Trust and relationship building in electronic commerce

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Keywords

Trust, Relationship marketing, Virtual reality, Agents

Abstract

In e-commerce, trust becomes an essential prerequisite for customer relationship building. Drawn from established theoretical work on trust and relationship marketing, a model is proposed aiming to help in highlighting the differences between traditional and e-commerce and to facilitate thinking as to how trust can be built in virtual environments. Conceptualized in the context of an electronic servicescape, the model helps to demonstrate how agent and virtual reality technologies can facilitate the expressiveness required for the formation of trust through iterative interaction with promises being made, enabled and fulfilled.

Internet Research: Electronic Networking Applications and Policy
Volume 11 · Number 4 · 2001 · pp. 322–332

Introduction

Internet commercialization has created an intense competitive environment forcing organizations to extend traditional marketing practices and focus on developing long-term relationships with customers to ensure their retention and loyalty. Customer relationships have come to constitute an important new asset category, as the accumulation of relationship capital increasingly provides a new foundation for marketing and sales revenue (Tapscott *et al.*, 2000). The cornerstone for a successful and lasting relationship with the customer is trust, as it largely determines the customer's future behavior and loyalty towards the business (Berry and Parasuraman, 1991; Berry, 1993). With loyalty becoming fast an economic and competitive necessity in e-commerce (Reichheld and Schefter, 2000), trust, its predecessor, is arguably the *sine qua non* of the digital economy (Tapscott *et al.*, 2000).

For "bricks-and-mortar" companies, customer relationship building largely means a concentrated marketing effort in establishing a brand name via controlled messages mediated to customer segments at an often prohibitive cost. The emphasis is placed on creating a trustworthy image of a company that delivers quality of products and services and offers convenience to customers at a competitive price. Customer trust depends on effective brand-oriented strategies based on broadcast promotion and advertising techniques and parameters such as the firm's size and reputation, the salesforce, and the physical location and appearance of a store. A notable characteristic of all these means for developing trust is their impersonal and unidirectional nature, which does not allow for a customer response to the message conveyed – the only exception being the customer's contact with the company's salesperson, enabling an interpersonal, direct communication.

Although to a large extent traditional principles for building trusting relationships may be still valid in e-commerce, their effectiveness must be re-assessed. The absence of salespersons and the interpersonal face-to-face contact with the customer cannot be easily replaced in an electronic environment. In addition, customer expectations are higher in

Internet Research: Electronic Networking Applications and Policy
Volume 11 · Number 4 · 2001 · 322–332

such an environment, as they include expectations not only of the service encounter but also of the underlying technology, and thus become more difficult to manage. Therefore, in this emerging setting with which the majority of the customers are unfamiliar and reluctant, building customer trust becomes a top priority.

Recognizing the above as an issue that deserves our immediate attention, we have developed a model for trust formation and relationship building in e-commerce. Models are needed in order to leverage acquired knowledge in such a way that it can be transferred easily to practice. Focusing on the capabilities of agent and virtual reality technologies, our model seeks to achieve this and can be used to inform the design of electronic environments that can support the creation of lasting commercial relationships. It is demonstrated that the agent paradigm (Guttman *et al.*, 1998a; Maes *et al.*, 1999; Ma, 1999) is ideally suited for developing such a virtual environment where agents can facilitate customer navigation and action, contributing to the creation of an illusory sense of a realistic commercial context. The personalized, autonomous, adaptive and proactive nature of agents provides for the high level of interactivity and expressiveness needed for an effective and fulfilling customer experience leading to a trusting relationship with the business.

Despite the continuing research advances regarding virtual environments and agents, very few studies address their application in e-commerce. Based on a set of principles and criteria stemming from the model, this paper discusses virtual reality and agent technologies in terms of their appropriateness and for facilitating trust building between the business and the customer. The structure of the paper is organized as follows. The next section offers a brief introduction to trust and identifies the main works that served as the theoretical foundation for the development of our model, whilst the model itself is described in the section that follows. The paper concludes with a description of an agent-mediated virtual environment for e-commerce, emphasizing the role of agents and illustrating the potential applicability of the model.

Trust in the literature

Trust is a highly complex and multi-dimensional phenomenon (Lewis and Weigert, 1985; Butler, 1991; Barber, 1983). Its importance to interpersonal and commercial relationships is evidenced by the plethora of research efforts within the various disciplines such as social psychology (Deutsch, 1960; Lindskold, 1978; Lewicki and Bunker, 1995), sociology (Lewis and Weigert, 1985; Strub and Priest, 1976), economics (Dasgupta, 1988; Williamson, 1991) and marketing (Anderson and Weitz, 1989; Dwyer *et al.*, 1987; Ganesan, 1994; Moorman *et al.*, 1992; 1993). A large stream of literature has emphasized the role of trust as being central to the success of customer relationship building, in all contexts of relational exchanges (Achrol, 1991; Becker, 1960; Dwyer *et al.*, 1987; Morgan and Hunt, 1994).

