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The Labor Illusion: How Operational Transparency Increases Perceived Value

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A ubiquitous feature of even the fastest self-service technology transactions is the wait. Conventional wisdom and operations theory suggest that the longer people wait, the less satisfied they become; we demonstrate that because of what we term the *labor illusion*, when websites engage in operational transparency by signaling that they are exerting effort, people can actually prefer websites with longer waits to those that return instantaneous results—even when those results are identical. In five experiments that simulate service experiences in the domains of online travel and online dating, we demonstrate the impact of the labor illusion on service value perceptions, demonstrate that perceptions of service provider effort induce feelings of reciprocity that together mediate the link between operational transparency and increased valuation, and explore boundary conditions and alternative explanations.

Key words: marketing; channels of distribution; queues; industries; business services; inventory–production; operating characteristics; service operations; service design
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1. Introduction

Rare is the modern consumer who has not found herself staring at a computer screen as a progress bar advances fitfully toward loading some application or completing some search without wondering, "*What* is taking so long?" and because of that frustration decreasing her approval of the service. We suggest that taking a different approach—showing consumers what *is* taking so long—can not only decrease frustration but actually increase ratings of the service, such that consumers actually value services more highly when they wait. In particular, we suggest that engaging in operational transparency, by making the work that a website is purportedly doing more salient, leads consumers to value that service more highly. Indeed, we suggest that the mere appearance of effort—what we term the *labor illusion*—is sufficient to increase perceptions of value. By replacing the progress bar with a running tally of the tasks being performed—the different airlines being searched when the consumer is looking for flights or the different online dating profiles being searched when the consumer is looking for dates—we show that consumers can actually choose to wait longer for the very same search results.

In five experiments, we demonstrate the role of the labor illusion in enhancing service value perceptions among self-service technologies, an ideal setting for testing the impact of operational transparency. Self-service technologies are capable of delivering service more quickly and conveniently than face-to-face alternatives (Meuter et al. 2000). However, unlike customers who receive service in face-to-face settings (such as interacting with a bank teller counting one's money), customers transacting in self-service environments (such as withdrawing money from an ATM) do not observe the effort of the service provider, an important cue that can signal the value of the service being delivered. As such, although an automated solution may objectively deliver faster performance, we suggest that customers may perceive that service as less valuable because of the absence of labor. Adding that labor back in via operational transparency, therefore, has the potential to increase perceptions of value.

2. Waiting, Effort, and Perceived Value

Because customers treat their time as a precious commodity (Becker 1965), operations researchers have produced numerous models set in service contexts based on the notion that customers are attracted to fast service. These models suggest that (a) delivery time competition increases buyer welfare (Li 1992), (b) firms with higher processing rates enjoy a price premium and larger market shares (Li and Lee 1994),

and (c) the choice of an optimal delivery time commitment balances service capacity and customer sensitivities to waiting (Ho and Zheng 2004). Empirical investigations of delivery time have similarly demonstrated that waiting adversely affects customer attitudes and the likelihood of patronage; for example, long delays increase uncertainty and anger, particularly when the delay seems controllable by the service provider (Taylor 1994).

Accordingly, growing streams of the service operations and marketing literatures have sought to identify strategies for both improving the experiences of waiting customers and reducing service duration itself. With regard to the former, research on the psychology of queuing focuses on managing the perceptions of waiting customers by occupying periods of idle time (Carmon et al. 1995), increasing the feeling of progress (Soman and Shi 2003), managing anxiety and uncertainty (Osuna 1985), setting accurate expectations, bolstering perceptions of fairness (Maister 1985), managing sequence and duration effects, providing customers with the feeling of control, shaping attributions (Chase and Dasu 2001), and shaping memories of the experience (Norman 2009). In addition to favorably influencing the *perceptions* of waiting customers, of course, managers have also sought to reduce *actual* service duration. In particular, one increasingly common strategy for improving the speed and productivity of service is the introduction of self-service technologies (Napoleon and Gaimon 2004). In 2008, for example, 70% of travel reservations were booked online (J.D. Power and Associates 2008), and more than 75% of customers used Internet banking (Higdon 2009). In general, self-service technologies reduce both perceived and actual waiting time for customers, excepting cases when the technology is overly complicated or the customers served lack technical proficiency (Dabholkar 2000). Moreover, perceptions of self-service technology value and quality are driven in part by speed of service delivery (Dabholkar 1996).

Although considerable emphasis has been placed on increasing the service speed that customers perceive and experience, offering service that seems to arrive too quickly or too easily can have costs. In particular, customers draw inferences from their in-process experiences about the value being created. If, for example, the outcome of a service is difficult to evaluate, consumers may use service duration as a heuristic to assess its quality (Yeung and Soman 2007). This heuristic is rooted in the notion that service quality increases with time spent with the service provider—as is often the case with customer-intensive services like health care, personal services, and financial and legal consulting (Anand et al. 2011). Perceived employee effort, which has a strong positive effect on customer satisfaction in face-to-face contexts (Mohr and Bitner 1995), can serve as a heuristic for product quality as well (Kruger et al. 2004). Similarly, Kahneman et al. (1986) suggest that when firms incur higher costs—as when exerting more effort—customers perceive higher prices to be fair. Most relevant to the present investigation, firms that exert more effort on behalf of customers can boost service quality perceptions via the impact of that effort on customer's psychological feelings of gratitude and reciprocity; even when the quality of the service remains unaffected, consumers can feel that they should reciprocate the efforts of the firm (Morales 2005).

Importantly, however, when the production and delivery of a service are separable, employee effort may be removed from a customer's service experience. In some cases, such as parcel delivery and automotive repair, the bulk of employee effort occurs out of the customer's view. In the cases we explore—technology-mediated services—marginal employee effort may be entirely absent. In particular, when service is automated, tasks that would otherwise be performed by employees are instead divided between the consumer and the technology. This omission of employee effort is ironically exacerbated by the efforts of self-service designers to maximize the ease of use, and minimize the complexity, of self-service offerings (Curran and Meuter 2005, Dabholkar and Bagozzi 2002), making such services appear even more effortless. This situation poses a critical trade-off for companies. Although automating service and shielding customers from the complexities of their offerings can promote adoption, these practices may also undercommunicate the value of the services being delivered. If perceived value is diminished, then customers engaging with these shielded self-service channels may exhibit diminished willingness to pay, satisfaction, and loyalty (McDougall and Levesque 2000).

