

The effect of counterproductive time on online task completion

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The Effect of Counterproductive Time on Consumer Online Task Completion

The objective of this study was to investigate how counterproductive time spent on a website affects consumers' online task completion. Two hundred and twenty-eight consumers were asked to perform a task on determined websites. Verbal protocols and clickstream data were collected. Results of Study 1 showed that the time spent waiting for pages to download had no effect on task completion, but that the time lost on pages that were useless to the task at hand had a negative impact on consumers' task completion. Study 2 indicated that the downloading time related to pages that were useful to consumers had no effect on task completion, but downloading times related to pages that were useless had a significant impact on task completion. Managerial and theoretical implications are discussed.

Keywords: Internet, Consumers, Downloading time, Dead-ends, Task Completion

1. Introduction

Between 25% and 75% of online shopping carts are abandoned by customers (Hill 2001). The quality of the website is always mentioned as one of the top reasons to explain this phenomenon. For instance, a study suggested that consumers abandoned their shopping carts for the following reasons: poor site navigation, hard-to-find shopping carts, and time-consuming checkouts (Hill 2001). According to eMarketer (2006) shopping cart abandonment rate was 48% in 2005. This problem explains, in part, why conversion rates for websites are still low, ranging from 2% to 5% (Betts 2001, Gurley 2000, Sismeiro and Bucklin 2004).

These low conversion rates suggest that much has yet to be learned about online buyer behavior. The objective of this study was to investigate the impact of two potential reasons why consumers who visit a website rarely complete their task: waiting for pages to download and losing time on pages that are in retrospect useless to the task at hand, i.e., losing time in informational dead-ends. No study has yet empirically investigated how counterproductive time affects consumers' online task completion. Thus, by investigating how much time is lost by consumers on a website in a goal-directed shopping task and how it affects consumers' task completion, this study makes an important contribution to both academia and online retail management.

2. Background Literature

2.1 Online Task Completion

Recent studies have investigated antecedents of online purchasing behaviors across multiple visits to a website and also within single visits to a website. Moe and Fader (2004) show that consumers who increase their visit frequency to a website over time are more likely to make a purchase than those with a decreasing frequency of visits to the same website. However, Sismeiro and Bucklin (2004) did not find that repeat visits to the website they analyzed affected purchasing probability. They suggest that the product category may moderate this relationship (Sismeiro and Bucklin 2004). Other studies investigated consumers' single website visits to better understand the different behaviors between purchasers and non-purchasers. In their study of web users who completed a transaction and those who did not complete a transaction on an online bookstore, Li *et al.* (2002) found that the former group tend to have longer sessions and to visit product category pages, while the latter group tend to have shorter sessions and to visit the website's homepage. These findings suggest that purchasers delve deeper into the website than non-purchasers (Li *et al.* 2002). Finally, Sismeiro and Bucklin (2004), using a task completion approach, investigated online purchase behaviors by dividing the shopping task for cars into three sequential tasks for a specific website: 1) product configuration, 2) input of personal information, 3) order confirmation with credit card provision. In support of Moe (2003), they found that online car buyers are more likely to spend more time on the site but view fewer pages than non-buyers (Sismeiro and Bucklin 2004).

2.2 Informational Dead-ends

As mentioned, elements related to the usability of a website (e.g., poor navigation, hard- to-find shopping carts) may affect its conversion rate (Hill 2001). Some authors maintain that the performance of a site lies in

its capacity to generate the desired information with the least amount of frustration and dead-ends for the consumer (Nielsen and Norman 2000). This postulate rests on the fact that consumers seek to become loyal to sites that enable them to function efficiently. Contrary to what some may believe, the cost of switching sites is relatively high if the original site is efficient (Johnson, Bellman, and Lohse 2003). In contrast, if consumers have the impression that they are spinning their wheels too often, even if they ultimately find the desired information or product, they will probably tend to migrate to another site. Thus, we suggest that in online goal-directed activities such as online shopping, consumers' unsuccessful attempts to find the desired information or find and purchase the desired product will affect the website conversion rate. We propose the term "informational dead-end" to represent the navigation performed by a user on one page or a set of pages that do not provide the expected utility and leads to a change of navigational course. For instance, a user using the back button of his/he browser after realizing that the visited page(s) is (are) not where he/she wanted to go or a user clicking on the homepage hyperlink after visiting a series of pages that did not provide the wanted information are examples of informational dead-ends.