There is currently an emerging body of literature related to trust in e-commerce. This has been based to a greater or lesser extent to findings and principles derived from traditional research on trust. However, due to the newness and complexity of this issue, the extant studies in this field address trust from different viewpoints and to different levels of analysis, contributing only partially and in a fragmented way to our knowledge. With trust research in e-commerce being still in its infancy, this poses a difficulty in gaining a clear understanding of its scale and scope. A recent literature survey (Papadopoulou *et al.*, 2001) indicates that whilst there is evidence of a general congruence regarding the importance of trust for e-commerce success, most of the current literature revolves around the role of trust for the adoption of e-commerce and does not offer an insight as to how trust may actually be developed and maintained. The majority of studies emphasize the short-term and transactional side of e-commerce, failing to examine the formation of trust as a process and as a means for long-term relationship building.

With the objective to understand how trust is formed in commercial relational exchanges that take place within electronic environments, our review of the literature identified a number of works that provided the necessary theoretical background to aid our endeavors towards filling this gap. McKnight and Chervany (1996)

provided a typology of interrelated types of trust constructs that helps to distinguish and capture the conceptual meanings of trust. In order to understand the nature of trust and its development in commercial relationships, Doney and Cannon's (1997) work identified five trust-building processes, whilst Morgan and Hunt (1994) contributed a set of trust determinant variables. Building on Doney and Cannon's work, we have defined another trust building process, the credibility process (Papadopoulou *et al.*, 2000a), associated with the assessment of business integrity, differentiating it from the capability process (Table I).

The three facets of trust, representing its constituents, its determinants and its 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. This model is presented in the next section.

A model for trust formation in e-commerce

In e-commerce, the physical-to-virtual transfer of commercial activity forces us to rethink the ways traditional rules for building trust and loyalty can be applied. Bitner (1995) has identified the functions of making, enabling and keeping promises for describing a service encounter and the associated relationship building between a business and the customer in conventional commerce, and has introduced the notion of the servicescape (Bitner, 1992) to describe the physical environment in which the encounter takes place. In a similar vein, Wanninger *et al.* (1997) extended those ideas by conceptualizing their applicability within an "electronic" servicescape. Based on the above works and realizing that emerging technologies can provide the ground for innovation as far as making, enabling and keeping promises are concerned (see Table II), we suggest that Web sites should be transformed to customer-centric e-servicescapes offering a digital experience that can contribute towards the development of an indelible relationship between the business and the customer (Papadopoulou *et al.*, 2000b).

Therefore the model that is presented in this section should be conceptualized in relation to such an e-servicescape aiming to serve as a guide for examining the applicability and effectiveness of a series of well-proven rules and principles, whilst helping us in the process to delve away from the purely transactional-based flavor that the majority of Web sites project today.

A customer seeking to engage in a commercial relationship with a business has initially a positive predisposition which is the result of the combination of three constructs:
(1) disposition to trust;
(2) institution-based trust; and
(3) initial trusting beliefs.

The customer has a general propensity to trust others stemming from personality and cultural

Table I Trust constructs, precursors and building processes

Trust constructs (McKnight and Chervany, 1996)	Precursors of trust (Morgan and Hunt, 1994)	Trust-building processes (Doney and Cannon, 1997)
Dispositional trust	Shared values	Intentionality
Institution-based trust	Communication	Capability
Trusting beliefs:	Opportunistic behavior	Prediction
Benevolence		Transference
Competence		Calculative
Honesty/Integrity		Credibility (Papadopoulou *et al.*, 2000a)
Predictability		
Confidence in beliefs[a]		
Trusting intention		
Trusting behavior		

Note: [a]"Confidence in beliefs" is not a separate trust construct like the other points in this column, but refers to the confidence related to the trusting beliefs construct

