

HUMAN COMPUTER INTERACTION AND ECOMMERCE: USING THE PRINCIPLES FOR BETTER USER EXPERIENCE

Nasiruddin Molla

Assistant Professor

VMS College of Arts & Science

Vinayaka Missions Sikkim University

&

Indraneel Mandal

Assistant Professor

Institute of Technology and Science

Mohan Nagar, Ghaziabad

Abstract

Human Computer Interaction (HCI) is the study of the relationship between computers and their human users with a view to improving the functionality and usability of the systems. At the same time, e-commerce is the online buying and selling of products and services incorporating a variety of models.

This paper looks at the application of HCI techniques for effective design of e-commerce websites. This has been considered in two ways: the evolution of e-commerce websites down the ages with changing system paradigms, and the movement from e-commerce to social commerce through the mediation of Web 2.0.

Keywords: Human Computer Interaction, E-commerce, Functionality, Usability, Social Commerce, Web 2.0.

1. Application of HCI to E-commerce: A Primer

Human computer interaction (HCI) can be considered as a design activity related to human beings working with computer systems. The user interface can be thought of as a channel where two different systems (humans and computers) communicate with each other. As human beings and computers obviously have very different ways of communicating, these systems have to be designed properly so that the mutual communication takes place properly. This is precisely the role played by HCI.

E-commerce is the exchange of goods, services, information, and payments across an electronic network. OECD (1997) defined e-commerce as "all forms of commercial transactions involving both organizations and individuals that are based upon the electronic processing and transaction of data, including text, sound, and visual image." The World Wide Web is especially being used for electronic transactions. Schneider and Perry (2000) formed a broader definition, "the user of electronic data transaction to implement or enhance any business process."

Commercial applications of the internet started in the 1990s, which led to the emergence of e-commerce. E-commerce encompasses diverse aspects like e buying, selling, delivery of information, providing customer service, collaborating with other business, increasing productivity, etc.(Napier et al. 2001).According to Napier (2001), e-business offers the following advantages to buyers as well as sellers:

Table 1 : Advantages of E-business

Merchants	Buyers
Greater opportunity for sales	Wider availability of selection
Simple, cheap and quick transaction	Simple, cheap and quick transaction
No time limit for the operation	Easier comparison of price and delivery
Access to global markets	Access to global markets

The OECD has also demonstrated (1997) the advantages of e-commerce with regard to transaction management and business efficiency.

One of the essential attributes that is used as a guiding tool in HCI is usability. As per the International Organisation for Standardization (ISO), usability is “the effectiveness, efficiency and satisfaction with which a specified set of users can achieve a specific set of tasks in a particular environment” (ISO 9241). Shneiderman (1992) referred to the five user-oriented attributes of usability: liability, efficiency, memorability, errors, and satisfaction. According to Dix et. al. (1998) the three main methods for supporting the usability of interaction design are liability, flexibility, and robustness, each of these principles further consisting of a number of sub-principles.

Table 2: Principles of usability

	Main Principles		
	Learnability	Flexibility	Robustness
Sub-principles	Predictability	Dialog initiative	Observability
	Familiarity	Task migratability	Responsiveness
	Generalisability	Substitutivity	Task conformance
	Consistency	Customizability	

[Hong-In Cheng, Human Computer Interaction in E-Business, Doctoral Thesis , Iowa State University]

It is not surprising that usability forms the bedrock of the design of e-commerce websites. The fact that the design of the website is an important factor for e-commerce can be deduced from the work of many. Grose et. al. (1998) showed after studying 357 websites and 270 traditional interface design recommendations that different considerations enter into the equation in each case. Vora (1998) suggested a methodology for website design which seems to mimic that for general system development. This methodology is shown below:

Table 3: Web Design Methodology

	Establishing the goals of a website
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Planning	Understanding user needs and computing environments
	Identifying owner and author needs
Analysis	Analysing content
	Analysing process of interaction
Design and Development	Understanding user behaviour
	Designing individual pages
	Utilising advanced technology
	Designing for international users
	Keeping consistency
Usability Testing	Deciding scope of usability testing
	Conducting usability test
Implementation	Transferring files to the web server
Maintenance	Updating website content
	Checking website integrity
	Monitoring trends
	Evaluating and implementing newer technology

2. Literature Survey and Justification for the Study

Some of the relevant literature in this area are as follows:

Jarvenpaa and Todd (1996) tried to find out the impact of the World Wide Web on the shopping behaviour of customers. For this purpose they interacted with users to decipher their views on areas like product perceptions, shopping experience, customer service and perceived consumer risk. This was done through an open ended survey involving a sample of 220 shoppers.

Jennings (2000) uses input from diverse disciplines like aesthetic experience, flow, landscape assessment and proposed aesthetic framework for the purpose of establishing engaging and immersive e-commerce experiences. He is of the opinion, website development based on aesthetics can lead to positive user experience.

