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# Using Co-Operative Evaluation to Explore Travel and Tourism Decision-Making

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## Abstract

This paper reports on the use of 'co-operative evaluation' to investigate tourists' decision making behaviours when using Internet resources. Co-operative evaluation is a qualitative 'think-aloud' technique used to investigate usability problems in interactive systems. In this study, the technique is adapted to examine both interaction problems and decision-making activities of subjects attempting to plan a weekend break to Paris. The results show that existing general accounts of decision-making in e-commerce are not sufficiently rich to describe decision behaviours in tourism. Also, these accounts may be enhanced by reference to descriptions of tourism decision-making that pre-date the development of e-commerce. The findings also suggest that many existing web-based tools to support tourism decision-making are poorly matched to the needs of Internet users.

**Keywords:** decision-support, human-computer interaction, co-operative evaluation, think-aloud, usability, decision-making.

## 1 Introduction

This paper reports on an investigation of users' behaviour in making travel and tourism decisions using Internet resources. Increasing numbers of people are using the Internet to research and purchase travel and tourism services. Travel and tourism make up a significant proportion of business-to-customer e-commerce activity. One major reason for the popularity of the Internet is the opportunity for users to research alternative suppliers, and to compare prices across suppliers. This paper describes a study of users in a simulated travel decision-making situation, and explores the computational support available for such behaviours.

The investigation applies the technique of 'co-operative evaluation' (Monk et al. 1993). Co-operative evaluation provides interactive systems designers with qualitative and diagnostic feedback on their existing designs, and can form an important part of a

participatory design strategy. Here, this technique is adapted in order to explore models of the structure of decision-making behaviours in tourism and in e-commerce (e.g. Wahab et al., 1976; Moutinho, 1987; Maes et al., 1999; Miles et al., 1999; Fesenmaier & Jeng, 2000), and to inform future designs for user-centred decision support tools in travel and tourism.

## **2 Issues**

It is widely recognised that interactive systems design should be guided by an understanding of users' goals, task structures and context of use. As more and more individuals use the Internet to plan travel and tourism, it is increasingly important to consider how users interact with systems when making such decisions. This research has been conducted in order to inform the design of new tools and techniques to support users in organising and managing tourism decisions.

A number of models have been proposed to describe the process of decision-making in e-commerce. Miles et al. (1999) posit a model with three-components, namely: search; comparison of alternatives; and criteria management, which involves adjusting previously specified constraints in response to information gathered, to ensure that some alternatives are available for consideration. Williamson & Shneiderman (1992) present 'dynamic query' interfaces, in which users can alter constraints and obtain immediate feedback about changes in the available result set. This approach can provide strong support for 'criteria management'. The influence of this design is evident in many flight and holiday booking websites, where users can relax or modify criteria after an initial search.

Maes et al. (1999) provide a broader perspective identifying six distinct stages of: need identification, 'product brokering', 'merchant brokering', 'negotiation', 'purchase & delivery' and 'service and evaluation'. Silverman et al. (2001) integrate these two models and extend them to include customer relationship management concerns such as personalisation, user preferences and customer help. Häubl & Trifts (2000) and Jedestki et al. (2002) suggest that on-line shoppers combine an initial screening of alternatives with later detailed comparison of a small number of selected candidates. Loban (1997) suggests using scoring functions based on utility theory to support comparisons. However, tourism decisions are unlikely to meet the assumptions needed to justify simple linear utility functions (see Vincke, 1992). Dearden (1995) demonstrates a range of interaction techniques, beyond simple numerical scoring, that can be used to create partial orders over a set of alternative purchases. Shearin & Leiberman (2001) suggest interaction techniques that can be used to elicit information about user preferences for different attributes of a product set. Designs using other decision-models such as outranking methods (Vincke, 1992) may also be worth investigating.

These approaches are still limited in the case of tourism for two main reasons:

- Firstly, they assume that all the alternatives can be described using a uniform set of attributes. But independent travellers may choose to construct their own ‘package’ by configuring a range of heterogeneous elements, e.g. flights, accommodation, car-hire, activities etc. drawn from different suppliers (Ricci, 2002, Fesenmaier & Jeng, 2000).
- Secondly, they do not consider the intangible and affective nature of many of the attributes that the tourist will consider (Moutinho, 1987). Such attributes are difficult to implement as computational constraints.