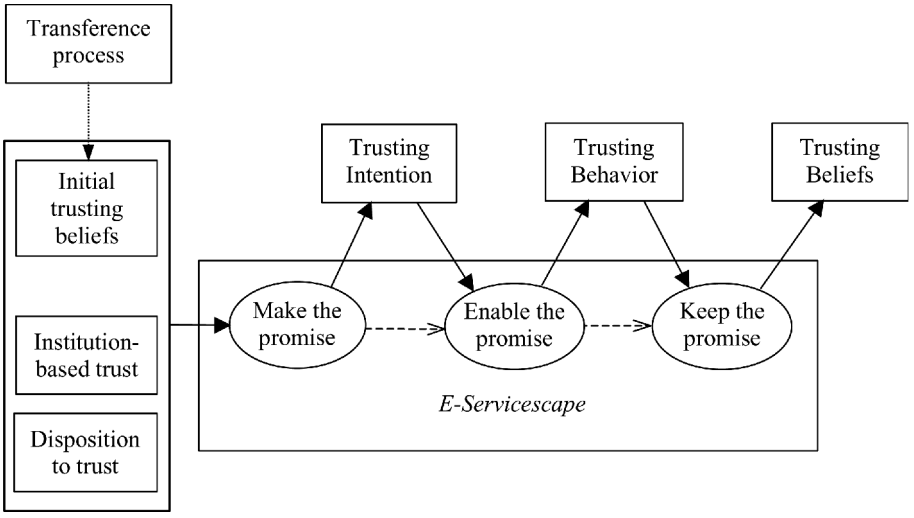
Table II Making, enabling and keeping promises: differences between physical and virtual commerce

Physical commercial environment	E-servicescape
Make a promise	
Broadcast advertising	Interactive advertising with agents
Message and target audience defined before presentation	Message is rendered with real-time segmentation, according to customer, during interaction
Gap between message exposure and customer response	Message exposure and customer response occur simultaneously, in real-time
One-way, one-to-many strategy	Interactive, personalized communication
Enable a promise	
Limited search and recommendations, depending on salesperson,	Full, extensive search and recommendations driven by customer
Subjective presentation	Objective presentation
Touch and feel product	Preview and experience 3D virtual product
Interpersonal communication and physical contact with salesperson	Personalized dialogue with agents
Order is placed separately in time and space from made promise	Order is placed at same time and space with promise made
Keep a promise	
Conventional payment	Online payment
Physical delivery	Online or physical delivery
Post-sales service separated from purchase	Post-sales service (inc. delivery tracking) at time and space of purchase

factors (disposition to trust), enhanced by the perceived propriety of the conditions (institution-based trust). In addition, the customer has initial trusting beliefs that have been formed through the transference process with information conveyed from third parties regarding the business reputation, including information from third party recognition bodies.

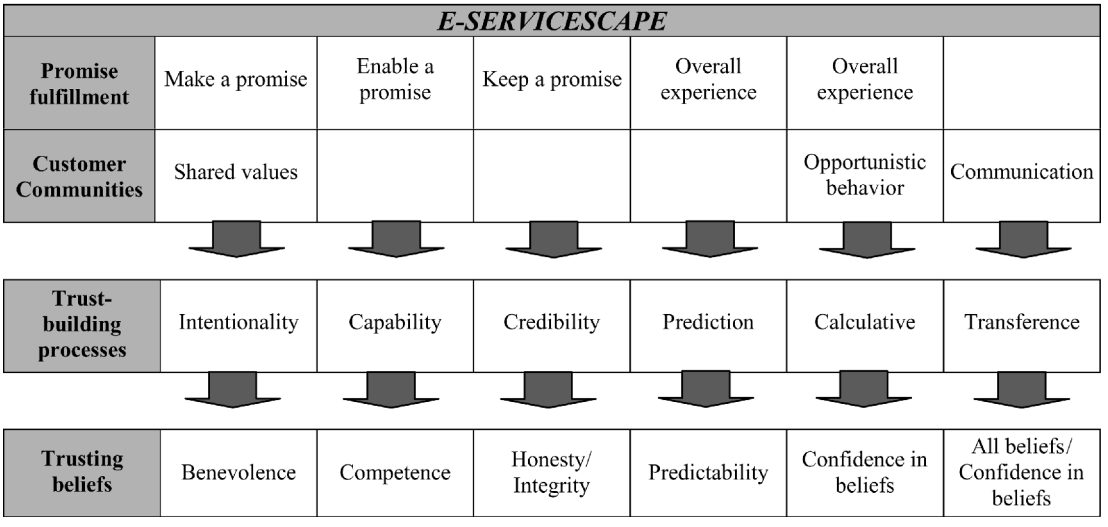
The combination of these three constructs results in the customer having a positive attitude and being open to any promises made by the business aiming to augment his trusting intention towards any service or product offerings. Provided that the customer is interested in the promise made, he expresses a willingness to depend on the business, a trusting intention, and anticipates the promise to be enabled. Enabling the promise within the e-servicescape allows a trusting intention to be manifested in an acceptance of the risk inherent in the situation and eventual dependence on the promise, resulting in a trusting behavior. Then, keeping the promise has a positive impact on the customer's perceptions and future expectations regarding the quality of the interaction with the business through the e-servicescape. This point, when all stages of promise fulfillment have been completed, represents what Carlzon (1987) calls "moment of truth". The customer evaluates the service encounter and compares the service he expected according to the promise that was initially made to him with the service he actually received upon the fulfillment of the promise. Service quality, i.e. the degree to which the perceived service meets customer expectations (Grönroos, 1984; Lewis and Booms, 1983; Parasuraman *et al.*, 1985), will determine customer satisfaction and will be reflected in the customer's trusting beliefs in the business. These trusting beliefs will now substitute for the aforementioned three prerequisites that define a positive predisposition and will serve as the launch pad for future interaction with the business. Any such interaction within this environment will further strengthen the trusting beliefs resulting in a sustained relationship between the business and the customer via the repeated use of the e-servicescape (Figure 1).

