Dec 12th, 12:00 AM

Interruptions during a service encounter: Dealing with imperfect chatbots

Elizabeth Han
Georgia Institute of Technology, elizabeth.han@scheller.gatech.edu

Dezhi Yin
University of South Florida, dezhiyin@usf.edu

Han Zhang
Georgia Institute of Technology, han.zhang@scheller.gatech.edu

Interruptions During a Service Encounter: Dealing with Imperfect Chatbots

Completed Research Paper

Elizabeth Han
Georgia Institute of Technology
800 West Peachtree St., NW
Atlanta GA, 30308-0520
elizabeth.han@scheller.gatech.edu

Dezhi Yin
University of South Florida
4202 E. Fowler Avenue
Tampa FL, 33620
dezhiyin@usf.edu

Han Zhang
Georgia Institute of Technology
800 West Peachtree St., NW
Atlanta GA, 30308-0520
han.zhang@scheller.gatech.edu

Abstract

This research investigates how and why chatbot-initiated service interruptions influence customers' service experience as well as a choice-based mitigation strategy. Based on the psychological reactance theory, we posit that a service interruption caused by chatbot failures trigger customers' psychological reactance manifested through anger and negative cognition. We further propose that the negative impact of chatbot-initiated interruption on service evaluations can be explained through the affective process of increased anger and the cognitive process of decreased perceived competence of the chatbot (caused by increased negative cognition). Based on these mechanisms, we suggest choice provision as a strategy to mitigate the negative impact of chatbot failures on anger and negative cognition. Results from two laboratory experiments substantiate our claims. By unveiling why chatbot-induced interruption hurts service evaluations and a mitigation strategy, we augment the current understanding of AI failures and provide insights for the deployment of (imperfect) AI applications in customer service.

Keywords: Artificial intelligence, customer service, AI failure, psychological reactance

Introduction

The hype for the future of chatbots began in 2015 when Facebook announced that it would launch a text-based virtual assistant called M, which can automatically complete various tasks such as making restaurant reservations, changing travel arrangements, and waiting on hold with customer service. Facebook's experiment with M seemed to go well for a number of years, but then they announced M's demise in 2018. What has gone wrong with M? It turned out that M cannot fully understand the nuances of human language in user input, and the high failure rate estimated to be around 70% incurred substantial costs in human labor to Facebook (Simonite 2018). It means that for 70% of the time, M could not understand or address user requests, and it had to pass on the task to human employees. The high failure rate was inevitable due to the imperfect technology of artificial intelligence (AI) and increasing sophistication in users' requests (Simonite 2017).

Despite the cautionary tale of Facebook's M, more firms have been investing in automation such that the investment will surpass $8 trillion by 2030 (Harris et al. 2018). This trend is especially apparent for handling standardized tasks in the service sector, where chatbots are increasingly replacing humans as the

service provider (Larivière et al. 2017). Although service chatbots have gained traction in recent years, the technology is not perfect and prone to errors, such as not understanding input messages or misinterpreting them. Had the cause of such failures been solely on the chatbot itself, the solution would have been simple: fixing the bugs and improving its algorithm. However, chatbots are dealing with sophisticated customers who may ask ambiguous questions, answer a question in unexpected ways, or demand impossible tasks (Honig and Oron-Gilad 2018). Failures in a chatbot's conversations with real customers are inevitable, resulting in interruptions to the conversations. Thus, more research is needed to uncover the impact and contingencies of such technology-mediated failures and interruptions in service innovation (Barrett et al. 2015).

To tackle this crucial problem, we ask the following questions: How do conversation interruptions caused by chatbot failures influence customers' service evaluations such as perceived service quality and customer satisfaction? What interventions can mitigate any potential negative consequences? Prior literature in customer service has examined how the failures of mostly physical robots affect customers' service evaluation and adoption intentions (Choi et al. 2020; Lee et al. 2010; Leo and Huh 2020; Sheehan et al. 2020). While many papers argued and found evidence for negative impacts of a robot failure, some papers observed the opposite as making errors can sometimes humanize machines and enhance perceived warmth of the robot (Bluvstein et al. 2019; Mirnig et al. 2017). Furthermore, only limited attention has been paid to mitigation strategies after a service failure, such as providing explanations for the error, offering an apology, and showing effort to correct the error (Bluvstein et al. 2019; Choi et al. 2020). While they examined the effectiveness of these error-centric strategies on enhancing perceived warmth, less is known about mitigation strategies that can prevent failure-caused interruptions to some degree and their impact on downstream service outcomes.

In this paper, we aim to extend the current understanding of AI failure in customer service by focusing on the failure of chatbots that do not have a physical appearance like robots, exploring mechanisms underlying the impact of service interruptions, and proposing a theory-driven solution to mitigate the potential problem. A chatbot failure would manifest in the interruptions to its conversations with a customer because the chatbot cannot understand the customer's input or perform his or her service demand. Given mixed evidence about the impact of robot failures, it is not entirely clear how interruptions to chatbot-customer conversations would influence service outcomes. More importantly, to devise an appropriate solution to the impact of interruption, we need to understand why interruption may represent a problem or pose a risk for service outcomes.

We build on a novel theoretical lens, the psychological reactance theory, to explain the impact of interruption due to a chatbot failure and propose a theory-based solution. Psychological reactance theory is concerned about a motivational state of individuals after they experience a threat to their freedom and control (Brehm 1966). Because interruptions can be perceived as a threat to customers' freedom and control over their goal of completing a service demand, we argue that interruption can trigger psychological reactance through both an affective process (i.e., anger) and a cognitive process (i.e., negative cognition) (Reynolds-Tylus 2019), which can in turn influence service outcomes. In addition, we propose the provision of choice as a strategy to mitigate the (potentially negative) impact of interruption on service outcomes. Choices are easy to implement when customers can click and choose from the pre-defined options provided by a chatbot instead of typing in their own messages. Also, choices are commonly implemented for standardized service tasks, and thus a viable feature for a service chatbot that is increasingly deployed for such standardized tasks. Providing such options can be effective in alleviating the negative impact of interruption because it gives back a sense of control to those who have experienced psychological reactance after the interruption (Brehm and Brehm 2013).

We tested our hypotheses using two experimental studies in which participants engaged in a hypothetical customer service scenario and chatted with a chatbot to resolve a service-related issue. We found consistent evidence supporting our hypotheses. Our theoretical framework and findings contribute to the literature on AI failure and the broader literature on human-AI interaction by adding to the ongoing debate about the implications of AI failure, discovering novel underlying mechanisms, and uncovering an actionable mitigation strategy unexamined before. Our research also extends customer service literature by revealing unintended consequences of service innovations such as chatbots and how to respond to such consequences. Finally, we bolster the literature on psychological reactance theory by identifying a novel context to which the theory can be applied and augment the existing discussion about how to reduce

reactance. We also provide practical implications for firms who have deployed service chatbots but may experience inefficiencies due to chatbot failures.

Theoretical Development

Erroneous AIs, Service Interruptions, and Service Experience

AI, a technology aiming to simulate human intelligence, has been deployed in various domains. AIs have several forms, ranging from a physical robot, a virtual agent, such as a chatbot, to an unnoticeable form embedded in other tools, such as search engines (Glikson and Woolley 2020). Depending on the form they are embodied in, AIs can be perceived differently by humans and elicit varied reactions. In our research, we focus on a chatbot, which is increasingly utilized for customer service in various industries.

