

# Designing Electronic Commerce Environments on Trust-Building Principles

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## ABSTRACT

*Overcoming the trust barrier is one of the main challenges facing electronic commerce today. The formation of trust is still an open issue largely because previous research efforts have not explained trust, formation as a process which can be influenced through a number of discrete interaction stages with the vendor. We present a theoretical model that describes these stages and provide initial empirical evidence which shows that users come to trust incrementally as they assess the online vendor's benevolence, competence, integrity and predictability. Based on these findings, we derive a set of principles for developing trust-centric web stores and present a prototype environment illustrating their practical applicability.*

**Key-words:** Electronic commerce, Trust, Software agents, Virtual reality

## RÉSUMÉ

*Gagner la confiance des internautes constitue aujourd'hui un des principaux objectifs auquel sont confrontés les acteurs du commerce électronique. La formation de la confiance demeure un axe de recherche à développer dans la mesure où elle n'a pas été analysée, dans la littérature, sous l'angle d'un processus susceptible d'être influencé par un certain nombre d'interactions avec le vendeur. Dans le cadre de cet article, nous présentons les différentes étapes pouvant influencer la confiance des acheteurs et démontrons, par le biais d'une étude empirique, que cette dernière peut se gagner progressivement selon la perception que les internautes ont de la bienveillance du vendeur, de sa compétence, de son intégrité et de sa prévisibilité. Sur la base de ces résultats, nous formulons un ensemble de principes susceptibles de développer la confiance des internautes à l'égard des points de vente virtuels et les illustrons par la présentation d'un prototype d'environnement commercial*

**Mots-clés :** Commerce électronique, Confiance, Agents de logiciel, Réalité virtuelle.

## 1. INTRODUCTION

The role of **trust is prominent for the achievement of customer retention and loyalty in e-commerce**. Firstly, there is an imperative need for trust for the conversion of Internet visitors to online shoppers, dictated by the reported reluctance of consumers **to engage in Internet purchases**. More importantly, trust is an essential prerequisite for **establishing and maintaining customer relationships** which are the vehicle for customer retention and business longevity online. Hence, characterized as the "sine qua non of the **digital economy** and the future currency of the Internet (Urban *et al.*, 2000), trust is a necessity for e-commerce, not only as a facilitator of customer acquisition, but also for enabling relationship building and ensuring customer loyalty.

As a topic of research in electronic commerce, trust has recently received attention as is evidenced by a number of studies and has been addressed from different viewpoints and to different levels of analysis. The emerging body of literature has focused on a range of issues covering why trust is needed (Urban *et al.*, 2000), antecedents and consequences (Jarvenpaa *et al.*, 2000; Gefen, 2000; Kini and Chobineh, 2000; Einwiller *et al.*, 2000), barriers contributing to the lack of trust (Hoffman *et al.*, 1999; Schoder and Yin 2000) and possible remedies **against it**. The emphasis is placed to the role of trust for e-commerce adoption and the short-term transactional value. However, there is still a gap **in understanding** how trust is formed and evolves in a long-term perspective **and as a means** for relationship building. More recent research efforts have examined trust

before (e.g. McKnight *et al.*, 2002) **or after interaction with an online store** (Gefen *et al.*, 2003), without however providing **a holistic view of the trust-building process as it takes place before, during and after interaction**. **In addition**, the effect of the interaction per se **in the formation of trust remains largely unaddressed**. While studies have identified **interaction and web site aspects as antecedents of trust**, such as perceived ease of use (Gefen *et al.*, 2003), they do not explain how such aspects **influence the formation of trust during the interaction with an online store**. The present study aims to address **this gap by analyzing interaction into discrete stages** and showing how each of them contributes to the **trust-building process**.

Although to **a large extent traditional** principles for building **trusting relationships** may be **still valid in e-commerce**, the 'physical-to-virtual' transfer dictates that they should be **revisited if their effectiveness is to be guaranteed**. For example, the absence **of salespersons and the interpersonal face-to-face contact with the customer, used as a basis for judging a vendor's trustworthiness** in the bricks-and-mortar commerce, **cannot be easily replaced in an electronic environment**. **With this in mind, we suggest that in terms of evolution e-commerce web sites should be transformed to customer-centric servicescapes offering a digital experience closer to the physical one that can contribute towards the development of an indelible relationship between the business and the customer**. **Looking at the issue of building trust in an electronic setting from a practical viewpoint and leveraging** the capabilities of available technology, the powerful fea-

tures of agents and virtual reality hold the potential to facilitate the design and implementation of environments that offer the expressiveness of a traditional commercial context, required for the formation of trust.

In this paper we present such an archetype environment that delves away from the purely transactional-based flavor that the majority of web sites arguably project today, and allows for ongoing relationship building, with trust being infused into every step of the customer-business interaction. Its purpose is not to mirror or simulate a real-world shopping environment but to serve as a vehicle for facilitating discussion, showing possible ways via which certain functionality can be infused into the next generation of web sites so as to project a vendor's trust-building attributes, by offering a shopping experience which is close to the physical one. Theory has informed the design of this environment by a model that explains the formation of trust in the broader context of building long-term relationships. Extending current research, the model approaches and describes the establishment of trust as an iterative and evolutionary process. In addition, instead of simply treating trust as a unidimensional construct (Jarvenpaa, 2000, Gefen, 2000) or as one construct comprising a set of beliefs (McKnight *et al.*, 2002; Gefen *et al.*, 2003) the model projects a clear conceptual and operational distinction of trust facets. The model has been empirically tested using a validated survey instrument comprising existing and new measures, with the results providing support for the underpinning theory.

