Are IT habits Functionally Different from IT Intentions?

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It is important to correctly identify the behavioral mechanisms that hold people from adopting novel information technologies (IT) to be able to design interventions to overcome their influence (Polites and Karahanna 2012). To this end IT habit has been greeted "as a key alternative mechanism" behind individual use of information technology (Venkatesh et al. 2012). The current consensus is that "habit has relatively little conceptual overlap with intention," (Limayem et al. 2007, p. 709) which justifies the use of IT habit side by side with IT intention in models predicting IT use. While intentional IT use is conscious and controlled IT habits are non-conscious and automatic. Such mechanistic habits do not consume cognitive resources, and can perform in parallel with cognitive tasks.

The alternative view is that IT habit is goal-oriented rather than mechanistic (Ortiz de Guinea and Markus 2009). This view is aligned with the current position of cognitive psychology on automatic behaviors (for a recent review, see Custers and Aarts 2010): Regularly pursued behaviors can be initiated from outside conscious awareness yet they remain goal-directed (Aarts and Dijksterhuis 2000) and are usually in line with one's values and general goals (Ajzen 2002). This suggests that intentional and habitual IT use may be functionally similar – apart from habits being non-conscious. The test for their similarity is whether IT habit employs the same resources as intentional IT use. That is, whether IT habit is supported by *executive functions*, collectively known as the *executive control*, which maintain the mental representations of goals during their execution (Marien et al. 2012)

The emerging view in cognitive psychology holds that executive control is required even for automatic behaviors. A growing body of empirical research supports this position. First, it has been shown that non-consciously activated goals can remain active for extended periods of time (Aarts et al. 2008; Aarts et al. 2009; Bargh et al. 2001). Second, non-conscious goals can inhibit competing goals to protect themselves from distraction (Aarts et al. 2007; Papies et al. 2008; Shah et al. 2002). Third, when goal attainment is important, non-conscious goals are capable of promoting behavior in novel settings and in the face of obstacles (Aarts et al. 2004; Custers and Aarts 2005a; Custers et al. 2008; Eitam et al. 2008; Hassin et al. 2009). Pursuit of non-consciously activated goals also appears to involve feedback (Custers and Aarts 2005b; Moskowitz et al. 1999): Behavioral situation that is discrepant with the goal encourages people to adapt their behavior. More recently, direct evidence showing that operation of non-conscious goals depends on cognitive resources and is effortful has emerged (Marien et al. 2012).

In this paper, we seek to answer the following research question: Are *IT habits* goal-oriented or "hard-wired" as suggested by the dominant IT use theory. We employ the classic dual-task laboratory experiment (Pashler 1994) with eye tracking equipment and test whether automatic avoidance of banner ads, also known as *banner blindness* (Burke et al. 2005), degrades the performance of a simultaneous reading task. Banner blindness is functionally related to those observations (Schneider and Shiffrin 1977; Shiffrin and Schneider 1977) that were central to formulation of the dominant IT habit theory, which justifies banner blindness be called a *habit* in the sense IS literature has given to the concept.

We operationalize our research question through a number of testable hypotheses. The first group of these hypotheses is related to testing presence of banner blindness: 1) Banner ads are entered less frequently than ads appearing in other screen locations. 2) Banner ads are fixated less frequently than ads appearing in other screen locations. To see if habitual avoidance of banner ads impairs a simultaneous cognitive task, we test whether presence of banner ads has a negative influence on reading. High reading performance is related to high reading rate (words per minute), short fixations on text, and low frequency of regressions (right-to-left eye movements). We formulate the hypotheses that test the influence of banner blindness on reading task as follows: 3) Presence of a banner ad decreases the reading rate. 4) 4) Presence of a banner ad increases the duration of fixations on text. 5) Presence of a banner ad increases the number of regressions during reading.

Participants and apparatus. Thirty volunteers with normal or corrected-to-normal vision gave an informed consent and were paid to participate in the experiment. Eye movements were recorded by a Tobii 1750 remote eye-tracking system with a spatial accuracy of .5°. The screen coordinates of both eyes were sampled at 50 Hz. For each participant, the system was calibrated before the experiment using a set of sixteen calibration points shown one at a time and covering the whole screen area. The stimuli were presented on a 17-inch display with a screen resolution of 1024 x 768 pixels. The display was located on a table at the distance of approximately 60 cm from the participants' eyes.