Although AIs, in general, have been popular due to their ever-increasing intelligence and efficiency, the technology is not mature yet. Acknowledging their imperfection, prior literature has investigated the consequences of AI failures during a social interaction with humans (Honig and Oron-Gilad 2018; Mirnig et al. 2017). AI failures can be classified to either technical or interaction failures, such that technical failures refer to the errors within an AI's software system, and interaction failures refer to errors triggered by uncertainties of the environment or the users (Giuliani et al. 2015; Honig and Oron-Gilad 2018). In the service literature, several studies have investigated the impact of AI failures, but they provided mixed evidence. While some showed a negative impact of the failure of a service robot on responsibility attribution (Leo and Huh 2020), adoption intent (Sheehan et al. 2020), and service evaluation (Choi et al. 2020; Lee et al. 2010), others found that errors made by an AI can, in fact, lead to favorable attitudes toward the AI by humanizing it (Bluvstein et al. 2019; Mirnig et al. 2017). Apart from these mixed findings, a physical robot is different from a chatbot because the latter lacks the physical form of the former. A lack of tangibility in the case of a virtual agent warrants its own investigation (Glikson and Woolley 2020). Although a chatbot is a prevalent form of AI adopted in customer service, little research has explored the consequences of chatbot failures and mitigating strategies for such failures.

One of the prevalent failures of a chatbot is its inability to understand an input message. Such failures can be technical errors due to an inherent problem with the chatbot's system or interaction failures due to "incomprehensible" user messages beyond the chatbot's capability. During a service encounter, such chatbot failure can cause an interruption to the service, deterring customers from efficiently and satisfactorily resolving a service-related issue. Although some studies have examined the implications of interruptions to a service delivery process, their focus was on the traditional service delivered by humans and on operational outcomes rather than customers' perceptions of the interruptions (Froehle and White 2014; Sampson and Froehle 2006; Seshadri and Shapira 2001). The impact of service interruptions due to human errors and the strategies for improving customers' service perceptions followed by those human errors may not be directly applicable to chatbots because people have different perceptions and expectations towards machines compared to humans (Gray et al. 2007). Furthermore, people tend to react differently after observing machines making errors compared to humans doing the same (Dietvorst et al. 2015). Therefore, we acknowledge the need to examine the impact of errors caused by the emerging entity in service interactions, and our research focuses on the impact of service interruptions initiated by chatbot errors.

Furthermore, customers' perceptions of a service encounter have important implications on how to design and manage service experience, which is directly linked to various business outcomes (Zomerdijk and Voss 2010). In this research, we are interested in the impact of chatbot-initiated interruptions on two important outcomes of service encounters: perceived service quality and customer satisfaction (Cronin et al. 2000). Customers' perception of service quality is critical for service providers because it is an overall evaluation of service outcome, interaction, and environment that is associated with key organizational outcomes, such as customer loyalty, market share, and purchase intention (Brady and Cronin 2001). Customers' satisfaction with service is also essential as it is a key predictor of their intention to continue using the service (Oliva et al. 1992). In the following, we build on the psychological reactance theory to explain how service interruptions can influence these two outcomes after a service encounter.

Psychological Reactance

Since a chatbot does not have any physical form, users' reactions to the chatbot would depend not on its appearance like a physical robot, but on how their conversation with the chatbot goes. During a service encounter, interruption due to a chatbot failure impedes the conversation, thus restraining customers from achieving their goal of resolving the service issue and increasing their reactance. First coined by Brehm (1966), psychological reactance refers to an individual's unpleasant state triggered by a threat to his or her sense of freedom or control. Brehm and Brehm (2013) define freedom as either outcome freedom—being able to obtain desired outcomes—or decision freedom—being able to choose outcomes and the means for seeking those outcomes—and they define control as having a control over the potential outcomes. Accordingly, an event would represent a threat to outcome freedom or control if the event hinders achieving a potential outcome or increases perceived difficulty of achieving it. For instance, pop-up advertisements trigger psychological reactance because their intrusiveness inhibit a user from achieving his or her primary goal of accessing the content (Edwards et al. 2002). Similarly, strict information security policies often cause non-compliant behaviors among employees due to the loss of their sense of freedom and control (Lowry and Moody 2015).

In the context of customer service, a customer's desired outcome is to successfully resolve his or her service issue through conversations with a service agent. Interruption poses a risk of halting an otherwise smooth conversation leading to a possible solution. Thus, it represents a threat to the customers' freedom and control over their goal of resolving the service issue and reaching the desired service outcomes, which will in turn trigger their psychological reactance. Psychological reactance had been regarded as a construct unable to measure until Dillard and Shen (2005) showed that reactance consists of an affective component manifested through anger and a cognitive component manifested through negative cognition, and thus can be measured through these two components. Anger, an intense emotional state involving negative feelings and hostile, non-cooperative responses, captures hostility and aggression associated with reactance (Kuppens et al. 2003; Quick and Stephenson 2007). Negative cognition, which encompasses negative perception, memory, and thought process, captures unfavorable thinking associated with reactance (Quick and Stephenson 2007). While each anger and negative cognition contributes equally to reactance, the two are different in nature, such that one is affective and the other is cognitive (Dillard and Shen 2005). Since affective responses generally occur implicitly and unconsciously and cognitive responses occur explicitly, reactance can be represented by the dual pathways of anger and negative cognition. Applied to our context, we argue that customers encountering interruption during a service interaction with a chatbot will experience greater levels of psychological reactance manifested through anger and negative cognition.

Once anger is triggered, customers may incorporate such affective feelings in their judgment of the service and experience. Based on affect-as-information theory, experienced emotions are often derived from unconscious appraisals of a situation, and they provide input to be used as people make judgments or decisions (Clore et al. 2001). Specifically, if individuals experience negative affect, they will perceive a situation they are involved in negatively, resulting in negative attitudes or evaluations, such as pessimistic expectation, blame on others, association of negative traits, and less trust toward others (Lerner and Tiedens 2006). Furthermore, individuals tend to form evaluations that are congruent with their moods, such that those in a negative mood will perceive or evaluate an event negatively (Clark and Isen 1982).

Applied to our context, anger triggered by interruption during a service encounter can lead customers to perceive the service encounter negatively. Indeed, prior service literature established that a customer's affect influences his or her service evaluations (Baker and Cameron 1996; Taylor 1994). Because anger is an extremely negative discrete emotion, it should lead to lower levels of perceived service quality and satisfaction with the service. We propose the following hypotheses.

Hypothesis 1*: The presence of interruption during a service encounter leads to lower (a) perceived service quality and (b) satisfaction with service.*

Hypothesis 2*: Anger mediates the negative impact of the presence of interruption on (a) perceived service quality and (b) satisfaction with service.*

Besides the affective factor of anger, a cognitive factor that can be provoked by interruption is negative cognition. When making inference or judgment about a target, individuals' existing thoughts or beliefs toward the target are used as cues (Wyer and Carlston 1979). Moreover, individuals may attribute their

thoughts to the traits of the target (Trope 1986). For example, if individuals hold negative thought toward a target, they may denigrate certain attributes of the target in order to align their inference outcome with existing thoughts. Thus, customers' negative cognition toward a chatbot may undermine their perception of the chatbot's attributes, an especially relevant one of which in our context is competence.

Competence and warmth are two universal dimensions of person perception (Fiske et al. 2007). Competence reflects the attributes related to perception of ability, such as intelligence or efficacy, while warmth reflects the attributes related to perception of intent, such as morality or friendliness (Fiske et al. 2007). When judging a chatbot, competence is a more relevant dimension than warmth because warmth is viewed as fundamentally lacking in machines (Gray et al. 2007). Thus, negative cognition toward a chatbot is likely to harm the perception of the chatbot's competence.

The judgment of competence for a service agent should have direct implications for service outcomes. A decrease in perceived competence of the agent should be regarded as a lack of ability to resolve a service issue and further insinuate the failure of a successful service delivery. Indeed, prior literature in customer service and marketing has found consistent evidence for the effect of perceived competence of a service employee on service evaluation (Li et al. 2018; Scott et al. 2013; Thompson and Ince 2013). Similarly, we argue that reduced perceived competence of a service chatbot will impair service outcomes—perceived service quality and satisfaction with service. In sum, we propose the following.