2.3 Downloading Time

Consumers' waiting time and wait management have been extensively investigated in the area of services marketing (for reviews see Durrande-Moreau 1999, Iacobucci 1998). Durrande-Moreau (1999) suggests that three main groups of factors affect consumers' response to waiting time. In order of importance, they are temporal factors (e.g., objective waiting time experienced by the consumer), individual factors (e.g., consumer's expectation of the time he/she has to wait), and finally situational factors (e.g., announcement of the expected waiting time by the service provider). Online, Ryan and Valverde (2005, 2006) suggest that there are many situations for which consumers have to wait while performing online tasks. Based on their qualitative work, they identified fourteen types of waiting situations. These waiting situations vary from download delay to installing software to continue a task (Ryan and Valverde 2005).

Focusing solely on download delay, some studies investigated how it affects online consumer behavior. A first series of studies investigated the downloading time associated with the homepages of websites. Dellaert and Kahn (1999) and Rose, Meuter, and Curran (2006) show that consumers are able to separate the evaluation of waiting experiences from the evaluation of the website. However, in their research Dellaert and Kahn (1999) also show that when there is uncertainty about the waiting (as with the majority of downloads), the negative feeling generated by the waiting experience carries over to the evaluation of the website. They suggest that waiting for the homepage to download is less damaging to the website evaluation than having to wait during the interaction with the website (Dellaert and Kahn 1999). Finally, they show that waits shorter than expected lead to better evaluations of the website (Dellaert and Kahn 1999). Nah (2004) also showed that the presence of a feedback mechanism, which decreases uncertainty about the waiting time, increases users' tolerable waiting time. Finally, Weinberg (2000), based on the anchoring and adjustment principle (Tversky and Kahneman 1974), found that web users exposed to a shorter waiting time anchor to download the homepage of a website (5 sec.) perceived a shorter waiting time (5.6 sec.) than the actual waiting time (7.5 sec.) and that web users exposed to a greater waiting time anchor (10 sec.) perceived a greater waiting time (8.7 sec.) than the actual waiting time (7.5 sec.). Furthermore, he found that web users exposed to the smaller waiting time anchor (5 sec.) perceived the quality of the homepage to be greater than those exposed to the greater waiting time anchor (10 sec.) (Weinberg 2000).

A second series of studies focused on downloading time for a sequence of web pages within a website. Weinberg, Berger, and Hanna (2003) found that perceived waiting time for a sequence of web pages was less for web users exposed to waiting time in ascending order (e.g., 3, 6, 9, and 12 sec.) than for those exposed to waiting time in descending order (e.g., 12, 9, 6, and 3 sec.). Furthermore, they suggest that users exposed to ascending waiting times rated the design quality of the website as being better than those exposed to descending waiting times (Weinberg, Berger, and Hanna 2003). In addition, Bucklin and Sismeiro (2003)

suggest that there is a negative relationship between downloading time for a web page and the probability of requesting an additional web page within a website. As in offline settings, Bucklin and Sismeiro (2003) suggest that online consumers show evidence of time-constrained behaviors. It seems that consumers balance the time they spend on each web page and the number of web pages they visit in order to stay within the limits of a time budget (Bucklin and Sismeiro 2003).

3. Hypotheses

Our hypotheses are based on a cost-benefit perspective of consumer decision-making (For a review see Payne, Bettman, and, Johnson 1993). The cost dimension is related to the time spent on a website trying to complete a task, i.e., finding the right product, and the financial cost of purchasing this product. The benefit dimension is related to the online task completion, i.e., finding the right product and completing the purchase on the website. Focusing on the time cost and following Bucklin and Sismeiro (2003), we suggest that when consumers visit a website in order to purchase a product, they have a predetermined time budget. If during their visit to a particular website they feel that they will not be able complete their task within their time budget, they will abort their task because they feel that the costs are exceeding the benefits. Consumers may abort their shopping task because they are unable to find the information and/or product they are looking for on the website or because they perceive the downloading time of pages from the website as being too long. In a similar vein, Pavlou and Fygenson (2006) suggest that there is a negative relationship between perceived download delay and consumers' perceived control over the website, which in turn affects consumers' online purchasing probability. Thus, we suggest that there is a negative relationship between the proportion of time consumers wait for pages to download or the proportion of time consumers lose in informational dead-ends

during a visit to a website and the probability that they will complete their task on the website. Thus, we propose the following hypotheses.

