

Internet e-Commerce: buying the book and catching the plane

David Whiteley , Ian Hersey, Keith Miller and, Pamela Quick

Department of Computing and Mathematics
Manchester Metropolitan University, UK

Abstract

Internet e-Commerce is predicted to become a major sales channel but there are many shortcomings to be rectified before it can fulfil its potential. One of these issues that needs addressing is that of usability; if e-Commerce is to be adopted outside a closed circle of Internet aficionados then it will need to be much more user friendly than is the case at present. This paper proposes a model of web site functionality and usability and reports on a survey of a number of web sites where the model was applied. The model is proposed as a checklist for designers of web sites and as a tool for those who wish to evaluate the e-Commerce facilities that are available on the Internet.

Introduction

Internet e-Commerce has, over the last couple of years moved centre stage in the thinking of many companies and of government. As this paper is prepared for publication, the British Government has appointed an e-Minister and the Prime Minister has declared:

'To British business I deliver a pretty blunt message: if you don't see the Internet as an opportunity, it will be a threat. ... If you're not exploiting the opportunities of e-Commerce you could go bankrupt.' (Teather, 1999)

However Internet e-Commerce, as a sales channel, is not without its problems. Many customers (or potential customers) do not have easy access and many of those that do are concerned about security. Further, less publicised, problems for e-shoppers are finding appropriate web sites, issues surrounding the delivery of goods, concerns about after sales service and the basic problem of getting the e-shop to work. As Rhoades (1999) says:

'if a site is not designed with usability in mind, people will be frustrated with the site. People that are frustrated with the site don't bookmark, don't buy, don't revisit, and won't tell other people about the site.'

It is the issue of site usability and assessing that usability that this paper addresses. The paper presents a web usability assessment model. The model is applied to / tested on a number of airline web sites and a summary of the findings is included. The original intention was to also apply the model to a number of e-Bookshops (hence the title) but this plan was later dropped in favour of extending the range of the airline websites that were evaluated.

Background

e-Commerce is relatively new and both the design principles and technology used for web sites are still evolving. There is a suspicion that web sites are designed by geeks to be used

by anoraks; not an approach that will do if e-Commerce is to become a mainstream way of selling. As Mark Hurst, a web design consultant (quoted by Tilson, et al, 1998) says:

'it is ease of use, it is ease of use, why doesn't the industry get that'

If ease of use is to be developed then one approach is to its promotion is to check out what works and what causes difficulty.

Schaffer and Sorflaten (1998) suggest that web sites should be tested by analysing the revenues and the repeat visitors that web sites obtain. Although users generally fail to recognise good and bad design (Andre and Wickens, 1995) they argue that the market place is ultimately a stern and accurate judge. Similarly Selz and Schubert (1998) articulated the idea that in order to identify general success factors, it is necessary to look at web sites that are actually yielding profits:

'profitable web sites can offer best practice examples. Providers of less successful e-Commerce applications can be compared against profitable ones with comparison profiles suggesting areas for improvement.'

Fair point but which web sites are yielding a profit, not very many of them, not even the much vaunted amazon.com.

A second approach to evaluating websites is that of surveying users. This is an approach taken by the Gvu survey (reported by Schaffer and Sorflaten, 1998) who found marked differences between novice and experienced users. Whiteley (1998a and 1999b) also found that many of a group of students, with little e-Commerce experience, had considerable difficulty when set an online shopping task.

The approach taken in this paper is to develop a model to evaluate e-Commerce sites. This involves identifying different stages in the transaction cycle between a business and the consumer. Schmid and Lindemann (1998) put forward the idea of analysing e-Commerce web sites with reference to a process model that links the main tasks of the buyers and merchants; this model identified: information, negotiation and settlement, as the three main stages.

Guttman, *et al* (1998) similarly defined the trade cycle but came up with the different categories of: needs identification, product brokering, merchant brokering, negotiation, purchase / delivery and service / evaluation.

