How Information Foraging Styles Relate to Tourism Demographics and Behaviours

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Abstract

Scholars have investigated information search in tourism for decades and recently, the Web's role in information search. Rather than information search with a particular source, this study adds to the literature by focusing on information foraging across multiple sources including the Web. Drawing on an analogy of animals foraging amongst different foods, tourists forage amongst different information sources. A cluster analysis of 882 tourists' information foraging prior to visiting Yellowstone National Park reveals three styles. One cluster has little hunger for information; the two other clusters tend to forage for information aggressively or passively. The aggressive foragers resemble sharks and hunt constantly for information, particularly external information. The passive foragers resemble spiders, waiting for personal information that comes their way or drawing on internal information. Similar to past information gathering research, the three clusters differ significantly in demographic and behavioural characteristics. Finally, rather than being a distinct source, the Web serves as an additional and complementary food in the sharks' information diet.

Keywords: Information foraging, Internet; information search; tourism

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Introduction

The role of information in consumer behaviour in general, and tourism in particular has a rich history. From early economics of information studies (Stigler, 1961), scholars have applied about a half-dozen terms to how consumers gather information. These terms include external search effort (Beatty & Smith, 1987), information seeking behaviour (Kiel & Layton, 1981; Newman & Staelin, 1972), information search (Alvarez & Asugman, 2006; Fodness & Murray, 1997; Luo, Feng, & Cai, 2004), information needs (Vogt & Fesenmaier, 1998) and information sourcing (Bieger & Laesser, 2004). In essence, most of these studies suggest that information gathering relates to consumer behaviour.

One theme in this research tradition relates to information characteristics, such as personal or impersonal, external or internal (Fodness & Murray, 1997; Gursoy & McCleary, 2004; Vogt & Fesenmaier, 1998), gathering information before or after the purchasing decision (Bieger & Laesser, 2004) and the role of prior information (Brucks, 1985; Kerstetter & Cho, 2004). A second theme relates to demographic characteristics of information gatherers. For example, research has shown differences in information search based on gender (D.-Y. Kim, Lehto, & Morrison, 2007), age (Capella & Greco, 1987; Laroche, Cleveland, & Browne, 2004), business versus leisure travellers (Lo, Cheung, & Law, 2002) and culture (Gursoy & Umbreit, 2004; Laroche, Saad, Kim, & Browne, 2000; Lee, Soutar, & Daly, 2007).

Two recent complementary additions to the information gathering literature are the role of the Internet (Bieger & Laesser, 2004; D.-Y. Kim, Lehto, & Morrison, 2007; Luo, Feng, & Cai, 2004; Pan & Fesenmaier, 2006) and the concept of information foraging (Pirolli, 2007; Pirolli & Card, 1999; Spink & Cole, 2006). This paper draws upon the former in order to focus on the latter. Stemming from anthropology and behavioural ecology research of animals foraging for food, information foraging takes an economic approach. Consumers conduct ongoing cost/benefit analyses of the types of information, their information *diet*, and the available information within and across information *patches*.

Drawing on the food analogy and diet, Pirolli (2007, p. 39) explains that 'a red-tailed hawk forages in habitat that contains a variety of prey of various size, prevalences and ease of capture, such as mice, ground squirrels, rabbits, and hares.' The hawk has evolved to know the caloric gain from consuming versus pursuing each food source. Similarly, individuals have evolved to realise that although email can be a valuable information source, junk email rarely constitutes a nutritious source in one’s information diet (Pirolli, 2007).

Secondly, consumers compare the information gained from a particular source against the time to gather information from that source. There 'will be a point at which the expected

future gains from foraging within a current patch of food diminish to the point that they are less than the expected gains that could be made by leaving the patch and searching for a new one (Pirolli & Card, 1999, p. 645).'

Similar to different foods and patches of that food, consumers forage amongst and within different types of information such as websites, newspapers, brochures, magazines and friends. For example, users estimate what information they can gather from a web page or website against the time and effort to discover and consume that information (Nielsen, 2003). Once the information benefits fall below the costs of gathering the information, users move to another website or another type of information.

The human information forager evolves by 'constructing effective foraging patterns and continuously fine-tuning or adapting these patterns to the ever-changing environment (Spink & Cole, 2006, p. 28).' Information foraging seems appropriate for today's multiple and dynamic information diets and patches, yet to the authors' knowledge no study apart from the seminal paper by Pirolli and Card (1999) has applied information foraging to multiple information sources. Industry (Nielsen, 2003) and academic articles (Pan & Fesenmaier, 2006) apply information foraging only to websites. Furthermore, tourism studies of the Internet and other information sources often draw solely on early adopters of the Internet, and fail to consider internal information sources such as past visits (Bieger & Laesser, 2004; Luo, Feng, & Cai, 2004).

