Explaining Cognitive Lock-In: The Role of Skill-Based Habits of Use in Consumer Choice

KYLE B. MURRAY
GERALD HÄUBL*

We introduce and test a theory of how the choices consumers make are influenced by skill-based habits of use—goal-activated automated behaviors that develop through the repeated consumption or use of a particular product. Such habits can explain how consumers become locked in to an incumbent product. The proposed theory characterizes how the amount of experience with the incumbent product, the occurrence of usage errors while learning to use that product, and the goal that is activated at the time a choice is made interrelate to influence consumer preference. The results of three experiments support the theory's predictions.

In domains that involve repeated consumption or use of a product, consumers can become locked in to a particular product, technology, vendor, service provider, or brand when the costs of switching to a competing alternative outweigh the benefits. Traditional analyses of this phenomenon have focused on financial switching costs (e.g., penalties for breaking contractual commitments or rewards forgone in a loyalty program; see Shapiro and Varian 1999) or on search costs (i.e., the effort required to find and evaluate alternatives; see Stigler and Becker 1977; Wernerfelt 1985; Zauberman 2003). However, recent work has demonstrated that it is possible for consumers to become locked in to a particular product or vendor, even in the absence of financial switching costs or search costs (Johnson, Bellman, and Lohse 2003; Murray and Häubl 2003).

The central notion underlying this stream of research is that the cognitive costs (Payne, Bettman, and Johnson 1993; Shugan 1980) associated with consuming or using different alternatives are important drivers of consumer choice. More specifically, the costs associated with thinking about and using a particular product decrease as a function of the amount of experience a consumer has with it. Thus, repeated consumption or use of an incumbent product results in a (cognitive) switching cost that increases the probability that a consumer will continue to choose the incumbent over competing alternatives. This phenomenon has been characterized by the term *cognitive lock-in* (Johnson et al. 2003).

While buyers' analyzing the costs and benefits of switching from an incumbent to an alternative product is central to the definition of the general concept of lock-in (Klemperer 1987, 1995; Shapiro and Varian 1999), this definition does not explain the psychological mechanism that leads to cognitive lock-in or even what specific costs and benefits consumers are trading off. Therefore, to obtain a deeper understanding of cognitive lock-in, it is essential that we develop a rich theoretical account of how cognitive switching costs arise and how they interrelate with key situational factors to influence the choices consumers make.

In this article, we propose and test a theory of cognitive lock-in that is centered around the notion of skill-based habits of use. We conceptualize such habits as goal-activated automated behaviors that develop to asymptotic performance as a result of repeated experience (Newell and Rosenbloom 1981). Our central thesis is that skill-based habits of use that are specific to a particular alternative (product, store, service, etc.) create a switching cost that can render consumers locked in to that alternative as long as their consumption goal is congruent with the one that was active when these habits of use were developed.

It is important to recognize that our focus is on habits of use and not habitual choice. While habitual choice has been used as a descriptive label for consumers' consistent, re-

*Kyle B. Murray is an assistant professor of marketing, Richard Ivey School of Business, University of Western Ontario, London, ON N6A 3K7, Canada (kmurray@ivey.uwo.ca). Gerald Häubl is the Canada Research Chair in Behavioral Science, R. K. Banister Professor in Electronic Commerce, and an associate professor of marketing, School of Business, University of Alberta, Edmonton, AB T6G 2R6, Canada (gerald.haeubl@ualberta.ca). Correspondence: Kyle B. Murray. This article is based on the first author's PhD dissertation at the University of Alberta, which was supervised by the second author, and benefited greatly from the helpful comments of Walter Bischoff, Norman Brown, Peter Dixon, Terry Elrod, Eric J. Johnson, Richard D. Johnson, Doug Olson, and Christian Schmid, as well as the editor, associate editor, and reviewers. The authors gratefully acknowledge the support provided by the Social Sciences and Humanities Research Council of Canada, as well as the University of Alberta Dissertation Fellowship awarded to Kyle B. Murray.

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peated purchase of the same brand over time (Aaker 1991; Ehrenberg 1988), skill-based habits of use characterize how the behaviors involved in using or consuming a particular product become increasingly automated as a consequence of repeated experience with it. Habits of use can create switching costs that may result in habitual choice. However, habitual choice can also be caused by various other factors (Chestnut and Jacoby 1978; Howard and Sheth 1969).

The remainder of this article is organized as follows. In the next section, we review prior research on cognitive lock-in. We then introduce our theory of how skill-based habits of use develop and influence consumer choice. In particular, we propose a trial-and-error learning mechanism by which skill-based habits of use are acquired and discuss the critical role of goals in activating habits of use when the consumer makes a choice. In the subsequent sections, we present the method and results of three laboratory experiments designed to test the theory's predictions. The article concludes with a brief discussion of the theoretical and practical implications of our findings.

PRIOR WORK ON COGNITIVE LOCK-IN

The current work was motivated in part by the finding of Johnson et al. (2003) that, based on naturally occurring Internet usage data, visit times to commercial Web sites tend to decrease over time, and, importantly, sites with more steeply declining visit times appear to experience higher rates of purchasing. In particular, these authors found that the steeper the slope of the learning curve (i.e., the faster/easier the Web site is to learn to use), and the smaller the intercept of that curve (i.e., the faster/easier the site was to use on the first visit), the higher the probability that a visitor will make a purchase. The task performance efficiency gains achieved by learning to use a particular product (or Web site) make switching to another product—for which similar efficiency gains have not been made—costly to the consumer, and this leads to cognitive lock-in. Unlike traditional notions of loyalty, cognitive lock-in does not require a positive attitude toward the product, trust in the product, or objectively superior product functionality (Johnson et al. 2003).