Fischer (1996) reports on a range of ‘domain-oriented design environments’ that interact with users in complex configuration activities. These systems include case-based reasoning, computational critics and explanation components. However, they do not address the intangible and affective dimensions relevant to tourism decisions.

Other researchers have offered accounts of decision-making behaviour specifically in the domain of travel and tourism (e.g. Wahab et al., 1967; Moutinho, 1987; Woodside & MacDonald, 1994; Loban, 1997; Fesenmaier & Jeng, 2000). However, many of these models pre-date the widespread adoption of business to customer e-commerce.

This situation suggests three questions:

- a. Are general models of e-commerce decision-making sufficiently detailed to account for tourism decisions?
- b. Are models of decision-making in tourism that pre-date the widespread adoption of the Internet still relevant?
- c. To what extent do the designs of existing Internet sites offering travel and tourism products adequately support the decision-making processes?

The investigation described below addresses these questions.

### **3 Methods**

#### **3.1 Selecting methods**

The practicalities of understanding user decision-making processes in tourism raise a number of methodological issues for HCI. Researchers in HCI are constantly faced with the dilemma of selecting between controlled experimental methods in which users behaviour can be closely examined, but only in an artificial environment, and observational methods where users are studied in their ‘natural environment’ but where the data collected is messy and difficult to interpret (Dix et al., 1998; Hughes et al., 1995). This problem is compounded when the behaviour to be studied takes place in the home rather than the workplace, and when the behaviour involves complex ‘knowledge intensive’ tasks.

### **3.2 Co-operative evaluation**

"Cooperative evaluation" is a 'think-aloud' protocol, in which the user is encouraged to see himself as a collaborator in the evaluation rather than just a subject (Monk et al., 1993). In a co-operative evaluation, a user is asked to perform a given task using the tools to be evaluated. As the user performs the task, the experimenter encourages the user to explain what they are doing, and their responses to the tools. For example, the experimenter might ask 'what do you think you need to do next?', 'did you expect that to happen?', 'can you explain why you are following that link?' or, if the user is not engaged in any observable actions, 'what are you thinking about now?'. Likewise, the user can ask the evaluator for clarification if problems arise. It is important that the user is encouraged to actively criticise the system rather than just performing the task. The users behaviour and comments can be recorded for later detailed analysis using a variety of media, e.g. video, audiotape, or simply hand written notes.

In this study, the method was adapted to include questions about both the user-interface and about the users' decision-making considerations. This adjustment is consistent with think-aloud protocols as used for knowledge capture in the KADS methodology for knowledge-based systems (Hickman et al. 1989).

### **3.3 Procedure**

Each subject was given an open task to perform, which was to plan a weekend trip to Paris for themselves and their partner, in a given month (about 2 months from the date of the experimental session). Subjects were asked to find the 'best deal' for their trip. Subjects were provided with two URLs for websites, one of which provided package breaks to the chosen destination ([www.bargainholidays.co.uk](http://www.bargainholidays.co.uk)) and one that supported hotel booking in the chosen city (e.g. [www.france-hotels.net](http://www.france-hotels.net)). The instructions informed the user that if they could not find the accommodation they wanted on the first website, they could visit the second website. The instructions did not forbid the subjects from visiting other websites; nor did the instructions discuss what a 'weekend' might consist of (e.g. Friday to Monday, Friday to Tuesday, Saturday and Sunday only etc.). If the subjects asked about these restrictions, they were informed that they were completely free to interpret the instructions as they wished.

Matchware's ScreenCorder® and Camtasia® Studio software were used to record subjects' behaviour. These tools record on-screen activity and audio input from a microphone. The resulting recordings can then be replayed using a variety of media players. A typical recording session lasted between 30 minutes and 1 hour. Rough working on paper and pencil, or printed output was also retained for later analysis.

