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Predicting consumer responses to a chatbot on Facebook

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Running title:

Predicting responses to chatbots

Abstract

As chatbots have become increasingly popular over the past years, most social networking sites have recognized their far-reaching potential for commercial purposes. Their rapid and widespread usage warrants a better understanding. This study examines the effectiveness of chatbots on Facebook for brands. The study proposes and tests a model based on the Consumer Acceptance of Technology Model (CAT-Model) including three *cognitive* (i.e. perceived usefulness, ease-of-use and helpfulness) and three *affective* (pleasure, arousal and dominance; PAD-dimensions) determinants that potentially influence consumers' attitude toward brands providing a chatbot, and their likelihood to use and recommend the chatbot (i.e. patronage intention). Structural equation modeling analyses show that two cognitive (i.e. perceived usefulness and helpfulness) and all three affective predictors are positively related to consumers' attitude toward the chatbot brand. The findings further indicate that attitude toward the brand explained a significant amount of variation in consumers' patronage intention. Finally, all the significant determinants also have an indirect effect on patronage intention, mediated through attitude toward the brand. In conclusion, our findings hold valuable practical implications, as well as relevant suggestions for future research.

Keywords: chatbot; cognition; affect; brand attitude; patronage intention

Word Count: 3328

INTRODUCTION

In the area of information technology, the use of online social or humanlike cues is considered as one of the most important developments for online interface applications.¹ Early in 2016, the use of these humanlike features has also found its way to Facebook, revealing an innovative tool: *chatbots*. Chatbots are chat services that respond automatically to language text in a humanlike manner and execute specific commands.² These instant responses usually consist of structured messages, images, links or even specific call-to-action buttons. The introduction of chatbots has marked the beginning of a new technological era that has been referred to as *conversational interfaces*.³ Importantly, these conversations will be similar to those users have with their friends and family.³ To illustrate the functioning of chatbots, imagine the following scenario: you are looking for a flight to an exotic holiday resort. Instead of spending time and energy in navigating yourself through several unfamiliar airline websites, you could ask an airline chatbot through Facebook Messenger for possible flight plans. Instantly, the chatbot responds and starts a conversation by offering you flight recommendations matching your preferences, accompanied by a call-to-action button to make your flight reservation online.

As this example illustrates, chatbots can be considered as virtual assistants providing automated customer support and e-commerce guidance in a conversational manner.⁴ They are an increasingly popular tool for marketing communication on Facebook.⁵ However, despite their widespread usage⁵, it remains largely unknown which factors affect the effectiveness of chatbots, and how these chatbots influence perceptions of the brand using this technology. The main purpose of this article is to investigate the (psychological) predictors that influence attitudes and behavioral intention to use chatbots. More precisely, based on the Consumer Acceptance of Technology model (CAT-model),⁶ the present study is the first to our knowledge to test the *cognitive* (i.e. usefulness, ease-of-use and helpfulness) and *affective*

(pleasure, arousal and dominance) determinants that influence consumers' attitude toward brands providing chatbots, and hence, their actual intentions to patronize these chatbots (i.e. the likelihood to use and recommend the chatbot).

THEORETICAL FRAMEWORK

In the literature, a substantive body of research has focused on human-chatbot interactions. Users' engagement with chatbots shows many similarities to interactions between humans,⁷ but however, there are some notable differences in the content and quality of such conversations as well. Hill, Ford and Farreras⁸ found that users communicated with chatbots with shorter messages, and more importantly, human–chatbot communication lacked much of the richness of vocabulary found in conversations between people, and exhibited greater profanity. On their turn, Corti and Gillespie⁹ investigated whether people are willing to repair misunderstandings with chatbots. They revealed that, for chatbots that are perceived as human-like, users were more likely to adjust misunderstandings than did users that perceived the chatbots as being automated. When it comes to the motivations that drive people to use chatbots, Brandtzaeg and Følstad¹⁰ showed that users tend to engage in a chatbot conversation mainly for productivity reasons (e.g. chatbots help users to obtain timely and efficient assistance or information). Furthermore, they also distinguished additional motivations, such as entertainment, social factors and curiosity.

