncertainty in electronic markets. Findings suggest that consumer uncertainty is traceable to inherent electronic market inefficiencies of anonymity and lack of product and process transparencies. The findings also suggest that uncertainty is a function of product price, but only when product transparency is lacking. However, the study did not find any significant influence of gender on consumer uncertainty, as previously theorized.

Keywords: Electronic market inefficiencies, anonymity, lack of product transparency, lack of process transparency, uncertainty

1 INTRODUCTION

An electronic market (EM) is defined as a *technology-based disintermediated* market-environment comprising of a growing network of buyers and sellers offering heterogeneous products (Bailey and Bakos, 1997). With the Internet signifying the “death of distance” (Sawhney, 1999), following Bailey and Bakos (1997), the Electronic Market Hypothesis (EMH) purports that electronic markets could eliminate any need for intermediaries as hierarchies in physical markets, owing to reduced costs of search (Bakos, 1997), coordination (Malone et al, 1987), communication (Clemons, Reddi, and Row, 1993) and processing (Sirbu and Tyger, 1995). Notwithstanding EMH claims, recent statistics obviate the contrary. The Internet is instead experiencing a preponderance of intermediaries such as Ebay[®], Amazon[®], Google[®], Verisign[®], and Thawte[®], to help transactors make more informed decisions. Intermediaries perform various functions like providers of search(Google), providers of aggregation(Amazon, Ebay) and providers of security(Verisign, Thawte). Economics of intermediation suggest that intermediaries arise when consumers are unsure of the market in general. Findings from a recent survey conducted by Verisign (2004) lay claim to this point of view of consumer uncertainty in disintermediated electronic market transactions. Their statistics reveal the following facts:

- 38% of Americans are less likely to make purchases because of uncertainty surrounding credit card fraud because of too many anonymous entities.

- 49 percent of consumers reduced their holiday shopping to some extent during the 2003 season. The main reasons for this reduction included uncertainty surrounding the security of credit card transaction processes leading to the risk of identity theft.
- 93% of US online shoppers say that it is important for an e-commerce site to include a third party (intermediary) trust mark to reduce uncertainty.

The aforementioned statistics paint a grim picture of consumer confidence in disintermediated electronic markets, begging the following research question: What are the preconditions and contingencies for consumer perceived uncertainty in electronic markets? Specifically we ask: (1) are there certain inherent inefficiencies of electronic markets that warrant such uncertainty? (2) is uncertainty an overarching phenomenon or underpinned by variations in users and products? Although previous research is often suggestive of two distinct contingencies in understanding online transaction behavior: gender (e.g Rodgers and Harris, 2003; Van Slyke, Communale and Belanger 2002) and product (e.g Ba and Pavlou ,2002), there is scant evidence that empirically grounds gender and product contingencies on consumer uncertainty.

The contribution of this study is, thus, twofold: First, it offers a fresh lens to define and dimension inefficiencies of disintermediated online (electronic) markets. A systematic dimensioning of such inefficiencies has missed scrutiny but is becoming increasingly an important predictor for consumer behavior online. Consumers today face lucrative transaction opportunities with anonymous entities offering goods from remote corners of the world. Often, consumers are well-cognizant with these products; sometimes they are not. In addition, electronic markets offer little control over the underlying process that are often more transparent in the physical world. A systematic understanding of these inefficiencies offer myriad opportunities for mitigating consumer concerns, leading to the creation of a truly global village.

Second, understanding gender and product contingencies are also necessary to our ongoing understanding of consumer behavior in electronic markets. Given that both men and women are consumers in electronic markets, gender-specific differences can have important implications for e-commerce businesses in general. For example, if women were found to be less uncertain in electronic markets, businesses could target goods and services more towards women than men. Companies could alternatively attempt to address and mitigate gender-specific concerns, thus raising overall consumer confidence.

Similarly, understanding if and how online consumer behavior varies across products offers tremendous insight on the choice of electronic markets as channels for particular products. In the existing literature, a common addressed aspect of product had been the risk associated with the product. It is essential to understand how perceptions shift with product price, commonly implicated as a proxy for product risk (Ba and Pavlou, 2002). If it is found that higher priced products influence greater uncertainty, then businesses might consider selling higher priced products offline. Alternatively, companies may also try to refine representational quality for heightened consumer experience that can mitigate price-specific concerns.