We suggest a solution to this trade-off. Although self-service technologies necessarily eliminate the opportunity for face-to-face interactions with a service provider in which consumers can witness an employee sweating to get the job done, the interfaces through which consumers engage with self-service can be modified by inserting operational transparency into the process, to demonstrate the "sweat" that the technology is exerting on the consumer's behalf. In particular, we suggest that supplementing nondescript, noninformative progress bars with interfaces that provide a running tally of the tasks being undertaken—creating the illusion of labor being performed—can serve to increase consumers' perceptions of effort, and as a result, their perceptions

of value. Previous research has demonstrated that perceived effort leads to feelings of reciprocity and increased perceptions of value (Morales 2005); we suggest that operational transparency provides cues for consumers to better understand how the quantity of work being conducted translates into how hard the company is working for them.

3. Presentation of Experiments

In five experiments and across two domains (online travel and online dating websites), we investigate the effect of the labor illusion on perceptions of service value. We define the labor illusion as a representation of the physical and mental work being conducted—signaled via operational transparency—as the customer waits for service delivery. We first demonstrate that the labor illusion increases customer perceptions of value in self-service contexts (Experiment 1). We next demonstrate that customers can even prefer websites that require waiting but demonstrate labor to those that offer the same results instantaneously but without labor (Experiment 2). In Experiment 3, we explore alternative explanations for the labor illusion effect, distinguishing it from the effects of enhanced information, credibility, and uncertainty while also exploring perceived effort and reciprocity as the mechanisms linking operational transparency to perceived value. In Experiment 4, we compare the impact of operational transparency and actual effort exerted by the firm on perceptions of value, stated satisfaction and repurchase intentions. Finally, in Experiment 5, we explore the role of outcome favorability as a boundary condition on the labor illusion, examining how the quality of the service outcome moderates the relationship between operational transparency and valuation. We conclude the paper with a discussion of managerial implications, limitations, and opportunities for future research.

3.1. Experiment 1: Demonstration of the Labor Illusion

In this first experiment, we explore how customer waiting time and operational transparency influence customer perceptions of service value. Participants experienced a simulated service transaction using the rebranded interface of a popular online travel website. Online travel websites accounted for $84 billion in worldwide sales in 2008, representing more than 70% of all travel reservations booked (J.D. Power and Associates 2008). In addition, online travel is an attractive context for studying the impact of the labor illusion, because most service providers have access to the same inventory of available flights. Two online travel websites that search fares and return identical itineraries for the same price have delivered outcomes that are objectively equivalent, a fact that enables us to analyze changes in perceived value while controlling for performance outcome.

3.1.1. Method.

Participants. Participants ($N = 266$, $M_{age} = 35.8$, 26% male) completed this online experiment over the Internet, in exchange for a $5.00 Amazon.com gift certificate.[1]

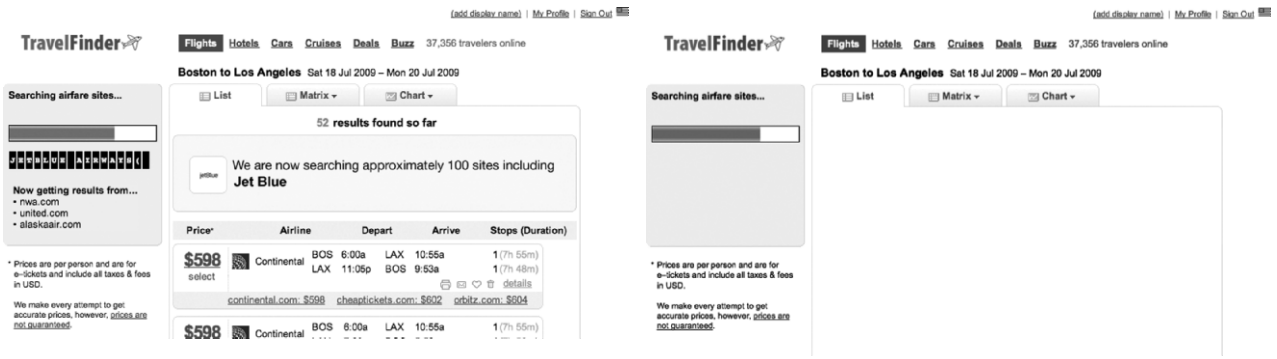
Design and Procedure. We recreated (and rebranded) the interface of a popular online travel website to provide participants with a simulated technology-mediated service experience. Participants were asked to use the simulated travel website to book travel arrangements for a trip. All participants were instructed to search for the same travel itinerary. Participants entered the point of origin, destination, and departure and return dates into the interface and clicked the search button.

Participants were randomly assigned to 1 of 13 experimental conditions. Some participants were assigned to an instantaneous condition, in which there was no delay between clicking the search button and receiving their outcomes. All other participants were assigned to one condition of a 2 (version: transparent versus blind) × 6 (wait time: 10, 20, 30, 40, 50, or 60 seconds) design, in which they experienced a wait with either operational transparency or not, before being presented with an identical list of possible trip itineraries and prices.

In the transparent condition, while the service simulation was "searching" for flights, the waiting screen displayed a continually changing list of which sites were being searched and showed an animation of the fares being compiled as they were "found." The animations of compiled results were time-scaled such that each participant in the transparent condition observed the same number of sites searched, and the same number of fares compiled, over their randomly assigned waiting time. When the search was complete, participants were forwarded to a search results page, where they could scroll through the various itineraries retrieved by the service. In the blind condition, in contrast, the waiting screen only displayed a progress bar that gradually filled at a uniform rate; when the progress bar filled completely, participants were forwarded to the same search results page described above (see Figure 1 for screenshots). This progress bar was designed to reduce the psychological costs of waiting and curb uncertainty by providing individuals with reliable information about the

[1] Including age and gender as covariates in our analyses does not impact the significance levels of our key analyses in either Experiment 1 or the subsequent experiments. In Experiment 1, for example, the main effect of transparency remained significant at $p < 0.01$, and the covariates on age and gender were insignificant at the $p = 0.88$ and $p = 0.65$ levels, respectively.

Figure 1 Screenshots of Transparent and Blind Conditions (Experiment 1)



Transparent condition Blind condition

remaining duration of their wait (Osuna 1985). Importantly, we included an identical progress bar in all of our nonzero wait time conditions—including the transparent conditions—in all experiments to control for the effect of uncertainty.