Although these studies show important insights on users' behavior and experiences with chatbots, little is known about variables that determine chatbot effectiveness from a marketing perspective. Nowadays, these chatbots easily find their way in the communication strategies of many companies and brands, as marketers have recognized the far-reaching potential of chatbots for their commercial agendas. Therefore, a thorough understanding is needed on the psychological determinants of commercial chatbot effectiveness. This study addresses this

critical and urgent research gap based on the CAT-model, a unified theory of technology acceptance in which *cognition* is comprehensively combined with *affect*.⁶ In essence, this theoretical framework posits that three cognitive (perceived usefulness, perceived ease-of-use and relative advantage) and three affective determinants (pleasure, arousal and dominance) are related to consumers' attitude toward the adoption of a technology, and on its turn, attitude then influences adoption intention. Importantly, to fit this framework in our research context, two important adjustments to the main outcome variables in the CAT-model will be made (see Figure 1): 1) attitude toward adoption of the technology will be replaced by attitude toward the brand that launches the technology, and 2) adoption intention will be replaced by patronage intentions (i.e. refers to a consumer's probability of using the branded chatbot in the future, as well as the willingness to recommend the chatbot to friends).

HYPOTHESES

The current study proposes six determinants (three cognitive and three affective), as shown in Figure 1, derived from the CAT-Model. The three cognitive predictors are: perceived usefulness, perceived ease-of-use and perceived helpfulness. The three affective determinants consist of the PAD-dimensions of Mehrabian and Russell:¹¹ pleasure, arousal and dominance. They will be outlined separately in the next sections.

[INSERT FIGURE 1 AROUND HERE]

Cognitive determinants

Perceived usefulness refers to the perceived likelihood that the chatbot will enhance a consumer's productivity or job performance.¹² A large body of research has shown that perceived usefulness is the strongest cognitive determinant of technology acceptance, since

consumers attach great importance to whether or not they will benefit from a new innovation.⁶ More so, it has also been demonstrated to have an important positive influence on consumers' brand experiences and attitudes toward new digital technologies.¹³⁻¹⁶ Therefore, we propose that the perceived usefulness of a chatbot will be positively associated with consumers' attitude toward the brand using a chatbot (H₁).

Perceived ease-of-use can be defined as the degree to which consumers think that using the chatbot will be simple and free of effort.¹² As it addresses the efficiency of an act, it has been identified as an important intrinsic motivation for consumers. Therefore, it is directly related to their attitude as well.¹⁷ Past empirical evidence has revealed that ease-of-use serves as an important factor in determining attitudinal consumer responses, such as attitude toward online shopping,¹⁸ mobile services,¹⁹ and even consumers' general attitude toward social networking sites²⁰. Following this reasoning, we expect perceived ease-of-use to be a significant positive predictor of consumers' attitude toward the brand providing a chatbot (H₂).

As argued in previous research, usefulness and ease-of-use may not entirely reflect consumers' attitude, necessitating an examination of additional predicting variables.²¹ In the CAT-Model, the *relative advantage* of a technology has been introduced. However, this construct refers to the degree to which an innovation is perceived to be better than its precursor.⁶ Since chatbots are a new technological development on social networking sites (without precursor), we opted to substitute relative advantage by another widely used and highly relevant cognitive predictor: *perceived helpfulness*. Perceived helpfulness can be described as the degree to which the responses of the chatbot are perceived to be relevant, hereby resolving consumers' need for information.²² For many consumers, it is very important to be able to communicate with companies online to get assistance regarding their questions and problems.²³ In this respect, perceived helpfulness has been shown to be imperative. Prior studies revealed that an increase in perceived helpfulness will lead to more positive attitudes

toward online services.^{23,24} Therefore, we suggest that perceived helpfulness will have a positive impact on attitude toward the chatbot brand (H₃).

Affective determinants

In order to arrive at a more accurate understanding of technology acceptance, researchers also need to take affective determinants into empirical consideration.⁶ In line with the CAT-model, the present study will focus on three independent emotional dimensions: pleasure, arousal and dominance (PAD-dimensions).¹¹ The pleasure dimension refers to the pleasantness or enjoyment of a chatbot conversation; arousal refers to the level of excitement and mental stimulation in the chat conversation; and dominance entails the extent to which consumers feel in control of or are free to act in the interaction with the chatbot.^{25,26} As the PAD-dimensions capture an essential part of emotional experiences,²⁵ they have been widely used in the past four decades by scholars from different research fields, including information systems and consumer behavior.^{6,27}

A large body of consumer research has showed that the PAD-dimensions are significant predictors of consumer attitude toward innovations.⁶ Previous studies, among others, have found that the PAD- dimensions are positively associated with consumers' attitude toward an online shopping mall,²⁸ positively linked to attitude toward the adoption of a personal digital assistant and a tablet device,^{6,29,30} and, related to the increase of attitude toward a commercial website.³¹ Furthermore, recent findings also revealed that the PAD-model can explain a significant amount of variation in attitudes toward the use of hedonic information systems (e.g. applications or tools on SNSs).³² Based on the aforementioned empirical evidence, we therefore expect pleasure (H₄), arousal (H₅) and dominance (H₆) to be significant positive predictors of consumers' attitude toward the brand using a chatbot.