Hypothesis 1:

The time spent waiting for pages to download during an online shopping task relative to the total time spent on the website will negatively affect consumers' task completion.

Hypothesis 2:

The time spent in informational dead-ends during an online shopping session relative to the total time spent on the website will negatively affect consumers' shopping task completion.

4. Study 1: The Effects of Two Types of Counterproductive Times on Task Completion

4.1 Sample and Procedure

To test these two hypotheses, 174 consumers were recruited with the help of two companies, an online travel agency (n=102) and an electricity company (n=72). Consumers were recruited via a hyperlink placed on the companies' websites. This procedure was intended to recruit genuine consumers who had at least minimal experience with both the Internet and the website in question. Each consumer who showed an interest in our study by registering and providing contact information was then invited to participate in a laboratory navigation session. Consumers were paid \$50 in exchange for their participation. The majority of consumers were in the 25-44 age group (67%) and most consumers were female (58%). The large majority had more than 3 years of experience with the Internet (82%) and only 6% of consumers had bought something online from one of the two companies in the past.

Each participant was invited to perform an individual task on one of the two sites. During navigation and throughout the experiment, participants were told to verbalize every thought that went through their minds, whether it regarded difficulties encountered, aspects of the site that surprised them, or simply a description of what they were doing. This approach, founded in the work of Simon (1956) and Ericsson and Simon (1993), is known as protocol analysis. It has proven to be very useful for website analysis (Benbunan-Fich 2001; Senecal, Gharbi, and Nantel 2002). Data were collected in three distinct steps.

Step 1: Warm-up Task. Following a brief description of the assigned tasks, participants were invited to go to a general portal website to read their horoscope. They were then asked to consult the movie listings on the site to find a film. This task was very important because it enabled participants to become familiar with navigation and verbalization. The warm-up task ended when the participants had read their horoscope and selected a film.

Step 2: Experimental task. First, participants were informed of the task that they had been invited to perform. Consumers recruited via the travel website were asked to purchase a trip for the holiday season on the website of the company while those recruited via the utility site were asked to shop for and purchase an electric heat pump on the website of the company. In order to complete their online purchase, consumers were given a fictitious credit card number (transactions with this credit card number were not processed by the two sponsoring websites). Although the task was imposed, consumers were told that they could interrupt the navigation at any time, for any reason. The only requirement was ongoing concurrent verbalization throughout their navigation process. For each task, the navigation data were recorded in AVI format (video and sound sequence) using the CAMTASIA software.

Step 3: The questionnaire After his or her navigation, each participant was asked to complete an online evaluation questionnaire. The questionnaire was intended to measure the participants' perception of the site that they visited and obtain their responses to a series of questions regarding their socio-demographic profile.

4.2 Independent Variables: Downloading Time and Time in Informational Dead-Ends

Two independent variables were measured: the total downloading time of pages and the total time lost in informational dead-ends during the shopping task. Using the CAMTASIA software, a video file was recorded that matched the verbalization of each consumer with the series of pages visited. This file captured all of the navigation performed, along with the associated voice track. Through systematic analysis of these files, we identified the following elements for each consumer: the task performed (travel agency task, or electricity provider task), the task completion, the total navigation time per session, the total downloading time per session, and the total time lost in informational dead-ends per session (excluding downloading time for pages in informational dead-ends). For an informational dead-end to be recorded, two conditions had to be met: 1) consumers were forced to go backward or migrate to another part of the site, either by pressing the "Back" button repeatedly or by using a hyperlink; 2) they also had to concomitantly verbalize the fact that they did not intend to go where they had found themselves. This verbalization is generally manifested in the form of frustration or exasperation, verifiable by the choice of adjectives used, available on the audio tracks resulting from the protocol analysis. These two conditions insured that not all navigational loops were categorized as informational dead-ends. Given these two conditions, the notion of an informational dead-end, we believe, brings additional information to the concept of back navigation (using the back button as a way to redirect the navigation) (Milic-Frayling et al. 2004). To ensure the accuracy of the informational dead-ends listed, two analysts coded each protocol. When a difference appeared in the coding, the main researcher prevailed. After

the initial coding, 94% of informational dead-ends inventoried were confirmed by convergence of the initial classification of the two analysts.