Materials. The stimuli comprised 32 web pages each containing a text and two ad areas, one above (banner) and one to the right (skyscraper) of the text. The text material came from 32 online magazine articles with mean length of 104 words and range of 90 – 118 words. The length average of words was 6.8 characters. The texts were displayed in a 14-point Arial font, the character height average was .4°, and width average .3° from the viewing distance. The advertisements comprised 64 full-color ads of 16 different topics. Four professionally designed ad versions (banner vs. skyscraper; animated vs. static) of each topic were used to control for the effects of ad content. Each participant saw all 64 ads; the same topic never appeared both as a banner and a skyscraper on a web page. Animations included different combinations of horizontal, vertical and rotating movement, and text or graphics fading in or out. The banners subtended 14.4° x 2.0° (468 x 60 pixels), and the skyscrapers subtended 4.4° x 11.6° (140 x 350 pixels). We used a Latin-square design in which each participant read eight texts per condition (combination of static and/or animated ads), and every text was read by equal number of participants. Texts and ad combinations were randomly assigned to different conditions to prevent possible interactions between the text and ad contents. The conditions were presented in randomized order with a Java servlet based stimulus onset system, and displayed using Internet Explorer web browser. The web pages fitted in one screen.

Procedure. We informed the participants that the experiment was about online reading, and instructed them to read the 32 texts for content. The participants read the texts at their own pace, and we measured their eye movements during this time. When finished reading a text, the participants clicked on a push button, which opened a new web page with a four-choice question. Answering the question displayed the next stimulus. After seeing all 32 stimuli and answering the related content questions, we asked the participants to rate on a five step Likert scale whether they had paid attention to ads and if the ads had interfered with reading.

Data analyses. We extracted fixations, saccades and blinks from the raw eye coordinate data with the Tobii Clearview software using a window-based algorithm with 40 pixel window and 100ms minimum fixation duration.

To measure reading performance as a function of the overall scanning behavior on the page, we calculated reading rate as the number of words divided by the time spent on the page (words per minute, wpm). To test whether attention to ads (fixations to the ads) or inhibiting attention to ads (decreased reading rate in the absence of attention to ads) interfered with reading, we calculated eye movement measures separately for the ad and the text regions. We calculated number of entries and total number of eye fixations to measure attention to ads. To measure reading difficulty, we calculated number of entries on the text region, mean fixation duration, and number of saccades that were directed backward on the current line (regressions), for the text region (reviewed in Rayner 1998).

Reading performance and eye movement measures for the text area were studied with repeated measures analysis of variance (ANOVA). Generalized Estimating Equations (GEE) model was used for the eye movement measures for the ads.

Results. On average participants fixated banners on 14% of trials while they fixated skyscrapers on 20% of trials. Number of entries [$\chi^2(1)=18.24$, $p<.001$] and fixations [$\chi^2(1)=27.45$, $p<.001$] were higher for skyscrapers than for banners (**H1 and H2 supported**). Ad position affected reading rate [$F(1, 26)=6.48$, $p=.017$, $\eta p^2 =.199$]: Reading was slower when banner was present compared to when skyscraper was present. Presence of banner was also related to longer mean fixation duration during reading [$F(1, 26)=11.73$, $p=.002$, $\eta p^2 =.311$] and greater number of regressions [$F(1, 26)=6.29$, $p=.019$, $\eta p^2 =.195$] on the text region (**H3, H4, and H5 supported**).

We find that online ads that appear in somewhat unexpected locations draw more overt attention than those ads that appear in the most expected location on top of the Web page. That ads appearing in the most expected locations, in turn, interfere more with the simultaneous cognitive task tells us that these ads are inhibited with some effort. This finding supports the idea that people learn strategies of avoiding online ads in their visual field. Banner blindness is related to impaired reading, which tells us that the habit consumes cognitive resources and occupies the *executive control*. We conclude that banner blindness, which can be considered in many ways the epitome of IT habit, is goal-oriented behavior. Thus, IT habits seem to be functionally identical with intentional behaviors save for the absence of conscious intention. Our findings suggest that we should reconsider the theoretical justification of using IT habit as a complement to IT use intention in IT use models.

Our findings suggest that the current IT habit theory is in need of mending. The only major difference between habitual and intentional IT use seems to be that habits are carried out with limited awareness, a relatively unimportant difference by the standards of modern cognitive psychology (Custers and Aarts 2010; Dijksterhuis and Aarts 2010): Intentions are merely conscious representations of goal pursuit (Bargh and Morsella 2009). The academic importance of our findings lies in the advice they give for improving predictions of IT use: It is not meaningful to say that IT habits limit the predictive power of IT intentions, for habitual and intentional IT use are both goal-oriented behaviors. We have a number of competing explanations for the low IT intention-IT use relationship (e.g. Burton-

Jones and Straub 2006; Bagozzi 2007). Providing evidence against the currently favored explanation should motivate IS researchers to invest their future efforts in testing these more fruitful avenues for closing the gap between IT intentions and IT use.

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