Hypothesis 3*: Negative cognition and perceived competence of the chatbot serially mediate the negative impact of the presence of interruption on (a) perceived service quality and (b) satisfaction with service.*

The Moderating Effect of Choice

Next, we delve into how to mitigate the detrimental effect of interruptions, which will be an important question for both researchers and practitioners. As interruption triggers psychological reactance and subsequently harms service outcomes, reducing the provoked reactance should mitigate the effect of interruption. Since reactance is provoked due to a sense of threat to freedom and control, restoring such freedom and control will appease the reactance. Thus, we suggest providing customers the ability to choose as one way for them to regain a sense of freedom and control.

During a decision-making process, having a choice endows a sense of control over a decision outcome (Averill 1973). In addition, having a choice imbues an individual with autonomy and self-control (Deci and Ryan 1987). Choice also ensures freedom by giving individuals the power to choose a potential outcome and how to achieve it (Brehm and Brehm 2013). As such, providing individuals the ability to choose will help them restore a sense of freedom and control after an event that threatened freedom and control, such as interruption, and thus alleviate psychological reactance.

Several service literatures have investigated how giving a choice increases customers' perceived control and therefore leads to positive emotional and behavioral responses. Hui and Bateson (1991) found that giving customers a choice of staying in or leaving a service situation increases perceived control, thus having a positive effect on pleasure and desire to affiliate with a service personnel. Providing a choice during the use of self-service technologies has also been revealed as an effective strategy for increasing adoption and usage intent by increasing perceived control (Meuter et al. 2005; Meuter et al. 2000).

When interacting with a service chatbot, the chatbot can provide customers an opportunity to choose the message they would like to input out of several options. Individuals' belief that they can exercise control over an event produces positive motivations and attitudes towards a goal they are seeking (Bandura 1993). Furthermore, if individuals perceive their action to be more autonomous, they tend to feel less anger from a negative event (Patrick et al. 1993). Taken together, the availability of choices will give customers a sense of control and autonomy over the service process, buffering reactance that follows the interruption. As such, a choice provided during service interactions can reduce the negative impact of interruption on anger and negative cognition, the two components of psychological reactance. Thus, we propose the following moderation hypothesis. Figure 1 depicts our theoretical model.

Hypothesis 4*: The presence of choice moderates the positive effect of chatbot-initiated interruption on (a) anger and (b) negative cognition, such that the effect is reduced when the chatbot provides options to choose.*

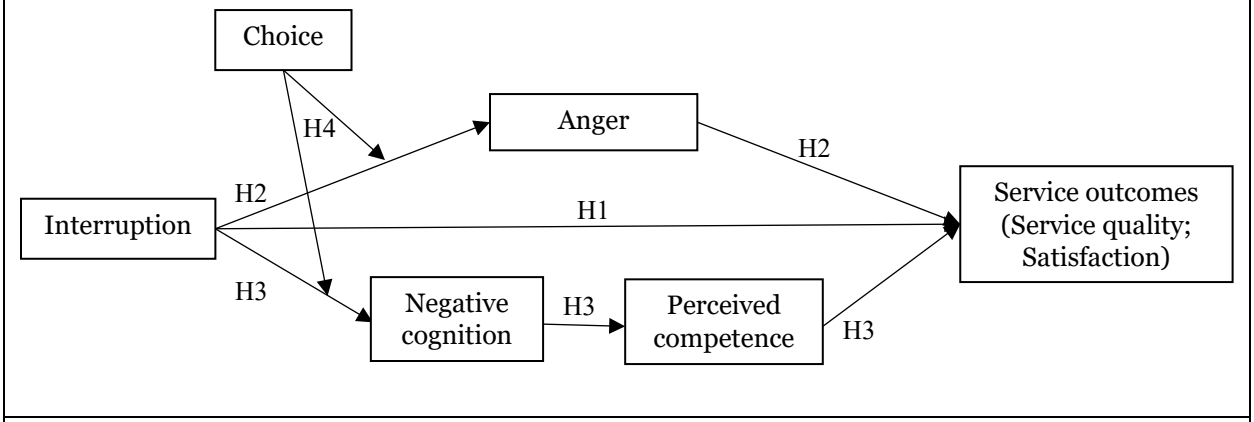

Figure 1. Summary of the model and hypotheses

Overview of Studies

We investigate our hypotheses through two experimental studies, in which participants interacted with a service chatbot to resolve a service issue based on a hypothetical customer service scenario. In the first study, we tested the main effect of interruption due to a chatbot failure on service perceptions. In the second study, we examined underlying mechanisms for the impact of interruption on service perceptions, and we also tested the moderating effect of the presence of choice.

Study 1

The goal of this study is to test Hypotheses 1, which investigates the impact of the presence of interruption during a service encounter on perceived service quality and satisfaction with service. Thus, we utilized a between-subjects design, manipulating the presence of interruption during the interaction with a service chatbot and keeping all other aspects of the interaction identical across conditions. During the study, participants took part in a hypothetical customer service task in which they interacted with a service chatbot via virtual chat to resolve a service-related issue. After the chat, participants evaluated the service provided by the chatbot and answered other questions.

Stimulus Materials

To ensure that all aspects of the interaction with the chatbot remain the same across conditions except for the presence of interruption, we used a predesigned script for the chatbot's messages. The script was devised based on examples of best practices and canned responses for live chat from livechat.com, a popular platform that provides live chat software, while slightly modified to fit into our setting. Also, we developed a rule-based chat interface so that each message from the predesigned script can occur in order after the participants typed in their responses.

We manipulated the presence of interruption by inserting error messages that the chatbot cannot understand the participant's response. We used such error messages for the manipulation because misunderstanding of a customer's input message is one of the most common pitfalls of a chatbot that disrupts conversational flow. While those in the interruption-present condition encountered several error messages throughout the chat, those in the interruption-absent condition did not encounter any error messages at all, as the frequency of interruption has been commonly used to manipulate interruption in prior literature (Speier et al. 1999; Zijlstra et al. 1999). Variations of the error message were inserted several times throughout the interaction for the interruption-present condition. In each of the error messages, participants were asked to repeat what they have said right before. Then, the chat continued as in the interruption-absent condition. Figure 2 shows the example of the chat interface for illustrative purpose. Table 1 shows the two versions of the entire predesigned script.

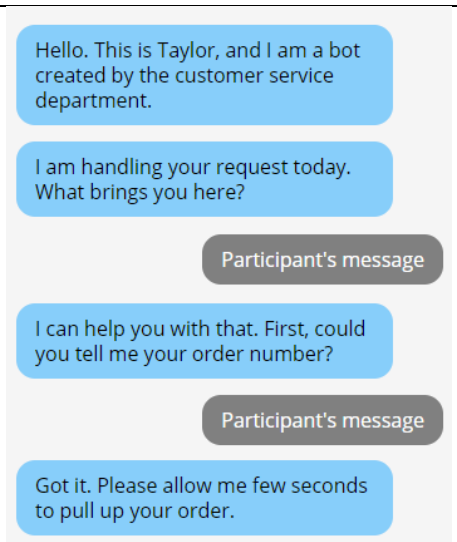

Figure 2. An example of the chat interface for interruption-absent condition

Interruption-absent	**Interruption-present**
Hello. This is Taylor from the customer service department. Thank you for contacting us. I am handling your request today. What brings you here?	Hello. This is Taylor from the customer service department. Thank you for contacting us. I am handling your request today. What brings you here?
Participant's message	*Participant's message*
I can help you with that. First, could you tell me your order number?	I do not understand what you said. Can you try again?
Participant's message	*Participant's message*
Got it. Please allow me few seconds for pulling up your order.	I can help you with that. First, could you tell me your order number?
[Slight delay]	*Participant's message*
Which item(s) is missing?	Got it. Please allow me few seconds for pulling up your order.
Participant's message	[Slight delay]
Can you describe conditions of the rest of the items?	Which item(s) is missing?
Participant's message	*Participant's message*
Thank you for telling me. Meanwhile, I've identified the problem: there was a miscommunication in the packaging process. I can create a new order that will be delivered within a day, or I can refund for the missing item. What would you prefer?	I don't quite get what you're saying. Please repeat.
Participant's message	*Participant's message*
Alright. I'll process your request. Please give me a moment.	Can you describe conditions of the rest of the items?
[Slight delay]	*Participant's message*
I have processed your request. The issue is resolved. Please contact us again if you need further assistance. Bye.	I can't process your message. Please type again.
	Participant's message
	Thank you for telling me. Meanwhile, I've identified the problem: there was a miscommunication in the packaging process. I can create a new order that will be delivered within a day, or I can refund for the missing item. What would you prefer?
	Participant's message
	I cannot understand. Can you repeat?
	Participant's message
	Alright. I'll process your request. Please give me a moment.
	[Slight delay]

	I have processed your request. The issue is resolved. Please contact us again if you need further assistance. Bye.