Dependent Measures. At the conclusion of the simulation, participants were surveyed about their perceptions of the service's value. We assessed perceived value using four items adapted from a survey designed to gauge value perceptions of branded durable goods (Sweeney and Soutar 2001): *Do you believe this is a high quality service*? *Is this a service that you would want to use*? *What would you be willing to pay for this service*? *Would other people approve of this service*? Participants provided responses to the four questions on a 7-point scale, and we averaged these four items to create a composite measure of each participant's perceptions of service value. We use an identical perceived value metric throughout this paper; across our experiments, the four items possess a high level of internal consistency (Cronbach's $\alpha = 0.82$). Note that this scale captures perceptions of quality as a dimension of perceived value, though the two attributes have also been modeled as distinct, but causally related. Prior literature suggests that perceptions of quality drive perceptions of value (Zeithaml 1988).

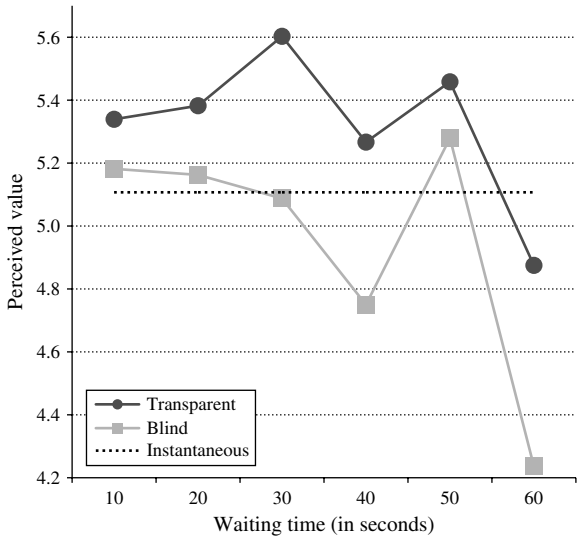
3.1.2. Results and Discussion. We conducted a 2 (version: transparent versus blind) × 6 (wait time: 10, 20, 30, 40, 50, or 60 seconds) analysis of variance (ANOVA) on the composite measure of participants' value perceptions. We observed a main effect of wait time, $F(5, 212) = 4.47$, $p < 0.01$, such that value perceptions showed a general downward trend over time. Most importantly, we observed the predicted main effect of operational transparency, $F(1, 212) = 10.68$, $p < 0.01$, such that value perceptions were higher with transparency ($M = 5.36$, $SD = 0.79$) than without ($M = 4.96$, $SD = 0.91$). As can be seen in Figure 2, perceptions of value with operational transparency were higher at every time point than perceptions of value without transparency, such that there was no interaction, $F(1, 212) = 0.55$, $p = 0.73$.

Indeed, as evidenced by the line in Figure 2 indicating value perceptions for the instantaneous service condition, value perceptions for operational transparency compared favorably with perceptions of the service delivering instant results—even though the results returned were identical in the different versions. These results offer initial support for our contention that operational transparency—listing the airlines being searched as participants waited for the outcome of their flight search—has a positive impact on value perceptions, demonstrating the clear value of increasing perceptions of the labor conducted by self-service technologies by creating the labor illusion.

3.2. Experiment 2: Choosing Services

Experiment 1 demonstrated that value perceptions are enhanced when automated service interfaces exhibit

Figure 2 The Effect of Operational Transparency and Wait Time on Perceived Value (Experiment 1)



cues that indicate that labor is being performed on the consumer's behalf during service delivery. By utilizing a between-participants design, Experiment 1 mimics many of the "one-off" service experiences consumers may encounter. However, in many cases, consumers "comparison shop" between competing providers who employ a variety of delivery strategies; in such cases, consumers may not necessarily prefer the most transparent operation—particularly when providing transparency may lengthen service duration. Given the fact that delivery time is an important component of service satisfaction (Davis and Vollmann 1990, Maister 1985, Taylor 1994) and, in turn, firm performance (Cachon and Harker 2002), we wanted to explicitly pit delivery time against the labor illusion: Is the value of operational transparency large enough that participants will choose the service that requires waiting—but induces the labor illusion—over one that gives them objectively similar results instantaneously? In Experiment 2, therefore, we used a within-participants design, asking participants to evaluate and choose between competing services delivering identical outcomes but different experiences.

3.2.1. Method.

Participants. Participants ($N = 118$, $M_{age} = 37.2$, 28% male) completed this experiment in the laboratory as part of a series of unrelated experiments, in exchange for $25.00.

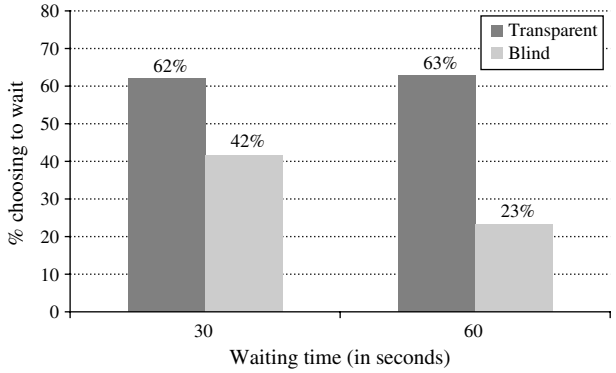
Design and Procedure. We replicated Experiment 1, with two important changes. First, rather than simulate only one travel website, we also simulated a rival, which had different branding from the first site. Second, participants engaged in two service transactions, one with each of the "competing" firms. Participants were instructed to conduct the same travel search on both sites, which returned identical itineraries and prices.

In each case, one firm delivered instantaneous service; the other delivered either blind or transparent service in either 30 or 60 seconds. We randomized which brand was displayed first, which type of service was displayed first, and which brand featured each type of service; these differences had no impact on the results so we do not discuss them further.

Dependent Measures. The within-participants design allowed us to ask participants to make forced choices between the two services, and we asked participants to express an overall preference for which service they would choose.