Figure 1 Trust formation through promise fulfillment within the e-servicescape



The development of trusting beliefs is accomplished by the activation of the trust-building processes during the different stages of promise fulfillment (Figure 2). When a promise is made within the e-servicescape, the intentionality process is initiated to help the customer determine the business motives and intentions, influencing his or her 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 a trusting belief in the business integrity. The entire interaction with the e-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 or her trusting belief in the business predictability. Finally, with the calculative process, the customer performs a cost/benefit-like analysis of a number of scenarios where the business may act in an untrustworthy manner towards him or her so as to eliminate any such suspicions and increase confidence in his or her beliefs.

Figure 2 Activation of trust-building processes within the e-servicescape



Trust evolves over time as the customer engages in repeated interactions with promises being fulfilled within the e-servicescape. Each time a promise is made, enabled and kept, it is evaluated with the intentionality, the capability and the credibility process confirming the customer's trusting beliefs in the business benevolence, competence and credibility. The level of trust is also related to the experience that the customer gains within the e-servicescape. Customers perceive the length of the relational exchange as an investment, which is made by the business and is valued highly enough to deter it from acting opportunistically. The number of business-customer contacts also provides a basis for a thorough interpretation of the business behavior, which enables the customer to predict subsequent interaction.

In the beginning of this section we highlighted a number of differences between traditional and e-commerce regarding the stages of make, enable and keep promises. We also stressed that the real value of the model rests in the way it helps to facilitate thinking about the potential effectiveness of applying traditional rules and principles in a virtual environment. It forces us to revisit them, identifying in the process novel approaches for the formation of trust that are only made possible via the application of new technologies. One such example is the use of customer communities as they can provide support for the three precursors of trust posited by Morgan and Hunt (1994), i.e. shared values, communication and opportunistic behavior, enabling the transference, intentionality and calculative trust-building processes. Customers, for example, can share their views and experiences of specific products and services and as a result learn from each other and formulate trusting beliefs using the transference process. This also offers the business a means for learning about their customers' opinions, for automating referrals and for acquiring new customers at a low cost. The emotional attachment that a customer may develop for the community he or she belongs to enhances perceptions about the business trustworthiness, as shared values enable inferences of benevolent intentions (Macneil, 1980) activating the intentionality process. In addition, customers see the provision of customer communities by the business and their participation in them as a mutual relationship investment. Driven by the calculative process, they consider a business opportunistic behavior to be unlikely, thus increasing their emotional security about their trusting beliefs.

It follows that a customer-centric e-servicescape should not only be restricted in strictly commercial activities, but should also include customer communities in order to be effective in its attempts to develop long-term customer relationships. Apart from fulfilling promises associated with the service encounter, a business should also understand the social aspect of the commercial transaction and enable contact between the customers, a value enhancement for both the business and the customer, to promote trust and relationship building. In this direction the business should act in the customer's interest, by proactively creating and offering customer communities as part of the e-servicescape so as to satisfy any customer needs for communication, socializing and self-expression that can emerge from a contact with the business.

Trust formation within an agent-mediated virtual servicescape

In its core, trust formation is a cyclic interactive process intertwining promises and trust building processes to develop a customer's trusting beliefs, intention and behavior towards the business. Moving on to an electronic environment and considering the powerful features of agents and virtual reality, we argue that these technologies can offer the contextual expressiveness for enabling trust formation as specified in the model presented in the previous section.

Agents are software entities that act on behalf of the user and offer services in an autonomous, proactive, adaptive and continuous fashion (Green *et al.*, 1997). They are autonomous because they control their own actions, proactive because they are after certain goals, adaptive because they sense changes in the environment and act accordingly and continuous because they execute continuously. Agents may possess additional properties such as the communicative property that enables them to communicate with other agents, the

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mobile property that allows them to travel around a network in order to do their work, the learning property that helps them adapt according to previous experience and the believable property that makes them appear believable to users (Lange, 1998). The services offered by agents include searching, comparing, learning, negotiating and collaborating. Several different types of agents have been identified: collaborative agents, interface agents, mobile agents, information agents, reactive agents, smart agents and hybrid agents (Jonkheer and Jansen, 1999), which are to a greater or lesser extent used in electronic commerce (Do *et al.*, 1996; Ma, 1999).