### **3.4 Subjects**

The subjects were students and staff at a UK university, including both UK and Malaysian nationals. The majority of subjects were based within the computing department. All of the subjects were regular computer users and all had experience of

researching or purchasing goods and services using the Internet. This subject group was selected to minimize the possibility that basic interaction problems would undermine the subjects' ability to progress their decision-making.

### **3.5 Data analysis**

The data was analysed by comparing each recording with each of a set of different models that describe users' decision-making behaviour in e-commerce or in travel and tourism. Each model was abstracted to identify a set of key elements, for example stages of the decision-making process or specific activities identified by the model. These elements were then used as a coding scheme to identify events within the recordings that corresponded to the given element. Additionally, user-errors (or more neutrally, 'interaction failures') were noted. The selected events and their time of occurrence were noted. Where significant events were observed for which the current model did not provide a suitable account, these events were also noted.

The main accounts selected for investigation, based on a prior literature review, were the tourism models of Wahab et al. (1976) and Moutinho (1987); and the e-commerce models of Miles et al (1999) and Maes et al. (1999). The data was also informally compared with other discussions of tourism decision-making including Woodside & MacDonald (1994) and Fesenmaier & Jeng (2000).

## **4 Results**

Data was collected from nine sessions, four females, four males and one couple. The age range was from 20 to 60. On two occasions technical difficulties resulted in loss of the recording. One subject eventually refused to attempt to find a holiday on the web, explaining that he found the websites visited too difficult to use. The other eight sessions all reached the point of considering one or more alternative holiday plans. Events are described using the format S# for subject number, and a four digit time referring to the time shown on the recording. The results address the three questions outlined in section 2, but begin by examining pre-Internet tourism decision models.

### **4.1 Are pre-Internet models of tourism decision-making still relevant?**

Existing accounts of tourism decision-making provided by Wahab et al. (1976) and Moutinho (1987) both contain many detailed elements that are absent from typical models of e-commerce. The data indicates that these models still contain useful insights for the design of decision-support tools in the context of e-commerce.

Wahab et al. (1976) claim that tourists develop a '*conceptual framework*' consisting of hypotheses about alternative satisfactions that guides their decision-making. These Subjects made various comments that support this contention, for example one subject explained that it was important to be near to the 'cultural' attractions in Paris [S3, 11.30ff]. Another subject discussed his aim of ensuring he arrived in Paris early

enough to enjoy two evenings out, and his desire not to travel too far to the departure airport when planning a weekend trip [S6, File 2, 15:06ff].

Moutinho (1987) distinguishes between *internal and external search*. All the subjects made some use of their previous knowledge in searching for options (internal search). Many navigated to websites that they already knew. Some made use of their existing knowledge of Paris when selecting hotels [S3, 13:00ff]. External search was also evident with subjects using search engines to look for "hotels in Paris" or "Flights to Paris" [S2, File 2, 15:50]

Wahab *et al.* (1967) suggests that after gathering facts to inform decision making, tourists test the validity of the evidence collected when generating their assumptions. Moutinho (1987) refers to a similar process as '*stimulus filtration*'. Some subjects explained that they were extremely suspicious of data provided by web-sites [e.g. S7, 09:30ff; S2, 27:15ff]. Other subjects were concerned whether prices shown included all the elements of the package, including taxes [e.g. S6, File 2, 5:20ff; S2, 22:18ff]. Some subjects were less cautious, but this may reflect the fact that the exercise was simulated and did not involve the subjects in real expenditures.

Wahab *et al.* (1967) suggest that tourists *define assumptions* when making their decisions. Two subjects [S1 & S6] discussed the quality and convenience of the Paris Metro and indicated that they would therefore consider hotels over a wider area.

Moutinho (1987) suggests that decision-makers will reject certain alternatives as '*infeasible*', and will construct a more limited '*choice set*' before actually conducting detailed comparisons. Häubl & Trifts (2000) suggest a similar two-stage process of 'filter' and 'compare'. Many subjects did not construct more than two complete packages. A number of cases were observed where options for one part of the package, e.g. a hotel or flight, were rejected and removed from further consideration before a conducting a more detailed comparison.