To include more than early Internet adopters, this paper uses 2006 survey data from a valid and reliable source of secondary data, The Park Studies Unit at the University of Idaho. To include myriad information sources, this study examines information foraging across 13 internal and external information sources, including the World Wide Web. In summary, this paper addresses three research questions. How do consumers cluster as information foragers across multiple internal and external information sources? How do these foraging styles relate

to consumer demographics and behaviours? Finally, how well does the seminal study of information foraging (Pirolli & Card, 1999) apply to multiple information sources?

Literature Review

Information Search

The role of information search in consumer behaviour has roots in economic theory through the economic costs and benefits of finding prices. When the cost of gathering information outweighs the benefit of additional information, the search stops (Stigler, 1961). Early studies in consumer behaviour built on this information economics approach to classify buyers based on their pre-purchase information gathering (Clayton, Fry, & Portis, 1974) or to examine external search efforts (Beatty & Smith, 1987).

In tourism, five articles in the last ten years illustrate how far research of information search has come, and has to go. In addition to an economic model, information search includes a psychological, motivational and process approach (Gursoy & McCleary, 2004). The authors developed 21 propositions around a theoretical model incorporating these three approaches and types of search such as internal versus external, and impersonal versus personal. A second study expanded information roles beyond traditional or functional information needs to include hedonic, innovative, aesthetic and social information needs (Vogt & Fesenmaier, 1998). The results of statistical tests identified significant differences in both socio-demographic and behavioural variables related the five information needs.

Similar to comparing consumer characteristics across information needs, the other three articles followed a common consumer behaviour research tradition, clustering (Alvarez & Asugman, 2006; Bieger & Laesser, 2004; Fodness & Murray, 1997). Studies compare consumer characteristics across clusters based on information gathering (Clayton, Fry, & Portis, 1974), information seeking (Kiel & Layton, 1981) and information search strategies

(Furse, Punj, & Stewart, 1984). Cluster analysis, an interdependence technique seeking a 'natural structure among the observations based on a multivariate profile (Hair, Black, Babin, Anderson, & Tatham, 2006, p. 555)', could identify homogeneous groups of information foragers across different information sources.

Compared with information seeking or information searching, information foraging has slightly less of a cognitive and problem solving orientation (Spink & Cole, 2006). Individuals interact with the environment, choosing information diets, following information scents and moving amongst information patches (Nielsen, 2003). Environmental interaction with information seems particularly apt for the inherent interaction in website navigation and personal conversations.

Based on two case studies, Pirolli and Card (1999) suggest a continuum of information foraging styles. At one end are wide ranging foragers such as sharks; at the other end are sit-and-wait foragers such as web-building spiders. The former voraciously seek and devour a range of information sources while the latter wait for a few convenient sources to come their way. Furthermore, information foraging styles are dynamic. Depending on environmental changes, a shark may adapt and become a spider or vice versa.

Tourism Information Gathering in the Internet Era

Using 1998-2001 data from four US counties in rural Indiana, a study examined preferences for five information sources: the Web, the Web and other sources, and three traditional sources – destinations, travel agents and friends/relatives (Luo, Feng, & Cai, 2004). Two of three situational factors and two of five demographic variables related significantly to the preferred information sources. For example, men were more likely than women to prefer the Web, and women were more likely to prefer friends/relatives. Income showed a positive relationship with the Web as a preferred source and a negative relationship with friends and

relatives. There were no significant differences in information preferences based on respondent age, education or occupation.

With regard to situational factors – previous visit, travel party composition and trip purpose – those travelling for pleasure tended to prefer destination sources of information (Luo, Feng, & Cai, 2004). Those travelling with their family or with others preferred destination information. Single travellers preferred travel agents and those travelling with friends favoured friends/relatives. There were no significant differences in preferred information sources and the number of previous visits.

In addition to variables related to a preferred information source, the study examined how using an information source related to three trip outcomes – length of stay, accommodation and expenditures (Luo, Feng, & Cai, 2004). Visitors that used just the Web stayed in hotels the most often and conducted the least amount of day trips. As expected, those that relied on friends/relatives stayed the most often with friends/relatives. Those that favoured the Web combined other information sources spent the most money. The preferred information source, however, showed no relationship with the length of stay.