We posit that the customer experience currently provided by agent technology in e-commerce can be further enhanced with the use of virtual reality that helps humans to visualize, manipulate and interact with computers and extremely complex data (Aukstakalnis and Blatner, 1992). Visualization involves the generation of visual, auditory and other sensual output from the computer to the user of the virtual world. This world may be a complex 3D model, a scientific simulation, or a view into a database (Isdale, 1993). The user can interact with the world and its components, directly manipulate movable objects, navigate inside the provided environment and chat with other inhabitants of the world. These inhabitants can be either computer generated characters or artificial impersonations of human participants and are visualized as avatars. Avatars can also be programmed to perform gestures, express feelings and act as humans (Roehl, 1995). Many virtual reality applications contain worlds that look and behave the way that real life does, while others incorporate features that differentiate them from anything we normally experience. In this way, virtual reality not only empowers the creation of ideal versions of our own world, but it provides for the alleviation of real world problems and the breaking of spatial and temporal bonds that exist in physical life (Horberg, 1995).

We believe that the "right" blend and smart use of these technologies can facilitate the development of a trust-oriented e-commerce servicescape as an agent-mediated virtual environment enabling customer interaction with business promises. As Cassel (2000) claims, since humans display a tendency to interact with computers following social norms of human behavior, interfaces should be implemented with embodied conversational agents to become anthropomorphized with properties of human face-to-face conversation. Our description will revolve around the role of agents and virtual reality in providing an insight as to how environments like these can function, focusing on the part of making and enabling promises. Thus, we suggest that an e-servicescape should be designed as a three-dimensional virtual world depicting a shopping mall comprising of several virtual stores. This virtual environment will be populated by anthropomorphized avatars representing customers and salespersons (Figure 3).

A customer will be able to visit the virtual servicescape in the form of an avatar and engage in shopping activities by interacting with the salesperson avatars, which will be implemented as agents. Whilst salespersons will be implemented as anthropomorphic agents, the agent implementation for customer avatars is not essential, although it could be considered as an option for an advanced type of customer interaction within the e-servicescape in the future. Salesperson agents will be divided into two categories, mall agents and business agents, depending on their role in the e-servicescape. Mall agents will welcome and greet the customer visiting the virtual mall and guide him or her to

Figure 3 An agent-populated virtual servicescape

Source: Blaxxum Interactive

the stores. They will be able to perform a search and recommend the store(s) with the products or services that are best suited to the customer needs. Business agents will act as surrogates of a company's store salespersons, serving the customer that visits a store by following the suggestion of the mall agent and offering assistance regarding the products or services available. In this view, the design of the e-servicescape as a shopping mall of multiple stores where customers, businesses and salesperson agents are visualized, allows for customer interaction within the e-servicescape at two distinct levels depicting the functions of making and enabling promises. At the first level, promises are made through the mall agents, while at the second level promises are enabled by the business agents in the virtual stores. Mall agents will demonstrate the business benevolent intention and motivation to act in the customer's interest in order to force the creation of a customer's trusting intention towards the business and a trusting belief in the business benevolence through the activation of the intentionality process. Business agents will show the business competence to meet the expectations raised by the promise made earlier by the mall agents in order to encourage the manifestation of the trusting intention to a trusting behavior and build a trusting belief in the business competence through the capability process. For keeping the promise, the e-servicescape should also offer a solid infrastructure for the delivery of digital or physical goods and services, which should be fulfilled exactly as it was originally made to the customer.

Based on the consumer buying behavior (CBB) model that identifies six stages within the buying process (Guttman *et al.*, 1998b), we envisage the role of a mall agent to be associated with the stages of need identification and merchant brokering and part of the product brokering of the buying process. Business agents will provide support for part of the product brokering and also for the negotiation stage. It must be noted that at this stage, our conceptualization of the agent's role in the e-servicescape does not involve payment, delivery and post-purchase service, which correspond to the function of keeping a promise, but is limited to making and enabling customer promises.

The role of agents

In an electronic environment mall agents will be responsible for making promises to the customer on behalf of the companies that are registered members of a specific e-servicescape. The content of the promise should be clear, explicit and carefully specified and communicated, as it will determine customer expectations from the service encounter. This type of agents will collect information from the various companies and proactively present selected advertising messages to the customer regarding business offerings, based on the customer profile. The customer will be able to request information about the advertised offers and be directed by the mall agent to the virtual store of the business making a particular offer. In addition, the customer will be able to declare his interest in a product or service to an agent of this type, regardless of those advertised. The mall agent will perform a search based on the customer request and characteristics derived from previous visits (Venners, 1997). In case of a new customer, the mall agent will ask the customer personal information to create a profile with his or her needs and preferences. Furthermore, customers will be able to watch and follow the mall agent traveling inside the virtual environment completing its search task. In order to make possible the visualization of the agent's searching process and the depiction of the state and percentage of completeness of an agent's task, all databases available to agents should be mapped to three-dimensional coordinates. These coordinates reflect the location of a business database within the virtual environment and along with the agent's initial position are fed to an interpolation module that is responsible for moving the agent inside the virtual environment.