3.2.2. Results and Discussion. In all conditions, we gave participants the choice between a service that provided instantaneous results and one that required waiting—and simply varied whether that waiting included operational transparency. We observed the predicted effect: Participants for whom the service that required waiting included operational transparency preferred this service over the instantaneous service when waiting for both 30 seconds (62%) and 60 seconds (63%). In contrast, participants who waited without operational transparency selected this service just 42% of the time at 30 seconds, and just 23% of the time at 60 seconds, demonstrating a strong preference for instantaneous results (Figure 3). We used a logistic regression to analyze the effect of operational transparency on an individual's preference for the service that required waiting. The effect of operational transparency on choice was significant (coefficient = 1.30, $p < 0.01$ two-sided), whereas the effect of waiting time was not (coefficient = -0.01, $p = 0.37$), and there was no interaction between operational transparency and wait time (coefficient = 0.03, $p = 0.26$). These results are particularly interesting because they suggest that even when customers are given an instantaneous option, they may actively prefer using a service with a longer delivery time, but only when the labor being performed by that service is made tangible through operational transparency.

Figure 3 Percentage of Participants Preferring the Service That Required Waiting (Experiment 2)



3.3. Experiment 3: Mechanisms Underlying the Labor Illusion

The experiments presented so far suggest that operational transparency increases individuals' perceptions of service value and preferences for services. In Experiment 3, our first goal was to provide evidence for our proposed process underlying the labor illusion: Operational transparency increases perceptions of effort, inducing feelings of reciprocity and therefore boosting perceptions of value. We assess each construct independently in Experiment 3 and then conduct a path analysis that tests our proposed model.

In addition, our second goal in Experiment 3 was to address two alternative explanations for our effects. First, operational transparency may provide customers with information that updates their priors about the amount of work being performed by the

service, and this enhanced knowledge may increase their perceptions of service value; indeed, previous research suggests that customers may not always intuit the work that is being done for them behind the scenes (Parasuraman et al. 1985) and therefore often misattribute the source of a wait (Taylor 1994). From this perspective, showing participants a running tally of the work being completed may only enhance value perceptions insofar as it reveals information that updates consumers' priors about the quantity of work undertaken by the website. Furthermore, imposing a 30-second wait may lend additional credibility to the assertion that more work is being undertaken, such that our results could be fully explained by this alternative explanation. If the provision of additional information accounts for the increase in service value perceptions accompanying operational transparency, we would expect that showing participants a list of the work *to be performed*—even without operational transparency—should also result in elevated perceptions of service value because of the impact of such claims on participants' perceptions of the number of sites the service searches. Furthermore, if credibility explains part of this effect, we would expect that the effect of providing information about upcoming labor is even more positive if the website also imposes a delay while it searches. In contrast, although we predict that providing information about upcoming effort will increase perceptions of the quantity of labor being performed, our model suggests that these perceptions will not drive increases in value perception.

Second, it is possible that the impact of operational transparency stems from its effect on the level of uncertainty individuals feel while waiting—an important contributor to the psychological cost of waiting experienced by consumers during service delivery delays (Osuna 1985). Although the progress bars utilized in all of our experimental conditions are designed to equate uncertainty (Nah 2004), providing participants with an enhanced level of information in the transparent conditions may further reduce uncertainty and, in turn, the psychological costs of waiting. As such, if uncertainty is comparatively high in the blind conditions (and particularly so in blind conditions that require waiting), we would expect that participants in the blind conditions will report being more uncertain than are participants in the transparent conditions and that these differences should be most acute when service duration is increased. In contrast, we suggest that although uncertainty plays an important role in many types of service delivery, the positive effect of operational transparency on value perceptions is due not to decreases in uncertainty but to increases in perceived effort and the reciprocity that such effort perceptions induce.

3.3.1. Method.

Participants. Participants ($N = 143$, $M_{age} = 45.5$, 29% male) completed this experiment online in exchange for \$5.00.[2]

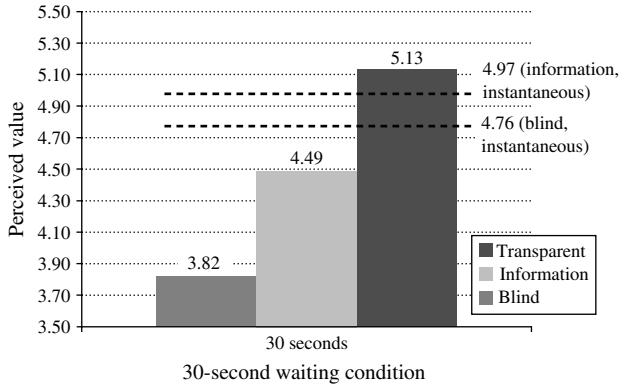
Design and Procedure. Participants were randomly assigned to one of five conditions. Some participants were assigned to receive an instantaneous service outcome, before which they were either given information regarding a list of the sites the site was going to search or not. Other participants were assigned to wait 30 seconds; some were given a list of sites before waiting without transparency, some were not given the list of sites and then waited without transparency, and others were not given a list of sites and then waited with transparency. As in Experiment 1, there was no instantaneous condition with transparency, because showing labor requires waiting time. Although the transparency manipulation was identical to that used in Experiment 1, participants who received information about the list of sites the site was going to search were briefly shown the message "We are preparing to search 100 sites" accompanied by a list of roughly 100 airline and airfare websites. The list was designed to provide participants with information about the work conducted by the website in the absence of operational transparency. All participants received an identical list of service outcomes.

Dependent Measures. We first assessed participants' perceptions of service value using the same items as in Experiment 1; then we included items designed to capture the role of perceived effort and reciprocity in the impact of operational transparency on perceived value. We measured perceived effort using the following three questions: *How much effort do you think the website exerted on your behalf*? *How much expertise do you think the website has*? *How thorough was the website in searching for your ticket*? To measure reciprocity, we followed the procedure outlined by Bartlett and DeSteno (2006), asking participants the following questions: *How positive do you feel toward the company*? *How grateful do you feel toward the company*? *How appreciative do you feel toward the company*? Responses to all items were provided on 7-point scales, and exhibited a sufficient level of internal consistency for both perceived effort (Cronbach's $\alpha = 0.71$) and reciprocity (Cronbach's $\alpha = 0.90$).

To examine the impact of enhanced information and credibility, we asked participants to report how many websites they believed the service had searched during the service process. To measure uncertainty, we followed the procedure outlined by Taylor (1994),

[2] The "number of sites searched" question described below permitted participants to provide unbounded responses, resulting in high-end variability. We excluded participants ($n = 17$) who reported ex post perceptions of more than 100 websites searched.

