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## **A New Trust Model for B2C E-Commerce Based on 3D User Interfaces**

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### **Abstract**

Lack of trust is one of the key bottle necks in e-commerce development. Nowadays many advanced technologies are trying to address the trust issues in e-commerce. One among them suggests using suitable user interfaces. This paper investigates the functionality and capabilities of 3D graphical user interfaces in regard to trust building in the customers of next generation of B2C e-commerce websites. It expands the McKnight and Chervaney's "Trust Model in E-Commerce" and proposes a new trust model based on 3D user interfaces functionality. For this reason the relationships between five dependent variables consisting the appeal of 3D user interfaces, interacting with 3D virtual models of products and services, 3D virtual interacting with the salesman, 3D virtual interacting with other online buyers, and presence in 3D virtual spaces in regard to increasing the trust level of B2C e-commerce customers were studied. The method of descriptive survey by library and field studies was deployed. Data were gathered by the mean of simple questionnaire, and analyzed through one sample t-test. Significant relations were found between dependent and independent research variables. So evaluating the research results, the proposed trust model was confirmed. Finally the paper proposes implementation strategies for 3D e-commerce websites based on research findings.

**Keywords:** Computational cultural modeling, Electronic commerce, Graphical user interfaces, Trust model, Virtual 3D worlds.

## **Introduction (Heading 1)**

Trust is a fundamental element of any successful transaction. It plays a critical role in e-commerce. So far many studies had focused on developing requisite platforms for obtaining and sustaining the acceptable trust level between online buyers and companies. These had lead to some trust models.

Existing web with all its significant opportunities among improving humankind communications and facilitations brought to all kinds of interactions, still suffers from some inefficiencies which are the reasons that e-commerce has not been growth as it was predicted [1]. One of these important inefficiencies is the low trust level in online transactions.

After three decades still people do not trust e-commerce transactions in total. Although selling some products like music files had reached the goal, but customers still prefer the time consuming tiring process of street shopping to the e-commerce for their needs such as clothes, shoes, furniture, etc.

Most of it refers to technical limits of the web regarding to transmission of qualitative data. 2D pictures and textual information of e-commerce websites are often lacking from enough efficiency to convince customers [2]. No enough data on the exact material, texture, color, weight, real scale, peripheral views and the functionalities of different parts of the product are some of these limits. These are parameters that a customer can get in seconds in a normal street shopping through seeing and touching. Low quality images are in count too. Also the absence of the salesman and other customers are of other reasons [3]. In this area, 3D user interfaces have found special functionalities by improving 3D simulations, visual

details, modeling, delivering different multimedia contents, and so in the e-commerce realm. Using them can lead us to new trust models.

## **THEORETICAL BACKGROUND**

### **Trust**

Trust is the basement in any social group. People trust each other for their individual and grouped tasks [4]. It has many different definitions in different fields and so far has been studied in verity of fields including theology, ethics, politics, marketing, management, Psychology, etc [5]. By the growth of modernization and sophistications of the societies, having an acceptable understanding of trust becomes much more important. Trust is one of the requisites of a benefiting work. Generally it can be defined as a mechanism which would decrease the complexity level of manners in an uncertain situation [6]. Julian Rotter one of leading researchers of trust concepts tries to give an equation for expectations and requisites of trust to calculate trust level between two parties [7].

Zoompa define trust as an inner situation towards others' probable manners [7]. It consists of frankness, loyalty, competency, faithfulness and stability in the studies of Schindler and Thomas [8]. Deutsch explains trust as an option someone would take in a decision making situation in which the probability of negative results are more than positive ones. He sees trust as a voluntary manner [9].

As Mayer defines, trust is a psychological situation regarding to one's manners or attitudes which ends to a trend of risk acceptance and expecting positive results [10]. In Kim's ideas trust is one's beliefs to others in a certain expected manner [11].

Researchers such as Baier and Hosmer have used ethical models for trust description. Sheppard and Sherman draw it as risk acceptance level of individuals. In their model dependence level of two parties plays the critical role. In organizational concepts, trust is one's attitude to voluntary exposure toward others expecting competent action [12].