Any transaction is based on the existence of a certain degree of trust between the participants. Manchala (2000) offers a look into models for evaluating trust between vendors and buyers that go beyond the traditional metrics. According to him traditional models do not suffice at a time when there are anonymous transactions that go beyond territorial and legal boundaries, and traditional value-chain structures. The author suggests that alternative ways of evaluating trust may provide a better measure of the risk inherent in transactions that take place in this changed environment.

Turk (2000) moves in an interesting direction with this take on perceptive media. As he explains, growth and improvements in input/output devices, interaction techniques and software techniques for HCI have not followed the same trajectories. Though GUI systems have made it easier for us to interact with and use devices, with the changes in the methods of using computers and the increasingly ubiquitous nature of computing itself, it may not be easy for GUIs to keep up with the increasing number of interactions necessary for user satisfaction. Thus interfaces need to be “natural, intuitive, adaptive and unobtrusive”. According to the author, this is where perceptive media - “an interdisciplinary initiative to combine multimedia display and machine perception to create useful, adaptive, responsive interfaces between people and technology”.

Tripathi (2011) has considered the issue of interaction in terms of the design, implementation and use of interactive computer systems by people and the effects of such systems on individuals, organisations and society. He feels that in addition to ease of use, this should also cover new methods of interaction for user support, better information access and developing more powerful means of communication.

C.S.Lee (2001) describes e-commerce as a disruptive technology that is changing the traditional way of doing business. A digital economy works in a totally different way compared to a traditional one. There is no established business or revenue models even for companies in the same industry, as far as e-commerce is concerned. As such, the author is of the opinion that an analytical framework is required so as to enable

ecommerce managers and planners determine the critical success factors while working out the business plans and strategies for e-commerce.

Chu et al. (2007) have looked at the evolution of ecommerce websites. They suggest four eras based on such evolution covering a period from 1993 to 2001. On the basis of a self suggested conceptual framework, they have conducted a longitudinal study, which confirms the existence of the four eras suggested earlier.

Constantinides and Boria (2008) have examined how Web 2.0 has played a major role in bringing about significant change in how the retail business is carried out.

Michaelidou et. al. (2011) throw some light on how social networks can play a role in achieving brand objectives. They have dealt with business-to-business (B2B) small and medium enterprises (SMEs) and their social networking practices.

Huang and Benyoucef (2013) examine the development of social commerce. They propose both a model as well as a set of guiding principles for social commerce design. They further utilise these to evaluate two leading social commerce platforms. They conclude by suggesting that a social commerce website should achieve a minimum set of design features, which include the layers of individual, conversation, community and commerce.

3. Evolution of E-Commerce Websites

While it is important to design the website properly so as to maximise convenience and ultimate use by the customers, the design of the website itself has gradually evolved with time. According to Chu et. al., four distinct phases of website evolution can be differentiated. These are referred to as the pre-web era (before 1990), the reactive web era (early 1990s), the interactive web era (mid 1990s) and the integrative web era (early part of the 21st century).

(a) The Pre-Web Era

This was a rather primitive stage where commercial transactions were not possible, since the World Wide Web (WWW) had not yet arrived. While Electronic Data

Interchange (EDI) was present, it was rather rigid. The core technology was mainly of the standalone type with no built in interface features.

(b) The Reactive Web Era

During this stage commercial activities had undergone some development as the environment was open and easily accessible. Information sharing was now possible over the internet. The introduction of the WWW had made e-commerce possible. Open access was also available. Sharing and viewing of information was much easier, and pre-arranged communication was no longer necessary.

The web was now in a growth phase. Powerful web browsers had come into existence. Using the WWW businesses could now target customers better. Generalised portals were also a common phenomenon.

Even though communication was possible, it was only one way. Thus businesses could only react to requests. Due to the inability to extract information, interactions between web users was not possible. Further, the inability to transfer confidential information securely proved a major stumbling block for e-commerce activities.

(c) The Interactive Web Era

This era was marked by the transition from one-way browsing to two-way commercial process. Development of e-commerce websites necessitated two-way interactive negotiations for buy-sell transactions. One of the instruments for achieving interactivity was the introduction of cookies. With process continuity many new e-commerce activities could be carried out. Online shopping became feasible. Interactive processes using new languages led to personalisation and customisation. Another related development due to the newly achieved interactivity was the appearance of online brokering. Websites were able to match buyers and sellers through the development of online links.

While buying and selling activities are definitely facilitated through shopping and brokering applications, an important prerequisite is the agreement between the

buying and selling parties. As the web was a public domain, there had to be some system of process guaranteeing secured information exchange before online activities could be initiated. Properly designed cryptographic systems were utilised for ensuring confidentiality and integrity for all concerned parties.

In order to provide a basis for activities like shopping, personalising, brokering, buying and selling, a set of core business functions were created. The major components here were transaction negotiation and formation (comprising of matching, ranking, authenticating and contracting). The significant outcome of this era was that buying and selling became more personalised.

(d) The Integrative Web Era

With the development of new ecommerce activities, their proper management became imperative. Interoperability became an important feature of websites at this time. Websites were simultaneously integrating processes. Processes related to e-commerce like e-supply chain management, e-collaboration, e-reengineering and e-procurement started making an appearance. Activities combined with processes online, resulting in websites which behaved at the same time as marketplaces as well as management platforms. Consequently, improvements in collaboration, strategic alliances and one-stop business processes became possible.