Whiteley (1998b) divided the trade cycle into four categories: pre-sale, execution, settlement and after-sales but further sub-divides these stages as follows:

- | | |
|---------------|---------------|
| ◆ Pre-sale | ◇ Search |
| | ◇ Negotiate |
| ◆ Execution | ◇ Order |
| | ◇ Deliver |
| ◆ Settlement | ◇ Invoice |
| | ◇ Payment |
| ◆ After-sales | ◇ After-sales |

Selz and Schubert (1998) put forward a process model for analysing e-Commerce web sites. This model provided a set of criteria to assess an e-commerce web site from both an external and internal perspective. They adapted Schmid's model as described above, divided the process into three phases and added a additional concept of community. The Selz and Schubert phases are:

- Information phase: customers collect information on potential products and services.
- Agreement phase: negotiations between suppliers and customers take place to fix the product specification, payment detail and delivery.
- Settlement phase: physical or virtual delivery of the product. Also includes possible after sales service such as help desk support.
- Community phase: serves as a tie between customers with similar interests and links products more firmly with potential customers. Shared beliefs allow for the building of communities that generate a certain level of trust among their respective members.

Selz and Schubert also took a marketing concept and applied it to the transaction cycle. In marketing the aim is to offer the customer not just a product, but to endeavour to propose a specific solution for individual customer segments, if not for each customer themselves. So companies need to offer integrated solutions embracing the: core product, external bundling, generic services, customer profile and community. For each stage of the cycle the site is evaluated to see how well it performs in each of these categories. In each transaction phase, different factors are deemed to be crucial, quite important or not important. For example in the information phase, the core product is crucial, in the agreement phase the customer profile is crucial, etc.

In another approach, Smithson (1999) developed what he called an E-audit methodology and applied it to the web sites of 100 large companies. Smithson divided the transaction cycle into seven dimensions. The method uses a trade cycle approach but moves towards integrating it with factors taken from the study of human computer interaction (HCI). The seven stages Smithson outlines are as follows:

- Company information.
- Advertising and promotion.
- Product information.
- Order.
- Settlement (payment).
- After-sales service.
- Ease of use/innovation.

Model

The model proposed by this paper is shown at **Figure 1**.

The model incorporates a trade cycle approach. Schmid initially broke the trade cycle down into information, negotiation and settlement. Whiteley (1998b) and Guttman, *et al*, (1998) broke the trade cycle down into more distinct parts, both of which played a valuable part in the formulation of the model. Selz and Schubert identified community as an important

attribute of successful trade in a virtual environment and this has also been incorporated in the trade cycle.

Smithson (1999) also uses a trade cycle approach but introduces ease of use and ease of navigation, factors that should be assessed for each phase of the trade cycle as opposed to being seen as a separate stage. The model proposed introduces the factors of: navigation, ease of use, aesthetic effect and innovation, as a second dimension to be assessed across all stages of the trade cycle (excluding search, a stage that is outside the ambit of the specific e-Commerce site); the model further recognises that navigation is of greater significance in the early and later stages of the trade cycle whereas ease of use assumes greater importance in the centre stages as the transaction is executed.

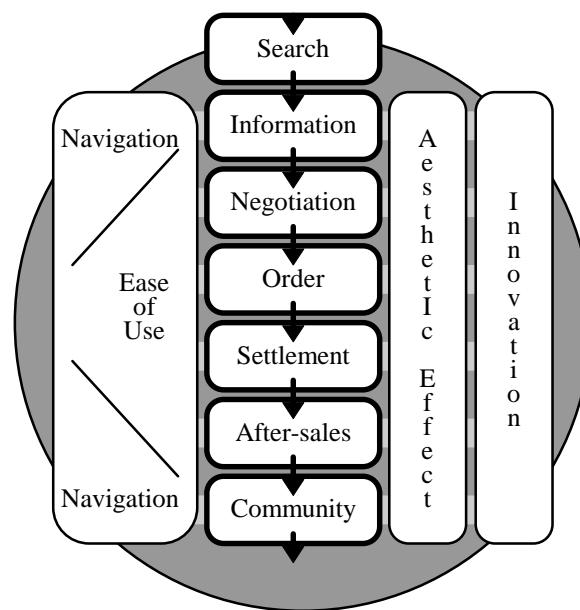


Figure 1: Web Evaluation Model

For the purposes of this study, the model is used to formulate a questionnaire with each attribute of the model to be assessed on a five point Likert scale. The questions are:

- Company Information: The web site gives me all the information a person could reasonably require on the company before undertaking an e-Commerce transaction.
- Product Information: The web site contains all the product information which a person could reasonably require before undertaking an e-Commerce transaction.
- Negotiation: The web site allows all the customisation of the product / price that the user could reasonably expect.
- Order: The web site provides as comprehensive a range of options for ordering the product or service as could reasonably be expected by the user.
- Settlement (Payment): The web site provides as good a range of payment options as could reasonably be expected.
- Settlement (Delivery): The web site provides as wide a selection of delivery options as could reasonably be expected which are generally satisfactory, convenient and reassuring.