In contrast to the work by Johnson et al. (2003), the current research was conducted in a controlled laboratory setting. As a result, we are able to examine the psychological mechanisms that cause cognitive lock-in and, more generally, underlie the formation of consumer preferences in repeated-consumption contexts, at a much greater level of detail than was possible in prior work. In particular, the experimental paradigm allows us to measure the key constructs in our theory and to examine how these variables interrelate to influence consumer choice.

The model proposed by Zauberman (2003) offers a time-discounting explanation of consumer lock-in when no traditional switching costs are present. It focuses on the trade-off between initial setup costs and ongoing usage costs. The key point of this model is that consumers tend to initially choose alternatives with low setup costs and high ongoing usage costs, which reduces the probability that they will switch to alternatives with higher setup costs and lower usage costs later on. The model does not allow for a reduction in usage costs as a result of skill acquisition—these are assumed to be constant over time. Zauberman's (2003) time-preference account and the learning mechanism proposed in this article are complementary in the sense that the two might operate in concert to create consumer lock-in. However, our theory of lock-in is more general in that it (1) allows for the development of incumbent-specific skills through repeated experience and (2) does not presume a choice between alternatives with differential setup and usage costs.

SKILL-BASED HABITS OF USE AND COGNITIVE LOCK-IN

We adopt the standard definition of lock-in as a specific type of loyalty that occurs when a cost-benefit analysis suggests to the buyer that the cost of switching away from an incumbent product outweighs the benefit of using an alternative product (Klemperer 1987, 1995; Shapiro and Varian 1999). Previous research has argued that the acquisition of skill through repeated experience with an incumbent product can increase the subjective value of the incumbent relative to a competing product (Johnson et al. 2003; Murray and Häubl 2003; Ratchford 2001; Wernerfelt 1985). The present research builds on this prior work by examining the specific mechanism that underlies the formation of consumer preference for an incumbent product, thus enhancing our understanding of the determinants of cognitive lock-in. In what follows, we introduce and test a theory of how skill-based habits of use—goal-activated automated behaviors that develop through the repeated consumption or use of a particular product—influence consumer preferences.

The Effects of Trial-and-Error Learning on Consumer Preference

We propose that skill-based habits of use are acquired through a trial-and-error learning process during which the behaviors associated with using an incumbent product become increasingly automated as a function of the amount of experience with it. The role of trial in this process is relatively straightforward and has been the focus of recent research (Johnson et al. 2003; Murray and Häubl 2003; Ratchford 2001). Simply put, repeated consumption or use of a product improves the efficiency with which that product can be used. This is reflected in a decrease (over trials) in the time required to complete a given task with the incumbent, thus enhancing the ease of use of that product (Card, Moran, and Newell 1983; Snoddy 1926). To the extent that the skill that is developed, and gradually becomes automated, does not transfer to other products, the incumbent's ease of use increases relative to that of alternative products. Thus, nontransferable incumbent-specific skill creates a switching

cost that is due to differences in ease of use between the incumbent product and competing alternatives.

The mechanism proposed here extends previous work that focused on repeated trials by also incorporating errors made during learning. In particular, consistent with theories of technology acceptance (Adams, Nelson, and Todd 1992; Davis 1989; Taylor and Todd 1995), we suggest that consumers who initially struggle to learn to use a product will tend to perceive it to be more difficult to use. Furthermore, we predict that this is true even if, through additional experience with the product, consumers eventually become just as proficient at using it as those who never had any difficulty with it. That is, we propose that the occurrence of usage errors in connection with an incumbent product reduces its eventual perceived ease of use. In addition, we argue that this effect is independent of the product's actual ease of use, which is a function of the amount of experience (i.e., the number of trials) with the product.

Consistent with the findings of work on the roles of actual and experienced ease of thought generation in judgment (Schwarz 2004), we contend that consumers' ability to accurately detect a product's actual ease of use (to them), and particularly changes in it over time, is quite limited. Consequently, while we do expect consumer preference for the incumbent to be influenced by its actual ease of use (as reflected in objective measures of task performance), we predict that this preference is driven primarily by the incumbent's perceived ease of use. Therefore, we hypothesize that repeated product trials enhance the actual ease of using the product, which in turn increases the perceived ease of using the product. In addition, we predict that errors made while learning to use the product reduce the perceived ease of using it. Finally, we expect that, as an incumbent product's perceived ease of use increases (decreases), preference for that product will also increase (decrease).

Goal Activation

While the proposed trial-and-error learning mechanism might (on the surface) be reminiscent of operant conditioning, it is important to distinguish the habits of use that we focus on from the reflexive responses studied by psychology's behaviorist tradition (Watson 1913). Rather than treating habits as simple trained reflexes, we adopt a contemporary view of habits as a continuum of behaviors that includes reflexive responses as well as more complex knowledge structures (Aarts and Dijksterhuis 2000b), thus building on prior work that has primarily examined the role of habits in travel mode choice (Aarts and Dijksterhuis 2000a; Aarts, Verplanken, and Van Knippenberg 1994, 1998). Under this view, habits are hierarchical knowledge structures, with goals at the top of the hierarchy and relevant behaviors at the bottom. Once a habit has developed, the relevant goal automatically activates the associated behaviors. This perspective establishes habits as a subset of a more general class of goal-activated automated behaviors (Bargh 1990), and it also allows us to draw on insights from cognitive psychology as to the mechanism by which behaviors become automated through repetition (Logan 1988; Palmeri 1999). Most important, this conceptualization of habits of use suggests that goals should play a key role in activating automated behaviors.

The importance of goals in the organization and activation of human behavior has been well established (Anderson 1983; Bargh 1990; Soman and Cheema 2004). In addition, goals have been shown to be critical in activating and directing habitual behavior (Aarts and Dijksterhuis 2000b). While it has been suggested that becoming more skilled at using one product relative to other products may be sufficient for the development of high levels of consumer loyalty (Johnson et al. 2003; Ratchford 2001; Wernerfelt 1985), the conceptualization of skill-based habits of use as goal-activated automated behaviors highlights the role of goal activation as a key determinant of consumer preference for an incumbent product—along with the increase in ease of use that accrues with repeated experience.