Attitude and patronage intention

A consumer's attitudinal experience with a chatbot is considered to be a critical determinant of his or her actual intention to use the tool.³³ This brings us to the relationship between attitude and behavioral intention, which is a well-established one in past technology research.^{13,15,34,35} More precisely, this study focuses on patronage intention, which can be defined as the willingness to use the branded chatbot in the future and recommend it to friends. In this respect, studies (mostly) point toward the same direction: attitude is a crucial factor in guiding consumers' actual patronage intention.³⁶ Thus, similarly, we suggest that consumers' attitude toward the chatbot brand will be positively related to chatbot patronage intention (H₇).

Indirect model effects

In the abovementioned sections, we have only addressed *direct* effects of the determinants on consumers' attitudes. However, it has been theorized that attitudes are influenced by cognition as well as affect, *and in turn*, influence behavioral intentions (*indirect effects*).³⁷ Bruner and Kumar³⁸ tested this assumption, and revealed in their study that attitude mediated the effects of usefulness, ease of use and fun on intentions. In line with these findings, the CAT-model also confirmed the significant indirect paths of cognitive and affective determinants on adoption intention, through attitudes.^{6,29} Therefore, we predict that attitude toward the brand mediates the effects of cognition (H_{8a}) and affect (H_{8b}) on patronage intention.

METHOD

Sample

Data were collected from 245 respondents aged 18-35 years ($M_{\text{age}} = 25.97$, $SD = 4.92$) recruited through Lightspeed, a digital data collection company specialized in global market research. One hundred twenty-seven participants were men (52%). Registered panelists who

met the criteria of being within the abovementioned age category *and* having a Facebook account were sent invitations to complete the survey. In order to participate, respondents first had to agree to an informed consent. The survey took around ten minutes to complete.

Materials

For the purpose of the present study, we developed a Facebook chatbot called “Cinebot”, which is provided by a fictitious brand Cinelux (a chain of movie theaters). This chatbot is able to assist users in browsing for movies and making movie reservations. Cinebot functioned based on preprogrammed rules to respond to specific questions and commands. The chatbot recognized sentence structures and responded in an ‘if this then that’-manner with an appropriate answer or call-to-action button (for making a reservation). The researchers spent a considerable amount of time in programming Cinebot in order to obtain a smooth and effective tool, hereby conducting many test conversations to make troubleshooting adjustments and fine-tune the chatbot.

Procedure

At the beginning of the online survey, respondents were given a direct link to start a conversation with the Facebook Messenger chatbot “Cinebot” (with their own Facebook account). They received instructions to make a ticket reservation for a movie airing the next week via the chatbot (they were allowed to choose their movie theater location and movie). Once the conversation started, participants were free to send messages to the chatbot in accordance with the instructions. Importantly, all participants engaged in a similar chat conversation with Cinebot. After successfully finishing the conversation, participants were directed back to the survey. The second part of the questionnaire then assessed all the main variables of the study.

Measures

Perceived helpfulness was measured on a seven-point semantic differential scale, using three bipolar items originating from the study of Yin, Bond and Zhang³⁹ ($\alpha = .91$). The scale constructed by Hassanein and Head⁴⁰ was used to measure perceived ease-of-use. Four items were used on a seven-point Likert-scale ranging from “*strongly disagree*” to “*strongly agree*” ($\alpha = .94$). To measure perceived usefulness, we used items from a study conducted by Gefen and Straub.⁴¹ These items were assessed on a seven-point Likert-scale ranging from “*strongly disagree*” to “*strongly agree*” ($\alpha = .94$). To capture pleasure, arousal and dominance, we used the Self-Assessment Manikin scale (SAM-scale).⁴² The SAM-scale is a visual self-report scale based on the PAD-dimensions of Mehrabian and Russell,¹¹ hereby depicting each dimension with graphic characters along a nine-point continuous scale. The variable attitude toward the brand was measured by using three widely adopted and well-established bipolar items that represent this construct (‘bad/good’, ‘like/dislike’ and ‘favorable/unfavorable’) ($\alpha = .95$). Finally, the measurement of patronage intention was based on three items derived from Wang and colleagues (e.g. *I would be willing to make reservations for movie tickets via Cinebot*).³³ Answer options ranged from one (*strongly disagree*) to seven (*strongly agree*) ($\alpha = .93$).