In the next section of this paper, we describe our theoretical model for trust and relationship building and provide some empirical results. In the third section the prototype servicescape is presented, whilst it is demonstrated how its design was guided by a number of trust building principles derived by the model. Conclusions and issues for further research follow.

## II. HOW TRUST IS FORMED IN ELECTRONIC COMMERCE

Drawing from established theoretical work on trust and relationship marketing, our aim was to capture and distinguish the conceptual meanings of trust and the dynamics of its formation in commercial relational exchanges. This attempt to understand the nature of trust and its development in commercial environments has been aided by an excellent typology of interrelated types of trust constructs proposed by McKnight and Chervany (1996) and by five trust-building processes as described by Doney and Cannon (1997) (Table 1). Building upon this work, we have added another trust building process, the credibility process, differentiating it from the capability process as originally proposed by the authors (Papadopoulou *et al.*, 2001).

The above, representing trust dimensions and development modes, have been synthesized and theoretically interrelated, resulting in an integrated model and a vertical understanding of how trust is formed in a relational exchange between two parties (Figure

1)<sup>1</sup>. **The model has been based on the assumption that customer trust in an e-commerce business is built through repeated interactions with promises made, enabled and kept (Bitner, 1995) within an electronic servicescape. A 'servicescape'<sup>2</sup>, according to Wanninger *et al.* (1997), is one of the three primary components that comprise an 'e-commerce information system'. The other two are the supporting infrastructure plus the customer database and analytical tools to support relationship marketing activities. The functions of making, enabling and keeping promises describe a service encounter and the associated relationship building between a business and the customer. In this context promises are made in terms of offerings to show the business intentions, setting customer expectations from the service encounter. Promises are then enabled through facilities offered by the servicescape to service the customer and meet his expectations raised earlier. The last stage of promise fulfillment is keeping the promise as it was originally made.**

As is evidenced in the literature, trust is characterized by a lack of consensus regarding its definition. Divided in two dominant conceptualizations, trust is viewed by many as a belief or expectation implying a notion of confidence and trustworthiness stemming from the partner's expertise, reliability, or intentions (Blau, 1964; Pruitt, 1981). From another perspective, trust is seen as a behavioral intention or willingness to be vulnerable and rely on another party, accepting the risk and uncertainty emanating from the assumption that the party will behave within accepted norms (Williamson, 1975; Coleman, 1990; Deutsch, 1960). Researchers adopting this view have separated beliefs from trust conceptualizations and defined them as antecedents of trust (Mayer *et al.*, 1995). While discriminating between beliefs and behavioral intention, a third research stream has argued that both are necessary components of trust (Moorman *et al.*, 1992; McAllister, 1995; McKnight *et al.*, 1998).

Following the theory of reasoned action (Fishbein and Ajzen, 1975), our model for trust formation in B2C e-commerce relationships encompasses both trusting beliefs<sup>3</sup> and trusting intention, as distinct yet related facets of trust (Table 2). The core idea underlying the model is that trusting beliefs lead to a trusting intention which is manifested in a trusting behavior. More importantly how-

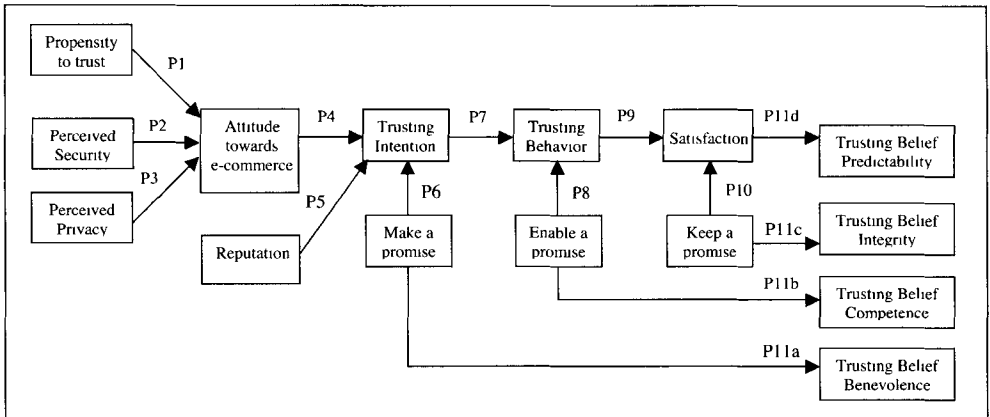
Trust Constructs [McKnight & Chervany, 1996]	Trust-building Processes [Doney & Cannon, 1997]
• Dispositional trust	Intentionality
• Institution-based trust	Capability
• Trusting beliefs:	Prediction
- Benevolence,	• Transference
- Competence,	• Calculative
- Honesty / Integrity.	• Credibility
- Predictability,	
<i>Confidence in belief,</i>	
• Trusting Intention	
• Trusting Behavior	

Table 1: Trust constructs and building processes.

1 For a full description of the research propositions ('Ps') underlying the model the reader is referred to Papadopoulou *et al.*, 2002

2 The notion of *servicescape* was introduced by Bitner (1992) to describe the physical environment in which a service encounter takes place.

3 **Trusting beliefs** are defined as the extent to which one believes (and feels confident in believing) that the other person involved in a relational exchange is trustworthy Four main categories of trusting beliefs are identified (McKnight *et al.*, 1996).