Moreover, we propose that goal activation can override the effect of a product's ease of use on consumer preference for it since habits are context specific (Ouellette and Wood 1998) and the requisite automated behaviors require goal activation (Aarts and Dijksterhuis 2000b). In particular, we hypothesize that the specific set of automated behaviors is only activated in the presence of the goal that was active when the incumbent-specific skill was acquired. This has important implications for consumer behavior. For example, learning to navigate a particular grocery store to purchase orange juice does not necessarily lock consumers in to that store when their goal is to buy a cake. Similarly, becoming skilled at looking up stock quotes at Yahoo.com does not mean that the user will inevitably sign up for a Yahoo e-mail account.

In sum, our theory states that, as skill-based habits of use develop that are specific to an incumbent product (through trial-and-error learning), consumers tend to become locked in to that product. This tendency is driven by the interplay between the amount of experience consumers have with the incumbent product, the occurrence of usage errors made while learning to use that product, and the goal that is activated at the time a choice is made.

GENERAL METHOD: STIMULI AND PROCEDURES

The three studies reported in this article were conducted in a computer-based research laboratory. In each experiment, the stimulus environments were Web site interfaces that had been created specifically for these studies. They were roughly fashioned on news Web sites that contain a large number of articles on various topics and are organized in terms of a hierarchical structure (e.g., cnn.com). We created two interfaces that were functionally identical and differed only in terms of one nonfunctional property—the navigation controls were based on either pull-down menus (interface A) or radio buttons (interface B).

Our choice of interfaces was informed by previous re-

search showing that the particular type of navigation controls used (i.e., pull-down menus vs. radio buttons) had no effect on consumers' choices among interfaces (Murray 2004; Murray and Häubl 2002, 2003). Moreover, the two interfaces were extensively pretested to establish their a priori equivalence by comparing them on perceptual and performance-based measures. Participants were asked to rate the interface they had used in terms of (1) its effectiveness in completing the task, (2) the ease of navigation throughout the task, and (3) their level of enjoyment when using the interface, each on a scale from 0 = very poor to 9 = outstanding. In addition, we measured the task completion times and the number of errors made while using each interface. We observed no significant differences between the two interfaces on any of these measures (all p-values > .3).

All three experiments employed a search task that required participants to navigate through a Web site with the goal of retrieving a specific piece of information (and typing it into a text box on the computer screen). A set of instructions—including a description of the target information—was displayed at the top of the screen until the task's completion. In all cases, there was only one navigation path that led to the successful completion of the task. Once participants had navigated to the correct article, the target information could be found within the first 90 words. If participants navigated down an incorrect path, they were presented with an error message and required to click a link that would take them back to the previous page.

EXPERIMENT 1

Experiment 1 was designed to test two key predictions about the development of preference as a result of repeated experience with an incumbent product. The first of these is that the actual ease of using the incumbent mediates the positive effect of the amount of experience with the incumbent on consumers' preference for it. To measure the actual ease of using an incumbent interface (relative to a competitor), we introduce a new metric, relative task completion time (RTCT), which is defined as the difference between the time it took a person to perform a task when s/he last used the incumbent (T_{li}) and the time it takes him/her to perform the same task with a competitor for the first time (T_c; i.e., RTCT = $T_{li} - T_c$).

The second hypothesis examined in this study is that the perceived ease of using the incumbent (relative to the competitor) is the primary driver of preference for the incumbent. In particular, we predict that perceived ease of use mediates the effects of both actual ease of use and errors made while learning to use the product on consumer preference.

Method and Procedure

Two hundred forty-five undergraduate psychology students at the University of Alberta participated in the study for partial course credit. The basic task was to locate a specific piece of information using interface A—the incumbent. The number of such tasks that a participant was asked to complete (incumbent trials) was manipulated at nine levels: 1, 2, 3, 4, 5, 6, 7, 8, or 9. In addition, whether or not the navigation path leading to the target information varied across trials was manipulated. Participants were randomly assigned to one of 18 conditions in a 9 (number of incumbent trials) × 2 (navigation path variability) between-subjects full-factorial design.

After the incumbent trials, participants were required to use interface B—the competitor—to complete one additional search task. The manipulation of navigation path variability carried forward throughout this competitor trial (and the remainder of the experiment). After using the competitor, participants were to choose one of the two interfaces to use for the remainder of the study, which would involve more of the same type of search tasks. Participants were then required to complete a final trial using the interface they had chosen. After that, they responded to a short survey composed of manipulation checks and additional rating-scale measures.

Results

We examined the task completion times for evidence of both learning and automation over repeated trials. Based on a well-established empirical regularity in the area of human skill acquisition (see Newell and Rosenbloom [1981] for a review), we expected to observe a decrease in task completion times over incumbent trials that is well approximated by a power function. In addition, we anticipated that such improvements in performance would be due to the gradual automation of skill. The conventional method of testing for such automation is to examine whether the standard deviation (across individuals) of task completion times decreases over trials and whether this reduction is, in fact, also approximated by a power function (Logan 1992).

The analysis of task completion times is based on the data for those participants who completed nine incumbent trials. Because task performance did not differ between the two treatments of navigation path variability on any of the nine trials (all p-values > .1), this factor is excluded from the following analyses. Mean task performance decreased dramatically over the first several trials before reaching an asymptote. The standard deviation of performance across participants followed virtually the same pattern over trials. The R^2 of the power-function model of the task completion times over trials (compared to those of logarithmic and linear benchmark models, in parentheses) is .892 (.733, .494), and the R^2 of the power-function model of the standard deviations of task completion times is .781 (.777, .605). These results provide evidence not only of skill acquisition but also of the automation of this skill with repeated use of the incumbent.