The paper is organized as follows. First, we briefly present our theoretical background linking market inefficiencies and uncertainty. Next, we understand how these perceived inefficiencies of the electronic market leads to consumer perceptions of uncertainty about the same and hypothesize about them. We also look at the two contingencies that might influence the effect of these inefficiencies of electronic markets on uncertainty. Next, we present our empirical study to test these hypotheses and present our results and findings. Finally, we discuss the contribution and implications of the paper, and point to avenues for future research.

2 THEORETICAL BACKGROUND

Economics of Information Theory (Stigler, 1961) and Transaction Cost Economics (Williamson, 1975; 1981; 1985) emphasize market inefficiencies and uncertainty as important factor endowments influencing actual transactions in the markets.

Stigler (1961) observed that markets are ever expanding, with growing number of sellers offering myriad price options. When consumers are not perfectly informed about these prices, they will search to discover favorable choices. However, every search incurs cost, and increasing search costs lead to decreased

perception of benefits. Building on Stigler's research, Williamson's (1975) transaction cost economics goes beyond search to encompass costs of securing information about buyers and sellers, costs of seeking information about goods to find a desired combination of price and quality, and costs of bargaining and negotiating a contract and costs of monitoring and enforcing the contract. Thus high transaction costs become a distinct possibility in physical markets, even though *products are tangible, processes are well defined, and sellers in transactions have a physical presence*. Compared to this, in electronic markets products are intangible, processes are ill defined (enveloped as a black box by technology) and sellers are anonymous, and hence transaction costs are even greater, especially due to the increased underlying threat of opportunism. The raised transaction costs showcase the essential inefficiencies of electronic markets as compared to physical markets. Following Williamson and Stigler, we argue that such inherent inefficiencies in electronic markets lead to uncertainty in electronic markets due to the increased transaction costs involved.

3 HYPOTHESES DEVELOPMENT

3.1 Perceived Inefficiencies of Electronic Markets

As defined before, an electronic or online market is a technology-based disintermediated market-environment comprising of a growing network of buyers and sellers offering heterogeneous products. Electronic markets (EM) as a whole are characterized by many benefits, but they do have their problems: cyber crimes, logistical bottlenecks, system breakdowns and hacking incidents. Altogether, these problems exemplify inherent electronic market inefficiencies.

In this study, we posit that inefficiencies of an electronic market can be attributed to network characteristics of anonymity (Kalakota and Whinston, 1996), product (Strader and Shaw, 1999), and process transparency (Hsu and Soo, 2002). The appropriateness of considering the aforesaid factors can be understood in the light of three concerns that dominate the psyche of a consumer when making a purchase: who or where the purchase is made from? what is being purchased? and, what is the underlying process by which the purchase is made? In the case of electronic markets, all these three concerns pose a problem because of the virtualness of the environment: The consumer cannot ascertain the "true" identity of the vendor, the "true" nature of the product (touch or feel it) and the process by which the product reaches the consumer. Thus, a consumer in an electronic market cannot be certain with regards to the aforementioned concerns. In the scope of the discussion that follows, electronic market inefficiencies are characterized using three distinct dimensions: anonymity (arising from the positive network externalities), lack of product transparency, and lack of process transparency. The overall hypothesized model is shown in Figure 1.