RESULTS

Data analysis

The hypothesized model was examined using structural equation modelling (SEM) with maximum likelihood estimation in Mplus.⁴³ The data were analyzed with a two-step approach (first measurement model, then structural model). Correlations between the main variables in the study are presented in Table 1. Importantly, all reported estimates are standardized.

[INSERT TABLE 1 HERE]

Measurement model

First, we estimated a *measurement model* to explore whether the observed variables truly reflect the underlying constructs they are designed to measure. Based on a confirmatory factor analysis, we conclude that all factor loadings are significant and above 0.84, and that the overall measurement model provides a good fit for the data (see Table 2).

[INSERT TABLE 2 HERE]

Structural model

Thereafter, a *structural model* was assessed in which we define the predicted relationships among the variables under investigation. Figure 2 presents the model, including the standardized regression coefficients. The goodness-of-fit indices indicate a good fit for the model: RMSEA: .042 [CI: 0.029 - 0.054]; TLI: .974; CFI: .979; $\chi^2(159) = 218.36, p < .001$. SEM analyses revealed that the cognitive and affective predictors explain 59 percent of the variance ($R^2 = .59$) in attitude toward the brand (A_b) that provided the chatbot (i.e. Cinelux). Furthermore, this brand attitude accounts for 44 percent of the variance ($R^2 = .44$) in the intention to patronize a chatbot. Hypothesis 1-3 related to cognition. As shown in Figure 2, perceived helpfulness ($\beta = .55, p < .001$) and usefulness ($\beta = .23, p < .01$) were significant determinants of A_b , but contrary to expectations, no significant direct path was found for ease-of-use ($\beta = -.14, n.s.$). Thus, $H_{1\&3}$ are confirmed, whereas the model failed to support H_2 . H_{4-6} were related to affect. According to our analyses, A_b is significantly influenced by the affective variables pleasure ($\beta = .11, p < .05$), arousal ($\beta = .11, p < .05$) and dominance ($\beta = .12, p < .01$). Therefore, H_{4-6} are supported. Finally, we also found a strong positive relationship between A_b and patronage intention ($\beta = .67, p < .001$), supporting H_7 .

In order to examine whether attitude mediates the relationship between the cognitive/affective predictors and patronage intention, we additionally tested the significance of indirect effects by exploring bias-corrected 95% confidence interval (1000 bootstrap samples). As shown in Table 3, all predictors have an indirect effect on patronage intention via attitudes, except for perceived ease-of-use. Thus, findings provide strong empirical support for the mediating role of attitude toward the brand, hereby partly supporting H_{8a}, while entirely confirming H_{8b}.

[INSERT FIGURE 2 HERE]

[INSERT TABLE 3 HERE]

DISCUSSION

This study tested *cognitive* and *affective* determinants that influence the effectiveness of chatbots through an adapted CAT-model, hereby opting for an integrated and multidisciplinary approach by uniting theoretical insights from technology literature with consumer behavior research. The findings reveal that perceived usefulness and helpfulness are two *cognitive* predictors that are positively related to consumers' attitude toward the brand providing a chatbot. With respect to the *affective* determinants, all three PAD-dimensions (pleasure, arousal and dominance) significantly predict consumers' attitude toward the chatbot brand. Furthermore, attitude toward the brand explains a significant amount of variation in consumers' patronage intention (i.e. the likelihood to use and recommend the chatbot). Finally, results reveal that all these determinants also have an indirect effect on patronage intention, through attitude toward the brand as a mediating variable. In sum, these results indicate that how consumers *think* as well as how they *feel* about chatbots significantly influences the effectiveness of chatbot technology.

This study builds upon prior research on consumers' engagement with and responses to online artificial agents. To date, research in this area is very limited, and moreover, has mainly focused on artificial agents that reside on the website of a company or organization.^{33,44,45}

These findings are, to the best of our knowledge, the first to provide much needed insights on consumer responses to a chatbot on Facebook Messenger. Therefore, this study could serve as an important departing point that paves the way for a relevant and timely research agenda on consumers' interactions with conversational interfaces.