Table 1. Predesigned chat scripts for Study 1

Procedure

61 undergraduate students (36 females) from a U.S. university participated in the study in exchange for course credit. Participants were randomly assigned to either the interruption-absent or the interruption-present condition.

Participants first encountered the cover story that involves a hypothetical but realistic scenario describing a service-related issue. As the setting of the scenario, online retail industry was chosen because it is a commonplace where a virtual chat is deployed to communicate with customers. Furthermore, because the industry's deployment of a service chatbot has been recent, the chatbot's ability to process customer's language is not at its maturity. It thus is appropriate for our purpose of examining the effect of interruption during a customer service interaction. For the service-related issue, we used one of the most common complaints in the online retail industry: a missing item from a delivery. This choice is motivated by both practical and design reasons: first, most chatbots are deployed to handle standardized service tasks in practice, and second, using such a standardized task reduces the risk of a chatbot making inconsistent responses to participants and ensures procedure equivalence across conditions. The scenario described a recent delivery in which one of the items was missing. Participants were asked to chat with a chatbot and request a delivery of the missing item. Participants were also instructed to freely type in their responses, but only based on the scenario they have read. After the cover story, we showed an introductory message of "being connected to a bot created by the customer service department" before the chat started, along with a robot icon, to strengthen participants' belief that they are interacting with a chatbot.

During the chat, as each message from the chatbot appeared, participants had to type in their response underneath, in order to see the subsequent message. When prompted to type in their response, participants saw a reminder of the key facts from the script, next to the chat interface, so that we can avoid them from forgetting the key details. We also collected the chat data to ensure that the chat appears logical without going off the topic.

After the chat, participants evaluated the service provided by the chatbot by reporting their perception of service quality and satisfaction with the service. Perceived service quality was measured using three items (e.g., "poor/excellent"). Satisfaction with the service was measured using three questions (e.g., "how satisfied or dissatisfied did your experience with the service agent leave you feeling?"). These measures were adapted from prior literature in customer service (Cronin et al. 2000). All these questions were measured on a seven-point, semantic differential scale. As a manipulation check, participants were asked how often they thought their encounter with the chatbot was interrupted in a five-point, semantic differential scale (e.g. 'never' equals to 1; 'always' equals to 5) (Speier et al. 1999).

Results

We first conducted a manipulation check for the presence of interruption during the interaction with the service chatbot. Analysis revealed that participants in the interruption-present condition perceived that the interruption was more frequent than those in the interruption-absent condition (M = 2.42 versus 1.80, $F(1,60) = 4.905$, $p = .031$). Thus, the manipulation of interruption was deemed successful.

To investigate the effect of interruption on perceived service quality and satisfaction with the service, we conducted a one-way ANOVA with the presence of interruption as a between-subject factor. Results revealed that the evaluation of service quality was significantly lower when the interruption was present (M = 5.90 versus 3.91, $F(1,60) = 45.601$, $p < .001$). Similarly, the presence of interruption led to significantly lower satisfaction with the service (M = 6.04 versus 4.34, $F(1,60) = 27.983$, $p < .001$). Such negative impacts of the chatbot-initiated interruptions on service perceptions provide initial support for Hypothesis 1.

Discussion

Study 1 supports our first hypothesis by manipulating the presence of interruption. Our results augment prior literature investigating the consequences of AI failure by focusing on service outcomes and a virtual AI that does not have any visual or physical form (Choi et al. 2020; Honig and Oron-Gilad 2018; Leo and Huh 2020). Our findings provide additional support for the negative consequences of AI failure among the ongoing debate about the mixed effect of AI making errors (Bluvstein et al. 2019; Choi et al. 2020; Mirnig et al. 2017). Meanwhile, Study 1 presents several limitations. First, we are yet to understand why interruption has negative consequences on service outcomes. Second, we have not explored a solution that can mitigate the negative impacts. Thus, in the next study, we aim to uncover the underlying mechanisms and suggest choice provision as one way to mitigate the negative effect of interruption.

Study 2

In this study, we aim to test the underlying cognitive and affective mechanisms for the negative effect of interruption on service outcomes (as proposed in Hypotheses 2 and 3), and the moderating effect of choice provision (as proposed in Hypothesis 4). To do so, we manipulated the presence of interruption and also the presence of choice in a between-subjects design. Similar to Study 1, participants were engaged in a hypothetical task of using a service chatbot to resolve a service-related issue, and then answered several questions.

Stimulus Materials

We used a similar predesigned script for the chatbot's messages from Study 1. While the content of the chat and how we varied the presence of interruption were the same as those in Study 1, now we also varied whether participants type in their messages (as in Study 1), or they simply clicked and chose the options provided by the chatbot as their input message. For instance, in the interruption-present and choice-present condition, when the interruption occurred because the chatbot could not understand the participant's message that describes the service issue, three choices were provided: 'Missing item,' 'Check an order status,' and 'Return or exchange item(s).' Only after participants click and choose one of the options, they could see the subsequent message from the chatbot. In the interruption-absent and choice-present condition, the same choices were provided at the same place without the preceding interruption. Choice-absent conditions were the same as the interruption-present and -absent conditions from Study 1. Figure 3 shows the example of how choices are presented in our chat interface. Table 2 shows the predesigned scripts for the two choice-present conditions.

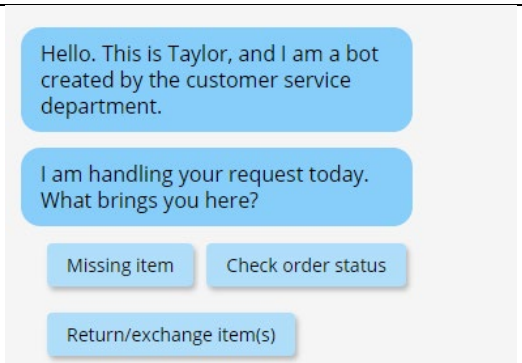

Figure 3. An example of the chat interface for choice-present, interruption-absent condition

Interruption-absent	Interruption-present
Hello. This is Taylor from the customer service department. Thank you for contacting us. I am handling your request today. What brings you here? • Missing item	Hello. This is Taylor from the customer service department. Thank you for contacting us. I am handling your request today. What brings you here? *Participant's message*

• Check order status • Return/ exchange items *Participant's message* I can help you with that. First, could you tell me your order number? *Participant's message* Got it. Please allow me few seconds for pulling up your order. [Slight delay] Which item(s) is missing? • Sweater • Jeans • Baseball cap *Participant's message* Can you describe conditions of the rest of the items? • In a good condition • Not in a good condition *Participant's message* Thank you for telling me. Meanwhile, I've identified the problem: there was a miscommunication in the packaging process. I can create a new order that will be delivered within a day, or I can refund for the missing item. What would you prefer? • Create a new order • Refund the item *Participant's message* Alright. I'll process your request. Please give me a moment. [Slight delay] I have processed your request. The issue is resolved. Please contact us again if you need further assistance. Bye.	I do not understand what you said. Can you choose one of the options below? • Missing item • Check order status • Return/ exchange items *Participant's message* I can help you with that. First, could you tell me your order number? *Participant's message* Got it. Please allow me few seconds for pulling up your order. [Slight delay] Which item(s) is missing? *Participant's message* I don't quite get what you're saying. Please choose an option below. • Sweater • Jeans • Baseball cap *Participant's message* Can you describe conditions of the rest of the items? *Participant's message* I can't process your message. Please select one. • In a good condition • Not in a good condition *Participant's message* Thank you for telling me. Meanwhile, I've identified the problem: there was a miscommunication in the packaging process. I can create a new order that will be delivered within a day, or I can refund for the missing item. What would you prefer? *Participant's message* I cannot understand. Can you choose from below? • Create a new order • Refund the item *Participant's message* Alright. I'll process your request. Please give me a moment. [Slight delay] I have processed your request. The issue is resolved. Please contact us again if you need further assistance. Bye.