The prerequisite for interoperability is data sharing. It is also necessary to have an operating environment, leading to an online mechanism called platforming. The platform is utilised for tracking, linking, editing, and display of e-commerce processes. Additionally, the need for online decision support was also met during this phase.

4. From E-Commerce to Social Commerce through the mediation of HCI

The development of Web 2.0 has led to greater user participation and enhanced economic value of the transactions. This has given rise to a phenomenon that has been labelled as social commerce. While there is still no comprehensive understanding of this new entity, work in this area has also been minimal.

The main contribution of Web 2.0 has been that it has transformed e-commerce from a product-oriented environment to a social and customer-centred one. While the term 'social media' is generally utilised as a reference to the collection of internet based applications developed on Web 2.0, Web 2.0 itself can be described as "a platform for harnessing collective intelligence" (Kaplan and Haenlein 2010). As this allows the customer to have better access to social knowledge and experiences, it enables her to not only to better understand the motivation behind her online purchases, but also for making more informed and accurate purchase decisions (Dennison et al 2009). On the other hand, online businesses are able to track the behaviour of the customers, which in turn allows them to gain insights into shopping experiences and expectations, consequently leading to the development of better business strategies (Constantinides and Fountain 2008). Recognition of such reciprocal advantages has led to evolution of e-commerce through the adoption of Web 2.0 features, functions and capabilities for greater customer participation (Kim and Srivastava 2007), improved customer relationships (Liang et al 2011), and increased economic value (Parise and Guinan 2008). Such evolution of e-commerce is generally understood to have given rise to social commerce.

Social commerce refers to the utilisation of Web 2.0 features like for e-commerce, specially core properties like user generated content and content sharing. The effect of Web 2.0 on e-commerce can be judged in terms of business outcomes as well as social interactions among customers. Web 2.0 can also positively impact business relationships with customers, attract greater traffic to company websites, identify new business opportunities and support product and brand development (Michaelidu 2011). It also permits businesses to provide high quality products, be in a better position for predicting market trends, and optimise the effectiveness of their marketing campaigns (Constantinides et al 2008). Looking at the opposite side, Web 2.0 can result in greater customer control and value creation. In the era of Web 2.0, perceptions, preferences and decisions of customers are influenced in a two-fold manner - information provided by e-commerce websites, and content generated by people on social networking websites (Constantinides and Fountain 2008).

Social commerce being a combination of e-commerce and Web 2.0 (Constantinides et al 2008), and design having a role to play in both, it is a foregone conclusion that design features will have a bearing on social commerce. The goal of design in e-commerce is to improve customer interaction, help in decision making by customers and encourage customers to indulge in repeat buying behaviours (Helander and Khalid 2000). The elements which come to the fore in the design process include the following:

(a) Usability

This is one of the most important factors in e-commerce design (Lee and Lee 2011). As per the International Standards Organisation (2008), usability is the effectiveness, efficiency and satisfaction achieved by specific users vis-a-vis specific goals in a specific context of use.

(b) Information Quality

This is a major factor in e-commerce as it is a source of value for the customers (Molla and Licker 2001). It can be described as the relevance, accuracy, understanding and usefulness of information provided by the e-commerce website (Susser and Ariga 2006).

(c) Website Quality

This refers to the performance of the e-commerce system with regard to delivery of information and services (Liao et al 2006). This has a substantial impact on customer related factors like purchase decision (Liang and Lai 2002), satisfaction (Chu et al 2007) and trust (McKnight et al 2002).

(d) Service Quality

This is another important factor in the design of e-commerce websites. It can be understood as online support capabilities provided by the e-commerce providers (Wolfenbarger and Gilly 2003). It can include a variety of helpful features such as frequently asked questions, order tracking and complaint management.

(e) Playfulness

Several designers have stressed on this point. It relates to the enjoyment experienced by the customers while dealing with e-commerce websites. A satisfied customer may derive pleasure from both material and emotional features (Jarvenpaa and Todd 1996). Besides raising customer motivation, this kind of enjoyment can also ensure repeat visits by the customer.

5. Conclusion

E-commerce is a growing phenomenon, which is expected to grow even more in the future. In such a background, the design of e-commerce websites becomes a very essential consideration with a view to business growth and consolidation of markets. With that objective in mind, it is worthwhile to invest in HCI as a means of getting the most effective website design possible.

In the preceding sections, we have observed how it is possible to classify websites chronologically on the basis of the design attributes. Accordingly the websites can be categorised into those which belong to the pre-web era, the reactive web era, the interactive web era and the integrative web era.

Again, we have also considered the phenomenon of social commerce emerging from e-commerce with the onset of Web 2.0. Some of the salient design requirements resulting from this include usability, information quality, website quality, service quality and playfulness.

Thus it is possible to optimise on the performance of an e-commerce website keeping in mind the necessary design attributes and the ongoing trends in markets as well as online behaviour of the customers.

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