In spite of all studies in recent years in the field of trust, still no integrated complete description has been reached

### **Online Trust**

Trust in commerce era can be described as the belief and expectation of the buyer regarding to reliability and fidelity of the seller's speeches and activities, and reciprocal, the belief and expectation of the seller regarding to reliability and fidelity of the buyer's speeches and activities. Reliability and fidelity of a commercial system is a precise systemic adjective rather than a sudden happening, which can be reached only through correct organizational policies and proper legal and law frameworks [13].

One of its complex aspects is that the trusty feelings of a customer depend deeply on his previous experiences and deals. Trustworthiness is a timely adjective following by positive thoughts. [14]. In other words even only one bad experience can ruin all the trustworthiness of a system or a company.

While the necessity of reliability cannot be ignored in any financial transaction, it is vital for the online ones. In special situation of e-commerce, which the buyer and seller do not know each other, do not see each other, and even do not hold the transaction in the same time and place, trust can be seen as a critical point [15]. It is always one of the fundamental concerns [3].

Surveying more than a hundred recent studies shows that critical parameters in building successful relationships in online transactions are: trust, security, reliability of online payment methods, distribution channels, and postal methods [16]. Therefore having a good understanding of trust components and its requisites seems quite brilliant.

As other e-commerce aspects, online trust has also been studied frequently in recent years. There has defined trust models to describe the components of it and the relationship between the online buyers and companies.

Geffen defines trusting to others and informational clarity as two essential factors of a trusty relationship in e-commerce. He points to the importance of the quantity of information delivered to the customer in two direction online communications [17].

In another research by Jarvenpaa and Tractisky, it is concluded that customers will not buy stuffs from sellers who fail in trust building process [18]. Other studies show relations between the quantity of past transactions and customer trust level [19].

### **Trust Models**

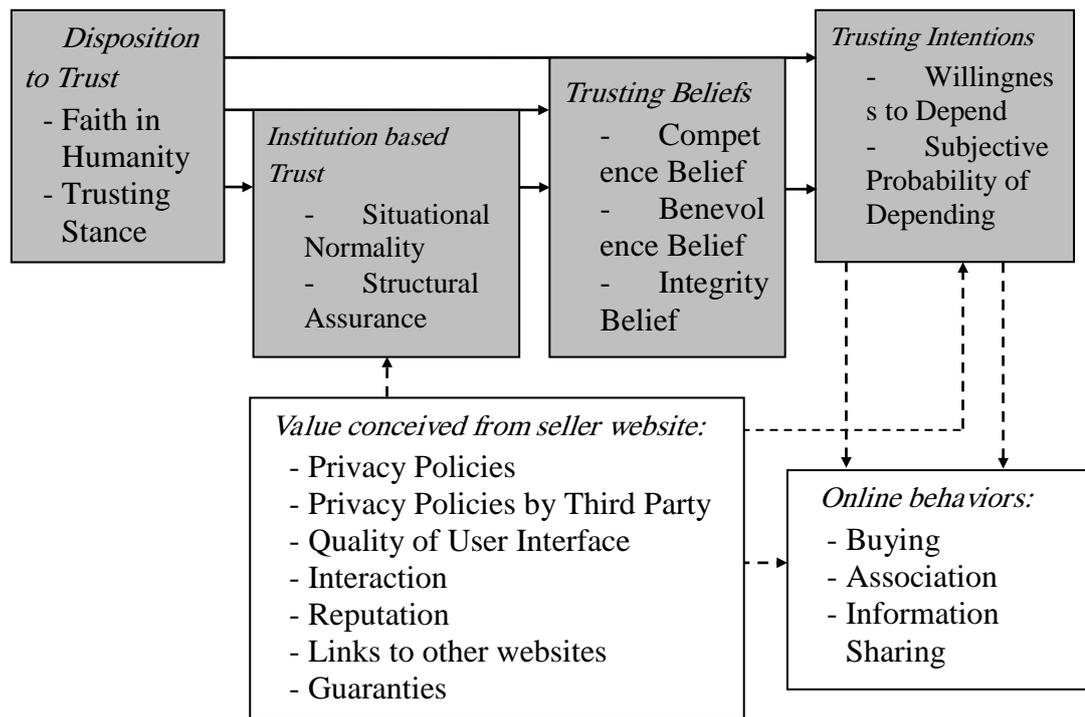
Adequate trust in online buyers to confirm the competency of an online company includes different levels. The most complex step is the initial trust formation [20]. In this step belief which websites transmit play important role. Then some confirming factors peruse the customers going through the buying process.