**Figure 1: Research model – Trust formation through promise fulfillment within the e-servicescape.**

TRUSTING BELIEF	DESCRIPTION
<b>Benevolence</b>	The belief that the other person cares about the welfare of one and is therefore motivated to act in one's interest. It includes the motivation of an Internet vendor to provide security of transactions and protect privacy of consumer information.
<b>Competence</b>	The belief that the other person has the ability to do for one what one needs done. It includes the ability of an Internet vendor to guarantee the security of conducting online transactions and the privacy of consumer data. This involves the use of appropriate and effective technological infrastructure, protocols, standards, techniques and mechanisms for secure transactions and protection of privacy as well as the adoption of security and privacy policies.
<b>Honesty/Integrity</b>	The belief that the other person makes good faith agreements, tells the truth and fulfills any promises made. Integrity includes the actual application and enforcement of the adopted security and privacy policies.
<b>Predictability</b>	The belief that the other person's actions are consistent enough that one can forecast what one will do in a given situation.

**Table 2: Trusting beliefs.**

ver, the model emphasizes that the development of trust in an e-commerce setting is dependent upon the fulfillment of promises. The model suggests that prior to interaction, trusting beliefs are formed from *reputation*, which in conjunction with *attitude towards e-commerce* affect *trusting intention* as depicted graphically in Figure 1. Attitude towards e-commerce is the result of *propensity to trust* and institution-based trust, which is analysed in *perceived security* and *perceived privacy* of the e-commerce context. Trusting intention is also influenced by the *promise that is made* by the online vendor. Trusting in-

tenion in turn and the *enabling of the promise* made influence *trusting behavior*. The latter together with the *keeping of the promise* will determine customer's *satisfaction from the overall interaction* with the online vendor. Finally, satisfaction from the encounter will prompt a reevaluation of the pre-interactional trusting beliefs which will replace the initial trust bases. Each repetition of the customer's contact with this environment acting in a trusting behavior will further enhance his trusting beliefs resulting in the continuation of the trusting relationship with the business via the repeated use of the servicescape.

Any interaction with a promise being made, enabled and kept, at any point of its fulfillment presents an opportunity for the organization to build trust by influencing the customer's trusting beliefs. Each stage of promise fulfillment reflects a particular attribute of the vendor which is assessed in comparison to the initial perceptions. This evaluation resulting in the establishment of trusting beliefs is performed through six trust-building processes. When a promise is made, the intentionality process is initiated to help the customer determine the business motives and intentions, influencing his trusting belief in the business benevolence. Enabling the promise invokes the capability process, an assessment of the business ability to realize its promise, which affects the customer's trusting belief in the business competence. Keeping the promise triggers the credibility process by which the customer evaluates the extent to which the business has actually delivered on its promise and develops the trusting belief in the business integrity. The entire interaction with the servicescape results in the activation of the rest of the trust building processes. Relying on the prediction process the customer makes inferences about the business consistency in delivering the promises it makes, enhancing his trusting beliefs in the business predictability. Finally, with the calculative process the customer assesses the costs and benefits of the business possibly acting in an untrustworthy behavior to increase his confidence in the trusting beliefs.

### 11.1.1. Empirical Results

An exploratory empirical study has been carried out to test of the model and the depicted relationships. A mea-

surement instrument was developed following the theory underpinning the model (Papadopoulou *et al.*, 2002). Measures were selected to capture the conceptual meaning of the constructs. Multiple items scales were used for each construct, based on Churchill's (1979) paradigm. Items were borrowed from existing validated measures, as suggested by Straub (1989) or adapted with slight modifications where necessary. New items were also used, generated on the basis of previous measures for trust, a review of the relevant literature and interviews. A pretest was conducted to refine the initial item pool and derive the final instrument which was used for the study.

Data were collected by administering an online questionnaire to a sample of 132 mature university students yielding an effective response rate of approximately 86%. The data were submitted to factor analysis and item correlation examination. The scales were refined by dropping several items in order to improve their measurement properties. Items showing high factor loadings and low cross loadings (loadings on multiple factors) were retained to establish discriminant and convergent validity. Items were also dropped to achieve high reliability values of the scales. As a result, 14 factors emerged with eigenvalues greater than 1.0 showing discriminant and convergent validity and explaining 77,1% of the total variance. The reliability of the constructs was assessed by calculating Cronbach's alpha coefficient for each construct, with values above the recommended .70 threshold (Nunnally, 1967). The measurement instrument in the form used for data collection can be found in the Appendix.

In order to test the hypothesized relationships multiple regression analysis was used. The results, presented in Figure 2, provide empirical support for the relationships depicted in the model. Considering the scope of this paper, it should be mentioned that we only focus on the constructs and the relationships involved in the three stages of promise fulfillment, i.e. the part of the model that describes trust formation during customer experience within the servicescape. In the next section we will show how this part of the model was utilized for guiding the design of a trust-building prototype environment, thus giving an example of its practical applicability.

### III. DESIGNING E-COMMERCE ENVIRONMENTS ON TRUST BUILDING PRINCIPLES

The empirical results show that customer interaction with an online ven-

dor can build trust in the vendor in three distinct yet related stages reflecting a promise being made, enabled and kept. The findings indicate that each stage of promise fulfillment has a separate impact on trust, by influencing, directly or indirectly, one of the trusting beliefs and intention about the vendor. This means that based on the interaction characteristics and satisfaction yielding from it at each stage of promise fulfillment, the customer makes inferences about a vendor's attributes reflected by that stage, i.e. benevolence, competence, integrity and predictability (see Figure 2). In addition our results indicate that interaction with the vendor when a promise is made contributes to trusting intention<sup>4</sup>. Thus, our empirical work highlights the importance of promise fulfillment for conveying a vendor's attributes and for generating satisfaction from the interaction which ultimately result in the formation of trusting beliefs and intention.