The promise will be made and communicated to the customer by the mall agent presenting the results of the search to the customer and recommending the best option that fits the search criteria and the customer needs. Mall agents should deliver an objective and unbiased presentation of their findings in order to demonstrate the benevolent intentions of the business that will be assessed to determine the customer's trusting belief in the business benevolence.

This can be implemented by using a thoroughly designed and specified ranking system that will also take into account the user's personal preferences. The presentation of an agent's findings can be further enhanced by providing a three-dimensional visualization of each finding, which the user can manipulate and interact with. In order to make such visualization possible, organizations and businesses should be responsible for providing access to three-dimensional objects associated with a specific finding. The objects used during the presentation of the search results should be small in size (for measuring the size of an object the system could either use the size in kilobytes or the polygon count) in order to decrease network traffic load. A full-featured version of the object should only be provided whenever the customer decides to visit the corresponding shop. Mall agents should also provide a complete list of references and places searched, as well as direct access to the primary information. This capability will give users the opportunity to extend the search themselves and will render the agents and the businesses represented in the e-servicescape trustworthy, further affecting the customer's trusting belief in benevolence. When the promise has been made, the customer will be guided by the mall agent to the store of the business offering the selected product or service, displaying a trusting intention towards this business.

Business agents will be 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. When a customer arrives to a virtual store driven by the mall agent, the business agent, serving as the business salesperson will take over from the mall agent and assume responsibility for offering service to the customer. This type of agent will provide up-to-date, detailed information on products and services available from the particular store and will allow customers to preview and experience them before purchase, aiming to impel customers towards trusting behavior. In addition, they will help the customer with the ordering process, which should include alternative payment methods and provide security and customer privacy, so as to eliminate any concerns that prevent him or her moving from the trusting intention stage to that of a trusting behavior towards the business.

Business agents will present a product's features and way of usage in a more explanatory and thorough description than the one previously given by the mall agent by having access to complete and detailed data on products and services offered. This presentation will be made in a personalized fashion, depending on the level of customer's knowledge and experience with the specific type of product or service. Leveraging the benefits that stem from the visual representation of products within the virtual environment, customers will be able to view a product from all possible angles, fully interact with it, get accustomed to all of its capabilities and learn how to use it before even buying it. Furthermore, depending on the product in question and on customer's properties, businesses should implement different sales policies via their agents. They should also propose different payment alternatives that suit customer needs and provide security options for the ordering and payment of goods. Enabling the promise in this manner will positively influence the customer's trusting belief in the business competence through the activation of the capability process and will incite the customer to act in a trusting behavior.

Provided that they meet certain criteria, the presence of mall and business agents in such environments can greatly enhance customer experience. Both types of agents should bear a user-friendly and intuitive interface, allowing the novice users to realize and manage their searches in a simple yet satisfactory manner. At the same time agents should also allow for full customization so that they can be further enhanced functionally by expert users. This capability can be implemented by either providing more specific and detailed options or by exposing the agent's object model and allowing programming using a scripting language (Lange *et al.*, 1999). Moreover, the provision of an additional agent ability to understand natural language questions as well as the usage of speech recognition technologies could further facilitate interaction, enriching the customer experience within the e-servicescape.

Another important feature that should be considered is that of learning. Agents should be able to learn users' behavior and preferences, providing them with alternatives during their searches in accordance with previous experience. The output of this learning process consists of recommendations and suggestions that originate from the agent's accumulated knowledge and should be presented to the user in a non-stereotypical and perhaps even unexpected fashion. Such behavior will increase the customer's sense of familiarity and comfort with agents promoting the formation of trust within the e-servicescape.

Conclusions

In this paper, we have presented a model for the formation of trust in e-commerce. Synthesizing and interrelating concepts from trust and relationship marketing, the model has been conceptualized in the context of an e-servicescape.

The model seeks to facilitate an examination of the applicability of conventional business rules and principles for trust and relationship building in e-commerce. In order to illustrate its use, the paper described an agent-mediated virtual servicescape, showing how the features of agent and virtual reality technologies can be effectively applied to provide an e-commerce environment enabling the formation of trust. Undoubtedly, the implementation of such environments is not a simple task. There are several issues that have to be taken into consideration, such as bandwidth availability, security and the lack of a globally accepted messaging language between agents.