There has suggested some frameworks called online trust models to describe effective parameters interfering in online trust building. Among them McKnight and Chervaney's will be explored. It is one of the most famous and cited one [21].

McKnight and Chervaney started pervasive studies to define a trust model in 2001. They used many definitions of sociology, psychology and economy. They finally released sixteen parameters affecting in trust building process. They categorized them in four sets including Disposition to Trust, Institution based

Trust, Trusting Beliefs, and Trusting Intention.

McKnight and Chervaney then expanded their model based on online transactional concepts and by adding two blocks proposed the complete model shown in fig. 1 for trust building in e-commerce [22].



**Fig. 1. McKnight and Chervaney's online trust model in e-commerce [22]**

There exist many different explanations on this model. One of most accepted one is Histosugi's explained below [21]:

- **Disposition to Trust**  
It's a situation in which the person feels attitude toward depending to others. Disposition to trust itself consists of two building blocks which are faith to the humanity and trust situation.
- **Institution based Trust**  
Institution based trust refers to believing that requisite frameworks for increasing the probability of success in trust exist.
- **Trusting Beliefs**

Among the McKnight and Chervaney's trust model units, trusting beliefs is a key part. It's an external factor affecting the formation of trust which would pursue individuals whether to trust to the other side or not. Companies can gain benefit from having a good understand of trusting beliefs and leading their customers to trust stage. Trusting beliefs consist of mental confidence of others positive manners regarding to the deal [12]. Yet many researchers have been focused on this area and different

parameters had been defined to explain trusting beliefs.

- **Trusting Intention**

This is the stage in which the person has reached a level of confidence that seeks to depend on others feeling safe.

The model shows that e-commerce companies may form trusting beliefs through exact components. The user interface is one among them. Online users start evaluation of the user interface after getting confidence of the security and privacy issues. And would trust the website or not due to the feeling the user interface induces to them.

### **3D Web and Trust Issue**

3D user interface is a kind of interface for interacting users with the machine (the computer) in which the input data are given by computer input systems such as mouse and keyboard, and the output is given in virtual 3D graphics on 2D monitor screens. The virtual 3D graphic is called to images that show objects by their three aspects; height, length, and depth simultaneously. These images may seem real in the user's mind [23]. 3D web is one of the mentioned parts of web 2.0 [11].

Human brain is very strong in image processing and recognition of forms and visual elements. We can use this ability to transfer a huge amount of data in a short time and so to overcome the shortage of memory and time in our customers. In website design visual elements including color, form, texture, scheme, motion and so are used to transfer products information. Right use of these elements is important in customer acquisition.

Today users are more and more interested in customization features and receiving customized products and services. Static 2D images are losing their attractiveness and usability in e-commerce especially for representation

of physical instruments and furniture. Customers desire to see them in 3D with all their details.

In a 3D e-commerce space, the user can receive his demanded product or service information through many various ways including 3D virtual images, animations, voice, video, text, and 3D models. He can easily move between scenes, walk through the virtual mall, and pick up his favorites. A near real experience which could not be sensed in classic 2D websites. Not only these properties will be more time saving, but also has more appeals for the user. And of course the more attractive the more customers would be eager to buy [24].

For instance a 3D online shoe store can let customers to walk between shelves, pick up designated shoes, hold them and see them in different views. Due to capability of these spaces online customers can see each other and talk over their points of views about the products. Salesmen can also do their duties regard to their customers. Such an experience is far more than classic 2D online shops. And can help customers in purchase decision makings.