4.3 Dependent Variable: Task Completion

In order for a task to be considered completed, consumers must have had completed an online transaction on the website to which they were assigned. Again, the review of the video files enabled us to observe whether or not consumers had completed an online transaction.

4.4 Results

Descriptive statistics for each shopping task are presented in Table 1.

Insert Table 1 about here

In order to test our hypotheses, and since our dependent variable was dichotomous, two logistic regressions were performed: one for each shopping task (or website). The following categorical covariates were used in each regression model: previous visit to the website, previous purchase on the website, and Internet experience. In addition to these three covariates, each regression model contained the following independent variables: proportion of time in informational dead-end¹, proportion of time waiting for page downloads, and a two-way interaction term of these two variables. The dependent variable was task completion. As expected, the correlation between the two independent variables was not significant (Table 1).

Each regression model yielded a non-significant Hosmer and Lemeshow Test (Table 2), which suggested that there was no difference between the observed and predicted classifications of consumers who completed or did not complete the task (Hair *et al.* 1998). In addition, for both logistic regressions, the $-2 \log$ likelihood value from the base model was significantly different than the $-2 \log$ likelihood value of the

estimated model (Table 2), suggesting a significant fit improvement from the base model. Combined, these two measures provided support for the overall fit of each logistic regression model tested. Finally, following the stepwise procedure, the only variable included in each regression model was the percentage of time spent in informational dead-ends (Table 2). The percentage of time waited for pages to download, the interaction term between the two independent variables, and the three covariates did not have sufficient predictive power to be entered in the logistic regressions models.

Insert Table 2 about here.

Hypothesis 1 suggested that the proportion of time lost due to waiting for pages to download on consumers' Internet browsers relative to the total time of the shopping session on the website would negatively affect their task completion. Logistic regression results did not support Hypothesis 1. Based on the stepwise procedure, coefficients for the percentage of downloading time were not significant and thus were not entered in the regression models. Thus, the percentage of time waiting for pages to download was not a significant predictor of task completion. As illustrated in Table 1, in the case of the heat pump shopping task consumers who completed a purchase spent a larger proportion of their online shopping task waiting for pages to download than those who aborted the task.

Hypothesis 2 suggested that consumers who would complete an online purchase would spend a smaller proportion of their time in informational dead-ends than those who would not complete an online purchase. Our results strongly support Hypothesis 2 (Table 2). The percentage of time spent in informational dead-ends had a negative impact on consumers' task completion.

¹ This is the time spent on a page once it has been downloaded. Thus all times referring to the navigation process which takes place on a page excludes the time required to download it.

4.5 Discussion

Results of this study suggest that the relative time spent by consumers on pages that did not provide the expected utility (i.e., relative time in informational dead-ends) had a significant impact on their task completion and that the relative time spent waiting for pages to download had no impact on their task completion. Although interesting, Study 1 had some shortcomings. First, it did not consider the downloading time of informational dead-end pages as part of the counterproductive time associated with informational dead-ends. One could argue that different types of downloading times may have different impacts on consumers' task completion. For instance, waiting ten seconds for a page that is ultimately considered useless by the user (because it is within an informational dead-end) may be less acceptable than waiting the same time for a useful page. Second, only relative times were used in the first study. Hence, a second study was performed to replicate the initial study and also to investigate in more details the effect of different types of downloading times on task completion.