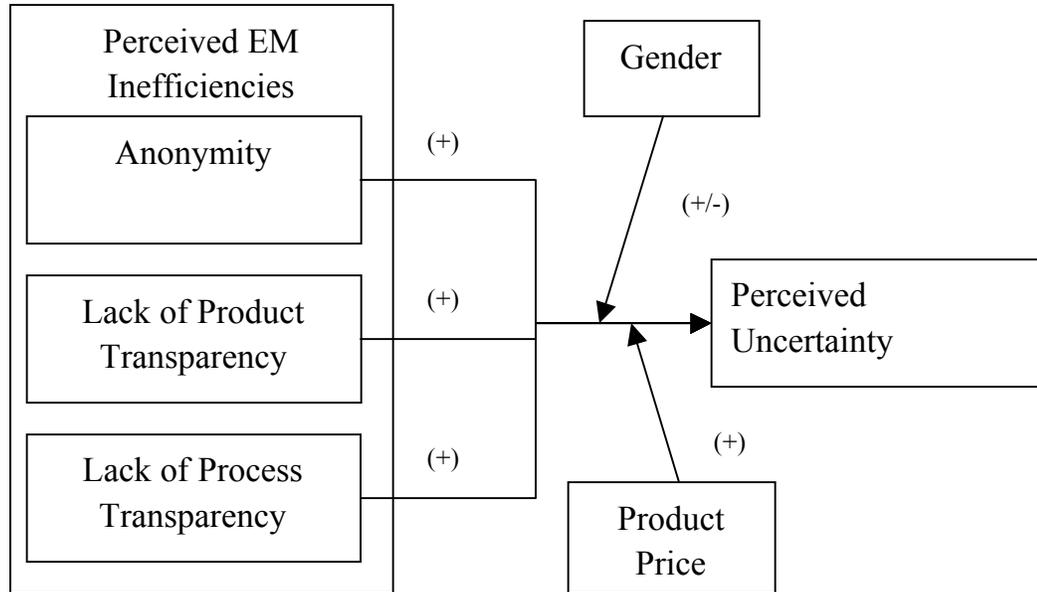


Figure 1: A Model of Perceived Uncertainty in Electronic Markets

3.1.1 Anonymity

In the scope of this paper, anonymity refers to the inability of consumers to determine the true identity of sellers. Anonymity is a function of the online network and has been well established as an inefficiency of electronic markets (Malone, Yates and Benjamin, 1989; Kalakota and Whinston, 1996). In the expanding electronic network, new nodes from around the world are being added everyday, their faceless presence warranted by an URL. While positive network externalities have made the Internet and the World Wide Web popular, it has also increased anonymity by making entities “faceless”. From domain names to screen-nicknames, pseudonyms create anonymity by masking both buyers and sellers, leading to problems such as repudiation and identity theft. In an electronic market, with thousands of nodes (entities), anonymity is acute. There is no way for any consumer to actually know if the entities (sellers) are what they really are. An entity can be easily hidden in the burgeoning nodes (sellers) in an electronic market. In the absence of any physical interaction, the transactor remains faceless. There might be a formal name for a node (seller), but the name alone never signifies what the node actually is. In a market that thrives on anonymity, buyers remain uncertain about the security offered by such a market.

3.1.2 Lack of Product Transparency

Product transparency concerns consumer ability to completely understand all necessary product attributes required to make an informed decision. The electronic market is limited in its ability to represent a product in all its completeness. Consequently, there is a tremendous information asymmetry. Different sellers may represent a product in myriad ways. Lacking a reference frame such as product tangibility in the real world, consumers’ understanding of a product is captive to the seller’s representation only. If a seller from Azerbaijan posits that their rugs have the highest quality Persian wool, the consumer is captive to only that information that the seller provides. Even if one is an expert in judging wool quality, the lack of tangibility and complete information will force one to accept the sellers’ claims at face value. Concerns about the lack of product transparency arise when the true product characteristics are not easily captured (Strader and Shaw, 1999), an issue germane to electronic markets. When one walks up to a store and buys a good, one can actually understand the various attributes of the product (for example texture and shape) and can also obtain first hand knowledge from a human sales or store representative. But in the case of electronic markets, the

maximum that a consumer can do is to have a look at the image of the product and read about its description and characteristics. This represents an acute loss of objectivity of the product characteristics. To surmise, an electronic market fails to capture the true nature of a product, leading to a certain sense of wariness and uncertainty (Liang and Huang, 1998) in the consumer's mind.