Both Wahab *et al.* and Moutinho include stages where the costs and benefits of different alternatives are evaluated and compared. Similar stages are evident in Miles *et al.* (1999) and Maes *et al.* (1999). All the subjects conducted some comparison.

Finally, Moutinho (1987) suggests that when a small shortlist of alternatives has been constructed, tourists may engage in additional information search to *reduce the perceived risk* of making a decision that they will regret. One subject explained how photographs of typical rooms, and the area surrounding the hotel helped them 'feel more comfortable' with their decision [S3, 18:00ff].

In summary, the data suggests that accounts such as those of Wahab *et al.* (1976) and Moutinho (1987) remain relevant in the context of tourism decision-making using Internet resources.

#### **4.2 Are general e-commerce models sufficiently detailed?**

General e-commerce models such as Miles *et al.* (1999), Maes *et al.* (1999) and Silverman *et al.* (2001) are typically presented at a higher level of abstraction than the models of tourism decision-making discussed above. For example, none of these

general models distinguish between *internal and external search*. Similarly, these models discuss decision criteria, but do not examine its relation to the broader *conceptual framework* that informs the decision. Silverman et al. (2001) include a discussion of trust, but do not relate it to any process analogous to *stimulus filtration* as described by Moutinho (1987). However, these general models do contain some distinct elements that extend beyond the scope of pre-Internet tourism decision models.

Miles et al. (1999) highlight the process of '*criteria management*' where a decision-maker adjusts his or her initial criteria in response to data collected. Some examples of this were observed. One subject initially wanted to fly from Manchester airport, but then weakened this constraint by looking for flights from another, slightly less convenient airport [S6, File 2, 14:40]. Another subject made changes to their preferred travel time in an attempt to find cheaper options [S1, 10:40].

Maes et al's (1999) include 'merchant brokering' as a distinct element of e-commerce decision-making. Most of the subjects considered options drawn from a variety of providers.

Such observations suggest that criteria management and merchant brokering should be considered when designing tools to support tourism decision-making. More generally, they suggest that models developed to account for decision-making in e-commerce might be used to extend previous accounts of decision behaviour in travel & tourism.

#### **4.3 How effective is current on-line support for tourism decision-making?**

The data reveals a number of significant limitations of the web in comparison with the observed needs of the subjects. Some of these limitations might be addressed by redesign of existing websites, but others may be constrained by the current state of web technology. Future technological developments (e.g. the use of XML) may impact the feasibility of addressing these limitations within websites.

##### **4.3.1 Support for comparison**

Although many sites provided opportunities to compare alternative packages from the same supplier, subjects found it difficult to compare offerings from different suppliers. In a follow up interview, one [S7] explained his preference for paper catalogues by recounting how he would place three or four open brochures together on the lounge floor in order to perform comparisons. All the subjects had to resort to external representations, usually pencil and paper, to record details of products and prices offered by different vendors. Two subjects [S3 & S8] printed out web pages in order to maintain a copy of the offer. Subject 1 opened a new browser window for each vendor that he visited so that he could refer back offers that he had discovered. After subjects had satisfied themselves that they had conducted a sufficiently broad search to allow them to make a choice, many would need to return to the website and re-enter their travel dates and constraints before they could make a purchase. None of the subjects found opportunities to 'reserve' a booking. None of the sites permitted



the user to add their own comments details to the comparison tables offered, although subjects commonly mentioned decision criteria derived from what Moutinho (1987) terms '*internal search*' that they were using.

#### **4.3.2 Support for criteria management**

Most sites offered poor support for criteria management. For example, on one hotel booking website a subject investigated the availability of one hotel, decided that it was too expensive, and then went to investigate a second (cheaper) option. However, the subject was required to re-enter details of her travel plans (dates, number travelling, required room type etc.) [S4, 17:00-18.30]. Another subject was frustrated when, after conducting a search that returned no results, he used the browser back button to return to the search page, but discovered that his preference information had been lost and he needed to re-enter these details. Some sites offered an improved design where users selection criteria are displayed on the same page as the results and so can be reviewed and updated easily if the user is unhappy with the first set of results returned. Other sites offered the chance to search for 'earlier' or 'later' travel options. This type of information about search criteria is valuable within sites, but for users it remains consistent throughout their search task.