## **METHODOLOGY**

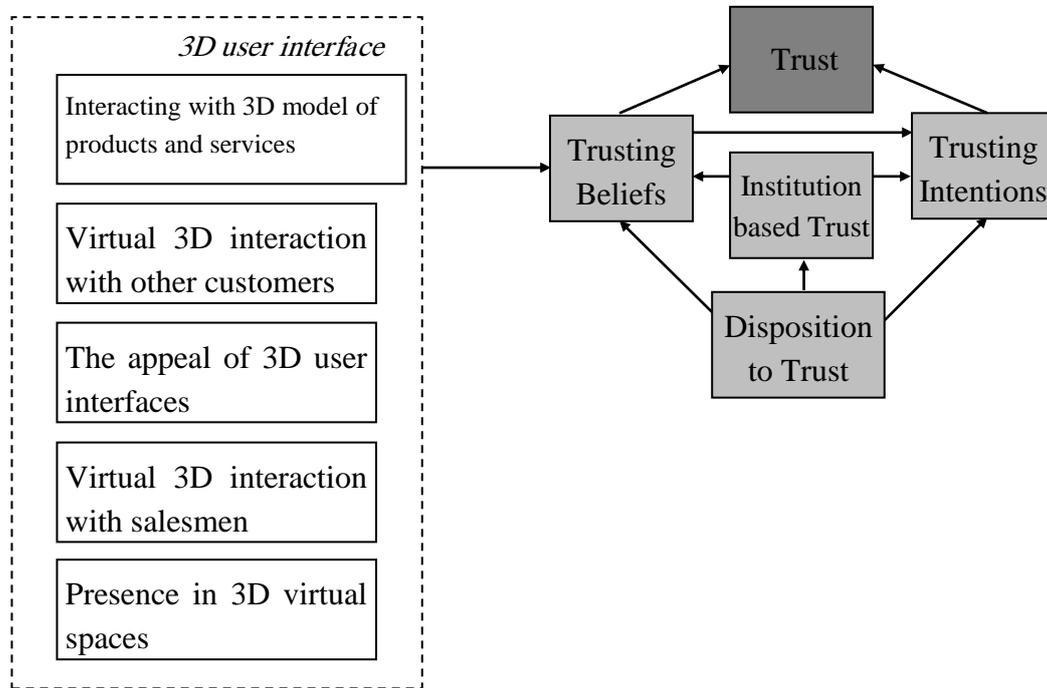
### **Research Model**

McKnight and Chervanay's online trust model has been expanded from different points of view yet. Regarding to this reference model, user interface is among one of the important constituents to improve trusting beliefs. In spite of many studies conducted in the online trust area, the researcher did not find any academic study on how a 3D user interface would enhance the trusting beliefs of B2C e-commerce customers and so increasing buying trends.

After a pervasive study of online trust issues and backgrounds, this paper proposes a trust model for B2C e-commerce based on 3D user interfaces

as shown in fig. 2. It is an expansion of McKnight and Chervaney's "Trust Model in E-Commerce" and

functionality of 3D user interfaces are considered.



**Fig. 2. Trust 2.0; A Trust Model for Next Generation of B2C E-Commerce**

**Based on 3D User Interface  
Research Questions**

Research questions were designed as bellow:

Question 1: Does the 3D user interface appeals act as an encouraging factor to increase the B2C e-commerce customers buying trend?

It points to whether or not the intrinsic appeals of 3D user interfaces in contrast to 2D websites, will act as an encouraging factor for trust building regarding to trust beliefs mentioned in McKnight and Chervaney's trust model.

Question 2: Does interacting with 3D models acts as an encouraging factor to increase the B2C e-commerce customers buying trend?

Good presentation of the product is essential for e-commerce. And presenting a 3D model is more effective

and attractive in the sense of information delivery. In virtual 3D spaces, the customer can touch the model, observe it from different view points, and test its functionalities. We wanted to see if these properties would result in more trusting beliefs in online customers.

Question 3: Does 3D interacting with salesman avatar acts as an encouraging factor to increase the B2C e-commerce customers buying trend?

This question will examine if the resemblance of 3D interacting to the real world ones would increase trusting beliefs in customers regarding to buy a product or service or not.

Question 4: Does 3D interacting with other online customers acts as an encouraging factor to increase the B2C e-commerce customers buying trend?

Buying is a social behavior for most of us [25]. We examined if possibility of interacting with other online customers in 3D virtual spaces would increase the trusting beliefs regarding to buy a product or service.

Question 5: Does the presence of a classic (2D) e-commerce website in 3D virtual spaces acts as an encouraging factor to increase the B2C e-commerce customers buying trend?