3.1.3 Lack of Process Transparency

Following Hsu and Soo (2002), process transparency refers to consumer visibility and verifiability of the underlying operation and execution process in any online transaction. Consider the case when a consumer physically goes to the store and makes a purchase. The consumer picks up good (possibly enquires about it to gain sufficient knowledge), walks up to the cashier and pays for it, either by cash, check or credit card and then walks off with the purchase. Compare this to buying in an electronic market. A consumer typically chooses a product and pays for it using credit cards or electronic checks. The moment one clicks a "submit order" button to send order and payment information, there is little knowledge of the process specifics running in the background. This is slightly different than swiping cards at a physical checkout where the connections are based on dedicated data communication channels, rather than over an insecure public network such as the Internet. In an electronic market, rather than paying a physical entity, consumers interact only with a web interface. The process details remain a black box with little control over how the order and payment information is received, handled, and forwarded to a shipper. The consumer has little or no knowledge of who picked the payment or how it was processed. One is even rarely aware of whether payment information was duly received by the intended party or was intercepted by some malicious entities in between. The only sure way the consumer will know if they made it properly would be to actually receive the good or service that was paid for. The consumer might have an order number, but has no idea of what that is tied to internally, or how it is processed. Information technology serves as a black box, shielding the complex sequence of steps required to successfully conclude a transaction. Consumers are not made aware of their sending of HTTP requests for authentication and funds validation applications. While complexity is subsumed by the technology black box, consumers also remain unaware to the extent of lurking dangers such as packet sniffing and spoofing. Yet, in a physical process, consumers would relatively be more aware of such background activities, thus reducing uncertainty. Reduced process transparency is therefore an inefficiency particular to the electronic market and leads to greater uncertainty as perceived by the consumer. Together, inefficiencies stemming from anonymity, lack of product transparency, and lack of process transparency lead to consumer perceptions of uncertainty (Liang and Huang, 1998).

3.2 Perceived Uncertainty

Uncertainty is defined as the lack of credible knowledge (Lascaux, 2003). Knight (1985) referred to uncertainty as "neither ignorance nor complete and perfect information but partial knowledge". Uncertainty refers to the quandary of the principally unknowable, unpredictable and uncontrollable future (Lascaux, 2003).

Consumers perceive uncertainty in conditions that do not offer control, predictability or complete knowledge. Our discussion of uncertainty revolves around consumers' perceptions of an electronic market. An electronic market is a black box for the consumer, shrouded with technology. The knowledge is limited to the information that is accessible and available. For example, the consumer may know the name of a vendor, or even an IP address, but may not know the true identity of the vendor in terms of the exact location, reputation, or reliability of the vendor. The consumer again might know something about the product (e.g. how it looks like from specific angles as per the images) but not how it feels like or how it is to use it. Also, the consumer might have some vague idea of the transaction process, but not knowledge of the complete sequence. A lack of complete knowledge creates a sense of predicament about the seller, the product and the process.

We claim that inefficiencies inherent to the electronic market (i.e. anonymity, lack of product transparency, and lack of process transparency) are prime candidates for increased perceptions of uncertainty. In the world of electronic markets, simplification is commonly achieved by shifting control from the consumer to the

technology. From cookies to plug-ins, technology tries to simplify the environment by reducing the need to understand how transactions are orchestrated. While that has certainly made electronic markets popular, it has greatly reduced control, knowledge, and predictability regarding the outcome of transactions in the electronic markets (Hodgson, 1997), leading to perceptions of uncertainty. In short, consumers' lack of information is attributable to inherent inefficiencies in the electronic market, thus raising their perceived uncertainty. Note that by uncertainty in this paper we always refer to the consumer perceptions of uncertainty.

Hypothesis 1: Perceived increase in anonymity in electronic markets would increase consumer perceived uncertainty about the electronic market.

Hypothesis 2: Perceived increase in lack of product transparency in electronic markets would increase consumer perceived uncertainty about the electronic market.

Hypothesis 3: Perceived increase in lack of process transparency in electronic markets would increase consumer perceived uncertainty about electronic markets.