5. Study 2: Investigating Download Delays within Informational Dead-ends

5.1 Sample and Procedure

A second study was set up using the same methodology as for the first one. In this study, 111 consumers were recruited on the website of a national hardware store. As for Study 1, consumers were invited to perform a shopping task on the store's website in a laboratory setting. Verbalizations were recorded following the three steps described in the initial study. In addition, in-depth interviews with each consumer were also performed. These interviews were used to gain a better appreciation of the reasons that could explain why some consumers failed to complete their task. Also, in addition to the original coding used in study one (total navigation time, % of time lost in dead ends, % of time lost downloading, success or failure to purchase) additional variables were measured. In doing so we represent the amount of time lost in downloads into three

sub-variables: 1) time lost downloading a useful page, 2) time lost downloading a page that turned out to be in an informational dead end, 3) time lost, after an informational dead-end had been encountered, downloading the next page. Number of “Back” clicks were also measured.

5.2 Results

Overall, results were coherent with those obtained with the two initial sites. Tables 3 and 4 show the results of the same analyses that were performed in Study 1 thus confirming the rejection of H1 and the acceptance of H2.

Insert Tables 3 and 4 about here

Although results of the stepwise logistic regression analysis confirmed that the percentage of time spent in informational dead-ends was the only significant variable, further analyses were conducted on the newly generated variables pertaining to downloading time.

Insert Table 5 about here

Table 5 clearly confirms what Study 1 had shown namely that, taken as a bulk, downloading time has no impact on the likelihood of successfully completing a purchase online. However, it also shows that when downloading time is broken down in various subcomponents reflecting the purpose of those downloads we clearly see that the time for downloading a useful page has no impact on task completion (t-test value: 0.115, $p > 0.05$) while the time to download pages leading and within informational dead-ends (t-test value: 2.63, $p < 0.05$) and the time to download pages leading out of such dead-ends (t-test value: 2.37, $p < 0.05$) have a tremendous impact on the likelihood of completing the task. Finally, no differences in the number of back clicks were found between consumers who completed their task and those who did not (t-test value: 1.09, $p > 0.05$).

In order to confirm what the analyses presented thus far had shown us, a careful analysis of the in-depth interviews was conducted. Specifically we looked at the reasons evoked by consumers who had not completed their task. To ensure the accuracy of the reasons listed, two analysts coded each interview. Most of the times (89%), the same classification was achieved by the two analysts. When a difference appeared in the coding, the main researcher prevailed. Results are summarized in Table 6.

Insert table 6 about here

As Table 6 shows, most of the reasons provided by consumers point out at a potential design flaws (Information overload, pop-ups, etc.) which in turn increased the chance of sending consumers into informational dead-ends. Our study brings empirical evidence to what is too often intuitively suggested namely that counterproductive practices such as pop-ups or too complex pages are detrimental to an efficient navigation, especially while trying to perform a goal-directed activity.

6. General Discussion

Consumers' online task completion is a major concern for online managers because it is synonymous with conversion rate. Thus, it is important to empirically investigate variables that influence online task completion. So far, most research has focused on variables such as visit frequency to a website (Moe and Fader 2004, Sismeiro and Bucklin 2004) and time spent on a website (Li *et al.* 2002, Sismeiro and Bucklin 2004) to explain online task completion. This research examined the impact of two additional variables on online task completion: downloading times and time spent in informational dead-ends. Contrary to Li *et al.* (2002) and Sismeiro and Bucklin (2004), no significant differences in total navigation time were found between consumers who completed an online purchase and those who did not ($F_{\text{Hardware Store}}(1,54) = 0.087$; $F_{\text{Travel Agent}}(1,102) = 0.587$; $F_{\text{Electricity Supplier}}(1,72) = 0.399$; and $F_{\text{All}}(1,228) = 0.507$, all p-values > 0.05). In both studies, the variables that discriminated between consumers who did complete their online shopping task

and those who did not all pointed in the same direction: informational dead-ends. The relative time spent on pages that did not provided the expected utility (informational dead-end pages), the total time downloading these pages, and also the downloading time to get out of informational dead-ends within a shopping session on a website were all significantly greater for consumers who did not complete their online shopping task than for those who did complete their online shopping task. Finally, results also suggest that the total downloading time and the downloading time of useful pages do not discriminate between consumers who do complete their online purchase and those who do not.