Next, we examined the effects of the manipulated factors on interface preference by estimating a logistic regression model with choice of the incumbent as the dependent variable and number of incumbent trials (linear and quadratic terms), navigation path variability, and both two-way in-

teractions involving the latter as independent variables. The number of incumbent trials had a positive (linear) effect on preference for the incumbent ($\beta = .115$, $p = .027$), but none of the other terms in the model were statistically significant (all p-values $> .5$). The choice shares of the incumbent by the number of trials participants completed with it prior to being exposed to the competitor (collapsed across navigation path variability) are shown in figure 1.

To test our prediction that usage errors affect subsequent preference, we reran the previous model with a variable indicating whether a participant made at least one such error (0 = no; 1 = yes) and its interactions added. The results (see table 1) confirm the positive effect of the number of incumbent trials. More important, they also demonstrate that usage errors have a significant negative effect on preference for the incumbent. Furthermore, the absence of an interaction between errors and the number of incumbent trials indicates that the negative effect of having made errors using a product on preference for that product is persistent and essentially irrecoverable, even with a significant amount of additional experience.

We applied the procedure outlined by Baron and Kenny (1986) to test whether the effect of the number of incumbent trials on preference is mediated by the incumbent's actual ease of use (as measured by the RTCT metric). First, the effect of the amount of experience with the incumbent on interface choice was already established (see above). Second, the number of incumbent trials had a significant effect on RTCT (linear term: $\beta = -6.243$, $p < .001$; quadratic term: $\beta = -.451$, $p < .001$). Table 2 shows, for each of the number-of-incumbent-trials conditions, the mean (absolute) task completion times for the last incumbent trial and the competitor trial, as well as the mean RTCT and its standard deviation. When both RTCT and the number of incumbent trials were included in the logistic regression model, RTCT had a significant effect on interface choice ($\beta = -.006$, $p = .021$), whereas the effect of the number of incumbent trials was no longer significant (linear: $\beta = .072$, $p = .202$; quadratic: $\beta = -.025$, $p = .319$). These results provide clear support for the predicted mediation effect—the amount of experience with the incumbent influences preference only through the incumbent's actual ease of use.

TABLE 1

EXPERIMENT 1: LOGISTIC REGRESSION RESULTS (PREFERENCE FOR THE INCUMBENT)

	β	Wald	p-value
Navigation path variability (PV)	−.135	.052	.819
No. of incumbent trials—linear (IT)	.705	16.998	<.001
No. of incumbent trials—quadratic	−.067	8.269	.004
Usage errors (UE)	−2.194	11.783	.001
PV × IT	.081	.354	.552
PV × UE	.844	1.409	.235
IT × UE	.187	1.841	.175
PV × IT × UE	−.157	1.040	.308

FIGURE 1

EXPERIMENT 1: INCUMBENT CHOICE SHARE BY NUMBER OF INCUMBENT TRIALS

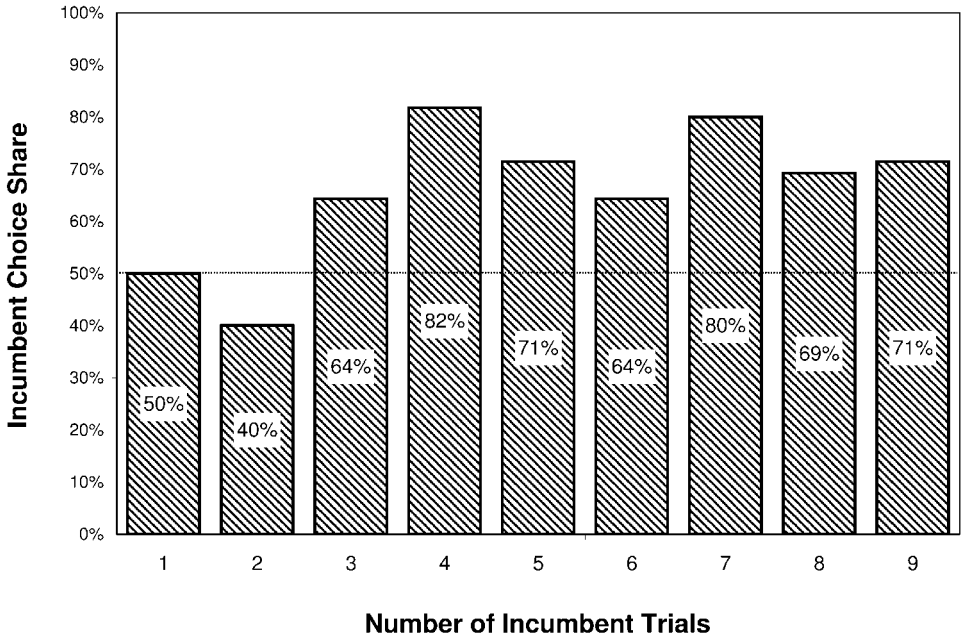


TABLE 2

EXPERIMENT 1: ABSOLUTE AND RELATIVE TASK COMPLETION TIMES ACROSS INCUMBENT TRIALS

	Absolute task completion times (means)		Relative task completion times	
No. of incumbent trials	Last incumbent trial	Competitor trial	Mean	Standard deviation
1	135.9	66.3	+69.6	77.7
2	46.4	50.3	−3.9	31.1
3	33.1	50.5	−17.4	27.0
4	32.2	46.8	−14.6	26.4
5	32.9	43.6	−10.7	19.5
6	22.1	37.4	−15.3	15.6
7	18.4	37.4	−19.0	17.7
8	17.8	34.3	−16.5	12.9
9	17.1	33.9	−16.8	14.8

We also predicted that perceived ease of use mediates the effect of usage errors on preference. The difference between a participant's rating of the subjective ease of use of the incumbent and that of the competitor was used as the indicator of the incumbent's relative perceived ease of use. The predicted mediation effect was supported because usage errors negatively affected the incumbent's relative perceived ease of use ($\beta = -1.181$, $p = .014$), the incumbent's relative perceived ease of use had a strong positive effect on preference for the incumbent ($\beta = 1.663$, $p < .001$), and, when both were included as predictors of interface choice, relative perceived ease of use continued to have a significant effect ($\beta = 1.672$, $p < .001$), but errors did not ($\beta = -.857$, $p > .3$). Thus, usage errors affect preference for the incumbent product via its perceived ease of use (relative to the competitor).