Figure 4 The Effect of Enhanced Information and Credibility on Perceived Value (Experiment 3)



asking participants to rate the extent to which they felt the following emotions while waiting for service using 7-point scales: *anxious, uneasy, uncertain*, and *unsettled*. These factors possessed a high level of internal consistency (Cronbach's $\alpha = 0.83$).

3.3.2. Results and Discussion.

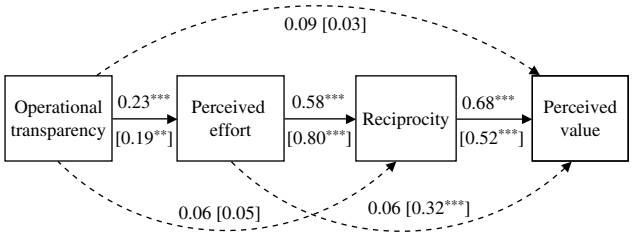
Perceived Value. Perceived value varied significantly across conditions, $F(4, 138) = 7.41$, $p < 0.01$ (Figure 4). First, there was no difference in perceived value between the instantaneous blind ($M = 4.76$, $SD = 1.04$) and list conditions ($M = 4.97$, $SD = 0.77$), $t(59) = 0.91$, $p = 0.37$, suggesting that providing information did not positively impact value perceptions in the absence of a wait. It is possible, however, that the impact of an informational claim about upcoming labor is enhanced by a delay that increases the credibility of that claim. Our results do not offer support for this hypothesis. Although perceived value varied among the 30-second waiting conditions $F(2, 79) = 12.71$, $p < 0.01$, perceived value was highest for the transparent condition ($M = 5.13$, $SD = 0.89$), which was significantly higher than perceived value in the list condition ($M = 4.49$, $SD = 0.98$), $t(62) = 2.71$, $p < 0.01$, which in turn was significantly higher than perceived value in the blind condition ($M = 3.82$, $SD = 0.99$), $t(41) = 2.20$, $p < 0.05$.

Perceived Effort and Reciprocity. Closely mirroring these results, perceived effort also varied significantly across conditions, $F(4, 138) = 3.15$, $p < 0.05$. There was again no difference in perceived effort between the instantaneous blind ($M = 5.07$, $SD = 1.05$) and list conditions ($M = 5.13$, $SD = 1.18$), $t(59) = 0.20$, $p = 0.84$, but differences were significant among the 30-second waiting conditions, $F(2, 79) = 7.01$, $p < 0.01$. Perceived effort was highest for the transparent condition ($M = 5.50$, $SD = 1.01$), which was significantly higher than perceived effort in the list condition ($M = 4.75$, $SD = 1.01$), $t(62) = 2.94$, $p < 0.01$, and blind conditions ($M = 4.59$, $SD = 0.23$), $t(55) = 3.12$, $p < 0.01$. There was no difference in perceived effort between the 30-second blind and list conditions, $t(41) = 0.50$, $p = 0.62$.

Feelings of reciprocity also varied across waiting conditions in a similar fashion, $F(4, 138) = 7.56$, $p < 0.01$. Participants in the instantaneous blind ($M = 4.90$, $SD = 0.24$) and list conditions ($M = 5.09$, $SD = 0.20$) reported no difference in reciprocity, $t(59) = 0.61$, $p = 0.55$, but differences were again significant among the 30-second waiting conditions, $F(2, 79) = 12.06$, $p < 0.01$. As with perceived value, reciprocity was highest among participants in the transparent condition ($M = 5.19$, $SD = 1.03$), which was significantly higher than the list condition ($M = 4.43$, $SD = 1.37$), $t(62) = 2.54$, $p < 0.01$, which in turn was higher than the blind condition ($M = 3.44$, $SD = 0.18$), $t(41) = 2.21$, $p < 0.05$.

Path Analysis. To test our model, which suggests that perceived value and reciprocity underlie the relationship between operational transparency and perceived value, we conducted a path analysis using the perceived effort, reciprocity, and perceived value measures. Path analysis facilitates the quantification and interpretation of causal theory by using a series of recursive linear models to disentangle the total and indirect effects of a series of variables on one another (Alwin 1975). In particular, we wished to test the theory that operational transparency increases perceptions of effort exerted by the website, which in turn triggers feelings of reciprocity that lead the consumer to perceive the service as valuable. The path analysis, which is represented graphically in Figure 5, reports standardized beta coefficients to indicate the relative strength of each link in the theorized causal path. Operational transparency is positively associated with perceptions of effort ($\beta = 0.23$; $p < 0.01$), which in turn is positively associated with reciprocity ($\beta = 0.58$; $p < 0.01$), which has a positive association with perceived value ($\beta = 0.68$; $p < 0.01$). In this analysis, no significant relationships between the variables lie off the hypothesized causal path. Perceived effort fully mediates the relationship between operational transparency and reciprocity, reciprocity fully mediates the relationship between perceived effort and perceived

Figure 5 Path Analysis (Experiments 3 and 4)



Note. Standardized beta coefficients from Experiment 3 (no brackets) and Experiment 4 (in brackets).

** and *** denote significance at the 5% and 1% levels, respectively.

value, and perceived effort and reciprocity fully mediate the relationship between operational transparency and perceived value. These results are highly consistent with our theoretical account of the mechanisms underlying the labor illusion effect.

Information and Credibility. To test the alternative explanation that increased service duration boosts perceived value by elevating perceptions of the *quantity* of labor conducted, we compared participants' perceptions of the number of sites searched, which varied significantly by condition, $F(4, 138) = 3.76$, $p < 0.01$. Although there was no difference between the blind ($M = 18.83$, $SD = 28.30$) and list instantaneous conditions ($M = 25.13$, $SD = 36.60$), $t(59) = 0.71$, $p = 0.48$, perceptions varied significantly among the 30-second treatments, $F(2, 79) = 5.10$, $p < 0.01$. Participants who saw the list of sites and waited 30 seconds for the delivery of service ($M = 53.28$, $SD = 43.87$) did perceive that more sites had been searched than did participants who saw the operationally transparent condition ($M = 28.13$, $SD = 33.48$), $t(62) = 2.59$, $p < 0.01$, or the blind condition ($M = 21.28$, $SD = 30.79$), $t(55) = 2.66$, $p < 0.01$. These results suggest that that information did increase participants' perceptions of the *quantity* of work being conducted by the website and that the revelation of information about the amount of work being conducted is more credible when service duration is increased. Importantly, however, additional OLS regression analyses suggest that increases in perceptions of labor do not underlie the impact of operational transparency on perceived value. Although transparency is a significant driver of both perceived effort (coefficient = 0.58; $p < 0.01$ two-sided) and perceived value (coefficient = 0.53; $p < 0.01$ two-sided), perceptions of the quantity of labor conducted do not predict either (coefficient = 0.00; $p = 0.33$ two-sided; coefficient = 0.00; $p = 0.78$ two-sided, respectively).