- After-sales Service: Overall the after-sales customer support service on offer is excellent.
- Aesthetic Effect: Overall the web site is aesthetically pleasing.
- Ease of Navigation: Overall the site was extremely easy to navigate.
- Ease of Use: Overall the site was extremely easy to use.
- Innovation: The web site is extremely innovative.
- Community: The web site fosters community excellently.

The assessment of each phase / attribute is supported by a series of subsidiary questions (space precludes their inclusion). Note that the Search phase was not included in the questionnaire as it was not possible to provide for an objective assessment within the scope of the project.

Airlines

The model once developed was tested on a number of airline sites. Eighteen airlines were selected for analysis, on a case study basis, and fall into the following categories:

	Western Europe	North America
Major International Airlines	Air France British Airways (BA) Lufthansa	American Airlines (AA) Delta United Airlines
Other International Airlines	Iberia Virgin	US Airlines Canadian Airlines
Regional Airlines	EasyJet Ryanair KLM UK Crossair	Alaskan Atlantic Coast Sky West South Western

The web sites, for each of these airlines, were examined by one assessor during August 1999. The assessment was assisted by the questionnaire but also relied on the skill and judgement of the assessor. Sites that are criticised may have been updated since the assessment were made. Problems with performance or malfunctioning of the sites may have been isolated incidents (although some of the errors persisted throughout the period of assessment) or may have subsequently been rectified.

The assessment of the airline web sites (in a very abbreviated form) is shown in **Figure 2**:

airline	score	comment
Air France	61%	Attractive web site with decent information. Only allowed online booking for US based customers.
British Airways	64%	Comprehensive web site - can be difficult to navigate. System produced errors on more than one occasion.
Lufthansa	82%	Comprehensive web site that is also quick, responsive, useable and attractive. Good payment information and options.
American Airlines	64%	Comprehensive web site that can be difficult to navigate. Showed competitor flights. Produced error on one attempt to order.
Delta	74%	Comprehensive attractive and quick. Only allows bookings for US based customers.
United Airlines	68%	Comprehensive, attractive and easy to use. Only allowed booking for US based customers.
Iberia	58%	Slow, ugly and amateurish. Registration required before use.

Virgin	72%	Attractive, concise and rapid - the site is still under construction
US Airlines	65%	Unattractive and slow. Bookings only available to customers based in the US or Canada.
Canadian Airlines	75%	Innovative, attractive and responsive. Only allows bookings by Canadians and for flights originating from Canada.
EasyJet	63%	Concise and easy to use. Provides less (background) information than other airlines.
Ryanair	47%	Ugly, slow and amateurish. Booking delegated to an online travel agent
KLM UK	61%	Sparse and ugly. Only allows bookings for UK or Eire based customers.
Crossair	76%	Attractive, informative and responsive
Alaskan	71%	Quite attractive and useable with a decent amount of information. Booking restricted to US credit card holders.
Atlantic Coast	59%	Contains basic information but delegates bookings to the United site. What it does do is done in style.
Sky West	59%	Contains basic information but delegates booking to United and Delta. What it does provide is well done.
South Western	81%	Beautifully designed, very quick, incredibly useable and provides excellent information.

Figure 2: Summary of assessment of Airline Websites

The 'score' is derived from the 12 Likert scale questions that were associated with the model; the calculation applied differential weightings to the various factors.

Where the evaluation model is used as a tool for a process of site evaluation and improvement then the individual factors would need to be examined. **Figure 3** plots the scores for the highest scoring major international carrier (Lufthansa) against the lowest scoring (Air France). Similarly, **Figure 4** plots the highest scoring regional (South Western) against the lowest scoring (Ryanair).



Figure 3: Attribute Scores for Lufthansa and Air France

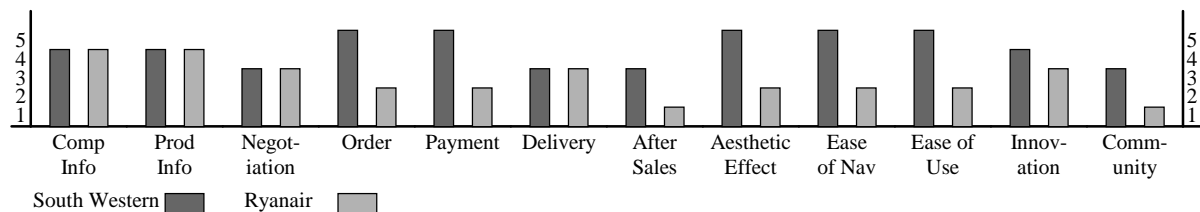


Figure 4: Attribute Scores for South Western and Ryanair

The following observations were made as the model was applied to the airline case studies:

- Company Information: Comprehensive on all except two of the web sites. Company information is seen as an important reassurance to potential customers (Sission, 1999). All the airlines covered were already established brands so having information about the company is less important than if the company was a start-up e-shop.
- Product Information: Three categories of information were identified and assessed:
 - Flight details, including the ability to search for flights by departure point, destination, date and time.
 - Other travel requirements (e.g. car hire and hotels) and travel information.
 - Customer information, including the requirement for pre-registration before the site can be used.

Not surprisingly virtually all studies show product information as a vital component of a web site (Schaffer and Sorflaten, 1998; Nielsen, 1999). For a complex product, such as a multi flight travel requirement (as opposed to point to point journeys on regional airlines), ease of search and presentation of the resulting options are vital.

Customer registration before obtaining information or placing an order is a debatable issue. Scission (1999) believes that users do not expect '*to authenticate themselves before they are ready to purchase*' whereas Rhoades (1999) stresses the potential for the use of individual customer profiles that facilitate an individual service. The approach among the airlines studies included, for example AA which required registration before the site was used and BA that did not require registration at all (although obviously BA required customer details when an order was placed).

- Negotiation: There is limited scope to negotiate with an airline over the price or specification for a booking. Canadian airlines offered a facility for an online auctions using air miles.
- Order: The detail required for the order process, in part, depended on the requirement for prior registration. Help with the order process for novice users was seen as a significant factor and one where Lufthansa and South Western excelled. Some airlines limited online bookings to specific markets, e.g. Delta only provided for US based customers whereas BA had no such restrictions.
- Settlement: Settlement was seen as having two aspects:
 - Payment.
 - Delivery of the ticket or use of e-tickets.

Studies have shown that customers are concerned about credit card security (Whiteley, 1999b); Tilson, *et al*, 1999; Windsor, 1998). A surprising number of airlines did not give information / reassurance on this aspect (at least before an order was placed). Only two airlines provided alternatives to credit card payments. Rhoades (1999) references amazon.com as the model of how to deal with payment and, of the airlines studies, only Lufthansa meets that standard.

- After-sales service: This category was interpreted as covering:
 - The frequent flyers programme (where applicable).
 - Customer queries and customer feedback.
 This interpretation had some overlap with the community phase.
- Aesthetic Effect: Having a professional looking web site as a means of encouraging trust and credibility among potential customers (Sisson, 1999; Nielsen, 1999); with a couple of exceptions, all the sites met this requirement. Most airlines followed the HCI consensus (Boyle, 1997; Seigel, 1996) of a white or light grey background with a coloured margin for links and a discrete company logo; exceptions to this included Virgin with a red background and KLM with sky blue; the former was judged a success but not the latter.
- Ease of Navigation: Most of the web sites could be navigated easily. Some sites such as EasyJet and Virgin seemed to be aiming for a sleek, concise, easily navigable web site. Sites with a great wealth of information were sometimes more difficult, e.g. BA and AA but Lufthansa, South Western and Crossair showed it was possible to combine ease of navigation and comprehensive information. Features that assisted ease of navigation included: an alphabetical index (BA); a site map (AA) and a search engine (Delta and others). The criteria for easy navigation is a clear hierarchical structure with a good combination of global and local site navigation tools.
- Ease of use: A principal factor identified in ease of use (as distinct from ease of navigation) is the speed of the web site and some notable differences were observed during the assessment of the sites: Ryanair, Iberia, US Airlines and, on occasions, BA were noticeably slow. Other ease of use factors included:
 - Reliance on Airport Codes (although the use of city names can also be problematic).
 - Unhelpful error messages, e.g. 'There are no flights at the time or date specified'.
 - Errors and dead links, BA was an offender in this category.
- Innovation: Whilst most features of airline booking sites are fairly standard a number of airlines have innovative features. These ranged from: video clips from the cockpit (BA); a booking assistant (Lufthansa) and a Java seat mapper with the layout of the plane and allowing customers to choose their seats (United and US Airlines).
- Community: Attempts to foster a sense of community among their customers was very limited; perhaps that is the nature of the product. Several sites provided for one or more of the following:
 - Facilities for the customer to establish a profile and in some cases check air miles.
 - Customer feedback on the web site and more general customer service issues, one site provided a message board.
 - Special offers and promotions sent by e-mail.