Table 2. Predesigned chat scripts for the choice-present conditions from Study 2

Procedure

258 undergraduate students (148 female) from the two universities in the United States participated in the study in exchange for course credit. Participants were randomly assigned to one of the four treatment conditions: interruption-present or -absent, and choice-present or -absent. The cover story and procedure were identical to that of Study 1.

We operationalized psychological reactance by measuring participants' anger using (e.g., annoyed; irritated) and negative cognition (e.g., mostly unfavorable/mostly favorable; mostly negative/mostly positive) (Reynolds-Tylus 2019; Reynolds-Tylus et al. 2020). Participants also reported perceived

competence of the chatbot, measured using six items (e.g., capable; efficient) (Fiske et al. 2007). These additional items were measured in a seven-point, semantic differential scale. Lastly, as a manipulation check for the presence of choice, we asked how often the participants could click and choose different options during the chat in a five-point, semantic differential scale (e.g., 'never' equals to 1; 'always' equals to 5). The rest of the measures were the same as in Study 1.

Results

Analysis of the manipulation check for the presence of interruption revealed that participants in the interruption-present condition perceived interruption to be more frequent than those in the interruption-absent condition (M = 2.37 versus 1.34, F(1, 257) = 49.582, p < .001). Examination of the manipulation check for the presence of choice confirmed that participants in the choice-present condition perceived the choices were more frequently provided than those in the choice-absent condition (M = 4.23 versus 1.45, F(1,257) = 664.759, p < .001). Therefore, both of our manipulations were deemed successful.

We first conducted a two-way ANOVA with the presence of interruption and choice as between-subjects factors and perceived service quality and satisfaction with service as two outcome variables. We gathered evidence for the main effect of interruption, such that overall, interruption led to lower perception of service quality (M = 6.09 versus 3.41, F(1,254) = 203.266, p < .001) and less satisfaction with service (M = 6.25 versus 4.09, F(1,254) = 144.120, p < .001). These replicated our findings from Study 1.

To determine if the effect of the interruption on service evaluations is mediated by anger as the affective pathway and by negative cognition and perceived competence as the cognitive pathway, we built a custom mediation model using the PROCESS macro with a bootstrapped sample of 5,000 and the presence of choice as a covariate (Hayes 2013). Figure 4 shows the summary of the model. Results confirmed that the presence of interruption significantly increased customers' anger and negative cognition. Furthermore, negative cognition hurt perceived competence of the chatbot, which significantly influenced service outcomes. While anger had a significant negative effect on satisfaction with service, it did not have a significant effect on perceived service quality (p = .11). Finally, the test of indirect effects revealed a significant indirect effect of the interruption through negative cognition and perceived competence on perceived service quality (B = -.57, SE = .16, 95% CI = [-.90, -.26]) and also on satisfaction with service (B = -.75, SE = .17, 95% CI = [-1.09, -.44]). While the indirect effect through anger was significant on satisfaction with service (B = -.17, SE = .07, 95% CI = [-.33, -.04]), it was not significant on perceived service quality (B = -.12, SE = .08, 95% CI = [-.29, .02]). Our findings indicate that the interruption triggers psychological reactance, which is manifested through anger and negative cognition; negative cognition further reduces perceived competence of the chatbot, which in turn undermines service outcomes. Results of these indirect effects capture the underlying cognitive and affective mechanisms for the negative effect of the interruption on satisfaction with service. Results did not support the affective mechanism for the negative effect of the interruption on perceived service quality, but supported the cognitive mechanism. These altogether provide partial evidence for Hypotheses 2 and 3.

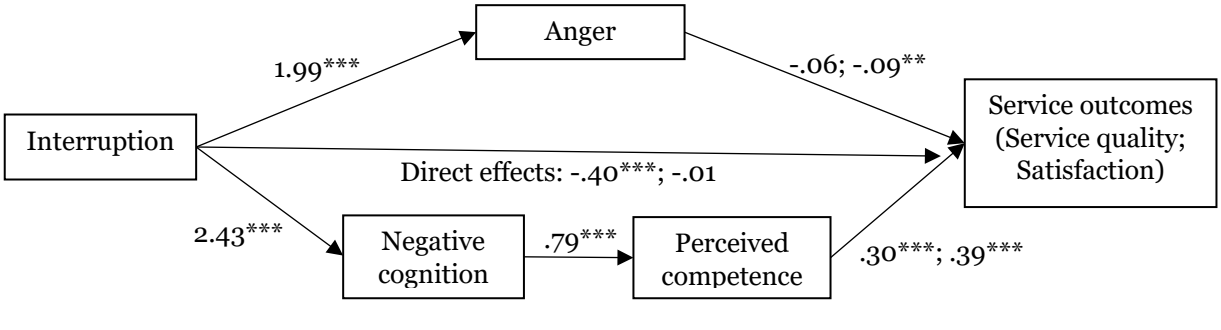

Figure 4. Mediation Analysis
Significance levels are denoted by ** at p<.05 and *** at p<.001.
The coefficients before the semi-colon refers to service quality, and after the semi-colon refers to satisfaction.

Next, we examine the role of choice. From the two-way ANOVA, we also found that, overall, the presence of choice led to higher perception of service quality (M = 5.10 versus 4.41, $F(1,254) = 13.483$, $p < .001$) and greater satisfaction (M = 5.40 versus 4.94, $F(1,254) = 6.748$, $p = .010$). Most importantly, we found a significant interaction between choice and interruption on perceived service quality ($F(1,254) = 13.330$, $p < .001$) and on satisfaction ($F(1,254) = 15.890$, $p < .001$). Pairwise comparisons further showed that when choice was not provided, the presence of interruption reduced perceived service quality (M = 6.09 versus 2.73, $F(1,254) = 161.450$, $p < .001$) and satisfaction (M = 6.37 versus 3.50, $F(1,254) = 128.736$, $p < .001$). When choice was provided, the presence of interruption again reduced perceived service quality (M = 6.09 versus 4.10, $F(1,254) = 55.865$, $p < .001$) and satisfaction (M = 6.12 versus 4.68, $F(1,254) = 31.933$, $p < .001$), but to a less extent. These findings indicate that offering a choice mitigates the negative effect of interruption on service perceptions. Figure 5 illustrates the interactions.