#### **4.3.3 Support for portability of constraints**

Many subjects adopted a strategy of initially selecting a package or a flight + hotel combination, then seeking to arrange rail travel to the airport (or international rail terminal) last. For that reason, their requirements for arrival times at the airport were already established. One subject had to refer to their hand written notes to remind themselves of the flight times [S3, 06:10]. Another subject finished with an overnight return rail journey that would include a 5-hour change of trains [S1, 40:00ff].

#### **4.3.4 Support for price calculation**

All the websites visited provided price calculations, but it was difficult for subjects to calculate the overall price of their holiday. Seven of the nine subjects resorted to paper and pencil calculations. In one case [S2], the subject's calculation only includes the price for one night at the hotel she was considering, not the two nights for two people that her travel plans required. Currency conversion imposed an additional burden for some subjects when dealing with multiple suppliers [S5, 40:30ff].

#### **4.3.5 Support for 'risk reduction' and 'stimulus filtration'**

The two subjects who engaged in later risk analysis activities were particularly concerned about the whereabouts of their hotel. Although the websites provided photographs and marketing information about the hotel locations, both subjects felt that they needed further information to confirm their decision. Subject 3 [13:00ff] felt that their existing knowledge (internal search) was sufficient to support their decision. Subject 7 reported that he was extremely suspicious of marketing information provided by vendors, and would seek data from an impartial information source.

#### **4.3.6 General interaction failures**

A large number of interaction failures were observed. Examples included:

- A user repeatedly clicking on an interactive map, expecting that this corresponded to selecting a particular hotel, when in fact the map was in a separate pop-up browser window and had no impact on their main search [S6, File 2, 00:00ff];
- A user finding no results because they thought of their weekend as a holiday with a duration of 3 days, rather than using the specific term 'city break' [S1, 25:00ff];
- A user abandoning a search for flights from their preferred airport because the drop down list of destinations appeared not to include Paris, when in fact the drop-down listed a number of major airports in alphabetical order first (from A to Z) before going on to a second list of other airports [S3, 2.30ff];
- A user finding only 'premium' fares of £500 from London to Paris because he had failed to indicate interest in standard fares on a previous page [S1, 07:00ff].

All of the subjects were experienced computer and Internet users. If these users experience high levels of interaction failure, this suggests that Internet vendors still have much work to do if they wish to achieve high levels of customer satisfaction.

## 5 Conclusions and further work

This investigation was prompted by three questions:

- a. Are general models of e-commerce decision-making sufficiently detailed to account for tourism decisions?
- b. Are models of decision-making in tourism that pre-date the widespread adoption of the Internet still relevant?
- c. To what extent do the designs of existing Internet sites offering travel and tourism products adequately support the decision-making processes?

The results demonstrate that detailed behaviours such as those described by Moutinho (1987) and Wahab et al. (1967) can still be observed in the context tourism e-commerce. These behaviours are not represented in general models of e-commerce, such as Miles et al. (1999), Maes et al. (1999) or Silverman et al. (2001). However, such general models of e-commerce may contribute useful additional insights for the travel & tourism domain. The results also support more recent observations on the interconnected nature of the tourism decisions (Fesenmaier & Jeng, 2000; Ricci, 2002). Finally, the results indicate that the Internet sites visited by the subjects provide only limited support for the decision-support needs of their customers.

A more general observation is that the technique of co-operative evaluation (Monk *et al.*, 1993) can be adapted to provide useful information on the usability of tourism websites and associated tools.

Future work is planned to design and evaluate new tools to support decision-making in tourism. Tool design will be targeted at relatively experienced computer users, and will permit such users to collate information from diverse sources (including both web-based, paper and 'word of mouth') and in diverse forms and to organise the

information to support decision-making. The proposed tool should allow the user to configure a package by integrating components from different suppliers, and should support criteria management, support for 'risk reduction' activities, and assist users in considering intangible and affective aspects of the decision.