In this question the validity and reputation of 3D virtual spaces is explored. It is investigated if merely existence of a 2D classic e-commerce website in such spaces would increase the trust beliefs in its customers regarding to buy a product or service.

#### **Data Collection**

The research was done by the method of descriptive survey. Library and field studies were conducted and a close questionnaire was designed. To eliminate possible ambiguities and increase reliability 35 questionnaires were tested before public distribution. They provided to five experts and ambiguous points discussed. In this phase the structure of some questions changed. And the question regarding to the age of participant changed to five age ranges.

Data gathering took two months from September 15 to November 15, 2010. The questionnaire was uploaded and its link was e-mailed to 300 designated experienced and professional users. We received 367 filled questionnaires in overall. 16 among them were dropped due to incomplete information.

#### **Data analyze**

For inferential statistics of the research after reassuring that data had normal distribution, the one sample t-test was used for each variable. This was chosen

because student's t-test is a parametric test for comparing means of several variables of a particular distribution and our research data followed a particular distribution too. Also as in each research question we had only one variable, the one sample t-test was chosen.

### **ANALYSIS AND TESTING**

#### **Reliability and Validity**

The internal consistency reliability of the variables was assessed by Cronbach's alphas. The Cronbach's alpha values of all five variables, ranging from 0.793 to 0.894, were well over 0.700, which were considered as satisfactory for measures [26].

#### **Test Results**

One samples t-tests were conducted and the following results were reached ss shown in table 1.

1. There was a significant relation in the scores between interacting with 3D model of products and services and online trust level (M=3.98, SD =.84);  $t(349)=22.00$ ,  $p=.00$ .
2. There was a significant relation in the scores between virtual 3D interaction with other customers and online trust level (M=3.81, SD=.75);  $t(349)=20.11$ ,  $p=.00$ .
3. There was a significant relation in the scores between the attractiveness of 3D user interface and online trust level (M=3.77, SD=.89);  $t(349)=16.20$ ,  $p=.00$ .
4. There was a significant relation in the scores between virtual 3D interaction with salesmen and online trust level (M=3.60, SD=.94);  $t(349)=11.95$ ,  $p=.00$ .
5. There was a significant relation in the scores between presence in 3D virtual spaces and online trust level (M=3.47, SD=.87);  $t(349)=10.15$ ,  $p=.00$ .

**Table 1. One sample t-tests results ( $\mu_0=3$ )**

|           | IV   | Mean | t     | N   | d.f. | Std. Dev. | Mean diff. | p-value |
|-----------|------|------|-------|-----|------|-----------|------------|---------|
| <b>DV</b> | 1.00 | 3.98 | 22.00 | 350 | 349  | 0.84      | 0.98       | 0.00*   |
|           | 2.00 | 3.81 | 20.11 | 350 | 349  | 0.75      | 0.81       | 0.00*   |
|           | 3.00 | 3.77 | 16.20 | 350 | 349  | 0.89      | 0.77       | 0.00*   |
|           | 4.00 | 3.60 | 11.95 | 350 | 349  | 0.94      | 0.60       | 0.00*   |
|           | 5.00 | 3.47 | 10.15 | 350 | 349  | 0.87      | 0.47       | 0.00*   |

□\* &lt; 0.01

These results suggest that using five research variables as encouraging factors really does have effect on increasing trust level in B2C online customers.

### FINDINGS

McKnight and Chervaney had mentioned to the quality of user interface as one of the effective parameters in increasing online trust. In other hand, due to rapid changes of Information technologies, internet is entering into the 3D age and some studies had called it as one of e-commerce facilitators in near future.

In our study we had five questions. So we designed a close questionnaire around them and evaluated online customers' opinions around the effectiveness of research variables on increasing trust level. Doing one sample t-tests on the data showed that all five questions were answered positively. And at %99 level of confidence there was significant relation between five dependent variables of research and online trust building. Research findings can be expressed as below:

- The 3D user interface appeals acts as an encouraging factor to increase the B2C e-commerce customers buying trend.
- Interacting with 3D models acts as an encouraging factor to increase the B2C e-commerce customers buying trend.
- 3D interacting with salesman avatar acts as an encouraging factor to

increase the B2C e-commerce customers buying trend.