Uncertainty. Finally, we find that uncertainty did not vary among conditions, $F(4, 137) = 1.68$, $p = 0.16$. In particular, participants experiencing the 30-second blind condition reported uncertainty ($M = 1.51$, $SD = 0.64$) equivalent to participants experiencing the 30-second transparent condition ($M = 1.69$, $SD = 1.06$), $t(55) = 0.62$, $p = 0.54$, suggesting that the positive impact of transparency on perceived value is not because of its impact on uncertainty. In support of this contention, an OLS regression of perceived value on operational transparency and uncertainty reveals a significant effect of operational transparency (coefficient = 0.51, $p < 0.01$ two-sided) but an insignificant effect of uncertainty (coefficient = 0.12, $p = 0.14$ two-sided), suggesting that differences in uncertainty do not explain the labor illusion effect.

Taken together, results from Experiment 3 offer support for our proposed model—that operational transparency leads to increased perceptions of effort, inducing reciprocity and enhancing value—and address several plausible alternative explanations centered on the roles of credibility, information, and uncertainty. Having provided initial support for the mechanism underlying the labor illusion, we test for boundary conditions in the remaining experiments, exploring whether diminishing the amount (Experiment 4) or quality (Experiment 5) of labor conducted mitigates the relationship between operational transparency and perceived value.

3.4. Experiment 4: Quantity of Actual Labor

The results of Experiment 3 indicate that perceived effort matters more for perceived value than perceptions of the quantity of labor conducted—as measured by perceptions of the number of sites searched. As a stronger test of the relative contributions of perceived effort and actual labor, we next manipulated the actual number of sites searched. Although our previous analysis suggested that perceptions of labor quantity and perceived effort are unrelated, and that perceived effort leads to perceived value whereas perceptions of labor quantity do not, it may be the case that if the actual quantity of labor performed by the process is sufficiently low, revealing that labor via operational transparency may not boost perceptions of value. If the actual quantity of labor performed serves as a boundary condition, then we would expect that by sufficiently diminishing the quantity of work performed by the service, the effect of operational transparency on perceived value should cease to hold. Alternatively, if perceptions of labor quantity are independent of perceptions of effort, reducing actual labor may have no effect on the relationship between operational transparency and perceived value. We predicted that operational transparency would promote perceptions of effort independent of actual labor, which, as in Experiment 3, would in turn increase feelings of reciprocity and perceived value.

Finally, although we continue to use our measure of perceived value as our key outcome variable, Experiment 3 includes additional measures of value of relevance to managers: satisfaction and repurchase intentions.

3.4.1. Method.

Participants. Participants ($N = 116$, $M_{age} = 45.4$, 53% male) completed this experiment online in exchange for \$5.00.[3]

Design and Procedure. Participants were randomly assigned to one condition of a 2 (version: transparent versus blind) × 2 (actual labor: low versus

[3] As in Experiment 3, we removed outliers ($n = 16$) on the "number of sites searched" question.

high) design; in Experiment 4, all participants waited 30 seconds for their service outcome.

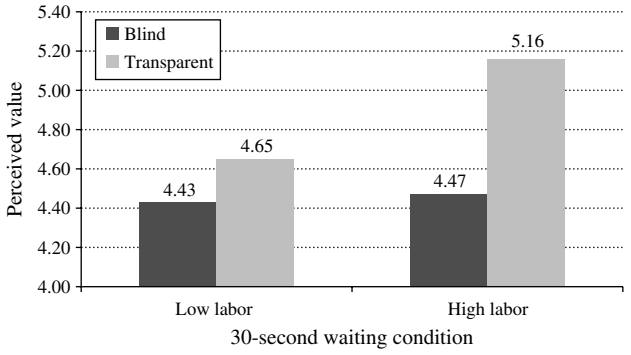
We made the manipulation of actual labor salient in three ways. First, during the search, participants saw a list of the airfare sites being searched by the service (3 for the low labor condition, 36 for the high labor condition). Second, to cycle through more sites in the same amount of time (30 seconds), the list of sites searched in the transparent conditions updated more quickly in the high labor than the low labor condition. Third, when the results were displayed, participants saw differing numbers of sites searched and differing numbers of results (15 results from 3 sites for low labor, 433 results from 36 sites for high labor). Although we manipulated the number of results returned, the best result presented in all conditions was identical, as in the previous experiments.

Dependent Measures. As in Experiment 3, we captured participants' perceptions of service value, perceptions of the number of sites searched, perceived effort, and reciprocity. Following the procedure outlined by Cronin and Taylor (1992), we assessed both participants' satisfaction by asking the following question: *My feelings toward these services can best be described as* (*very unsatisfied to very satisfied*, on a 7-point scale) and repurchase intentions, using the following question: *If it were made available to me, over the next year, my use of these services would be (very infrequent to very frequent*, on a 7-point scale).

3.4.2. Results and Discussion.

Perceived Value, Perceived Effort, and Reciprocity. We conducted a 2 (version: transparent versus blind) × 2 (actual labor: low versus high) ANOVA on perceptions of perceived value, which revealed a significant main effect of version, such that perceived value was higher in the transparent ($M = 4.89$, $SD = 0.98$) than in the blind conditions ($M = 4.46$, $SD = 1.22$), $F(1, 112) = 4.69$, $p < 0.05$. There was no main effect of actual labor and no interaction, Fs > 1.70, ps > 0.19. As can be seen in Figure 6, there was no difference in perceived value between the low labor blind ($M = 4.44$, $SD = 1.16$) and transparent conditions ($M = 4.65$, $SD = 0.99$), $t(52) = 0.73$, $p = 0.47$, but the difference was significant between the high labor blind ($M = 4.47$, $SD = 1.28$) and transparent conditions ($M = 5.16$, $SD = 0.92$), $t(60) = 2.35$, $p < 0.05$.