Although the previous study examined the Web and other information sources, the study has at least three limitations. Firstly, the study may not reflect tourists today. Diffusion research shows that organisations and individuals evolve in their use of an innovation (Rogers, 2003). The Web may have not reached critical mass in rural Indiana in 1998-2001; the study could have examined just innovators and early adopters of the Web (Rogers, 2003). Secondly, the study examined differences across separate information sources. This approach ignores that tourists combine information sources into information search strategies (Fodness & Murray, 1997). Finally, the study assumed that consumers wanted to gather information. The results of a Turkish study suggest that travel style relates to information gathering;

planners gather information and explorers tend to avoid gathering information (Alvarez & Asugman, 2006).

A study that drew on a comprehensive dataset of 1,233 Swiss households, which generated 8,744 trips, helps address the latter two limitations (Bieger & Laesser, 2004). That the data stems from 2001, however, may fail to represent widespread Internet adoption or evolving Internet use by individuals and organisations. Unlike most studies of information gathering, this study examined information gathering in two phases, before and after the decision to visit a destination. Lastly, rather than note if they used a source, respondents rated the importance of 18 sources of information.

Concerning information gathering prior to a definite trip decision, a three-cluster solution – informal, direct and professional – proved the most meaningful (Bieger & Laesser, 2004). The *informal* cluster placed its highest mean value on friends and relatives, about double the value for most of the 17 other information sources. The *direct* cluster preferred destination information, as well as friends and relatives. The last cluster, *professional*, valued information from tour operators and travel agents highly, as well as sources similar to the direct cluster. The professional cluster placed the highest mean value of importance across the 18 information sources and the informal cluster reported the lowest mean value.

Clustering visitors on their information sourcing after a definitive trip decision also yielded three clusters – no info, highly informal and high info – as the best solution (Bieger & Laesser, 2004). The *no info* cluster tended to give low importance values to all information sources. The second cluster, *highly informal*, valued friends and relatives. The third cluster, *high info*, placed the greatest worth on professional information sources such as destinations, hotels and tour operators. This cluster also placed the highest mean importance value across the 18 information sources.

While both the Swiss and US study included the Web as an information source, their studies may have looked at just early adopters of the Web (Rogers, 2003). Furthermore, destination and hotel websites have evolved since the turn of the century (Chu, Leung, Van Hui, & Cheung, 2007; Murphy, Olaru, & Schegg, 2006). Finally, both studies looked at external information sources but ignored internal information sources such as past visits. The following sections use data from a 2006 visitor study that includes internal information, external information and covers Internet adoption at a later period than in the previous studies. Information foraging analogies help explain and discuss the results of clustering visitors across the use of internal and external information sources.

Methodology

The Park Studies Unit (PSU) at the University of Idaho produces an annual report on how the United States National Park Service serves its visitors (www.psu.uidaho.edu). Since 1982, the PSU has conducted almost 200 visitor studies in over 150 US national parks. Upon request, many of these data sets are available for public use. Data for this paper stemmed from the Summer 2006 Yellowstone National Park Visitor Study (Manni, Littlejohn, Evans, Gramann, & Hollenhorst, 2007).

Established in 1872 and the world's first national park, Yellowstone National Park (YNP) encompasses 8,987 square kilometres in the rugged Rocky Mountains in northwest USA (www.nps.gov/yell/planyourvisit/upload/randi07intro.pdf). Featuring abundant wildlife such as elk and bison, and approximately half of the world's hydrothermal features, YNP hosted almost three million visitors in 2006. Due to its average altitude of about 2,000 meters, harsh climate with snow possible every month, the overwhelming majority of YNP visitors are in the summer.

Using systematic random sampling across the five YNP entrances, PSU distributed 1,302 questionnaires to arriving visitors from 23-29 July 2006. The unit of analysis was visitor groups, i.e., visitors arriving in cars. Resembling previous YNP questionnaires, the 16-page questionnaire – available at www.psu.uidaho.edu/files/vsp/questionnaires/178_YELL_Q.pdf – included questions related to gathering information, reasons for visiting YNP, activities at YNP, expenditures, lodging, customer service and demographics. On behalf of the visitors in their car, almost seven of ten (69%) individuals returned a completed questionnaire. Based on the literature and three statistical tests, the authors concluded there was no response bias and the data represented the YNP visitor population (Manni, Littlejohn, Evans, Gramann, & Hollenhorst, 2007, p. 6).