However, it is our belief that these technologies can be successfully leveraged for the development of customer-centric e-commerce environments. Several companies, such as British Telecom and Coca-Cola (*Wall Street Journal*, 2001) have already started introducing the use of avatars and virtual reality in their commercial Web sites so as to enrich the customer's experience. This suffices as proof of the commercial viability and future potential that such servicescapes may hold.

References

Achrol, R. (1991), "Evolution of the marketing organization: new forms for turbulent environments", *Journal of Marketing*, Vol. 55 No. 4, pp. 77-93.

Anderson, E. and Weitz, B. (1989), "Determinants of continuity in conventional industrial channel dyads", *Marketing Science*, Vol. 8 No. 4, pp. 310-23.

Aukstakalnis, S. and Blatner, D. (1992), *Silicon Mirage: The Art and Science of Virtual Reality*, Peach Pit Press, Berkeley, CA.

Barber, B. (1983), *The Logics and Limits of Trust*, New Rutgers University Press, Brunswick, NJ.

Becker, H.S. (1960), "Notes on the concept of commitment", *American Journal of Sociology*, Vol. 66, pp. 32-42.

Berry, L. (1993), "Playing fair in retailing", *Arthur Andersen Retailing Issues Newsletter*, March, Vol. 5 No. 2.

Berry, L. and Parasuraman A. (1991), *Marketing Services*, The Free Press, New York, NY.

Bitner, M.J. (1992), "Servicescapes: the impact of physical surroundings on customers and employees", *Journal of Marketing*, Vol. 54, pp. 69-82.

Bitner, M.J. (1995), "Building service relationships: it's all about promises", *Journal of the Academy of Marketing Science*, Vol. 23 No. 4, pp. 246-51.

Butler, J.K. (1991), "Toward understanding and measuring conditions of trust: evolution of the conditions of trust inventory", *Journal of Management*, Vol. 17, pp. 643-63.

Carlzon, J. (1987), *Moments of Truth*, Bollinger, New York, NY.

Cassel, J. (2000), "Embodied conversational interface agents", *Communications of the ACM*, Vol. 43 No. 4, pp. 70-8.

Dasgupta, P. (1988), "Trust as a commodity", in Gambetta, D. (Ed.), *Trust: Making and Breaking Cooperative Relations*, Basil Blackwell, Inc., New York, NY.

Deutsch, M. (1960), "The effect of motivational orientation upon trust and suspicion", *Human Relations*, Vol. 13 pp. 123-39.

Do, O., March, E., Rich, J. and Wolff, T. (1996), "Intelligent agents and the Internet: effects on electronic commerce and marketing", available at: http://bold.coba.unr.edu/odie/paper.html

Doney, P. and Cannon, J. (1997), "An examination of the nature of trust in buyer-seller relationships", *Journal of Marketing*, Vol. 61, pp. 35-51.

Dwyer, F.R., Schurr, P.H. and Oh, S. (1987), "Developing buyer-seller relationships", *Journal of Marketing*, Vol. 51, pp. 11-27.

Ganesan, S. (1994), "Determinants of long-term orientation in buyer-seller relationships", *Journal of Marketing*, Vol. 58, pp. 1-19.

Green, S., Hurst, L., Nangle, B., Cunningham, P., Somers, F. and Evans, R. (1997), "Software agents: a review", Intelligent Agents Group, Available at: http://www.cs.tcd.ie/publications/tech-reports/tr-index.97.html

Grönroos, C (1984), "A service quality model and its market implications", *European Journal of Marketing*, Vol. 18 No. 4, pp. 36-44.

Guttman, R., Moukas, A. and Maes, P. (1998a), "Agents as mediators in electronic commerce", *Electronic Markets*, Vol. 8 No. 1, pp. 22-7.

Guttman, R., Moukas, A. and Maes, P. (1998b), "Agent-mediated electronic commerce: a survey", *Knowledge Engineering Review*, June, p. 2, available at: http://ecommerce.media.mit.edu/papers/ker98.pdf

Horberg, J. (1995), "Talk to my agent: software agents in virtual reality", available at: http://www.ibiblio.org/cmc/mag/1995/feb/horberg.html

Isdale, J. (1993), "What is virtual reality? A homebrew introduction and information resource list", 8 October, available at: http://www.cms.dmu.ac.uk/~cph/VR/whatisvr.html

Jonkheer, K. and Jansen, A. (1999), "Intelligent agents, markets and competition: consumers' interests and functionality of destination sites", FirstMonday, Vol. 4 No. 6, 7 June, available at: http://www.firstmonday.org/issues/issue4_6/jonkheer/index.html.