The occurrence of usage errors did not affect the (eventual) actual ease of using the incumbent interface. There was no difference between participants who made usage errors and those who did not in terms of both task completion time on the last incumbent trial ($M_{err} = 33.62$ seconds, $M_{no.err} = 36.44$ seconds, $F(1, 243) = .188$, $p = .665$) and RTCT ($M_{err} = -7.78$ seconds, $M_{no.err} = -4.42$ seconds, ANOVA, $F(1, 243) = .208$, $p = .649$).

The actual ease of using the incumbent, measured by RTCT, had a significant effect on the perceived ease of using it relative to the competitor ($\beta = -.203$, $p < .001$). Moreover, as predicted by our theory, when both measures of ease of use were included as independent variables in a logistic regression model of interface choice, perceived ease of use continued to have a significant effect ($\beta = 1.671$, $p < .001$), but RTCT did not ($\beta = -.004$, $p = .344$). It is worth noting that perceived and actual ease of use were only weakly correlated ($r = -.203$), which highlights the need to conceptually (and empirically) distinguish between these two constructs.

We obtained measures of three potential additional predictors of interface preference—participants' liking of the interface they chose, how much they trusted it, and how much less risk they felt there was in using that interface. Logistic regressions show that none of these are significant predictors of interface choice, although the effect of trust approaches significance at the .05 level (like: $\beta = .106$, $p = .114$; trust: $\beta = .132$, $p = .051$; less risk: $\beta = -.020$, $p = .651$).

When asked which of the two interfaces they would have chosen had they not had any experience with either, participants were significantly more likely to indicate that, in that case, they would still have preferred the interface that they did choose (81%) than to state that they would have selected the other interface (19%, $p < .001$). Moreover, while the number of trials had a positive effect on participants' perceptions of their acquisition of skill at using the incumbent ($\beta = .228$, $p = .021$), the latter is not predictive of interface choice ($\beta = .100$, $p = .178$). Thus, participants did not attribute their preference to the amount of experience they had had with the two interfaces nor to the interface-specific skill they had acquired.

Discussion

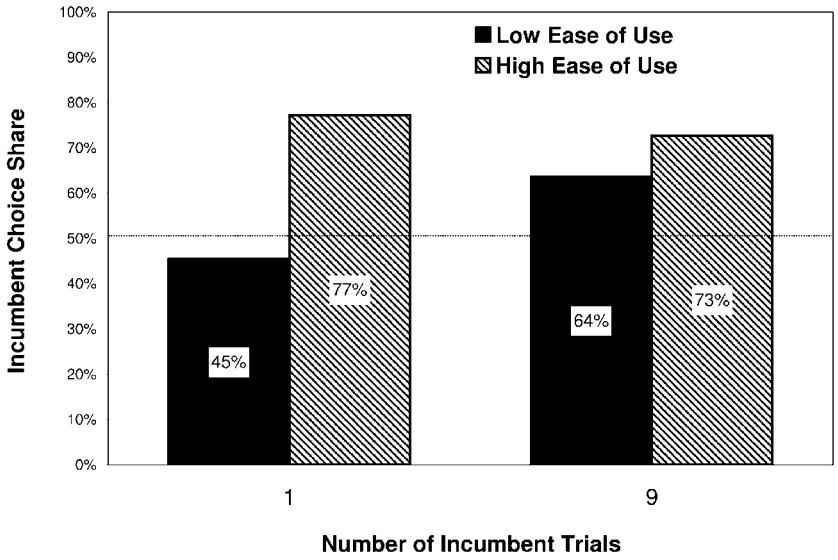
The results of experiment 1 provide strong support for the proposed trial-and-error mechanism of preference formation. In particular, they indicate that the acquisition of skill specific to an incumbent product, through repeated experience with that product, is a key driver of consumer preference. In addition to showing that the amount of experience with an incumbent product has a positive effect on consumer preference for it, the results of this experiment demonstrate that, as predicted, this effect is fully mediated by the incumbent's actual ease of use relative to a competitor (measured by the RTCT metric).

Our findings also show that errors made while learning to use an incumbent product have a significant impact on consumer preference, even when (as in the current study) such errors are actually of no consequence in terms of how easy to use a product ultimately becomes to the consumer. However, usage errors do influence a product's perceived ease of use (which, as expected, is also affected by actual ease of use). In fact, our results demonstrate that the impact of errors made while learning to use a product on eventual preference is completely mediated by a consumer's perception of its ease of use. Finally, as predicted, the effect of actual ease of use on preference is also mediated by perceived ease of use, which highlights the central role of the latter in the trial-and-error mechanism of consumer preference formation.

The manipulation of navigation path variability did not influence participants' speed of task completion with the incumbent, nor did it affect their ultimate choice of interface. One interpretation of this is that the manipulation was too subtle. Clearly, if we increased the degree of change in task demands over trials enough, performance would eventually diminish, and interface preference would be affected. However, the lack of an effect of this factor shows that our main findings are robust to at least minor changes in the environment over time. We tested plausible alternative mecha-

FIGURE 2

EXPERIMENT 2: INCUMBENT CHOICE SHARE BY NUMBER OF INCUMBENT TRIALS AND INITIAL INTERFACE EASE OF USE



nisms for the effect of repeated experience on preference (i.e., greater liking of, increased trust in, and lower perceived risk in using the interface they chose); none of these were supported by the data. Finally, although our evidence on this is limited to self-report measures, the apparent lack of conscious awareness of the role that repeated experience plays in shaping preference provides further support for our conceptualization of skill-based habits of use as determinants of consumer preference, and this is consistent with prior research on habitual behavior and on the effect of habits on choice (Aarts and Dijksterhuis 2000b; Ouellette and Wood 1998; Wood, Quinn, and Kashy 2002).