Figure 6 The Effect of Actual Labor on Perceived Value (Experiment 4)



Perceived effort demonstrated a similar pattern of results, with a main effect of version, $F(1, 112) = 4.32$, $p < 0.05$, but no main effect of actual labor or interaction, Fs < 0.28, ps > 0.59. Perceived effort did not vary either between the low labor blind ($M = 4.78$, $SD = 0.25$) and transparent conditions ($M = 5.27$, $SD = 0.24$), $t(52) = 1.39$, $p = 0.17$, or the high labor blind ($M = 4.89$, $SD = 0.24$) and transparent conditions ($M = 5.42$, $SD = 0.24$), $t(60) = 1.56$, $p = 0.12$. Results for feelings of reciprocity also followed this pattern, with a main effect of version, $F(1, 112) = 4.67$, $p < 0.05$, but no main effect of actual labor or interaction, Fs < 0.27, ps > 0.60. Feelings of reciprocity did not vary between the low labor blind ($M = 4.31$, $SD = 1.55$) and transparent conditions ($M = 4.78$, $SD = 1.46$), $t(52) = 1.13$, $p = 0.26$, but did differ marginally between the high labor blind ($M = 4.24$, $SD = 0.29$) and transparent conditions ($M = 5.00$, $SD = 0.23$), $t(60) = 1.95$, $p = 0.06$.

Path Analysis. These results demonstrate a clear replication of the primary results from Experiment 3: operational transparency has a significant impact on perceived value, perceived effort, and feelings of reciprocity. We replicated the path analysis conducted in Experiment 3 and observed substantively similar results with significant relationships along the path from operational transparency to perceived value (Figure 5; standardized beta coefficients from Experiment 4 are displayed in brackets). These results lend further support to our account that operational transparency increases perceptions of effort, which in turn boost reciprocity and perceived value.

Perceptions of Actual Labor. Given the lack of interaction effects above, our results suggest that the quantity of actual labor does not influence the effect of operational transparency on perceived value. Furthermore, we observe no main effect of quantity of actual labor on perceived value. Importantly, the absence of these relationships was not because of a failure of our manipulation of actual effort: participants in the high labor conditions ($M = 12.95$, $SD = 9.46$) perceived the service as searching more sites than those in the low labor conditions ($M = 7.19$, $SD = 5.93$), $F(1, 112) = 18.01$, $p < 0.01$. Importantly, however, we also observed a main effect—as with our analyses for the other dependent measures—for operational transparency, $F(1, 112) = 7.02$, $p < 0.01$; even when we explicitly told participants the amount of labor the site would perform, those in the transparent conditions estimated ($M = 11.88$, $SD = 8.99$) that the service had searched more sites than participants in the blind conditions ($M = 8.71$, $SD = 7.72$). There was again

no interaction, $F(1, 112) = 0.03$, $p = 0.86$. As in Experiment 3, actual labor (participants' estimates of the number of sites searched) was not a predictor of perceived value (coefficient $= -0.00$, $p = 0.90$ two-sided), whereas perceived effort was (coefficient $= 0.64$, $p < 0.01$ two-sided).

Satisfaction and Repurchase Intentions. Finally, underscoring the importance of the labor illusion for service managers, we also observed main effects of task transparency for both satisfaction, $F(1, 112) = 5.52$, $p < 0.05$, and repurchase intentions, $F(1, 112) = 8.85$, $p < 0.01$, such that transparency positively impacted both metrics. For satisfaction and repurchase intentions, respectively, there were again no main effects of actual labor, Fs < 2.65, ps > 0.10, and no interactions, Fs < 1.91, ps > 0.17. Additionally, using OLS regression, we find a strong positive relationship between perceived value and satisfaction (coefficient $= 0.90$, $p < 0.01$ two-sided) and perceived value and repurchase intentions (coefficient $= 1.05$, $p < 0.01$ two-sided) as well as positive and significant relationships between operational transparency and satisfaction (coefficient $= 0.52$, $p < 0.05$ two-sided) and operational transparency and repurchase intentions (coefficient $= 1.01$, $p < 0.01$ two-sided). These results are consistent with previous research suggesting that perceived value is an important antecedent to both of these managerially relevant service metrics (McDougall and Levesque 2000).

Taken together, results from Experiment 4 offer additional support for the model we outlined in Experiment 3, whereby operational transparency increases perceptions of value because of increased perceptions of effort and resultant feelings of reciprocity. Also as in Experiment 3, we find that the actual quantity of labor—whether manipulated or measured—does not appear to play a significant role in producing the labor illusion; at minimum, it appears that operational transparency does not *harm* value perceptions, even at very low levels of actual labor (three sites searched). Our goal in Experiment 4 was not to show that actual labor never plays a role in shaping value perceptions during service experiences; clearly, actual labor is an important driver of value in many contexts (Kruger et al. 2004, Morales 2005). Our results suggest, however, that individuals may be relatively insensitive to actual effort in the absence of cues that orient their attention to the amount of labor being conducted. Operational transparency appears to serve as one such cue, helping people understand how the quantity of labor being conducted translates into how hard the company is working on their behalf—and in turn how valuable the service is. Indeed, we show that operational transparency can increase not only value perceptions but also satisfaction and repurchase intentions.