3.3 Influence of Gender in Consumer Perceptions of Uncertainty

Gender has remained an important, yet under-theorized aspect in IS research (Adam, Howcroft and Richardson 2004). Prior research in IS confirms significant difference in online shopping behavior between men and women. In particular, studies have suggested that men use the Internet for shopping purposes more than women do (Rodgers and Cannon, 2000; Wells and Chen 1999). Other studies (Rodgers and Harris, 2003) confirm that women are more uncertain of electronic markets, partly because they perceive certain electronic market inefficiencies more than their gender counterpart. Thus, we conclude that there is a distinct gender bias in uncertainty. This is attributable to gender specific perceptions of electronic markets and the inefficiencies therein.

Hypothesis 4: Gender will moderate the direct effects of electronic market inefficiencies on consumer perceptions of uncertainty in electronic markets to the effect that women would have greater perceptions of uncertainty of electronic markets than men.

3.4 Influence of Product Price in Consumer Perceptions of Uncertainty

It has been shown that consumer concerns are related to the product itself; specifically, the higher the product risk, the higher the perceived uncertainty (Bhatnagar et al, 2000). In this study, a product is discriminated as a function of its price, particularly because expensive products tend to bear a risk premium (Bhatnagar, Mishra and Rao, 2000), i.e. product price subsumes product risk. This can be understood because a higher product price implies that "more is at stake" and with the inherent inefficiencies of electronic markets, this creates greater perceptions of uncertainty. This is because "having more at stake" increases the threat of opportunism in electronic markets (Ba and Pavlou 2002).

For example, the uncertainty in buying a pencil online would be significantly different from buying a television online. Bhatnagar et al (2000) state that the higher the price of the product, the higher the consumer perceived risk of buying that product online. Independent of underlying electronic market inefficiencies, product price influences consumer perceptions of uncertainty. It should be noted that even when perceived electronic market inefficiencies do not change, uncertainty increases with an increase in the product price.

Hypothesis 5: Product price will positively moderate the direct effects of electronic market inefficiencies on consumer perceptions of uncertainty in electronic markets.

4 RESEARCH STUDY

4.1 Developing measures for the constructs

In the area of research we are concerned with, hardly any measures exist of electronic market inefficiencies. Due to the non-traditional nature of the discipline, it is difficult to develop information technology constructs (Segars 1997). Careful analysis and intense theorization is required in order to develop measures for such constructs. Developed measures were tested and validated for clarification and coherence.

4.1.1 *Electronic Market (EM) Inefficiencies*

Hardly any work before has ventured in to develop measures for these three constructs. Hence we had to fall back on intense theorization in order to develop these items. A total of 13 items were developed for measuring the overall construct of EM inefficiencies: five items for anonymity, and four each for lack of product transparency and lack of process transparency. With respect to anonymity, we identified “true” knowledge about sellers and the predictability of their behavior as major concerns. With respect to lack of product transparency, we identified the discernability of product characteristics and attributes and comparability with other products within an electronic market as the major concerns. For the lack of process transparency, we were concerned with the verifiability, awareness and control of the entire online transaction (for buying a product), from start to end. These concerns were the rationale behind the items that we developed for each of these three constructs.

4.1.2 *Uncertainty*

Surprisingly, uncertainty measures are also scarce in literature, even though almost every work on e-commerce mentions uncertainty either directly or indirectly. There have been instances of operationalizing risk (e.g. Pavlou and Gefen 2004 where they measure risk in a community of sellers), however, there has been no clear cut attempt to develop the measures of uncertainty, especially in e-commerce. We again fell back on our conceptual discussion on uncertainty above in order to come up with items for the same. From the existing e-commerce literature and our own theorizing, we identified the facets of consumer perceived uncertainty in terms of predictability, risk, threats, optimization and control. This was the rationale behind the items that we developed. A total of five items were developed to measure uncertainty.