EXPERIMENT 2

In experiment 1, the actual ease of using the incumbent was endogenous, in the sense that it was influenced by the amount of experience with that interface. To examine the role of this construct in greater depth, we directly manipulated the incumbent's initial (actual) ease of use in experiment 2. We expected that high initial ease of use would result in an instant preference for the incumbent that parallels what would otherwise be the result of repeated experience with it. In addition, our theory predicts that this effect of initial ease of use will be mediated by the incumbent's perceived ease of use. Moreover, the amount of experience with the incumbent should have a stronger (positive) influence on preference for it when initial ease of use is lower.

Method and Procedure

Eighty-eight undergraduate psychology students at the University of Alberta participated for partial course credit. As in experiment 1, participants were required to complete a series of information search tasks. Apart from the differences noted here, the procedure was identical to that used in experiment 1. The number of incumbent trials was manipulated at two levels: one or nine. In addition, the interface's initial ease of use was manipulated via the number of intermediate pages that had to be navigated through in order to locate the target information on each trial—either six (low ease of use) or two (high ease of use). The manipulation of ease of use carried forward throughout the competitor trial and the postchoice trial. Participants in experiment 2 were randomly assigned to one of four conditions in a 2 (number of incumbent trials) × 2 (initial ease of use) between-subjects full-factorial design.

Results

The incumbent choice shares in the four experimental conditions are shown in figure 2. A logistic regression with choice of the incumbent as the dependent variable revealed a significant interaction effect between initial ease of use and the number of incumbent trials ($\beta = -.985$, $p = .031$). The amount of experience with the incumbent had a positive effect on interface preference only when initial ease of use was low (Fisher's exact test, $p = .002$). No such effect was present when the incumbent interface's ease of use was high ($p = .212$). As predicted, the incumbent's initial ease of use had a strong positive influence on pref-

erence when participants completed only a single incumbent trial (Fisher's exact test, $p < .001$), and this effect was not significant with nine incumbent trials ($p = .396$).

The strong preference for the incumbent after only a single trial under high ease of use (77% choice share) was clearly not the result of a switching cost arising from the acquisition of a skill-based habit of use. In fact, the mean RTCT was positive for both single-incumbent-trial conditions (49.14 and 39.23 seconds for low and high ease of use, respectively) but negative for the two nine-incumbent-trial conditions (−26.82 and −19.73 seconds for low and high ease of use, respectively). An ANOVA revealed that only the number of incumbent trials had a significant effect on RTCT ($F(1, 84) = 46.087$, $p < .001$), while neither the effect of ease of use nor the interaction between the two factors was significant (both p-values $> .3$).

According to our theory, the effect of the manipulation of ease of use on interface preference in the case of a single incumbent trial should be mediated by the perceived ease of use of the incumbent. We tested this by estimating four logistic regression models. First, the manipulation of initial ease of use had a positive effect both on the incumbent's perceived ease of use relative to the competitor ($\beta = .761$, $p = .023$) and on preference for the incumbent ($\beta = .640$, $p = .005$). Furthermore, the incumbent's relative perceived ease of use had a significant positive influence on preference for it ($\beta = .501$, $p < .001$). Finally, when both the manipulated initial ease of use and the incumbent's relative perceived ease of use were included in the same model, only the latter had a significant influence on choice of the incumbent ($\beta = .492$, $p < .001$), whereas the effect of the former was no longer significant ($\beta = .051$, $p = .859$). Thus, as predicted, the manipulation of initial (actual) ease of use influenced interface preference via perceptions of ease of use.

The other relationships predicted by our theory were examined for the low-ease-of-use condition, where the amount of experience with the incumbent had an effect on interface preference. First, the occurrence of usage errors had a negative influence on subsequent preference for the incumbent ($\beta = -1.163$, $p = .035$). As predicted, this effect was mediated by the perceived ease of use of the incumbent relative to the competitor. Usage errors negatively affected the incumbent's perceived ease of use relative to the competitor ($\beta = -2.526$, $p = .042$), the latter had a strong positive effect on preference for the incumbent ($\beta = .748$, $p = .002$), and, when both predictors were included in a model of interface choice, perceived ease of use continued to have a significant effect ($\beta = .730$, $p = .002$), but errors did not ($p = .580$). Furthermore, the incumbent's actual ease of use, measured by RTCT, had a significant influence both on its perceived ease of use relative to the competitor ($\beta = -.021$, $p = .040$) and on interface preference ($\beta = -.016$, $p = .039$). Yet, when both measures of ease of use were included in a model of interface choice, the effect of perceived ease of use remained virtually unchanged ($\beta = .430$, $p = .005$), while that of RTCT became insignificant ($p = .215$). In sum, these results provide strong support for our theory and corroborate the findings of experiment 1.

Using the same tests as those employed in experiment 1, we again find that participants did not attribute their interface preference to the amount of experience they had had with the two interfaces ($p < .001$) and that their perceptions of skill acquisition did not affect interface choice ($p = .239$). In addition, as in the first experiment, we find that participants' liking of the interface they chose, how much they trusted it, and how much less risk they felt there was in using that interface are not significant predictors of interface choice (all p-values $> .4$).

Discussion

In contrast to experiment 1, the initial ease of use of the interfaces was manipulated in this study. When both interfaces were very easy to use, even a single experience with the incumbent resulted in a strong preference for it, and repeated experience did not lead to a further increase in preference. However, when initial ease of use was low, a preference for the incumbent developed only through repeated experience with it—in line with the findings of experiment 1. By demonstrating the importance of actual and perceived ease of use, as well as usage errors, the results of experiment 2 provide further support for the proposed trial-and-error mechanism of consumer preference formation.