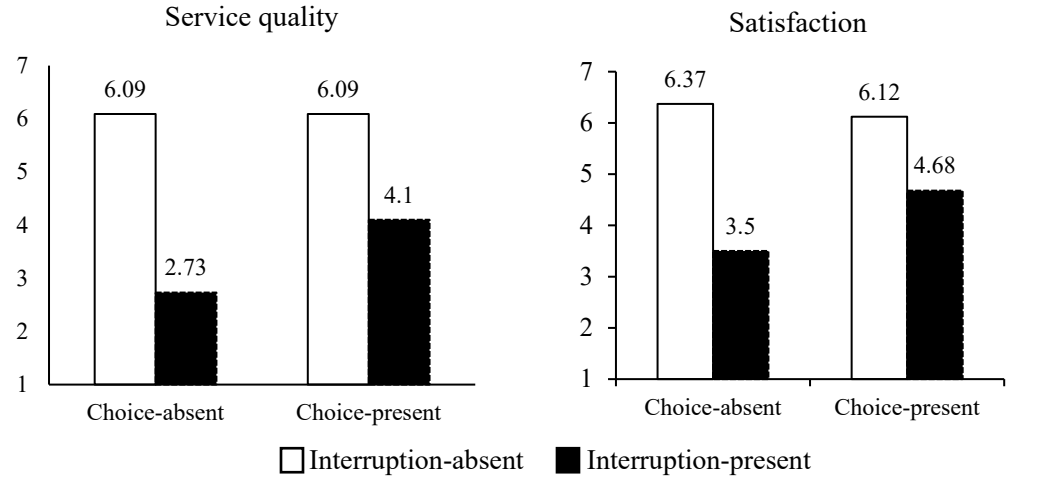

Figure 5. Interaction effect of the presence of interruption and choice

To investigate the underlying mechanisms for the observed interaction, we tested the moderating role of choice provision in the effect of interruption on anger and negative cognition. Results revealed evidence for the main effect of the presence of interruption, such that overall, interruption led to greater anger (M = 3.94 versus 1.95, $F(1,254) = 94.26$, $p < .001$) and greater negative cognition (M = 4.33 versus 1.89, $F(1,254) = 183.03$, $p < .001$). Most importantly, the presence of choice significantly moderated the positive effect of the presence of interruption on anger ($F(1,254) = 12.43$, $p = .001$) and on negative cognition ($F(1,254) = 13.59$, $p < .001$). Pairwise comparisons showed that when choice is not offered, interruption increased anger (M = 4.47 versus 1.77, $F(1,254) = 88.164$, $p < .001$) and negative cognition (M = 4.89 versus 1.80, $F(1,254) = 149.188$, $p < .001$). When choice is offered, interruption again increased anger (M = 3.39 versus 2.12, $F(1,254) = 18.990$, $p < .001$) and negative cognition (M = 3.75 versus 1.98, $F(1,254) = 48.113$, $p < .001$), but to a less extent (see Figure 6). By providing direct support for the interaction between choice and interruption, these results insinuate that increased anger and negative cognition due to interruption can be alleviated by letting customers choose their messages instead of typing in by themselves, thus confirming Hypothesis 4.[1]

[1] Additionally, we tested the full moderated mediation model in which the presence of choice moderates the mediating pathways through anger and negative cognition (followed by perceived competence). When satisfaction was the outcome variable, we found significant moderated mediations for both pathways. When service quality was the outcome variable, we found a significant moderated mediation through the cognitive pathway but not through the affective pathway.

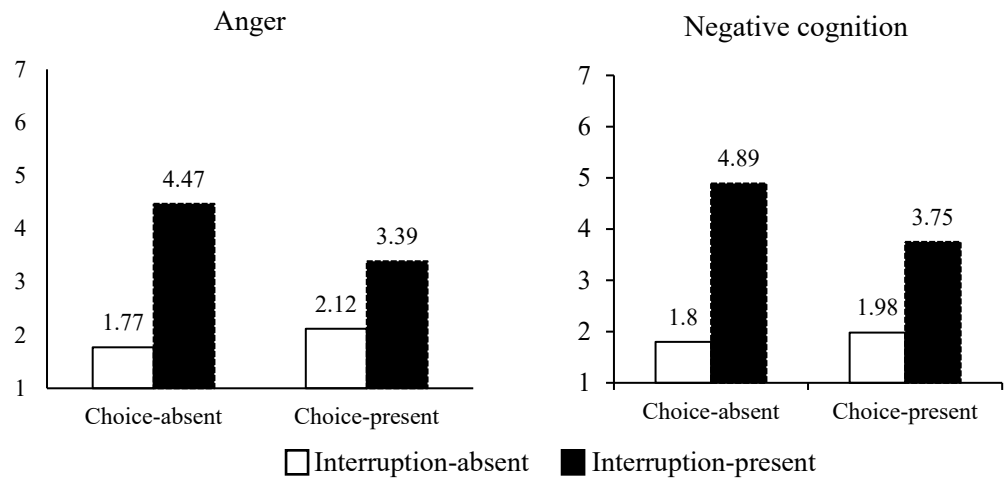

Figure 6. Interaction effect of the presence of interruption and choice on anger and negative cognition

Discussion

This study replicated Study 1's findings and extended it by providing direct evidence for the underlying mechanisms and the moderating effect of choice. Interruption provokes anger and negative cognition, two components of psychological reactance. Through the affective pathway, provoked anger hurts consumers' satisfaction with service. Through the cognitive pathway, negative cognition diminishes perceived competence of the chatbot, which subsequently undermines both perceived service quality and satisfaction with service. We further demonstrated that the negative effects of interruption on service outcomes can be mitigated (although not eliminated) by the presence of choice because the presence of choice buffers anger and negative cognition caused by interruption. The weaker effect of anger on perceived service quality than that on satisfaction with service can be explained by the nature of the two outcome variables: perceived service quality is predominantly cognitive while the nature of satisfaction is both cognitive and affective (Liljander and Strandvik 1997; Oliver 2014). These findings altogether underscore our theory on how interruption triggers psychological reactance and the presence of choice lessens the impact of interruption on such reactance.

General Discussion

Drawing on psychological reactance theory (Brehm and Brehm 2013), we propose that interruption caused by a service chatbot failure is perceived as a threat to customers' freedom and control over their goal, thus triggering psychological reactance manifested through anger and negative cognition. The activated psychological reactance can in turn reduce customers' perceived service quality and satisfaction with service. We further propose that the effect of interruption on psychological reactance can be weakened by the provision of choice, such that when choice is provided after interruption, customers may feel a sense of control and perceive that their lost freedom and control are recovered to some extent. As a result, providing a choice moderates the indirect effect of interruption through reactance on service outcomes and alleviates the detrimental effect of interruption. We conducted two experimental studies and found support for most of our hypotheses, except that the indirect effect of interruption through anger on perceived service quality was not supported. A likely reason is the predominantly cognitive nature of perceived service quality, which is less likely to be influenced by individual's affect.

Theoretical Implications

Prior studies on AI failure have been conducted primarily in the context of human-robot interactions (Giuliani et al. 2015; Honig and Oron-Gilad 2018). As robots are a specific form of AIs that possess a

physical embodiment, people can react differently toward robots compared to other forms of AIs. Thus, findings obtained for one form cannot be directly extended to other forms without additional research (Glikson and Woolley 2020). Compared with physical robots, a more common form of AIs that people interact with in their daily lives is virtual AIs that lack a physical form, such as chatbots. Meanwhile, the impact of AIs making error has not been unanimous, such that some argued for negative user reactions, while some argued that errors can humanize AIs under certain circumstances (Bluvstein et al. 2019; Mirnig et al. 2017). By investigating the impact of chatbot failures and how users react cognitively and affectively, our research extends the current understanding of AI failures in a novel context.

Our research also contributes to customer service literature, specifically to the stream about technology-enabled service innovations (Barrett et al. 2015). Interruption studied in our research is a new phenomenon that has emerged due to the advent of AI technologies. Because of the uncertainty of a service environment, the technology at the moment cannot perfectly avoid potential failures, and thus, interruption is inevitable. Since interruption can have a huge impact on service outcomes, it is crucial to understand how interruptions shape customers' service perceptions and how to tackle potential negative consequences of interruptions. In addition to revealing negative consequences of a chatbot failure, we illuminated mechanisms underlying the impact of chatbot failures and suggested a theory-driven mitigation strategy. Our work builds on and extends the psychological reactance theory to the service chatbot context, proposing and finding evidence that a chatbot-initiated interruption to its conversation with customers can activate their negative reactions in the forms of anger and negative cognition. This finding adds to the nascent literature on failures during a service encounter with AIs (Choi et al. 2020; Leo and Huh 2020; Sheehan et al. 2020), and points to a theory-driven and readily applicable remedy strategy—providing choices.