4.2 Research method

This study was conducted as a part of a larger research on online intermediation. A questionnaire was administered online to an MIS undergraduate student body in a public university in Northwest United States. The items were measured using Likert scales, ranging from Strongly Agree to Strongly Disagree. Participants received research credit for participating in the study. At the beginning of the study, the subjects were briefed to make them aware of the scope of the research study and asked to respond according to their understanding of electronic markets. Participants were partitioned by product types differentiated by price attributes: the first group would consider buying a movie DVD online, the second group would consider buying a big screen TV online and the third would consider buying a car online. Gender is treated as a nominal variable (Male=1, Female=2) and product price as an ordinal variable (Movie DVD=1, TV=2, Car=3). A quiz was embedded in the questionnaire as a manipulation check to gauge the level of the subjects' involvement in the study and their understanding of pertinent concepts. Of a total of 403 subjects, manipulation checks resulted in 225 usable questionnaires. 130 of them were males(57.8%) and 95(42.2%) were females. Mean item scores were used for each construct. Table 1 shows the descriptive statistics including the mean scores for the constructs of our study.

Construct	Mean	Std. Deviation
UNCERTAINTY	2.9675	.75397
ANONYMITY	4.518	1.2565

LACK OF PRODUCT TRANSPARENCY	3.972	1.2862
LACK OF PROCESS TRANSPARENCY	4.13	1.466

Table 1. Descriptive Statistics

4.3 Results

4.3.1 Reliability and Validity

Since our instrument¹ was developed from scratch, it is important that we demonstrate its reliability and validity. Reliability analysis was conducted using Cronbach's alpha. Results suggested high reliability across all scales measuring the constructs. For the three electronic market inefficiencies, reliability was 0.8857 for anonymity, 0.8253 for lack of product transparency and 0.9126 for lack of process transparency. For items measuring uncertainty, we initially found a reliability of 0.7492. But on scrutiny we found that one of the items (UNC4), which had been reverse coded, had pulled down the overall reliability and if that item was excluded, the reliability went up to 0.78, which is acceptable, given the fact that this is a first approach towards measuring uncertainty (consumer perceived) in electronic markets. Thus in general, our instrument showed good reliability.

For demonstrating validity of our instrument, the factor loadings are shown in Table 2. Four components are extracted (three EM inefficiencies and uncertainty). ANON1...ANON5 reflect the 5 items measuring anonymity, PRODTR1...PRODTR4 reflect the 4 items measuring (lack of) product transparency and PROCTR1...PROCTR4 reflect the 4 items measuring (lack of) process transparency. All the items load highly on one factor as compared to other factors. UNC1...UNC5 reflect the items measuring uncertainty. The item loadings are high except for UNC4, which had a loading of 0.457 and was subsequently dropped. This is the same reverse coded item that had caused the reliability for the items measuring uncertainty to go down. Apart from this item, the loadings are high with regards to the respective factors and that is why none of the other items are dropped. High intra-factor loadings and low cross-factor loadings respectively substantiate ample convergent and discriminant validity.

Items	Factor 1 (Anonymity)	Factor 2 (Lack of Process Transparency)	Factor 3 (Lack of Product Transparency)	Factor 4 (Uncertainty)
ANON1	.680	.239	.223	.114
ANON2	.834	.226	.247	.118
ANON3	.764	.266	.179	.337
ANON4	.808	.241	.008	.210
ANON5	.735	.007	.253	.363
PROCTR1	.138	.837	.113	.138
PROCTR2	.213	.806	.114	.213
PROCTR3	.226	.653	.154	.226
PROCTR4	.446	.592	.178	.446
PRODTR1	.147	.005	.903	.189
PRODTR2	.184	.127	.900	.008
PRODTR3	.379	.385	.757	.164

¹ Items were omitted for the sake of brevity and will be available on request

PRODTR4	.256	.483	.717	.197
UNC1	.148	.386	.293	.819
UNC2	.113	.272	.147	.748
UNC3	.200	.202	.185	.738
UNC5	.242	.202	.149	.758
UNC4	.148	-.03	-.234	.457
Total Variance Explained	51.26	9.97	11.34	51.156

Table 2. Factor Loadings

4.3.2 Hypothesis testing

In order to test our hypotheses, we primarily conducted a series of stepwise regressions using variable means. Specifically, we conducted three stepwise regressions:

1. $UNC = a + b1*ANON + b2*PRODTR + b3*PROCTR$.
2. $UNC = a + b1*ANON + b2*PRODTR + b3*PROCTR + b4*GEN + b5*GEN*ANON + b6*GEN*PRODTR + b7*GEN*PROCTR$
3. $UNC = a + b1*ANON + b2*PRODTR + b3*PROCTR + b4*PRODPR + b5*PRODPR*ANON + b6*PRODPR*PRODTR + b7*PRODPR*PROCTR$

Where, UNC= Uncertainty; ANON= Anonymity; PRODTR= Lack of Product Transparency; PROCTR= Lack of Process Transparency; PRODPR= Product Price; GEN= Gender.