Results and Discussion

Demographics

Most YNP visitors arrived in groups rather than alone. Almost half (46%) the visitors were groups of two and three, followed by groups of four (24%), and of five or more (24%). The groups were usually families (71%), followed by families with friends (10%). US residents accounted for nine out of ten visitors, with California the leading (12%) state, followed by Utah (10%). No other state accounted for over five percent of the US visitors. Of the international visitors, Canada had the highest percentage (25%), followed by the Netherlands (17%), Germany (10%), the United Kingdom (9%), Italy (7%), France (5%), Switzerland (5%) and another 15 countries (22%). An equal mix of males and females, the visitor age distribution appeared bi-modal with youth and 41-50 years old. An educated sample, over half (53%) the visitors had a university degree and another 22% had some university education.

Spiders and Sharks: Information Foraging Styles

Despite the questionnaire listing 13 information sources, almost one in ten respondents (9%) reported gathering no information prior to visiting YNP, resembling *explorers* in the Turkish study (Alvarez & Asugman, 2006) and the *no info* cluster in the Swiss study (Bieger & Laesser, 2004). Of the visitors that reported gathering information, by checking or not checking each item, Table 1 lists the checked information sources in descending order. About half the visitors gathered information from each of the top five sources.

[Take in Table 1 about here]

The characteristics for measuring similarity, and therefore clusters, were the 13 information sources visitors used prior to the current visit. Clustering was in two stages – a hierarchical cluster analysis using an agglomerative method to obtain the suitable number of clusters, followed by a quick cluster method using seed points from the hierarchical analysis (Everitt, 1993; Hair, Black, Babin, Anderson, & Tatham, 2006). As the 13 information sources were binary variables, the (dis)similarity measure was the squared Euclidean distance. The agglomeration schedule suggested two clusters as appropriate. The last three values in the average linkage method schedule – 6.43, 6.54, and 7.00 – show how heterogeneity increased as clusters combined. The results of several agglomerative clustering procedures helped ascertain the stability of the solution. The two-cluster solution was superior to three and four-cluster solutions.

In an effort to highlight web-based information sources, combining the three web sources – YNP website, the concessionaire Xanterra's website and other websites – yielded 11 information sources. Profiling the clusters based on the 11 and on the 13 information sources showed no statistically significant differences between cluster solutions with 11 and 13 information sources.

Predictive validity of the two-cluster solution stemmed from by splitting the data into a calibration sample and holdout sample. Cross-tabulating the two solutions yielded a hit ratio of 341/348. Cross-validation of the entire sample via a self-organising map based on artificial neural networks (J. Kim, Wei , & Ruys, 2003; Kohonen, 2001) supported the two cluster solution with 13 information sources; there were no significant statistical differences between the artificial neural network solution and the hierarchical cluster solution. Finally, as Table 1 shows, the two clusters differed significantly across the use of all 13 information sources.

The two clusters of respondents resembled the analogy of *sharks* and web-building *spiders* (Pirolli & Card, 1999). The spiders tended to feast on a convenient information diet (see Table 1) of previous visits, friends, relatives, and word of mouth. While about 60% of these sit-and-wait foragers consumed a diet of internal and personal information, the shark-style foragers used less than 50% of these internal and personal sources.

The differences between the two clusters were even stronger with an external information diet such as maps, travel guides and websites. The sharks devoured impersonal and external information sources from two to eight times more often than the spiders did. Finally, in line with their gluttonous information appetitive, the sharks foraged almost double the information sources that the spiders did (4.9 versus 2.5; $p < .001$).

Although there were two distinct information foraging styles, a third group of visitors reported gathering no information prior to visiting YNP. Similar to hibernating bears or lions after a big feed, these visitors seemed to have *satiated* information needs. To explore how these three groups – spiders, sharks and satiated – differed, a series of ANOVA and Kruskal-Wallis non-parametric tests assessed relationships across demographic characteristics, length of stay and YNP expenditures with information foraging styles. Did information foraging styles relate to visitor demographics and behaviours?

Demographic and Behavioural Variables Related to Information Foraging

Table 2 displays the cluster profiles across six demographic characteristics. There seemed to be little difference across clusters in household size and age, and a marginal difference in education. Shark-style foragers had the highest education level and the spider-style foragers had the lowest level. There were significant cluster differences across the three other demographic variables. Sharks had the most income and spiders had the least income. US tourists dominated the satiated cluster and non-US tourists dominated the shark cluster. Finally, males were predominantly (60%) sit-and-wait foragers, while females (59%) tended not to gather information.