Thus, our results suggest that the concept of informational dead-end is crucial in understanding consumers' online task completion. It is by nature very different from «back navigation». As suggested by Milic-Frayling et al. (2004), it is important for site designers to gain a good appreciation of the reasons consumers use the back button since such behavior is, by far, one of the most prevalent on the Web. As those authors have pointed out, not all back navigation necessarily reflect the fact that a user took the wrong direction. Our results show that informational dead-ends, which require a careful usage of consumers' verbalizations provide information which is more significant to understand cart abandonment behaviors than the strict analysis of the number of back button usages as provided by log analysis.

This study has many theoretical and managerial implications. First, the introduction of a new construct, namely informational dead-ends, as a predictor of online task completion is a major contribution of this study. In order to address some shortcomings of clickstream data (Bucklin *et al.* 2002), we introduced a multi-method approach that assesses informational dead-ends by identifying only those navigational loops that create frustration on the part of consumers. Second, results suggest that it would be more profitable for web designers to focus on minimizing the number of informational dead-ends, and frustration in general, experienced by consumers while on the website than on making the website faster. It is as if consumers are prepared to experience some waiting time when shopping online as long as the pages they download are

useful and that they don't get lost in the website. Thus, web designers should have a very good understanding of consumers' decision-making processes in order to facilitate their online shopping experience.

Many research avenues could be pursued following this study. First, although the proportion of time spent in informational dead-ends as well as downloading time to and from those informational dead-ends explained a good portion of task completion variance, other determinants of task completion need to be identified. Specifically, recently introduced clickstream complexity measures such as linearity and compactness may influence consumers' task completion (Senecal, Kalczynski, and Nantel 2005). Second, although various reasons that explain why consumers have abandoned their task, the concepts of frustration and/or satisfaction need to be further investigated in order to better understand what consumers experience while shopping online (Szymanski and Hise 2000). Furthermore, it would be interesting to investigate how certain personality traits such as need for cognition (Das *et al.* 2003) affect consumers' perception of informational dead-ends. Finally, studies, such as this one, using a multi-method approach, (in this study, clickstream and verbal protocols) should be pursued in order to gain a better understanding of online consumer behavior.

This study has some limitations that should be kept in mind before applying the results to real market situations. First, only self-selected consumers participated in this study. Thus, as with most online studies, due to the possible self-selection bias it is not possible to confirm that our participants are representative of the population of Internet shoppers. Second, results are based on fictitious purchases; i.e., consumers were not spending their own money in order to complete their online purchases. Third, although similar results were observed across websites, results of the present study are limited to only three websites. Thus, additional studies conducted with different samples and different websites would contribute to the generalization of the present study.

7. References

- Benbunan-Fich, R., 2001, Using Protocol Analysis to Evaluate the Usability of A Commercial Web Site, *Information and Management*, 39 (2), pp.151-163.
- Betts, M., 2001, Turning Browsers into Buyers, *MIT Sloan Management Review*, 42 (2), pp.8-9.
- Bucklin, R.E. and C. Sismeiro, 2003, A Model of Web Site Browsing Behavior Estimated on Clickstream Data, *Journal of Marketing Research*, 40 (3), pp.249-267.
- Bucklin, R., Lattin, J.M., Ansari, A., Gupta, S., Bell, D., Coupey, E., Little, J.D.C., Mela, C., Montgomery, A., and Steckel J., 2002, Choice on the Internet: From Clickstream to Research Stream, *Marketing Letters*, 13 (3), pp.245-258.
- Das, S., Echambadi, R., McCardle, M., and Lockett, M., 2003, The Effect of Interpersonal Trust, Need for Cognition, and Social Loneliness on Shopping, Information Seeking and Surfing on the Web, *Marketing Letters*, 14 (3), pp.185-202.
- Dellaert, B. and Kahn, B.E., 1999, How Tolerable is Delay? Consumers' Evaluations of Internet Web Sites After Waiting, *Journal of Interactive Marketing*, 13 (1), pp.41-54.
- Durrande-Moreau, A., 1999, Waiting for Service: Ten Years of Empirical Research, *International Journal of Service*, 10 (2), pp.171-189.
- Emarketer (2006), *US Retail E-Commerce Shopping Cart Abandonment Rates, 2001-2005*.
- Ericsson, A. and Simon, H.A., 1993, *Protocol Analysis: Verbal Reports as Data* Cambridge, Mass.: MIT Press.
- Gurley, J.W., 2000, The One Internet Metric That Really Matters, *Fortune*, 141 (5), p.135.
- Hair, J.F., Anderson, R.E., Tatham, R.L., and Black, W.C., 1998, *Multivariate Data Analysis*, Upper Saddle River, NJ: Prentice Hall.
- Hill, A., 2001, Top 5 Reasons Your Customers Abandon Their Shopping Carts, *Ziff Davis Smart Business for the New Economy*, 14 (3), pp.80-85.
- Iacobucci, D., 1998, Services: What Do We Know and Where Shall We Go? A View From Marketing, in T.E. Swartz, D.E. Bowen, and D. Iacobucci (Eds.), *Advances in Services Marketing and Management*, 7, pp.1-96, Greenwich, CT: JAI Press.
- Johnson, E., Bellman, S. and Lohse, G.L., 2003, Cognitive Lock-in and the Power Law of Practice, *Journal of Marketing*, 67 (2), pp.62-75.
- Li S., Montgomery A.L., Srinivasan K., and Liechty, J.C., 2002, Predicting Online Purchase Conversion Using Web Path Analysis, Working Paper, Carnegie Mellon University.