## References

- Dearden, A.M. (1995). *Improving the Interfaces to Interactive Case Memories*. In Ian D Watson (ed.), *Progress in Case Based Reasoning*, No. 1020 in *Lecture Notes in Artificial Intelligence* (pp. 73 – 84). Berlin: Springer.
- Dix, A., Finlay, J., Abowd, G., Beale, R. (1998). *Human Computer Interaction (Second Edition)*. Prentice Hall Europe.
- Fesenmaier, D. R. and Jeng, J.-M. (2000). Assessing Structure in the Pleasure Trip Planning Process. *Tourism Analysis*, 5, 13 – 27.
- Fischer, G. (1996). Domain-oriented design environments. In, *Automated Software Engineering* (pp. 177-203). Boston, MA: Kluwer Academic Publishers.
- Häubl, G. and Trifts, V. (2000). Consumer Decision Making in Online Shopping Environments: The Effects of Interactive Decision Aids. *Marketing Science*, 19 (1), 4 – 21.
- Häubl, G. and Dellaert, B. G. C. (2002), "Electronic Travel Recommendation Agents and Tourist Choice," in K. Weiermair, (Ed.) *Leisure Futures* (pp. 57-58). New York: Haworth Press.
- Hickman, F.R., Killin, J.L., Land, L., Mulhall, T., Porter, D. & Taylor, R.M. (1989) *Analysis for Knowledge-Based Systems*. Chichester: Ellis Horwood.
- Hughes, J., O'Brien, J., Rodden, T., Rouncefield, M., Sommerville, I (1995). Presenting ethnography in the requirements process. In *Proceedings of RE 1995* (pp 27-39). IEEE Press.
- Jedetski, J., Adelman, L & Yeo, C. (2002). How Web Site Decision Technology Affects Consumers. *IEEE Internet Computing*, March-April, 2002, 72 – 79.
- Loban, S. R. (1997). A Framework for Computer Assisted Travel Counseling. *Annals of Tourism Research* 24 (4), 813 – 834.
- Maes, P., Guttman, R. H., Moukas, A. G. (1999). Agents that buy and sell, *Communications of the ACM*, 42 (3), 81-89.
- Miles, G.E., Howes, A. and Davies, A. (1999). A framework for understanding human factors in web based electronic commerce. *International Journal of Human-Computer Studies*, 52, 131 – 163.

Monk, A., Wright, P., Haber, J. & Davenport, L. (1993). *Improving Your Human Computer Interface*. New York: Prentice Hall.

Moutinho, L. (1987). Consumer behaviour in Tourism. *European Journal of Marketing*, 21 (10), 5 – 44.

Ricci, F. (2002). Travel Recommender Systems. *IEEE Intelligent Systems*, November/December 2002, 55 – 57.

Shearin, S. and Lieberman, H. (2001). Intelligent profiling by example. In *Proceedings of the 6<sup>th</sup> International Conference on Intelligent User Interfaces* (pp. 145 – 151). ACM Press.

Silverman, B.G., Bachann, M. and Al Akharas, K. (2001). Implication of buyer decision theory for design of e-commerce websites. *International Journal of Human-Computer Studies*, 55, 815 – 844.

Vincke, P. (1992). *Multi-criteria Decision Aid*. Chichester: John Wiley & Sons.

Wahab, S., Crompton, L. J. and Rothfield, L.M. (1976). *Tourism Marketing*. London: Tourism International Press.

Williamson, C. and Shneiderman, B. (1992). The Dynamic HomeFinder: Evaluating Dynamic Queries in a Real-Estate Information Exploration System, *Proceedings of ACM SIGIR 1992* (pp. 339—346). ACM Press

Woodside, A. G. and MacDonald, R. (1994). General systems framework for customer choice processes for tourism services. In, Gasser R.V. and Weiermair, K. (Eds.) *Spoilt for choice. Decicion processes and perference changes of tourists - intertemporal and intercountry perspectives* (pp. 30 – 59). Vienna: Kultur Verlag.