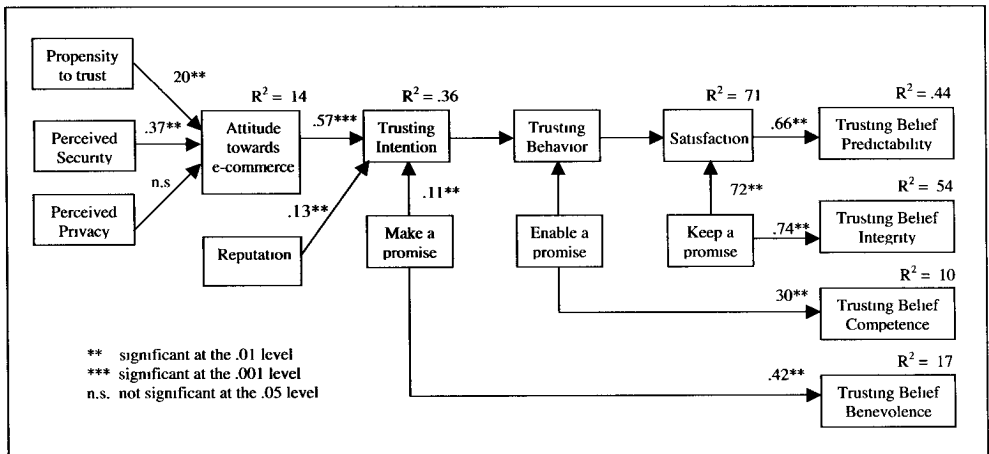


Figure 2: Empirical Results.

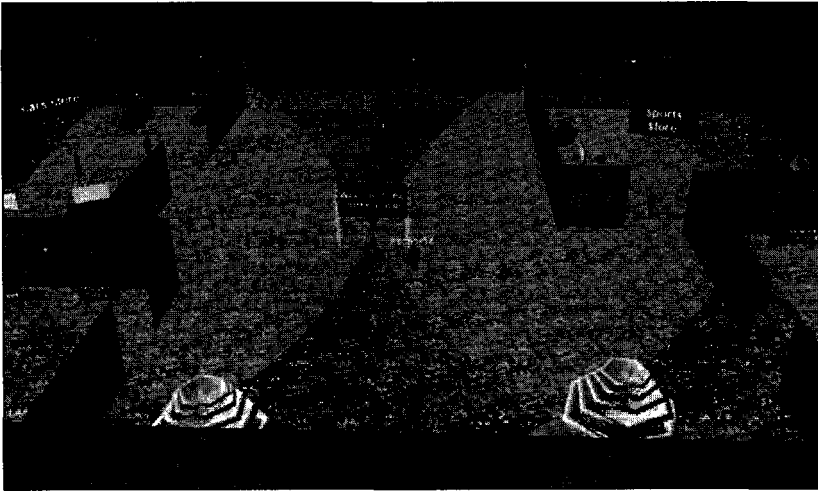
4 Trusting intention is also predicted by prior-to-interaction factors, which are out of the scope of this study

At a functional level, in an electronic environment, promise fulfillment is achieved through the set of services available by an online store. Making a promise is conducted through recommendations and search facilities. A promise is enabled through order placement and payment facilities. Keeping a promise involves the prompt and correct, physical or electronic delivery of the order, including order-tracking mechanisms. As already mentioned, the stages of promise fulfillment reflect vendor attributes which are assessed to form the respective trusting beliefs and intention. Thus, these facilities, underlying the stages of promise fulfillment, are the tools for exhibiting a vendor's attributes and delivering a satisfying interaction so as to build customer trust.

Thus, we identify two facets of promise fulfillment in an electronic setting. The first facet is related to the type of services provided to the customer for his convenience in conducting transactions with a vendor. The second is related to how these services are provided to clearly show evidence of a vendor's benevolence, competence, integrity and predictability to the customer so as to make respective attributions of the vendor. Whilst the functionality of an online store enables the conduct of transactions, it is the way that this functionality is provided which enables the assessment of the vendor's trustworthiness. In this vein, the interface has a dual role, as a medium for transactions and as a medium for communication with the vendor. For a start, it provides *what* is needed at a functional level for the fulfillment of promises in terms of commercial ac-

**tivities translated into search, order placement, payment and order tracking. At the same time, the interface is the only medium of contact with the vendor. In the absence of personal, face-to-face buyer-seller interaction, it provides the medium for judging the vendor's trustworthiness, through the way the facilities underlying promise fulfillment are given. The provision of its functionality, i.e. *how* it is offered, shows the vendor's benevolence, competence, integrity and predictability and enables the customer to assess these attributes for building trust.**

Therefore, we argue that the interface of an online store should be the gateway for delivering the functionality needed for promise fulfillment with the expressiveness needed to surpass the lack of interpersonal contact and allow for the evaluation of the vendor's trust-related attributes. For example, recommendations and search mechanisms associated with making a promise is the means for showing benevolence. Satisfaction from the interaction with these mechanisms influences a customer's trusting belief in the vendor's benevolence. Facilities for order placement and payment related to enabling a promise is the vehicle for showing competence. Satisfaction from the interaction with these facilities influences a customer's trusting belief in the vendor's competence. Order tracking services, beyond the delivery of an order which can be out of an electronic context, are the channel for showing integrity. Satisfaction from the interaction with these services influences a customer's trusting belief in the vendor's integrity. As a whole, these services offer a way for showing



**Figure 3: The virtual servicescape.**

predictability, with satisfaction from the overall interaction affecting a customer trusting belief in the vendor's predictability.

In the remainder of this section we describe a prototype interface, which has been designed to convey the list of attributes necessary for the building of trust utilizing agent and virtual reality technologies. It should be remembered that this prototype must not be approached as a simulation of a physical commercial setting. Rather than trying to make an exact replica of a bricks-and-mortar shopping environment both in visual and functional terms, our aim is to use the prototype in order to illustrate how principles derived by the model can be practically applied to guide the design of online stores that can engender trust.