Lange, D.B. (1998), "Mobile objects and mobile agents: the future of distributed computing?", in the *Proceedings of the 12th European Conference on Object-Oriented Programming*, 20-24 July, Brussels.

Lange, D.B., Hill, T. and Oshima, M. (1999), "A new Internet agent scripting language using XML", in the *Proceedings of the AAAI-99 Workshop on AI in Electronic Commerce*, 18-19 July, Orlando, FL.

Lewicki, R.J. and Bunker, B.B. (1995), "Trust in relationships: a model of development and decline", in Bunker, B.B. and Rubin, J.Z. (Eds), *Conflict, Cooperation and Justice*, Jossey-Bass, San Francisco, CA.

Lewis, J.D. and Weigert, A.J. (1985), "Trust as a social reality", *Social Forces*, Vol. 63 No. 4, pp. 967-85.

Lewis, R. and Booms B.H. (1983), "The marketing aspect of service quality", in Berry, L., Shostack, G. and Upah, G. (Eds), *Emerging Perspective of Services Marketing*, American Marketing Association, Chicago, IL, pp. 99-107.

Lindskold, S. (1978), "Trust development, the GRIT proposal and the effects of conciliatory acts on conflict and cooperation'', *Psychological Bulletin*, Vol. 85 No. 4, pp. 772-93.

Ma, M. (1999), "Agents in e-commerce", *Communications of the ACM*, Vol. 42 No. 3, pp. 79-80.

Macneil, I.R. (1980), *The New Social Contract*, Yale University Press, New Haven, CT.

Maes, P., Guttman, R.H. and Moukas, A.G. (1999), "Agents that buy and sell", *Communications of the ACM*, Vol. 42 No. 3, pp. 81-91.

McKnight, D.H. and Chervany, N.L. (1996), "The meanings of trust", available at http://www.misrc.umin.edu/wpaper/default.asp

Moorman, C., Deshpande, R. and Zaltman, G. (1993), "Factors affecting trust in market research relationships'', *Journal of Marketing*, Vol. 57, pp. 81-101.

Moorman, C., Zaltman, G. and Deshpande, R. (1992), "Relationships between providers and users of market research: the dynamics of trust within and between organizations", *Journal of Marketing Research*, Vol. 29, pp. 314-28.

Morgan, R.M. and Hunt, S.D. (1994), "The commitment-trust theory of relationship marketing", *Journal of Marketing*, Vol. 58, pp. 20-38.

Papadopoulou, P., Kanellis, P. and Martakos, D. (2000a), "Trust formation in e-commerce relationships", in the *Proceedings of the 7th Research Symposium on Emerging Electronic Markets*, 17-19 September, Appenzell.

Papadopoulou, P., Kanellis, P. and Martakos, D. (2001), "Investigating trust in e-commerce: a literature review and a model for its formation in customer relationships", to appear in the *Proceedings of the 7th Americas Conference on Information Systems*, 3-5 August, Boston, MA.

Papadopoulou, P., Triantafillakis, A., Kanellis, P. and Martakos, D. (2000b), "A generic framework for the deployment of an Internet billing servicescape", in the *Proceedings of the 1st World Congress on the Management of Electronic Commerce*, 19-21 January, Hamilton.

Parasuraman, A., Zeithaml, V. and Berry, L.L. (1985), "A conceptual model of service quality and its implications for future research", *Journal of Marketing*, Vol. 49, pp. 41-50.

Reichheld, F.F. and Schefter, P. (2000), "E-loyalty. Your secret weapon on the Web", *Harvard Business Review*, July-August, pp. 105-13.

Roehl, B. (1995), "Some thoughts on behavior in VR systems", August, available at: http://www.ece.uwaterloo.ca/~broehl/behav.html

Strub, P.J. and Priest, T.B. (1976), "Two patterns of establishing trust: the marijuana user", *Sociological Focus*, Vol. 9 No. 4, pp. 399-411.

Tapscott, D., Ticoll, D. and Lowy, A. (2000), "Relationships rule", *Business 2.0*, May, available at: http://www.business2.com/content/magazine/indepth/2000/05/01/19505.

Venners, B. (1997), "Solve real problems with Aglets, a type of mobile agent", *JavaWorld*, May, available at: http://www.javaworld.com/javaworld/jw-05-1997/jw-05-hood.html.

Wanninger, L., Anderson, C. and Hansen, R. (1997), "Designing servicescapes for electronic commerce: An evolutionary approach", available at http://www.misrc.umin.edu/wpaper/default.asp

Wall Street Journal (2001), "Avatars widen realms of virtual reality on Internet", *Wall Street Journal*, 24 January.

Williamson, O.E. (1991), "Calculativeness, trust and economic organization", *Journal of Law and Economics*, Vol. 26, pp. 453-86.