This research holds relevant implications for practitioners for the development of an effective chatbot campaign. Launching a chatbot on Facebook can be characterized by a high degree of uncertainty since they can be programmed in many different ways, using a distinct set of rules. This study offers inspiration to help programming these rules by showing that utilitarian (*cognition*) as well as hedonic features (*affect*) of a chatbot have a significant impact on its effectiveness. For instance, companies might include jokes or smileys in the conversations to increase pleasure, respond to customers in a quick and time-efficient manner to increase usefulness, provide detailed and relevant information to increase helpfulness, and so on. These features might then contribute to develop an effective chatbot on Facebook.

Finally, the present study has also some limitations and future research venues. The first limitation relates to the fact that every participant received the same instructions for the chat conversation. Future research could install some variation through experimental manipulation to explore whether the current predictors hold under different conditions (e.g. too much arousal might lead to a decrease in effectiveness, or too much pleasure might cause distraction from the brand, etc.), and moreover, investigate which other (chat)factors affect the effectiveness of a SNS chatbot (e.g. length of the chat, tone of voice of the chatbot, etc.).

Second, this study was conducted based on a convenience sample. Although research often relies on data from nonprobability samples, scholars should take precautions in terms of generalizing the current findings. Third, when a consumer initiates a conversation with a chatbot, passive consent is given to the brand to contact the consumer in the future through Facebook Messenger with commercial messages.⁴ It would be particularly relevant to investigate how consumers react to advertisements they receive by the chatbot through instant messaging (e.g. in terms of acceptance, irritation, perceived intrusiveness, etc.), and whether these messages alter their initial evaluation (e.g. attitude and intentions) of the chatbot itself. Finally, as the present study mainly focused on marketing psychology, it is of great importance to shed some additional light on the human-chatbot psychology as well. We encourage scholars to carry out research inquiries on topics related to human-chatbot interaction, hereby pursuing patterns that might otherwise never be revealed with a marketing focus. The latter is crucial to yield new and insightful knowledge that will help us to arrive at better understanding the topic of chatbot interaction.