The e-servicescape has been designed and implemented as a three-dimensional virtual world depicting a shopping mall comprised of virtual stores. Each store represents an e-commerce company, offering products

available by it. This virtual environment is populated by anthropomorphized avatars representing customers and salespersons (Figure 3). A customer is able to visit the virtual servicescape in the form of an avatar and engage in shopping activities by interacting with a salesperson avatar, which is implemented as an agent. Each customer entering the virtual mall is assigned a salesperson agent, which is his personal shopping assistant throughout the duration of the visit. The customer is constantly in contact with the salesperson while he can freely navigate in the stores and virtually look and examine the 3D products in the presence of other shoppers.

Salesperson agents have a multiple role in the e-servicescape, which is reflected in three levels of action. In the first level a salesperson agent welcomes and greets the customer visiting the virtual mall and guides him to the stores. The agent is able to perform a search and recommend the products that are best suited to the customer needs. In the second level, the agent

acts as a surrogate of a company's store salesperson, serving the customer that visits a store and offering assistance in ordering products available by the business represented by the virtual store. In the third level, the agent helps the customer track the status of placed orders.

In this approach, the design of the servicescape as a shopping mall of multiple stores where customers, businesses and salesperson agents are visualized, allows for customer interaction within the servicescape at three distinct levels depicting the functions of making, enabling and keeping promises. At the first level a salesperson agent makes a promise, at the second level the agent enables the promise in a virtual store, while at the third level the agent contributes by communicating information related to keeping the promise.

### **III.1. Trust formation by making a promise (Level 1)**

At the first level, agents are responsible for making promises to the customer on behalf of the companies that are members of the virtual servicescape. In line with our model, their aim is to achieve customer's satisfaction from the promise being made, as this will augment the customer's trusting intention towards a business (*P6*), and will determine customer's trusting belief in the business benevolence through the intentionality process (*P11a*). In this direction, the agents provide for personalized and friendly customer com-

munication in order to maximize the 'perceived satisfaction from the promise being made' construct of the model resulting in customer's trusting intention and benevolence trusting belief.

When a customer visits the virtual mall, a salesperson agent appears which welcomes the customers and kindly offers to help him. The customer can personally interact with his salesperson agent and converse with him using a predefined set of natural-type of language phrases. Even upon initiation, customer interaction is targeted towards satisfying the customer, showing goodwill and friendliness. The salesperson collects information from the servicescape companies and proactively presents selected advertising messages to the customer regarding business offerings, based on the customer profile. The agent recommends products to the customer based on characteristics derived from his previous purchases. The agent can also make suggestions based on previous visits and searches, but only after customer's consent, to further demonstrate business benevolent intentions. The customer can personally interact with his salesperson agent and converse with him using a predefined set of natural-type of language phrases. The customer is able to request information about the advertised offers and be directed by the agent to the virtual store of the business making a particular offer. In addition, the customer is able to declare his interest in a product to the agent, regardless of those advertised. The customer is able to make a re-

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5. See Figure 1 for the relationships represented by 'Ps' in the rest of this section.

quest about a product and has the option to show his product-specific preferences to a number of criteria in a dialogue with the agent, seeking to increase his satisfaction. Then the agent performs a search based on the customer's request and according to the specified preferences and characteristics, presents the results of the search, and in doing so simultaneously makes and communicates the promise to the customer. The search functionality of the agents is designed so as to deliver an objective and unbiased presentation of the findings in order to render them and the businesses represented in the servicescape trustworthy, enhancing thus the customer's satisfaction from the promise being made.

The customer can visit a specific store from which a product is available by either granting permission to the agent to transfer him to the store or by clicking on the selected product or even by moving to the store himself. In this way, the agents attempt to strengthen the customer's trusting intention while showing the business benevolence that will be assessed

through the intentionality process to determine the respective customer trusting belief.

### III.2. Trust formation by enabling a promise (Level 2)

At this point, interaction proceeds to the second level, where agents are responsible for enabling promises to the customer, on behalf of a specific business that is virtually represented in the e-servicescape by a store of the shopping mall (Figure 4). Based on our model, the goal at this stage is to induce a customer's trusting behavior by capitalizing on his trusting intention and reaching customer's satisfaction from the promise being enabled. As suggested by the model, both these constructs will positively affect a customer's trusting behavior (*P7* and *P8* respectively). In addition, the perceived satisfaction from the promise being enabled will determine customer's trusting belief in the business competence through the capability process (*P11b*). Hence, at this level the focus shifts on maximizing the custo-

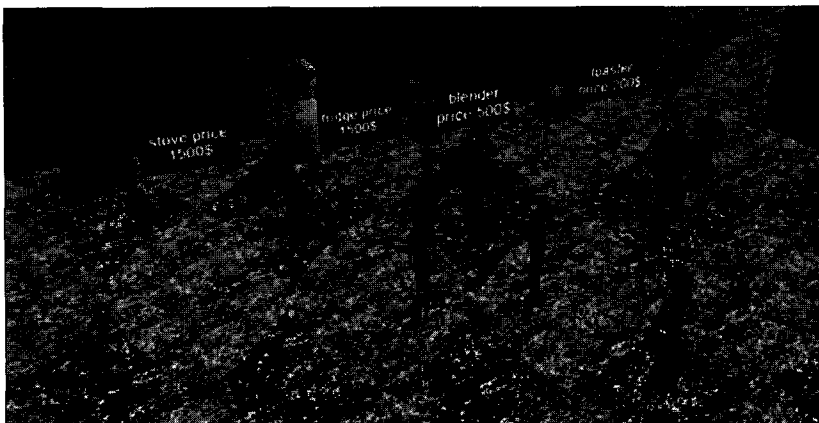


Figure 4: Customers and salesperson agents in a virtual store.

mer's perceived satisfaction from the promise being enabled so as to allow the trusting intention to manifest in a trusting behavior and develop the competence trusting belief.