- Milic-Frayling, N., Jones, R., Rodden, K., Smyth, G., Blackwell A., and Sommerer, R., 2004, SmartBack: Supporting Users in Back Navigation, in *Proceedings of the 13th international conference on World Wide Web*, pp.63-71, New York City, NY, USA.
- Moe W.W., 2003, Buying, Searching, or Browsing: Differentiating Between Online Shoppers Using In-Store Navigational Clickstream, *Journal of Consumer Psychology*, 13 (1-2), pp.29-40.
- Moe, W.W. and Fader, P. S., 2004, Capturing Evolving Visit Behavior in Clickstream Data, *Journal of Interactive Marketing*, 18 (1), pp.5-19.
- Nah, F., 2004, A study on tolerable waiting time: how long are Web users willing to wait?, *Behavior & Information Technology*, 23 (3), pp.153-163.
- Nielsen, J. and Norman, D.A., 2000, Usability on the Web Isn't a Luxury, *InformationWeek*, 773, pp.65-70.
- Pavlou, P.A. and Fygenson, M., 2006, Understanding and predicting Electronic Commerce Adoption: An Extension of the Theory of Planned Behavior, *MIS Quarterly*, 30 (1), pp. 155-143.
- Payne, J.W., Bettman, J.R., and Johnson, E.J, *The Adaptive Decision Maker*, Cambridge, NY: Cambridge University Press, 1993.
- Rose, G.M., Meuter, M.L., and Curran, J.M. 2005, ON-line Waiting: The Role of Download Time and Other Important Predictors on Attitude toward E-retailers, *Psychology and Marketing*, 22 (2), pp.127-151.
- Ryan, G. and Valverde, M., 2005, Waiting for Service on the Internet, *Internet Research*, 15 (2), pp.220-240.
- Ryan, G. and Valverde, M., 2006, Waiting in Line for Online Services: A Qualitative Study of the User's Perspective, *Information Systems Journal*, 16, pp.181-211.
- Sénécal, S., Gharbi, J-E., and Nantel, J. (2002), "The Influence of Flow on Hedonic and Utilitarian Shopping Values," in S. Broniarczyk and K. Nakamoto (Eds.), *Advances in Consumer Research*, 29, p. 483-484.
- Senecal, S., Kalczynski, P., and Nantel, J., 2005, Consumers' Decision-Making Process and Their Online Shopping Behavior: A Clickstream Analysis, *Journal of Business Research*, 58 (11), pp.1599-1608.
- Simon, H.A. (1956), *Models of Thought*, New Haven, CT: Yale University Press.
- Sismeiro, C. and Bucklin, R.E., 2004, Modeling Purchase Behavior at an E-Commerce Web Site: A Task Completion Approach, *Journal of Marketing Research*, 41, pp.306-323.
- Szymanski, D.M. and Hise, R.T., 2000, e-Satisfaction: An Initial Examination, *Journal of Retailing*, 76 (3), pp.309-322.
- Tversky, A. and Kahneman, D., 1974, Judgment Under Uncertainty: Heuristics and Biases, *Science*, 185, pp.1124-1131.