[Take in Tables 2 and 3 about here]

As the results in Table 3 illustrate, there were significant differences across the three foraging styles in five of the eight behaviours. Although the clusters showed no differences in visits within the last 12 months, the satiated cluster had significantly more visits in their lifetime and the sharks had significantly less visits. With regard to significant differences in both group size and number of vehicles, the spider-style foragers led and the sharks lagged. Although there were no significant differences across clusters in overnight stays or type of lodging, the shark-style foragers spent significantly more money inside YNP, almost double what the satiated cluster spent. The sharks also participated in significantly more activities in the park than the other two clusters did. Although not a behaviour, there were no differences across clusters in perceived service quality.

Finally, information foraging style showed significant associations with the primary reason to visit YNP. Over four in ten (43%) visitors with satiated information needs were local residents visiting friends or on business trips, whereas 73% of the spider cluster and 87% of the shark cluster sought recreation, such as watching wildlife or fishing, in the YNP and nearby Grand Teton areas.

Discussion

The significant indirect relationship between prior visits and the amount and type of information foraged helps generalise the role of prior knowledge in gathering information (Brucks, 1985; Kerstetter & Cho, 2004). The shark-style foragers had the least prior visits and did the most extensive information gathering, averaging almost double the information sources of the spiders. Furthermore, the satiated foragers – those who reported gathering no information – had the most YNP visits of all clusters, almost 21 times in their lifetime versus almost 13 for the sit-and-wait spider foragers and five for the ravenous sharks.

To investigate which demographic and behavioural elements discriminated amongst information foraging clusters, a series of logistic regressions used the variables in Tables 2 and 3 against cluster membership. To reduce missing values, the analysis omitted seven insignificant variables – education, age, household size, household income, group size, and perceived overall quality. The results of omnibus tests on both regressions showed the log-likelihood function improved from -540.1 to -475.9 ($\chi 2$=128.4, df=16, p<.001). Pearson and Deviance goodness-of-fit criteria indicated that the remaining seven variables contributed significantly (p<.05) to the discrimination. The overall hit ratio of 62% was higher than classification by chance of 48%. The parameters for the two logistic regression equations discriminating amongst the three clusters are in Table 4.

[Take in Table 4 about here]

The number of activities, and to a lesser extent total per capita expenditures, were significant in both regressions. These results suggest that the intensity of leisure activities and expenditures relate to the probability of classification as a shark-style information forager. Compared to the satiated group, being male increased the chance of being a shark. Compared

to the shark group, spiders included more males, US visitors to YNP and groups with more vehicles.

Conclusions and Future Research

To the authors' knowledge, this is the first quantitative study to cluster consumers on information foraging across multiple sources. The results support the shark and spider styles of information foraging based on two case studies (Pirolli & Card, 1999). The results also show a third foraging style, the satiated forager. A continuum of information foraging seems to start with little or no foraging, similar to the Turkish cluster of spontaneous explorers that tend not to gather information (Alvarez & Asugman, 2006) and the Swiss cluster of travellers with little interest in information after the decision to visit a destination (Bieger & Laesser, 2004). Furthermore, the study supports tourism research showing that information gathering relates to consumer demographics and behaviours (Bieger & Laesser, 2004; D.-Y. Kim, Lehto, & Morrison, 2007; Luo, Feng, & Cai, 2004; Vogt & Fesenmaier, 1998).

The results, however, do not show causality. It may be that situational factors, such as living far away from YNP or never having visited YNP drive the discovered relationships. The active sharks, predominantly newer/foreign tourists, seemed hungry for complete vacation experiences and foraged from external information patch to external information patch in order to satisfy their ravenous information appetite. Sharks, with high information needs due to their active and diversified tourism behaviour and low familiarity with YNP – were likely to increase their intake of foraged information and consume a diverse diet of external information.

Spiders were passive foragers, seeming to nibble on convenient information provided by their experiences, friends and relatives. The hunt/search for external or impersonal

information was probably not worth their effort, yet they did consume information that came to them. The satiated foragers might become active foragers, perhaps sharks then spiders, due to behavioural or environmental changes. For example, they may want to visit YNP with grandchildren and investigate activities for children. Or if a new hotel opened in YNP, the satiated foragers may want to explore the hotel's website.