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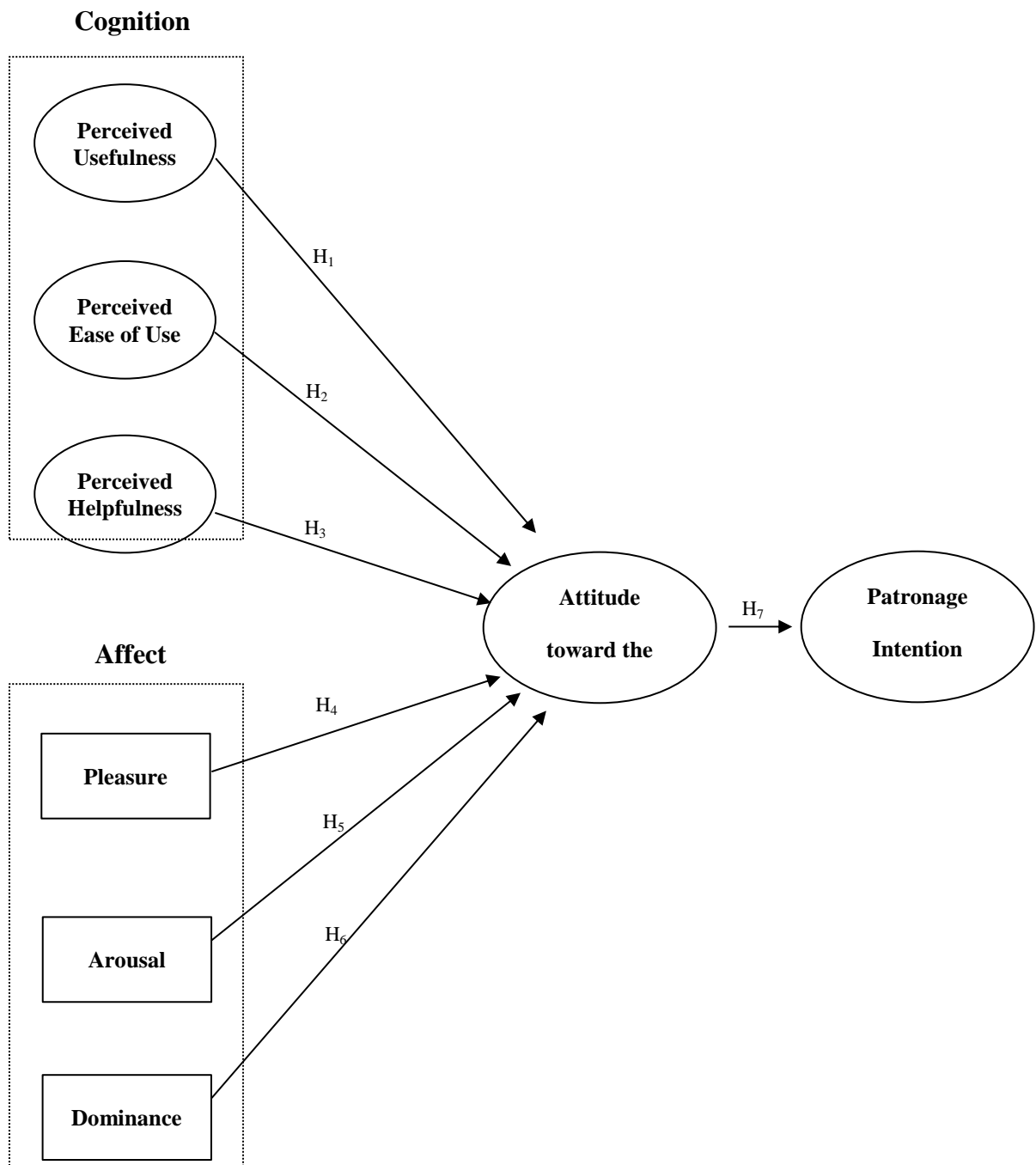
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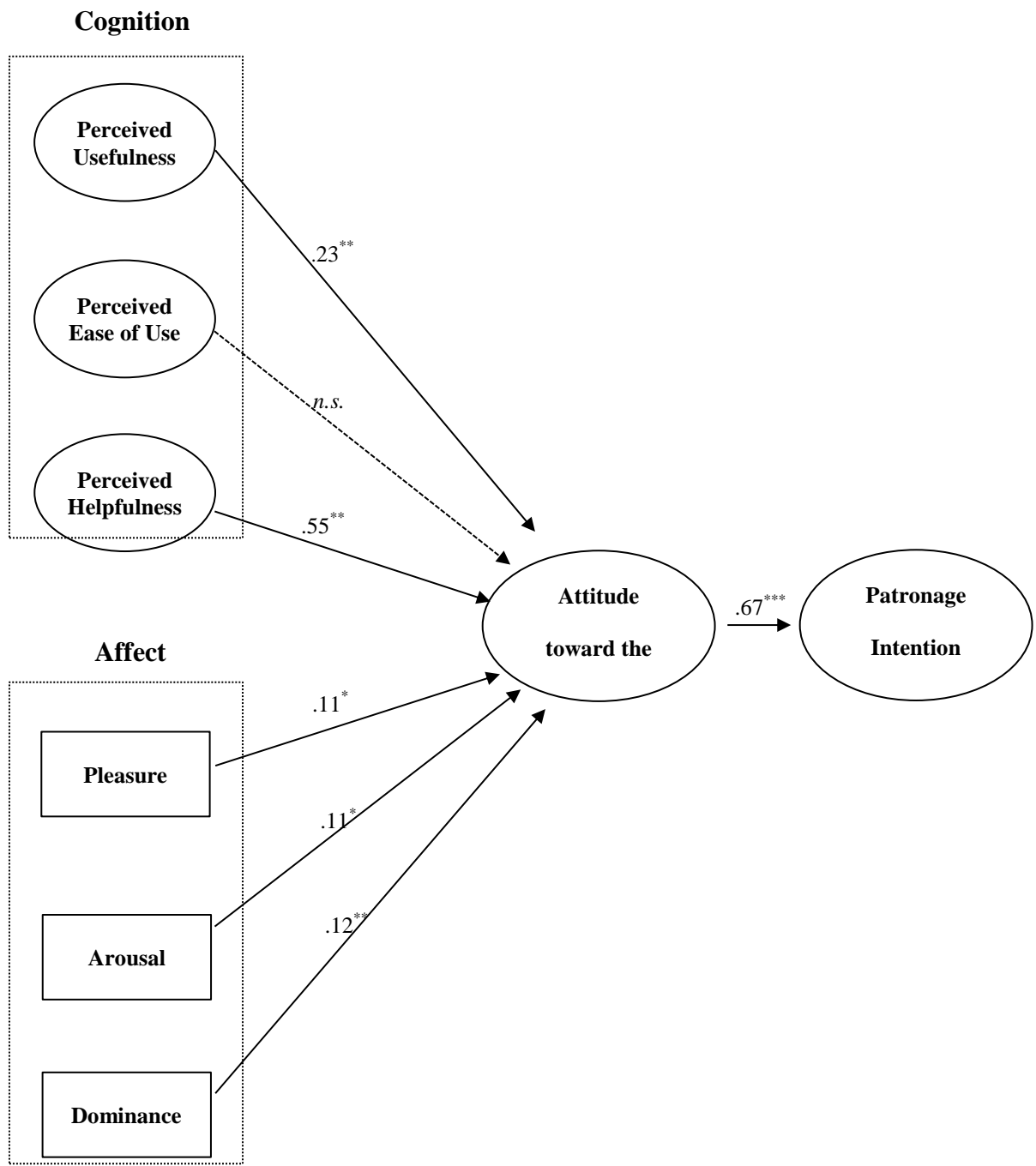
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Note: the indirect pathways (mediation) are not represented.