We also bolster psychological reactance literature by introducing a relatively new phenomenon—interruption due to a chatbot failure—as the trigger of psychological reactance. We further suggest that providing a choice can restore the lost freedom and control and thus alleviate the impact of interruption on psychological reactance. While some studies argued that choice can offer individuals a greater level of freedom and sense of control, others counter-argued that choice can sometimes limit individuals' freedom (Brehm and Brehm 2013; Miller et al. 2020). By providing evidence that offering a choice can buffer the lost freedom and control, we add on to the ongoing discussion about the role of choice for shaping psychological reactance.

Broadly, our research augments the existing literature on human-AI interaction. The majority of research in this area has focused on the factors that influence the effectiveness of human-AI interactions, such as the transparency of an AI's decision-making process or an AI's behaviors that can enhance its social presence or conform to the norms (Amershi et al. 2019; Rai 2020). Only recently have researchers turned their attention to addressing the implication of erroneous AIs that are commonly encountered and largely inevitable (Honig and Oron-Gilad 2018). We underscore the negative consequences of a chatbot making errors and propose a recovery strategy that can alleviate such negative consequences.

Practical Implications

Our work offers valuable guidance for practitioners who are struggling with erroneous AIs or devising strategies to prevent detrimental effects of AI errors. Similar to Facebook's experience with M, AIs that are supposed to save costs and streamline automation process may in fact incur even greater costs due to inevitable failures. Our findings alarm practitioners by highlighting how a chatbot failure causes interruption with a service process, ultimately hurting service outcomes. We urge firms to acknowledge the likelihood and negative consequences of an AI failure and carefully weigh its potential costs against benefits before the adoption of an AI.

Furthermore, we discovered a recovery strategy that firms can easily implement to reduce potential negative consequences of AI failures. Providing a choice after interruption from an AI failure can relieve the damage caused by interruption to some extent, although the damage cannot be entirely eliminated. From a firm's perspective, providing a choice not only alleviates the negative impact of interruption, but can also lead to a more structured conversation and prevent further failures. Other recovery strategies suggested by prior literature, such as making an apology or providing explanations for a failure (Choi et al. 2020), may restore the perception of a chatbot, such as warmth, but they are implemented after the damage is already done, which may hinder a service process from being ultimately completed. While human employees can take over the task from the AI chatbot when needed, as in the case of Facebook's M, to resolve customers' service

issues, they can be costly as firms need to pay for both AI systems and human employees. Providing a choice can be an effective solution as it not only is cost-efficient but also has a higher chance of getting the conversation back to track and complete the service process satisfactorily.

Limitations and Future Research

Our work opens up several opportunities for future research. First, although our studies manipulated interruption using the most common form of chatbot failures (i.e., not understanding input messages), there may be other types of failures, such as misinterpreting a message, making nonsensical responses, not adhering to conversational norms, and so on. Different types of errors may be processed differently by customers and even have different implications on service outcomes. Future studies can categorize chatbot errors (for example, technical errors versus social errors) and examine if they have distinct impacts on service outcomes and further downstream consequences, such as trust and brand loyalty.

Second, we proposed offering a choice as a strategy to mitigate the negative impact of interruption due to chatbot failures. However, when manipulating choice, we assumed that the choices provided can perfectly address customers' requests. In fact, choices may not be comprehensive, and customers may not often find a choice that accurately address their requests, especially when the request is unstandardized and complex. In such case, the effect of choice may have different implications. Future research can examine how different service tasks (for example, standardized versus unstandardized) or task complexity influence the comprehensiveness of choice and the effect of choice.

Lastly, while our proposal of choice as a mitigation strategy was based on the underlying theory of psychological reactance, there are several other factors that are known to reduce reactance. Researchers can consider and test other recovery strategies based on the reactance theory. For instance, forewarnings about the possibility of reactance have been shown to make people guard themselves against a subsequent threat to freedom or control, thus being able to deal with the actual experience better (Richards and Banas 2015). Thus, warning customers about potential chatbot failures in advance might be a preventive strategy of tackling potential failures. Furthermore, providing a choice was not able to completely eliminate the impact of interruption on reactance and thus not able to fully recover the lost service perceptions. Future research unveiling the ways to eliminate or even reverse the negative impact of interruption due to chatbot failures will contribute greatly to both academics and practitioners.

References

Amershi, S., Weld, D., Vorvoreanu, M., Fourney, A., Nushi, B., Collisson, P., Suh, J., Iqbal, S., Bennett, P. N., Inkpen, K., Teevan, J., Kikin-Gil, R., and Horvitz, E. 2019. "Guidelines for Human-Ai Interaction," in: *Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems*. Glasgow, Scotland Uk: Association for Computing Machinery, p. Paper 3.

Averill, J. R. 1973. "Personal Control over Aversive Stimuli and Its Relationship to Stress," *Psychological Bulletin* (80:4), pp. 286-303.

Baker, J., and Cameron, M. 1996. "The Effects of the Service Environment on Affect and Consumer Perception of Waiting Time: An Integrative Review and Research Propositions," *Journal of the Academy of Marketing Science* (24:4), p. 338.

Bandura, A. 1993. "Perceived Self-Efficacy in Cognitive Development and Functioning," *Educational Psychologist* (28:2), pp. 117-148.

Barrett, M., Davidson, E., Prabhu, J., and Vargo, S. L. 2015. "Service Innovation in the Digital Age: Key Contributions and Future Directions," *MIS Q.* (39:1), pp. 135–154.

Bluvstein, S., Zhao, X., Barasch, A., and Schroeder, J. 2019. "“Hello! How May I Helo You?”: How (Corrected) Errors Humanize a Communicator."

Brady, M. K., and Cronin, J. J. 2001. "Some New Thoughts on Conceptualizing Perceived Service Quality: A Hierarchical Approach," *Journal of Marketing* (65:3), pp. 34-49.

Brehm, J. W. 1966. *A Theory of Psychological Reactance*. Oxford, England: Academic Press.

Brehm, S. S., and Brehm, J. W. 2013. *Psychological Reactance: A Theory of Freedom and Control*. Academic Press.

Choi, S., Mattila, A. S., and Bolton, L. E. 2020. "To Err Is Human(-Oid): How Do Consumers React to Robot Service Failure and Recovery?," *Journal of Service Research*), p. 1094670520978798.