In this study, the diet and amount of foraged information reflected the number of activities and associated expenditures. Tourism operations and destinations should reflect upon targeting their consumers based on information foraging styles. For example, to reach the big spending sharks that are often first-time visitors, impersonal information diets such as maps, brochures and websites seem important. In contrast, to reach repeat visitors with satiated or spider-style information gathering, permission email newsletters that come to the recipient (Marinova, Murphy, & Massey, 2002) may fit their sit-and-wait information gathering style.

In a similar vein, destinations could reflect upon the predominant audience consuming a particular information source. For examples, the big spending sharks rather than spiders and satiated foragers favour maps, brochures, travel guides, tour books and websites, with rich content and trails leading to information of interest. As sharks have the least prior visits, their favoured information sources should be comprehensive and replete with opportunities and activities to spend money. In contrast, permission email newsletters could assume that most recipients are familiar with the destination and focus on new events and reasons to revisit.

Although the results generalise to YNP visitors in 2006, future research should address several shortcomings of this study. For example, the database combined information sources such as friends/families/word of mouth, making it impossible to gauge the effect of each information source. Furthermore, the questionnaires failed to distinguish two stages in gathering information (Bieger & Laesser, 2004), before and after the decision to visit YNP.

Future Research

Future research should add more information sources and investigate cluster dynamics. Information sharks may slow their aggressive foraging behaviour and evolve towards spider-style foraging and dormant information acquisition, depending on the environment such as changes in available services and dynamic information sources. Information foraging theory argues that both foragers and the environment adapt; information technologies should 'evolve to improve foraging returns (Pirolli & Card, 1999, p. 644).' For example, RSS feeds – a recent online technology that delivers web-based information to subscribers (Thelwall & Stuart, 2007) – seem ideal for sit-and-wait foraging. One approach to capture dynamic information foraging would be to 'tag' repeat visitors, for example with longitudinal studies or web-based solutions such as individuals logging into a website or the website setting cookies on the individual's computer (Murphy, Hofacker, & Bennett, 2001).

The results in this study suggest that socio-demographics, education and income, relate to information foraging. Future research should use attitudinal data and theoretical approaches such as the role of attitudes (Fishbein & Ajzen, 1975), to complement the behavioural data and investigate why these relationships exist. Finally, future research should expand beyond consumer behaviour literature and benefit from library science studies of human information behaviour (Spink & Cole, 2006) and the digital divide (Hargittai & Hinnant, 2006), which also relate information behaviours to socio-demographics.

References

Alvarez, M., & Asugman, G. (2006) 'Explorers versus Planners: A Study of Turkish Tourists'. *Annals of Tourism Research, 33*(2), 319-338.

Beatty, S. E., & Smith, S. M. (1987) 'External Search Effort: An Investigation across Several Product Categories', *Journal of Consumer Research, 14*(1), 83-95.

Bieger, T., & Laesser, C. (2004) Information Sources for Travel Decisions: Toward a Source Process Model', *Journal of Travel Research, 42*(4), 357-371.

Brucks, M. (1985) 'The Effects of Product Class Knowledge on Information Search Behavior', *Journal of Consumer Research, 12*(1), 1-16.

Capella, L. M., & Greco, A. J. (1987) 'Information Sources of Elderly for Vacation Decisions', *Annals of Tourism Research, 14*(1), 148-151.

Chu, S.-C., Leung, L. C., Van Hui, Y., & Cheung, W. (2007) 'Evolution of e-Commerce Web Sites: A Conceptual Framework and a Longitudinal Study', *Information and Management, 44*(2), 154-164.

Clayton, J. D., Fry, J. N., & Portis, B. (1974) 'A Taxonomy of Prepurchase Information Gathering Patterns', *Journal of Consumer Research, 1*(3), 35-42.

Everitt, B. S. (1993) *Cluster Analysis* (Third ed.) London: Edward Arnold.

Fishbein, M., & Ajzen, I. (1975) *Belief, Attitude, Intention and Behavior: An Introduction to Theory and Research.* Reading, MA: Addison-Wesley Publishing Company.

Fodness, D., & Murray, B. (1997) 'Tourist Information Search', *Annals of Tourism Research, 24*(3), 503-523.

Furse, D. H., Punj, G., & Stewart, D. W. (1984) 'A Typology of Individual Search Strategies among Purchasers of New Automobiles', *Journal of Consumer Research, 10*(4), 417-431.

Gursoy, D., & McCleary, K. W. (2004) 'An Integrative Model of Tourists' Information Search Behavior', *Annals of Tourism Research, 31*(2), 353-373.