When a customer arrives to a business virtual store directed by the agent, the agent assumes responsibility as the business salesperson. The agent welcomes the customer to the store and takes him to the location of the requested product. All products are visually represented within the virtual environment as three-dimensional objects, allowing a customer to preview and experience them before purchase. To ensure satisfaction from the enabling of the promise, a customer is able to view a product from all possible angles and fully interact with it. Furthermore, the customer is able to see detailed information about a product by clicking on the sign that is next to it, and judge whether or not to depend on the promise. A customer can place an order by asking the agent to add a selected product in his shopping cart. To promote the enactment of a trusting behavior, the customer is allowed to delete a product in case he decides not to buy it, while an order is not actually submitted unless the customer specifically asks the agent to do so. In addition, the customer can also ask the agent to show him the content of his shopping cart before purchase. Throughout the duration of the encounter, a customer is free to move in the store and see other products, or visit other stores. The agent follows the customer closely wherever he goes into the servicescape being always at the customer's disposal. Aiming to provide a satisfying enabling of the pro-

mise, the agent is exclusively dedicated to the customer and persistently ready to help him, showing the business ability to meet customer expectations and impelling the customer to behaviorally express his trusting intention. Enabling the promise in this manner positively influences the customer's trusting belief in the business competence and incites the customer to act in a trusting behavior.

### **III.3. Trust formation by keeping a promise (Level 3)**

Having enabled a promise and achieved the manifestation of a trusting behavior, the servicescape also provides for satisfying the customer with the fulfillment of the promise. In accordance with the model, following a trusting behavior and in conjunction with his degree of satisfaction from the promise being kept, the customer forms his perception of satisfaction from the overall interaction (*P9* and *P10*). In addition, satisfaction from the promise being kept will be assessed through the credibility process to determine customer's trusting belief in the business integrity (*P11 c*). As described earlier, keeping a promise is mainly associated with the underlying infrastructure of the servicescape guaranteeing the correct and timely delivery of products. This involves physical aspects of the delivery process, and in the third level, the servicescape partially covers the function of keeping a promise by offering an order tracking facility.

Upon submission of an order, the customer can ask the agent to inform him about the status of the order (Fi-

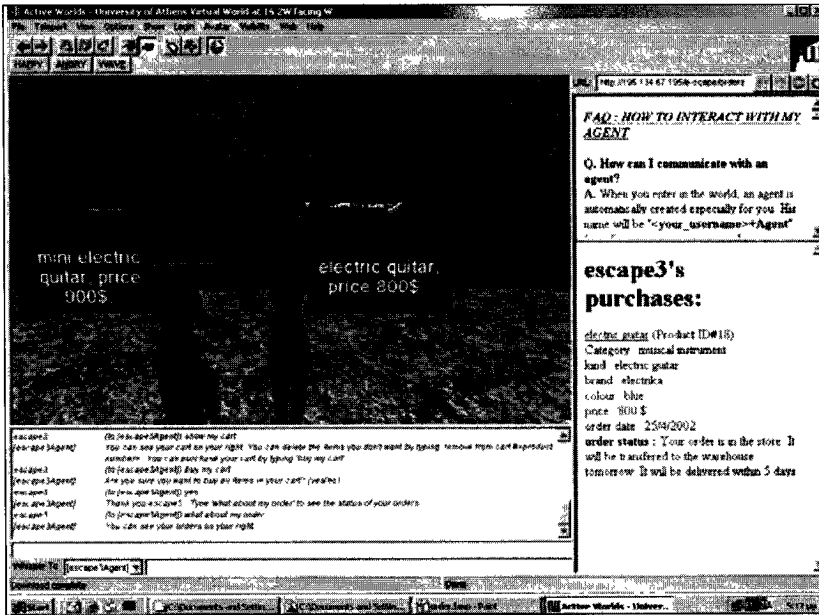


Figure 5: A salesperson agent informs a customer about the status of her order.

figure 5). The customer can see the products he has ordered, the date the order was submitted, the date it will be delivered and the current status of the order. In this way, the customer is able to check if the promise is being kept as expected, evaluating the business credibility. In addition the customer is able to track his orders without having to enter the virtual environment. Using a desktop application, the customer can view information regarding his order status and he is allowed to cancel an order or modify an order by removing products from it, as long as the order has not been shipped yet. By keeping the customer constantly up-to-date about the progress of his order delivery and by granting him control of his order, the servicescape aims to maximize customer's satisfaction from the fulfillment of the promise and build his credibility trusting belief. In addition, the satisfaction from the over-

all interaction that is intended to result from this interaction stage will shape a customer's trusting belief in predictability through the prediction process (*P11d*) and a customer's confidence in the formed trusting beliefs, through the calculative process.

#### IV. CONCLUSIONS AND FURTHER RESEARCH

In e-commerce trust is increasingly been recognized as the bedrock for customer retention. Due to its complex and multifaceted nature, understanding how trust is formed and maintained is an issue that dominates research agendas which seek to inform effectively the practice of e-commerce.

In this paper we have attempted to provide a much needed focus towards this direction by a) proposing a model

for relationship-oriented trust formation in virtual environments, and b) by presenting a prototype environment, the design of which emanated directly from the model. The first contribution, i.e. the model, systematizes knowledge in such a way that enhances our understanding with respect to not only how trust can be formed in electronic commerce but also how it can be maintained. Previous models do not propose in a consistent manner specific methods or processes for trust formation nor do they examine trust in the broader context of building long-term relationships, where in fact, its essence lies. As far as practical relevance is concerned (Benbasat and Zmud, 1999), we demonstrated how the model was used to inform the design of a prototype environment explaining how trust can be possibly infused into a commercial transaction by the use of agent and virtual reality technologies.