EXPERIMENT 3

Evidence of the acquisition and automation of incumbent-specific skill, while necessary, is not sufficient to demonstrate that skill-based habits of use are a key force in the formation of consumer preference, as we have proposed. In particular, our conceptualization of skill-based habits of use as being goal activated implies that, in the absence of the goal, the associated behaviors will not be activated. Therefore, the key link between skill acquisition and consumer choice is the activation of these skills in the presence of a consumption goal that is congruent with the goal that was active when the skills were acquired (Aarts and Dijksterhuis 2000b).

Experiment 3 was designed to explicitly test this conceptualization of habits of use as goal-activated automated behaviors. We expect that, when a goal that is congruent with the goal that was present while consumers learned to use an incumbent product is activated, their preference for the incumbent will be greater than when an incongruent goal is activated. Moreover, we predict that this effect is amplified as experience with the incumbent increases. This is based on the notion that, since goal-action associations are strengthened through practice (Anderson 1983), experience causes an increase in the probability of an action being performed when a congruent goal is activated but a decrease in that probability when an incongruent goal is activated.

Method and Procedure

Eighty undergraduate psychology students at the University of Alberta participated in experiment 3 for course credit. Each participant was randomly assigned to complete either one or nine trials with the incumbent interface in the presence of an information search goal (as in experiment 2). After the incumbent trial(s), participants were required to complete one additional trial using the competitor interface but this time in connection with a different goal—to access a discussion area on the Web site and submit their opinion about a short news article they read. As a result, participants had information search experience with the incumbent interface but no experience posting opinions. Conversely, they had experience posting opinions using the competitor interface but no information search experience. That is, different goals were associated with the two interfaces.

For the critical choice between the incumbent and the competitor, participants were randomly assigned to one of two goal conditions. They were asked to choose an interface either to complete additional information search tasks (goal associated with incumbent) or to post their opinions about some additional news articles (goal associated with competitor). They were then required to complete a final trial with the assigned task goal using the interface they had chosen. After that, participants responded to a short survey composed of manipulation checks and additional rating-scale measures. To summarize, a 2 (goal activation) × 2 (number of incumbent trials) between-subjects full-factorial experimental design was used for this study.

Results

We are primarily interested in examining the effect of goal activation on interface choice. However, given the proposed trial-and-error mechanism, and the central role that product usage errors played in experiment 1, it was important to account for the impact of such errors here as well. The results of a logistic regression with choice of the incumbent as the dependent variable and number of incumbent trials (one trial $= -1$; nine trials $= 1$), goal activation (associated with competitor $= -1$; associated with incumbent $= 1$), usage errors (none $= -1$; at least one $= 1$), and all interactions among these as independent variables are provided in table 3. Preference for the incumbent was greater when the activated goal was the one associated with it, as compared to when the activated goal was associated with the competitor ($\beta = 1.322$, $p = .022$). As predicted, this effect became stronger as experience with the incumbent increased (goal activation × number of incumbent trials: $\beta = 1.244$, $p = .032$).

The logistic regression analysis also revealed a significant three-way interaction among goal activation, the number of incumbent trials, and usage errors ($\beta = -1.438$, $p = .036$). Figure 3 illustrates the strong influence that the occurrence of usage errors had on the interaction between goal activation and the number of incumbent trials. For those participants who did not make any errors ($n = 33$), the effect of the amount of experience with the incumbent on preference for it was dramatically moderated by the nature of the activated goal, as evidenced by a significant goal activation × number of incumbent trials interaction ($\beta = 1.405$, $p = .022$). When the activated task goal was the one associated with the incumbent, more experience with the incumbent increased preference for it, but when the goal associated with the competitor was activated, experience with the incumbent had a negative effect on preference for it. For those participants who did experience at least one usage error ($n = 47$), the amount of experience with the incumbent had no effect on interface preference ($p = .699$), although activation of the goal associated with the incumbent had a marginally significant positive effect on preference for it ($\beta = .677$, $p = .064$).

TABLE 3

EXPERIMENT 3: LOGISTIC REGRESSION RESULTS (PREFERENCE FOR THE INCUMBENT)

	β	Wald	p-value
Goal activation (GA)	1.322	5.270	.022
No. of incumbent trials (IT)	−.057	.015	.908
Usage errors (UE)	.533	2.127	.145
GA × IT	1.244	4.594	.032
GA × UE	−.645	.895	.344
IT × UE	.148	.062	.803
GA × IT × UE	−1.438	4.398	.036