FIG. 1. Proposed model for the effectiveness of a commercial chatbot on Facebook



*** $p < .001$, ** $p < .01$, * $p < .05$;
 RMSEA: .042 [CI: 0.029 - 0.054]; TLI: .974; CFI: .979; $\chi^2(151) = 218.36, p < .001$;

FIG. 2. Structural model for the effectiveness of a commercial chatbot on Facebook

TABLE 1. Correlations Matrix of main study variables

Variable	1	2	3	4	5	6	7	8
1 AB	-							
2 PI	.66	-						
3 PU	.62	.42	-					
4 PH	.71	.47	.70	-				
5 PE	.41	.28	.59	.65	-			
6 PL	.32	.21	.33	.26	.27	-		
7 AR	.30	.20	.19	.21	-.02	.12	-	
8 DOM	.33	.22	.27	.28	.24	.07	.09	-

AB: Attitude Toward the Brand; PI: Patronage Intention; PU: Perceived Usefulness; PH: Perceived Helpfulness; PE: Perceived Ease-of-Use; PL: Pleasure; AR: Arousal; DOM: Dominance.

TABLE 2: unstandardized and standardized parameter estimates

Latent construct	Observed variable	β	B	P-value
Attitude Toward Brand	Item 1	0.91	1.00	0.000
	Item 2	0.94	1.09	0.000
	Item 3	0.95	1.06	0.000
Patronage Intention	Item 1	0.85	1.00	0.000
	Item 2	0.93	1.26	0.000
	Item 3	0.89	1.10	0.000
Perceived Usefulness	Item 1	0.88	1.00	0.000
	Item 2	0.92	1.07	0.000
	Item 3	0.88	1.02	0.000
	Item 4	0.89	0.99	0.000
Perceived Helpfulness	Item 1	0.84	1.00	0.000
	Item 2	0.92	1.15	0.000
	Item 3	0.87	1.08	0.000
Perceived Ease-of-Use	Item 1	0.90	1.00	0.000
	Item 2	0.93	.96	0.000
	Item 3	0.92	.99	0.000
	Item 4	0.86	.90	0.000

RMSEA: .025 [CI: 0.000 - 0.043]; TLI: .993; CFI: .994; $\chi^2(109) = 126.02$, $p = .127$;

TABLE 3: Testing for indirect effects with bias-corrected confidence intervals (bootstrapping)

Path	Estimate	SE	BC 95% CI	
			Lower	Upper
PH → AB → PI	.37***	.06	.231	.505
PU → AB → PI	.15**	.05	.030	.278
PE → AB → PI	-.09	.05	-.214	.029
PL → AB → PI	.07*	.03	.003	.145
AR → AB → PI	.07*	.03	.008	.138
DO → AB → PI	.08**	.03	.021	.144

* $p < .05$, ** $p < .01$, *** $p < .001$

AB: Attitude Toward the Brand; PI: Patronage Intention; PU: Perceived Usefulness; PH: Perceived Helpfulness; PE: Perceived Ease-of-Use; PL: Pleasure; AR: Arousal; DOM: Dominance.