Hypotheses 1, 2, and 3 tests the direct effects of the three EM inefficiencies on uncertainty. Hypothesis 4 tests the moderating effect of gender on uncertainty; Hypothesis 5 tests the moderating effects of product price on uncertainty. The results of the regression analysis are presented in the Table 3. The overall model significance in all three regressions were very high (F significance < 0.001)

		Predictors	Standardized Coefficients	t-value	Significance of beta	R-square	Adjusted R-square	Model Significance (F-significance)
Direct Effects			Beta			0.487	0.480	.000***
		(Constant)		7.131	.000***			
	Hypothesis 1	ANONYMITY	.309	4.766	.000***			
	Hypothesis 2	LACK OF PRODUCT TRANSPARENCY	.141	2.265	.024*			
	Hypothesis 3	LACK OF PROCESS TRANSPARENCY	.363	5.693	.000***			
Moderation of gender on direct effects	Hypothesis 4	GENDER	-.010	-.208	.836	0.487	0.480	.000***
		GENDER*ANONYMITY	-.008	-.126	.900			
		GENDER* LACK OF PRODUCT TRANSPARENCY	-.008	-.122	.903			
		GENDER*LACK OF PROCESS TRANSPARENCY	-.022	-.311	.756			
Moderation of product price on	Hypothesis 5	PRODUCT PRICE	-.088	-1.052	.294	0.495	0.488	.000***
		PRODUCT PRICE * ANONYMITY	-.088	-.953	.342			

direct effects	PRODUCT PRICE * LACK OF PROCESS TRANSPARENCY	-.165	-1.679	.095			
	PRODUCT PRICE * LACK OF PRODUCT TRANSPARENCY	.149	2.939	.004**			

Dependent Variable: UNCERTAINTY

*** p<0.001; ** p<0.01; * p<0.05

Table 3. Regression Analysis

Our regression analysis had adequate power because the highest number of predictors we had hypothesized about was 9 (3 direct effects and 6 moderating or interaction effects). Following the heuristic of 20*k subjects (k=number of predictors), our subject pool offers conditions for stable beta weights and acceptable power.

The findings support hypotheses 1, 2, and 3. Consumer perceptions of anonymity, lack of product transparency, and lack of process transparency were significant predictors directly influencing consumer perceived uncertainty. The positive beta weights showcase that as each of these three predictors increased, the criterion (uncertainty) increased. Process transparency (b=0.363) and anonymity (b=0.309) seem to be the major concerns as compared to a lack of product transparency (b=0.141) surrounding consumer perceptions of electronic markets.

Hypothesis 4 was not supported. Uncertainty does not vary by gender, as reported by existing research (Rodgers and Cannon, 2000). Neither was there a main effect.

Hypotheses 5 received partial support. Product price (b= 0.149) seems to positively significantly moderate consumer uncertainty only when coupled with a lack of product transparency. The finding suggests that a lack of product transparency is not extremely important per se unless expensive. In our study, we looked at perceptions across purchases of three products with substantial price differential (1 = movie DVD, 2 = big screen TV, 3 = car). The result indicates that, regardless of how much consumers are able to understand a product by its online description, it is the price that drives their uncertainty. Interestingly, the interaction consequently rendering perceived lack of product transparency insignificant. However, product price was not a significant moderator in the effects of either anonymity or lack of process transparency on consumer perceived uncertainty. The model with anonymity, lack of process transparency and an interaction of product price and lack of product transparency explains greater variance of uncertainty (Adj-R square is 0.488) as compared to the model with anonymity, lack of product transparency and lack of process Transparency (Adj-R square is 0.480). Thus, we find that product price interacting with lack of product transparency is a stronger predictor of uncertainty as compared to simply lack of product transparency.