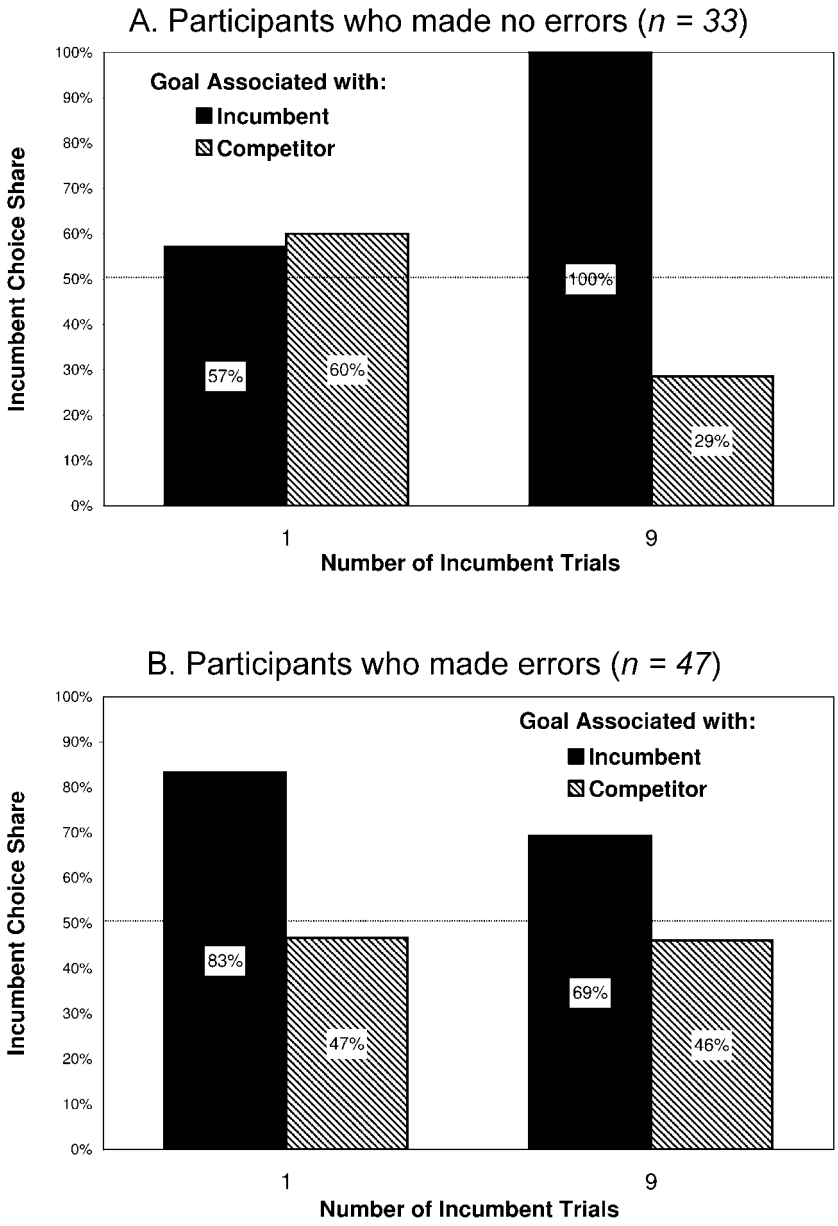
Based on the same tests as those employed in experiments 1 and 2, we again find that participants did not attribute their interface preference to the amount of experience they had had with the two interfaces ($p = .048$) and that their perceptions of skill acquisition did not affect interface choice ($p = .768$). In addition, as in the first two studies, we find that participants' liking of the interface they chose, how much they trusted it, and how much less risk they felt there was in using that interface are not significant predictors of interface choice (all p-values $> .05$). Finally, to test for possible demand effects, we asked all participants at the conclusion of the experiment what they thought might have been the purpose of the study and what specific research questions it might have sought to address. We also randomly selected four participants and conducted an extensive post-experiment interview with each to elicit their thoughts on what the research questions might have been. No participant correctly guessed the purpose of the study.

Discussion

The results of experiment 3 demonstrate that goal activation plays a pivotal role in consumer choices that are driven by skill-based habits of use. Moreover, the influence of goal activation on choice behavior becomes stronger as the amount of experience with the incumbent increases (i.e., as usage behavior becomes more automated). In fact, after nine incumbent trials, when the consumption goal associated with the competitor was activated, most participants chose

FIGURE 3

EXPERIMENT 3: INCUMBENT CHOICE SHARE BY NUMBER OF INCUMBENT TRIALS AND GOAL ACTIVATION



the competitor, and, when the goal associated with the incumbent was activated, most participants chose the incumbent. This effect was particularly strong when participants did not make any errors during the incumbent trials.

The findings of experiment 3 cannot be explained as the result of mere exposure to, or mere familiarity with, an incumbent (Johnson and Russo 1984; Zajonc 1968), and they do not support models that posit that skill acquisition alone is sufficient to create high levels of loyalty (Johnson et al. 2003; Murray and Häubl 2002, 2003; Ratchford 2001; Wernerfelt 1985). They are, however, consistent with the theory about skill-based habits of use and their role in consumer choice introduced in this article.

GENERAL DISCUSSION

This research extends current models of cognitive lock-in by proposing and testing a trial-and-error learning mechanism that underlies the formation of skill-based habits of use and explains the link between consumption experiences and the formation of consumer preferences through the mediating effects of ease of use. The trial part of this psycho-

logical mechanism has been previously identified as an important determinant of consumer choice (Johnson et al. 2003; Murray and Häubl 2002, 2003; Wernerfelt 1985). The present work extends this basic finding and demonstrates that the effect of the amount of experience with an incumbent on preference for that incumbent relative to a competitor is mediated by their relative perceived ease of use. More generally, this research reinforces the notion that past consumption experiences affect the attractiveness of consumption alternatives currently available to the consumer (Becker 1996; Ratchford 2001; Stigler and Becker 1977). In addition, this article illustrates the important and persistent impact of errors made while using, or learning to use, a product on consumer preference for it.

The literatures in both psychology (Aarts and Dijksterhuis 2000b; Anderson 1983) and consumer research (Soman and Cheema 2004) have recognized the important role that goals play in organizing and activating human behavior. However, previous theories of skill-based loyalty (Johnson et al. 2003; Ratchford 2001; Wernerfelt 1985) have failed to incorporate consumption goals. Defining skill-based habits of use as goal-activated behaviors led us to predict that consumption goals play a key role in activating behavior and influencing choice, which is supported by our data. This is an important finding because it demonstrates the specific nature of the link between the development of habits of use and consumer loyalty. In fact, the results of the current research indicate that, although habits of use can create a substantial advantage for an incumbent where otherwise none exists, such an advantage appears to be limited to the achievement of a particular goal.

Finally, although we used computer-based stimulus environments in our studies, the theory and empirical evidence presented in this article provide important new insights into consumer choice behavior in a wide variety of domains—all those where using or consuming the available alternatives (products, stores, services, etc.) requires some form of alternative-specific skill and where consumers make repeated choices over time. When customers acquire incumbent-specific skills, cognitive lock-in arises, giving the incumbent an advantage over its competitors. In this article, we have demonstrated that skill-based habits of use provide an explanatory mechanism for this phenomenon.

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