Conclusions

Generally the Web Assessment Model proved a useful tool for the analysis of e-Commerce enabled web sites. The model married the two previously disparate approaches of a process oriented analysis involving the stages within the trade cycle and the HCI approach that treats a web site as a user interface. Overall the model contained all the elements necessary for the assessment of web sites. There were however three areas that, on the basis of the evaluation, require further examination:

- Product Information: As well as product information this stage was used to assess customer information / registration requirements; the two elements are both important and disparate and seem to merit separate stages.
- Settlement: This stage encompassed payment and delivery; an issue that was recognised by giving each requirement a separate assessment in the questionnaire. Logically they seem to merit separate stages.
- Navigation / Ease of Use: These two topics are closely related and much of the assessment under the second heading was to do with speed and reliability, possibly renaming the second category as Performance would be appropriate.

The use of the web assessment model contrasts with the 'gut reaction' to a site that many of us have as web users. Schaffer and Sorflatten (1998), using the Gvu survey, report that many web users assess a web site as: too slow, disorganised or confusing, or not offering the required service, and move on. Fair enough but not an objective basis for comparing web sites (other than on a two point scale) or for planning improvements.

The issue of search was left out of the study. The ability to find a web site is vital for the user and the vendor and other studies (Whiteley, 1998a, 1999b) illustrate the problem that can arise when searching for an airline sites. Research into search would require a structured experiment using a number of users and is not amenable to the case study investigation approach used in this study.

And as a final observation, it is noted that one web site (outside this study) quoted £572.60 for a round trip London to Toronto when the same airlines booking office gave a telephone quote of £323.30 for the same trip. See Whiteley (1999a) for further discussion of airline e-Commerce and, *caveat emptor* (let the buyer beware)

References

- Andre A. and Wickens D (1995) When users want what's not best for them', *Ergonomics Digest*, 4(4), pp 10-14
- Boyle (1997) *Design for Multimedia*, Prentice Hall
- Guttman R., Moukas A. and Maes P. (1998) 'Agent-mediated Electronic Commerce: a Survey', *Knowledge Engineering Review*, June 1998.
- Gvu (1998) '9th WWW User Survey', Graphic, Visualisation and Usability Centre, http://www.gvu.gatech.edu/user_surveys/survey-1998-04/
- Rhodes (1999) *Credit Cards and Web Site Usability*, <http://www.webword.com/moving/creditcards.html>
- Schaffer E. and Sorflaten J. (1998) 'Web Usability Illustrated: Breathing Easier with your Useable E-Commerce Site', *EDI Forum: The Journal of Electronic Commerce*, Vol. 11, Part 4 pp. 50-52, 57-64, 101

- Schmid B, and Lindemann M. (1998) 'Elements of a Reference Model Electronic Markets', *31st Annual Hawaii International Conference on Systems Science*, Hawaii, Jan 98
- Selz and Schubert (1998) *WA - The Web Assessment Model*, http://www.businessmedia.org/businessmedia/businessmedia.nsf/pages/wa_model.html
- Seigel D. (1996) *Creating Killer Web Sites: The Art of Third-Generation Site Design*, Hayden Books, New York
- Smithson (1999) *Surveying Global Business on the World Wide Web*, <http://www.novell.com/corp/intl/uk/company/web100.html>
- Teather D. (1999) 'Blair puts finger on the e-problem', *Guardian*, 14 Sept 1999, p 23.
- Tilson R., Dong J., Martin S. and Kieke E. (1998) Factors and Principles Affecting the Usability of Four E-commerce Sites, <http://www.research.att.com/conf/hfweb/proceedings/tilson/index.html>
- Whiteley (1998a) *e-Commerce Survey*, www.doc.mmu.ac.uk/STAFF/D.Whiteley/e-Commerce.htm.
- Whiteley D. (1998b) 'Would you buy an ice-cream cone over the Internet?', *Eleventh International Bled Electronic Commerce Conference*, June 1998, Bled, Slovenia.
- Whiteley D. (1999a) Whiteley D. and Miller K. (1999) 'e-Commerce: Flying in the Face of Competition', *BIT World'99*, June 1999, Cape Town, South Africa
- Whiteley D. (1999b) 'Learning to drive e-Commerce', *IeC'99*, Manchester, Nov 1999
- Windsor (1998) 'e-Commerce: Hit of Hype', *Documents*, June/July, pp 36-42