This study contributes to the existing body of literature in a number of ways. First of all, it extends the focal concept of trust from a unidimensional construct as it has been treated in existing trust models, by making a conceptual distinction between its facets. Instead of trying to understand trust by identifying its antecedents and consequences, we examine the formation of trust as a gradual process linking its constituent elements. As a result, trust is not approached from a short-term transactional perspective, as an enabling factor for a customer to make a purchase, but it is placed in the center of building a long-term relational exchange between the customer and the Internet vendor. Furthermore, we have explicitly addressed the role of the Internet vendor's beha-

avior in the development and evolution of trust, an issue which has not been previously dealt with to the extent it deserves. Our model introduces aspects from the Internet vendor's side, in the form of making, enabling and keeping customer promises, and assesses the customer reaction to them and their impact to the building of trust. As such, this study also explores the interaction that takes place within online environments and the effects on the formation of trust in this context.

As shown by the empirical results of the exploratory study, promise fulfillment develops trust during the period of customer interaction with an online store, with the satisfaction perceived from each stage resulting in trusting beliefs and intention. The stages of promise fulfillment reflect vendor attributes which are assessed to form the respective trusting beliefs. The satisfaction from each stage determines the trusting belief about a vendor's attribute which is reflected by that stage. We further analyzed promise fulfillment stages to the underlying functionality required for them and the way this functionality is provided so as to engender trust. We stressed that the functionality of an online store, beyond covering transaction needs of promise fulfillment as it stands today, should convey vendor's benevolence, competence, integrity and predictability. Driven by these findings, we presented a trust-oriented prototype as an agent mediated virtual servicescape, showing a practical example of how the functionality currently found in conventional web stores can be provided for building trust through the fulfillment of promises.

As with any empirical research, this study has a number of limitations. First

of all, the sample used for the collection of the empirical data consisted of students who had strong computing background and were experienced Internet users. These sample characteristics may not apply to a more diverse population raising certain questions regarding the external validity and generalizability of the presented results. However the use of students for data collection is a practice widely followed in empirical research. Moreover, the empirical study did not capture how trust evolves over time, through repeated consumer-vendor interactions. This evolutionary nature of trust development should be more rigorously examined in a longitudinal study. In addition, further research should focus on the empirical testing of the trust building processes proposed by the model to be invoked during customer interaction with the online vendor. It should be noted that due to the exploratory nature of the study, it was not possible for the participants to engage in actual shopping activities. This was a barrier for the measurement of trusting behavior and thus the hypotheses which involve this construct were not tested. However, these will be addressed qualitatively via participant observation within the virtual servicescape, as part of our further research endeavours.

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## APPENDIX: MEASUREMENT INSTRUMENT

Items were measured on a 5-point Likert scale from 'strongly agree' to 'strongly disagree' (unless stated otherwise). Items marked with asterisks (\*) denote items that were dropped and not included in the analysis of the data. Items marked with an 'R' denote reverse scored items.

### PROPENSITY TO TRUST

<b>Item</b>	<b>Source</b>
I generally trust other people	<i>Gefen, 2000</i>
I tend to count upon other people*	<i>Gefen, 2000</i>
I feel that people are generally reliable	<i>Gefen, 2000</i>
I generally trust other people unless they give me a reason not to	<i>Gefen, 2000</i>
Most people can be counted on to do what they say they will do	<i>Mayer &amp; Davis, 1999</i>
These days you must be alert or someone is likely to take advantage of you*	<i>Mayer &amp; Davis, 1999</i>

### PERCEIVED SECURITY

<b>Item</b>	<b>Source</b>
I feel safe completing commercial transactions over the Internet*	<i>Adapted from Jarvenpaa, 2000</i>
The existing legal and regulatory framework is adequate for guaranteeing security of online commercial transactions	<i>Adapted from Cheung &amp; Lee, 2000</i>
The available technology guarantees secure payments over the Internet	<i>New item</i>
Most internet vendors provide secure electronic payment mechanisms	<i>Adapted from Cheung &amp; Lee, 2000</i>
Most internet vendors ensure that the information consumers provide during a transaction will not be in any way accessed by other parties while it is transmitted to a store*	<i>Adapted from Cheung &amp; Lee, 2000</i>
Most Internet vendors collect information during transactions without consumers' knowledge [R]*	<i>New item</i>

### PERCEIVED PRIVACY

<b>Item</b>	<b>Source</b>
I feel safe providing personal information to a commercial web site*	<i>New item</i>
The existing legal and regulatory framework protects consumers' privacy online sufficiently*	<i>Adapted from Cheung &amp; Lee, 2000</i>
Most Internet vendors protect consumers' privacy	<i>Adapted from Cheung &amp; Lee, 2000</i>
Most Internet vendors will not sell consumers' personal information collected during an online commercial transaction to third parties without consumers' consent	<i>Adapted from Cheung &amp; Lee, 2000</i>
Most internet vendors will not allow unauthorized personnel to access consumers' private data	<i>New item</i>
Most Internet vendors use the information they collect for purposes that fall outside from the scope of the transaction execution, without consumers' knowledge [R]*	<i>New item</i>

**ATTITUDE TOWARDS E-COMMERCE**

**Item**

I am positive towards buying products on the Internet  
 The thought of buying a product at the website of a vendor is appealing to me  
 I like the idea of using the Internet to shop from a store

**Source**

*New item*  
*New item*  
  
*Adapted from Jarvenpaa, 2000*  
*Adapted from Jarvenpaa, 2000*  
*New item*  
*New item*