Weinberg, B.D., 2000, Don't Keep Your Internet Customers Waiting Too Long At The (Virtual) Front Door, *Journal of Interactive Marketing*, 14 (1), pp.30-39.

Weinberg, B.D., Berger, P.D., and Hanna, R.C., 2003, A Belief-Updating Process For Minimizing Waiting Time In Multiple Waiting-Time Events: Application In Website Design, *Journal of Interactive Marketing*, 17 (4), pp.24-37.

Table 1. Descriptive Statistics for Study 1

Website	Task	Number of participants	Time spent on website (min.)	(1) Percentage of time in dead-ends	(2) Percentage of time downloading pages	Correlation between (1) and (2)
Travel Agent	Purchase a vacation package	102	C: 19.81 NC: 16.51 AVG: 17.87	C: 17.6 NC: 33.2 AVG: 26.8	C: 15.9 NC: 17.6 AVG: 16.9	-0.057
Electricity Supplier	Purchase a heat pump	72	C: 6.18 NC: 6.85 AVG: 6.55	C: 10.1 NC: 19.2 AVG: 15.2	C: 10.9 NC: 9.7 AVG: 10.2	-0.047

Notes: C: task completed; NC: task not completed; AVG: Average; All p-values > 0.050.

Table 2. Stepwise Logistic Regression Results for Study 1

Website	Hosmer and Lemeshow Test		Change in -2LL	Nagelkerke R ²	Coefficient for the Percentage of time in dead-ends (%DE)	
	X ²	df	X ² (df = 1)		β	Wald Statistic
Travel Agent	12.147	8	15.526*	0.190	-4.401	12.319*
Electricity Supplier	5.313	8	5.386*	0.097	-3.549	4.524*

Note: *: p< 0.05

Table 3. Descriptive Statistics for Study 2

Website	Task	Number of participants	Time spent on website (min.)	(1) Percentage of time in dead-ends	(2) Percentage of time downloading pages	Correlation between (1) and (2)
Hardware Store	Purchase a humidifier	111	C: 10.08 NC: 10.15 AVG: 10.11	C: 11.3 NC: 23.9 AVG: 16.9	C: 19.6 NC: 32.2 AVG: 25.2	0.264

Notes: C: task completed; NC: task not completed; AVG: Average; p-value > 0.050.

Table 4. Stepwise Logistic Regression Results for Study 2

Website	Hosmer and Lemeshow Test		Change in -2LL	Nagelkerke R ²	Coefficient for the Percentage of time in dead-ends (%DE)	
	X ²	df	X ² (df = 1)		β	Wald Statistic
Hardware Store	10.500	8	9.254*	0.211	-5.928	7.449*

Note: *: p < 0.05

Table 5. Student T-Tests of Various Counterproductive Times

Variable	Means (minutes and seconds)	t-test	p-value
Total Downloading time	C: 1:12 (n = 58) NC: 1:38 (n = 53)	1.142	0.158
Total Downloading time for useful pages	C: 0:53 NC: 0:55	0.115	0.909
Total downloading time of dead-end pages	C: 0:18 NC: 0:43	2.63	0.01
Total Downloading time to get onto the first page out of a dead-end*	C: 0:23 NC: 0:50	2.37	0.019
Number of times the back button was used	C: 2.88 NC: 3.75	1.09	0.277

Notes: C: task completed; NC: task not completed, *: The total of rows 2 and 3 equals row one. Time shown in row 4 is by essence included in the previous row but is presented here as a different variable in order to show the impact of losing time getting out of a dead-end.

Table 6. Main Reasons Evoked for Abandoning the Site (n=53)

Reasons	Incidence
Too much information on pages. Should present information in a treelike manner	40%
Pop-up windows	30%
Search engine hard to find	15%
Print characters are too small and lead to the wrong page	15%
Products are not sorted by price order	10%
Hard to compare two products	10%
No links between products and advices about the product	8%