5 CONTRIBUTION AND IMPLICATIONS

This paper's contribution towards the IS literature and practice in multiple ways. *First*, the paper clearly develops and delineates the three basic inefficiencies of electronic markets. In doing so, the paper strikes at the heart of consumer uncertainty surrounding transactions in a disintermediated electronic environment, thus prompting our reliance on 3rd party structures such as Ebay and Verisign as noted earlier. To the best of our knowledge, there is no current research that delineates and understands the basic inefficiencies of electronic markets in this way. *Second*, the paper systematically conducts instrument development and validation for the underlying constructs. As such, these instruments offer newfound testability of the proposed constructs, particularly when no such measures exist in the IS literature. Thus, this paper provides a starting point for an in-depth analysis, both theoretical and empirical, of the nature of electronic markets, and provides measures to facilitate those analyses. *Third*, the paper furthers model and instrument development with subsequent empirical validation. It confirms consumer uncertainty in transacting in electronic markets, particularly for expensive item purchases. The issue is core to both research and practice. It is important for companies

marketing expensive wares online to understand that inherent consumer uncertainty can be reduced by decreasing anonymity and increasing product and process transparencies. Anonymity can be reduced by increasing consumer awareness of the vendor through media or by 3rd party assurance mechanisms. Process transparency can be reduced by open disclosure surrounding the storing and use of information, security policies (e.g. level of encryption offered), among others. Product transparency can be increased by a variety of rich media representations, e.g. shockwave, 3D rendering, VRML, etc. Fourth, the paper refutes uncertainty as being gender-biased. Such a finding suggests that men and women are likely to be equal participants in online transactions, providing vendors with an opportunity to target both sexes as a part of their marketing strategy. *Finally*, the non-significant moderating influence of product price on direct effects of anonymity and process transparency offers an interesting cue. It suggests that our perceptions of anonymity and process transparency are independent of the type or price of the product itself. Consumers perceive a lack of process transparency and anonymity as inherent conditions in expanding digital networks and therefore consider them uncontrollable, irrespective of the type of products they intend to purchase. Positive network externalities and the convenience of web technologies as a black box have contributed to a lack of general understanding of who occupies a node in the network or how information flows between nodes.

This study offers multiple opportunities for future research. First, future research could try to empirically validate the proposed model across different samples. Our choice of undergraduate students as informants is justified to the effect that they are current consumers in electronic markets. However, it remains to be seen if their perceptions are essentially different from other consumer segments. Future attempts at validating the model should expand the sample to encompass different consumer segments. A second direction for future research could be an investigation of other moderators that could influence consumer uncertainty. For example, country-specific policies could have a significant effect on consumer uncertainty. In Europe, strict privacy laws and opt-in policies could perhaps mitigate consumer uncertainty vis-à-vis the United States. Often having a recourse to law can raise consumer confidence. Similarly, demographic characteristics such as age and education may produce different perceptions of uncertainty. Again, prior exposure to technology may offer an interesting perspective. For example, in countries that are nascent in their experience of online electronic market transactions, consumers might be enamored by the novelty to an extent that it overshadows inherent uncertainties. Again, a possible limitation of this study could be the unidimensional view of product price as representing the product risk. Product risk could possibly have other dimensions (such as product characteristics and complexity) which need to be explored in order to get a more complete picture of the moderating effects of product risk. A third direction for future research would be a longitudinal treatment of consumer uncertainty in electronic markets. Is uncertainty static or does it change over time? Finally, future research could extend the model by illuminating how consumer uncertainty in disintermediated electronic markets propels intermediation. For instance it could investigate if uncertainty reduces the trust in electronic markets in general and if the presence of intermediaries act as a way to counter this reduction in trust in order to facilitate online transactions. If pursued, these directions for future research should go a long way towards helping to enhance our understanding of the changing e-commerce landscape.

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