Gursoy, D., & Umbreit, W. T. (2004) 'Tourist Information Search Behavior: Cross-cultural Comparison of European Union Member States', *International Journal of Hospitality Management, 23*(1), 55-70.

Hair, J. F., Black, W. C., Babin, B. J., Anderson, R. E., & Tatham, R. L. (2006) *Multivariate Data Analysis* (Sixth ed.) Upper Saddle River, NJ: Prentice Hall.

Hargittai, E., & Hinnant, A. (2006) Toward a Social Framework for Information Seeking. In A. Spink & C. Cole (Eds.), *New Directions in Human Information Behavior* (pp. 55-70) New York: Springer.

Kerstetter, D., & Cho, M.-H. (2004) 'Prior Knowledge, Credibility and Information Search', *Annals of Tourism Research, 31*(4), 961-985.

Kiel, G., & Layton, R. (1981) 'Dimensions of Consumer Information Seeking Behavior', *Journal of Marketing Research, 18*(2), 233-239.

Kim, D.-Y., Lehto, X., & Morrison, A. M. (2007) 'Gender Differences in Online Travel Information Search: Implications for Marketing Communications on the Internet', *Tourism Management, 28*(2), 423-433.

Kim, J., Wei , S., & Ruys, H. (2003) 'Segmenting the Market of West Australian Senior Tourists Using an Artificial Neural Network', *Tourism Management, 24*(1), 25-34.

Kohonen, T. (2001) *Self-Organising Maps* (3 ed.) Berlin, Heidelberg, New York: Springer-Verlag.

Laroche, M. M., Cleveland, M., & Browne, E. (2004) 'Exploring Age-related Differences in Information Acquisition for a Gift Purchase', *Journal of Economic Psychology, 25*(1), 61-95.

Laroche, M. M., Saad, G., Kim, C., & Browne, E. (2000) 'A Cross-Cultural Study of In-Store Information Search Strategies for a Christmas Gift', *Journal of Business Research, 49*(2), 113-126.

Lee, J., Soutar, G., & Daly, T. (2007) 'Tourists' Search for Different Types of Information: A Cross-National Study', *Information Technology and Tourism, 9*(3/4), 165-176.

Lo, A., Cheung, C., & Law, R. (2002) 'Information Search Behavior of Hong Kong's Inbound Travelers - A Comparison of Business and Leisure Travelers', *Journal of Travel & Tourism Marketing, 13*(3), 61-81.

Luo, M., Feng, R., & Cai, L. A. (2004) I'nformation Search Behavior and Tourist Characteristics: The Internet vis-a-vis Other Information Sources', *Journal of Travel and Tourism Marketing, 17*(2/3), 15-25.

Manni, M. F., Littlejohn, M., Evans, J., Gramann, J., & Hollenhorst, S. J. (2007) *Yellowstone National Park Visitor Study, Summer 2006* (No. 178): U.S. Department of the Interior.

Marinova, A., Murphy, J., & Massey, B. (2002) 'Permission E-mail Marketing as a Means of Targeted Promotion', *Cornell Hotel and Restaurant Administration Quarterly, 43*(1), 61-69.

Murphy, J., Hofacker, C. F., & Bennett, M. (2001) 'Website Generated Market-research Data: Tracing the Tracks Left Behind by Visitors', *Cornell Hotel and Restaurant Administration Quarterly, 42*(1), 82-91.

Murphy, J., Olaru, D., & Schegg, R. (2006) 'Investigating the Evolution of Hotel Internet Adoption', *Information Technology and Tourism, 8*(3/4), 161-178.

Newman, J. W., & Staelin, R. (1972) 'Prepurchase Information Seeking for New and Major Household Appliances', *Journal of Marketing Research, 9*(3), 249-257.

Nielsen, J. (2003) Information Foraging: Why Google Makes People Leave Your Site Faster. Retrieved 2 March, 2008, from http://www.useit.com/alertbox/20030630.html

Pan, B., & Fesenmaier, D. R. (2006) 'Online Information Search: Vacation Planning Process', *Annals of Tourism Research, 33*(3), 809-832.

Pirolli, P. (2007) *Information Foraging Theory: Adaptive Interaction with Information*. New York: Oxford University Press.

Pirolli, P., & Card, S. (1999) 'Information Foraging', *Psychological Review, 106*(4), 643-675.

Rogers, E. M. (2003) *Diffusion of Innovations* (Fifth ed.) New York, New York: Simon & Schuster.