Using the Internet to shop from a store is not a good idea [R]\*  
  
 I like shopping from the Internet  
 Online shopping is more pleasant than physical\*

**REPUTATION**

**Item**

This Internet vendor has a good reputation  
  
 This Internet vendor has a reputation for being honest  
  
 This Internet vendor has a reputation for being concerned about the customers  
  
 This Internet vendor has a reputation for being able to meet its obligations towards the customers  
 This Internet vendor has a reputation for being consistent  
 This Internet vendor has a reputation for fulfilling its promises  
 This Internet vendor has a reputation for guaranteeing security of transactions\*  
 This Internet vendor has a reputation for guaranteeing consumers' privacy\*

**Source**

*Adapted from Ganesan, 1994*  
*Adapted from Ganesan, 1994*  
*Adapted from Anderson & Weitz, 1992*  
*New item*  
  
*New item*  
*New item*  
*New item*  
  
*New item*

**TRUSTING INTENTION**

**Item**

I would use my credit card to purchase products from this Internet vendor  
 I would not hesitate to provide information about my habits to this Internet vendor\*  
 I would be willing to give this Internet vendor information which is critical to me\*  
 I would be willing to rely on this Internet vendor to find information about a product\*  
 How likely is it that you would consider to purchase a product from this Internet vendor in the short term? (very likely / very unlikely)  
 How likely is it that you would consider to purchase a product from this Internet vendor in the long run? (very likely / very unlikely)

**Source**

*Adapted from Gefen, 2000*  
*Adapted from Gefen, 2000*  
*Adapted from Mayer & Davis, 1999*  
*New item*  
  
*Adapted from Jarvenpaa, 2000*  
  
*Adapted from Jarvenpaa, 2000*

**MAKING A PROMISE**

**Item**

This Internet vendor makes realistic promises\*  
 The offerings this Internet vendor makes fit my personal

**Source**

*New item*  
*New item*

needs and interests\*

This Internet vendor is willing to help me\*

*New item*

I feel that this Internet vendor interacts with me in a personal manner\*

*New item*

The information this Internet vendor provides me about a product is sufficient

*New item*

The information this Internet vendor provides me about a product is objective

*New item*

This Internet vendor provides sufficient information about the security of conducting commercial transactions with it

*New item*

This Internet vendor provides sufficient information about the protection of my privacy

*New item*

### **ENABLING A PROMISE**

#### **Item**

#### **Source**

This Internet vendor provides facilities that are useful in my shopping task\*

*New item*

This Internet vendor provides search facilities that are easy to use

*New item*

This Internet vendor provides order submission facilities that are easy to use

*New item*

This Internet vendor provides payment facilities that are easy to use

*New item*

This Internet vendor responds to my requests for information about a product very quickly\*

*New item*

This Internet vendor responds to my requests for information about a product very effectively\*

*New item*

This Internet vendor provides adequately for the security of online transactions\*

*New item*

This Internet vendor provides adequately for my privacy\*

*New item*

### **KEEPING A PROMISE**

#### **Item**

#### **Source**

This Internet vendor does things exactly as promised to me

*New item*

### **SATISFACTION FROM OVERALL INTERACTION**

#### **Item**

#### **Source**

This Internet vendor's behavior meets my expectations

*New item*

This Internet vendor is very consumer-oriented in its interactions with me

*Adapted from*

*Moorman et al., 1992*

Overall, how would you characterize the quality of the interaction with this Internet vendor? (very good / very bad)

*New item*

Overall, how would you feel about this Internet vendor? (very pleased / very displeased)

*New item*

Overall, how would you characterize your experience with this Internet vendor? (much better than expected / much worse than expected)

*Adapted from*

*Anderson & Narus, 1990*

Overall, to what degree are you satisfied with this Internet vendor? (very satisfied / very dissatisfied)

*New item*

**BENEVOLENCE**

**Item**

My needs and desires are very important to this Internet vendor\*  
 This Internet vendor would not knowingly do anything against my interest  
 This Internet vendor would not take advantage of me

This Internet vendor is concerned about the security of my transactions with it  
 This Internet vendor is concerned about my privacy

**Source**

*Adapted from Mayer & Davis, 1999*  
*Adapted from Mayer & Davis, 1999*  
*Adapted from Butler, 1991*  
*New item*  
*New item*

**COMPETENCE**

**Item**

This Internet vendor is capable of meeting its obligations  
 This Internet vendor is capable of fulfilling its promises (e.g. regarding the delivery of orders within the time promised)  
 This Internet vendor can guarantee security of transactions\*  
 This Internet vendor is able to protect my privacy\*

**Source**

*New item*  
*New item*  
*New item*  
*New item*

**INTEGRITY**

**Item**

This Internet vendor keeps promises it makes  
 This Internet vendor is not always honest with me [R]  
 This Internet vendor does not make false claims  
 This Internet vendor behaves exactly as expected according to its promises  
 This Internet vendor provides secure electronic transactions\*  
 This Internet vendor protects my privacy\*

**Source**

*Adapted from Doney & Cannon, 1997*  
*Adapted from Doney & Cannon, 1997*  
*Adapted from Ganesan, 1994*  
*New item*  
*New item*  
*New item*

**PREDICTABILITY**

**Item**

I never have to worry whether this Internet vendor sticks to its word  
 This Internet vendor behaves in a consistent manner  
 This Internet vendor does the same thing every time the situation is the same  
 I seldom know what this Internet vendor will do in a given situation [R]\*

**Source**

*Adapted from Mayer & Davis, 1999*  
*Adapted from Butler, 1991*  
*Adapted from Butler, 1991*  
*Adapted from Butler, 1991*