Clark, M. S., and Isen, A. M. 1982. "Toward Understanding the Relationship between Feeling States and Social Behavior." Cognitive social psychology, pp. 73-108.
Clore, G. L., Gasper, K., and Garvin, E. 2001. "Affect as Information." Handbook of affect and social cognition, pp. 121-144.
Cronin, J. J., Brady, M. K., and Hult, G. T. M. 2000. "Assessing the Effects of Quality, Value, and Customer Satisfaction on Consumer Behavioral Intentions in Service Environments," *Journal of Retailing* (76:2), pp. 193-218.
Deci, E. L., and Ryan, R. M. 1987. "The Support of Autonomy and the Control of Behavior," *Journal of Personality and Social Psychology* (53:6), pp. 1024-1037.
Dietvorst, B. J., Simmons, J. P., and Massey, C. 2015. "Algorithm Aversion: People Erroneously Avoid Algorithms after Seeing Them Err," *Journal of Experimental Psychology: General* (144:1), pp. 114-126.
Dillard, J. P., and Shen, L. 2005. "On the Nature of Reactance and Its Role in Persuasive Health Communication," *Communication Monographs* (72:2), pp. 144-168.
Edwards, S. M., Li, H., and Lee, J.-H. 2002. "Forced Exposure and Psychological Reactance: Antecedents and Consequences of the Perceived Intrusiveness of Pop-up Ads," *Journal of Advertising* (31:3), pp. 83-95.
Fiske, S. T., Cuddy, A. J. C., and Glick, P. 2007. "Universal Dimensions of Social Cognition: Warmth and Competence," *Trends in Cognitive Sciences* (11:2), pp. 77-83.
Froehle, C. M., and White, D. L. 2014. "Interruption and Forgetting in Knowledge-Intensive Service Environments," *Production and Operations Management* (23:4), pp. 704-722.
Giuliani, M., Mirnig, N., Stollnberger, G., Stadler, S., Buchner, R., and Tscheligi, M. 2015. "Systematic Analysis of Video Data from Different Human–Robot Interaction Studies: A Categorization of Social Signals During Error Situations," *Frontiers in Psychology* (6:931).
Glikson, E., and Woolley, A. W. 2020. "Human Trust in Artificial Intelligence: Review of Empirical Research," *Academy of Management Annals* (14:2), pp. 627-660.
Gray, H. M., Gray, K., and Wegner, D. M. 2007. "Dimensions of Mind Perception," *Science* (315:5812), pp. 619-619.
Harris, K., Kimson, A., and Schwedel, A. 2018. "Why the Automation Boom Could Be Followed by a Bust," in: *Harvard Business REVIEW*.
Hayes, A. F. 2013. *Introduction to Mediation, Moderation, and Conditional Process Analysis: A Regression-Based Approach*. New York, NY, US: Guilford Press.
Honig, S., and Oron-Gilad, T. 2018. "Understanding and Resolving Failures in Human-Robot Interaction: Literature Review and Model Development," *Frontiers in Psychology* (9:861).
Hui, M. K., and Bateson, J. E. G. 1991. "Perceived Control and the Effects of Crowding and Consumer Choice on the Service Experience," *Journal of Consumer Research* (18:2), pp. 174-184.
Kuppens, P., Van Mechelen, I., Smits, D. J. M., and De Boeck, P. 2003. "The Appraisal Basis of Anger: Specificity, Necessity and Sufficiency of Components," *Emotion* (3:3), pp. 254-269.
Larivière, B., Bowen, D., Andreassen, T. W., Kunz, W., Sirianni, N. J., Voss, C., Wünderlich, N. V., and De Keyser, A. 2017. ""Service Encounter 2.0": An Investigation into the Roles of Technology, Employees and Customers," *Journal of Business Research* (79), pp. 238-246.
Lee, M. K., Kiesler, S., Forlizzi, J., Srinivasa, S., and Rybski, P. 2010. "Gracefully Mitigating Breakdowns in Robotic Services," *2010 5th ACM/IEEE International Conference on Human-Robot Interaction (HRI)*, pp. 203-210.
Leo, X., and Huh, Y. E. 2020. "Who Gets the Blame for Service Failures? Attribution of Responsibility toward Robot Versus Human Service Providers and Service Firms," *Computers in Human Behavior* (113), p. 106520.
Lerner, J. S., and Tiedens, L. Z. 2006. "Portrait of the Angry Decision Maker: How Appraisal Tendencies Shape Anger's Influence on Cognition," *Journal of Behavioral Decision Making* (19:2), pp. 115-137.
Li, X., Chan, K. W., and Kim, S. 2018. "Service with Emoticons: How Customers Interpret Employee Use of Emoticons in Online Service Encounters," *Journal of Consumer Research* (45:5), pp. 973-987.
Liljander, V., and Strandvik, T. 1997. "Emotions in Service Satisfaction," *International Journal of Service Industry Management* (8:2), pp. 148-169.
Lowry, P. B., and Moody, G. D. 2015. "Proposing the Control-Reactance Compliance Model (Crcm) to Explain Opposing Motivations to Comply with Organisational Information Security Policies," *Information Systems Journal* (25:5), pp. 433-463.

Meuter, M. L., Bitner, M. J., Ostrom, A. L., and Brown, S. W. 2005. "Choosing among Alternative Service Delivery Modes: An Investigation of Customer Trial of Self-Service Technologies," *Journal of Marketing* (69:2), pp. 61-83.

Meuter, M. L., Ostrom, A. L., Roundtree, R. I., and Bitner, M. J. 2000. "Self-Service Technologies: Understanding Customer Satisfaction with Technology-Based Service Encounters," *Journal of Marketing* (64:3), pp. 50-64.

Miller, C. H., Massey, Z. B., and Ma, H. 2020. "Psychological Reactance and Persuasive Message Design," in *The Handbook of Applied Communication Research*. pp. 457-483.

Mirnig, N., Stollnberger, G., Miksch, M., Stadler, S., Giuliani, M., and Tscheligi, M. 2017. "To Err Is Robot: How Humans Assess and Act toward an Erroneous Social Robot," *Frontiers in Robotics and AI* (4:21).

Oliva, T. A., Oliver, R. L., and Macmillan, I. C. 1992. "A Catastrophe Model for Developing Service Satisfaction Strategies," *Journal of Marketing* (56:3), pp. 83-95.

Oliver, R. L. 2014. *Satisfaction: A Behavioral Perspective on the Consumer*. Routledge.

Patrick, B. C., Skinner, E. A., and Connell, J. P. 1993. "What Motivates Children's Behavior and Emotion? Joint Effects of Perceived Control and Autonomy in the Academic Domain," *Journal of Personality and Social Psychology* (65:4), pp. 781-791.

Quick, B. L., and Stephenson, M. T. 2007. "Further Evidence That Psychological Reactance Can Be Modeled as a Combination of Anger and Negative Cognitions," *Communication Research* (34:3), pp. 255-276.

Rai, A. 2020. "Explainable Ai: From Black Box to Glass Box," *Journal of the Academy of Marketing Science* (48:1), pp. 137-141.

Reynolds-Tylus, T. 2019. "Psychological Reactance and Persuasive Health Communication: A Review of the Literature," *Frontiers in Communication* (4:56).

Reynolds-Tylus, T., Bigsby, E., and Quick, B. L. 2020. "A Comparison of Three Approaches for Measuring Negative Cognitions for Psychological Reactance," *Communication Methods and Measures*), pp. 1-17.

Richards, A. S., and Banas, J. A. 2015. "Inoculating against Reactance to Persuasive Health Messages," *Health Communication* (30:5), pp. 451-460.

Sampson, S. E., and Froehle, C. M. 2006. "Foundations and Implications of a Proposed Unified Services Theory," *Production and Operations Management* (15:2), pp. 329-343.

Scott, M. L., Mende, M., and Bolton, L. E. 2013. "Judging the Book by Its Cover? How Consumers Decode Conspicuous Consumption Cues in Buyer–Seller Relationships," *Journal of Marketing Research* (50:3), pp. 334-347.

Seshadri, S., and Shapira, Z. 2001. "Managerial Allocation of Time and Effort: The Effects of Interruptions," *Management Science* (47:5), pp. 647-662.

Sheehan, B., Jin, H. S., and Gottlieb, U. 2020. "Customer Service Chatbots: Anthropomorphism and Adoption," *Journal of Business Research* (115), pp. 14-24.

Simonite, T. 2017. "Facebook's Perfect, Impossible Chatbot," in: *MIT Technology Review*.

Simonite, T. 2018. "Facebook's Virtual Assistant M Is Dead. So Are Chatbots," in: *WIRED*.

Speier, C., Valacich, J. S., and Vessey, I. 1999. "The Influence of Task Interruption on Individual Decision Making: An Information Overload Perspective," *Decision Sciences* (30:2), pp. 337-360.

Taylor, S. 1994. "Waiting for Service: The Relationship between Delays and Evaluations of Service," *Journal of Marketing* (58:2), pp. 56-69.

Thompson, D. V., and Ince, E. C. 2013. "When Disfluency Signals Competence: The Effect of Processing Difficulty on Perceptions of Service Agents," *Journal of Marketing Research* (50:2), pp. 228-240.

Trope, Y. 1986. "Identification and Inferential Processes in Dispositional Attribution," *Psychological Review* (93:3), pp. 239-257.

Wyer, R. S., and Carlston, D. E. 1979. *Social Cognition, Inference, and Attribution*. Psychology Press.

Zijlstra, F. R. H., Roe, R. A., Leonora, A. B., and Krediet, I. 1999. "Temporal Factors in Mental Work: Effects of Interrupted Activities," *Journal of Occupational and Organizational Psychology* (72:2), pp. 163-185.

Zomerdijk, L. G., and Voss, C. A. 2010. "Service Design for Experience-Centric Services," *Journal of Service Research* (13:1), pp. 67-82.