- 3D interacting with other online customers acts as an encouraging factor to increase the B2C e-commerce customers buying trend.
- The presence of a classic e-commerce website in 3D virtual spaces acts as an encouraging factor to increase the B2C e-commerce customers buying trend.

In other words, it was proved that in the next generation of e-commerce in which websites have 3D user interfaces, five parameters affect the trust level of B2C customers. So increasing each parameter's performance will increase the trusting beliefs and thereupon the trust level. Trust level itself has a direct impact on buying trends in online customers.

### DISCUSSION AND IMPLICATIONS

Based on research findings, implementation strategies for 3D e-commerce websites can be proposed as bellow.

1. Enabling virtual interaction with 3D models of goods and services
  - Providing 3D virtual contents of products and services
  - Providing customization features in 3D models
  - Implementation of products and services' functionalities by dynamic features
  - Simulating texture, material, structure and other features in details

2. Enabling 3D virtual interaction of customers with each other

- Providing technical platforms of simultaneous existence of multiple users in the website
- Providing motivations to bring the users to their place such as holding contests or gatherings related to their business

3. Create attractiveness served through 3D user interface

- Using complex 3D effects
- Designing 3D virtual e-shops
- Using visual elements such as colors, shadows, texture cleverly
- Using from 3D graphic experts in their team

4. Enabling 3D virtual interaction between salesman and customers

- Designing attractive and adorned avatars for salesman and marketers
- 7/24 presence of company avatars online
- Using uniforms in line with company brand
- Using company's expert personnel for online services

• Enabling technical platform for several online interactions with customers such as text, voice, or webcam chat

5. Make presence in 3D virtual spaces

- Codification of long term organizational strategies for investment in 3D e-commerce
- Buying or renting spaces in famous 3D virtual worlds for the company

Of course in website designing, we always should consider all customer profiles, their needs and preferences. So despite recommending to use the above factors for increasing online customer trust, its suggested to keep providing information in 2D formats in parallel for those how doesn't like or don't know how to act in 3D worlds, can't use 3D user interfaces technically, or are connected via low speed internet connections.

## CONCOLUSSION

The research finding show significant relations between the trust level in next generation of B2C e-commerce and five research variables. In other words, it expresses that appropriate use of each of the independent variables can increase the trust level and encouraging the customers to do e-commerce.

While in all previous studies including EGGER's and McKnight and Chervaney's, effectiveness of the quality of user interface in increasing the trust level of online customer of B2C e-commerce was mentioned, the findings of this research is aligned with them.

On the other hand, although many researches have been conducted in the field of affecting factors on trust building in B2C electronic commerce, and some models had been proposed, this research is unique and the first one conducted in the field of 3D concepts and its issue does not match with any of the previous ones.

## FURTHER STUDIES

According to research approaches and also the time limitation, only a narrow field of study has been chosen from online trust issues. For further studies the followings are suggested.

It's suggested to deploy the research findings to evaluate the influence of each ones on increasing trust beliefs and trust level in B2C e-commerce customers practically. For this reason both classic and 3D e-commerce processes may offer to two groups separately and their opinions would be gathered and comprised. For the deployment also two methods can be used. First, one can use existing facilities of virtual 3D worlds such as Second Life ([www.secondlife.com](http://www.secondlife.com)) or Habbo ([www.habbo.com](http://www.habbo.com)) and implement 3D e-commerce platforms on them. And second, is the design and

implementation of a standalone 3D e-commerce website. The later method obviously requires more time and budget. But benefits from independence of survey and the researchers could fulfill all their ideas.

In a separate study the demographic statics of virtual 3D e-commerce customers and their relations to trust can be discussed. There might be a meaningful relation between users' age, sex, usage patterns, online skills, etc, and their interaction with 3D user interfaces.

In classic 2D e-commerce when we discuss of the website design, we have two methods naming catalog base and customer centric design. In 3D e-commerce websites, the design is more realistic. Maybe we can call it "shelf base design". We propose it to be explored in details.

Also the influence of 3D user interfaces on trust issues in other e-commerce categories such as B2B, G2C and so on should be studied as well.

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