Spink, A., & Cole, C. (2006) 'Human Information Behavior: Integrating Diverse Approaches and Information Use', *Journal of the American Society for Information Science and Technology, 57*(1), 25-35.

Stigler, G. J. (1961) 'The Economics of Information', *Journal of Political Economy, 69*(3), 213-225.

Thelwall, M., & Stuart, D. (2007) 'RUOK? Blogging Communication Technologies During Crises', *Journal of Computer Mediated Communications, 12*(2), http://jcmc.indiana.edu/vol12/issue12/thelwall.html.

Vogt, C. A., & Fesenmaier, D. R. (1998) 'Expanding the Functional Information Search Model', *Annals of Tourism Research, 25*(3), 551-578.

Table 1: Information Foraging Clusters

Information gathered prior to visit	Total %	Spider %	Shark %	p value
Maps/brochures	56	28	**84**	**<.001**
Friends/relatives/word of mouth	55	**59**	50	**.019**
Previous visits	53	**64**	42	**<.001**
Travel guides/tour books	48	11	**87**	**<.001**
YNP website	46	29	**65**	**<.001**
Television/radio programs/videos	22	16	**28**	**<.001**
Xanterra (concessionaire) website	19	8	**32**	**<.001**
Other websites	17	11	**24**	**<.001**
Newspaper/magazine articles	15	9	**21**	**<.001**
E-mail/telephone/written inquiry	10	4	**16**	**<.001**
State welcome centre	7	3	**11**	**<.001**
Info from airport, motel or other business	5	3	**7**	**<.001**
Chamber of commerce	4	3	**5**	**.015**
N	800	410	390	

Table 2: Demographics and Information Foraging Styles

Cluster profiles	Total	Spider cluster	Shark cluster	Satiated cluster	p value
Household size	3.12	3.14	3.14	2.9	.346
N	796	363	359	74	
Respondent age	48	48.7	47.3	48.2	.288
N	849	389	383	77	
Education – bachelor and above	62%	59%	**66%**	59%	.066
N	840	386	376	78	
Median annual household income ($k)	81.3	77.2	**86.6**	77.0	**.001**
N	844	391	374	79	
US tourists	87%	89%	85%	**91%**	**<.001**
N	783	359	353	71	
Males	53%	**60%**	48%	41%	**<.001**
N	852	393	383	76	

Table 3: YNP Behaviour and Information Foraging Styles

Cluster profiles	Total	Spider cluster	Shark cluster	Satiated cluster	p value
Prior visits in the last 12 months	2.2	3.2	1.3	1.9	.118
N	769	354	343	72	
Prior visits (lifetime)	9.8	12.6	5	**20.6**	**.003**
N	783	357	356	70	
Number in group	4.4	**5.08**	3.83	4	**.005**
N	863	400	387	76	
Number of vehicles	1.36	**1.56**	1.17	1.27	**.006**
N	865	399	388	78	
Per capita expenditures	$388	$316	**$484**	$255	**<.001**
N	782	351	361	70	
Overnight stays in YNP	4.4	4.5	4.3	4	.840
N	653	291	301	61	
Number of activities within YNP	7.1	6.58	**8.08**	4.97	**<.001**
N	869	404	385	80	
Perceived overall service quality	4.33	4.32	4.37	4.24	.326
N	865	401	386	78	

Table 4: Logistic Regressions among Clusters (N=588)

Clusters - information gathered prior to visit		**B**	**Wald**	**Df**	**Sig.**	**Exp (B)**
Satiated foragers versus Sharks	Intercept	.918	1.151	1	.283	
	Total per capita expenditures	-.001	3.096	1	**.078**	.999
	Number of activities	-.425	34.086	1	**<.001**	.654
	Prior visits in the last 12 months	-.074	.437	1	.508	.929
	Prior visits (lifetime)	.016	.010	1	.129	1.016
	Number vehicles	-.044	.018	1	.894	.956
	[US tourists]	.969	2.282	1	.131	2.635
	[gender=male]	-.619	3.081	1	**.079**	.538
Spiders versus Sharks	Intercept	.427	.977	1	.323	
	Total per capita expenditures	-.001	10.190	1	**.001**	.999
	Number of activities	-.195	27.193	1	**<.001**	.823
	Prior visits in the last 12 months	-.013	.071	1	.790	.987
	Prior visits (lifetime)	.008	.896	1	.344	1.008
	Number vehicles	.312	4.246	1	**.039**	1.367
	[US tourists]	.822	8.035	1	**.005**	2.274
	[gender=male]	.323	3.036	1	**.081**	1.381