3.5. Experiment 5: Outcome Favorability as a Boundary Condition

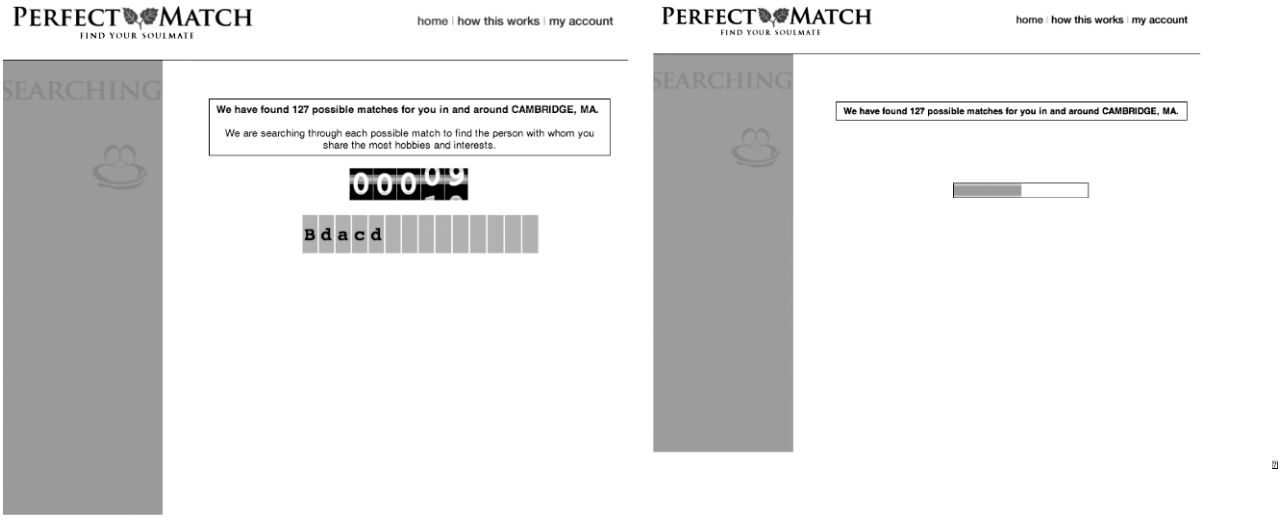
All of the experiments reported thus far have demonstrated that operational transparency promotes service value perceptions with objectively decent outcomes—reasonably priced flights. However, real world service outcomes vary in favorability, and even those that are technically successful—in that they return a result—sometimes fail to live up to consumer expectations. Experiment 5 was designed to examine the robustness of the labor illusion for creating service value perceptions when technically successful outcomes vary in subjective favorability. Although effort in the service of finding decent and excellent options likely adds value (as in the first two experiments), what happens when outcomes are very poor? In the same way that a waiter who is very attentive to customer needs yet delivers horrible food will suffer when it comes time to collect a tip, we predicted that when a service searches diligently and carefully and yet *still* cannot find a decent option, consumers will infer that the service must not actually be of high value.

To test this hypothesis, as well as to examine the generalizability of the labor illusion to other domains, we moved from asking consumers to search for flights to asking them to search for mates. Online dating is a relatively large and rapidly growing technology-mediated service sector; by 2013, Americans are expected to spend $1.68 billion per year in the space (Piper Jaffray & Company 2009). From a research perspective, online dating is an attractive context in which to study the labor illusion for several reasons. First of all, online dating sites require the customer to engage in a significant amount of up-front labor, documenting his or her own personal characteristics as well as preferences in a mate; this labor should serve to highlight the relevance of the provider's labor as well. Second, although online dating results have an objective component (a compatibility score), the photos presented on the results screen introduce a subjective (and importantly for our purpose, easily manipulated) component to the outcome as well. The dual nature of online dating results enables us to experimentally introduce service outcomes that are technically successful (a good compatibility score), though subjectively dissatisfying (a less than attractive photo). Therefore, we use the context of online dating to unpack how outcome favorability moderates the relationship between the labor illusion and perceptions of service value.

3.5.1. Method.

Participants. Participants ($N = 280$, $M_{age} = 29.8$, 42% male) completed this experiment in the laboratory as part of a series of unrelated experiments, in exchange for $25.00.

Figure 7 Screenshots of Transparent and Blind Conditions (Experiment 5)



Transparent condition Blind condition

Pretest. To create outcomes that varied in favorability, we asked a different group of participants ($N = 45$) to rate 40 pictures of men and women on a 10-point scale. Images rated above six were classified as favorable, those rated between three and six were deemed average, and those rated below three were deemed unfavorable. We used a total of three images for each condition and matched the gender of the image to the participant's stated sexual preference.

Design and Procedure. We created a simulated online dating website called "Perfect Match." Participants were asked to enter their dating preferences into the website's interface by clicking on those characteristics that were important to them in selecting someone to date (see Figure 7 for screenshots). Once preferences were submitted, the site "searched" its database of singles to find a compatible match.

Some participants were assigned to one of three instantaneous service conditions in which they received either a favorable, average, or unfavorable outcome. Other participants were assigned to one condition of a 2 (wait time: 15 or 30 seconds) $\times$ 2 (version: transparent or blind) $\times$ 3 (outcome: favorable, average, unfavorable) design.

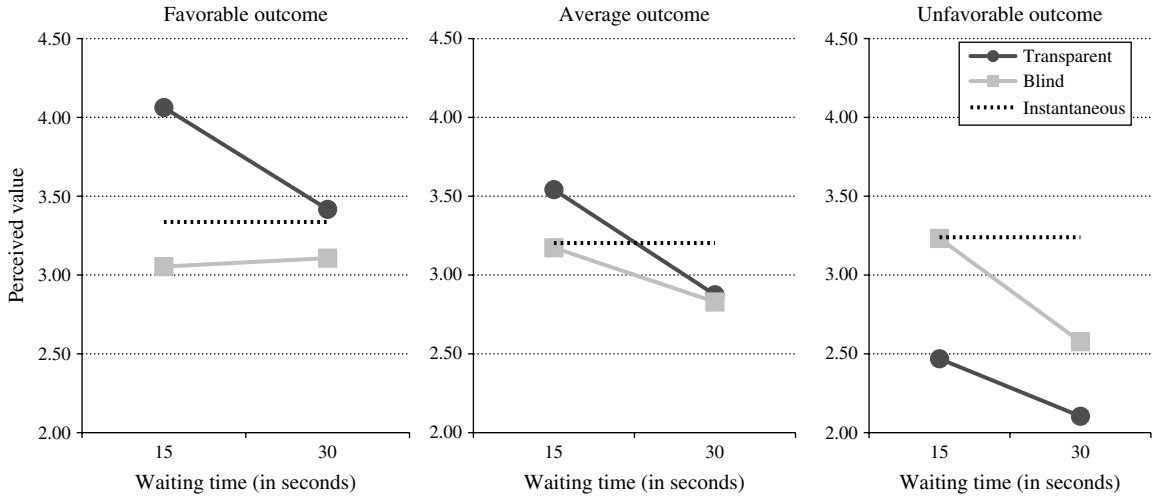
The site exhibited operational transparency by stating, "We have found 127 possible matches for you in and around CITY, STATE. We are searching through each possible match to find the person with whom you share the most hobbies and interests." The website then displayed each of the characteristics that the participants had indicated was important in a partner, as a signal that it was working to find matches on each characteristic, while displaying an odometer ticking through the 127 people. In the blind condition, participants saw, "We have found 127 possible matches for you in CITY, STATE," along with a progress bar tracking the time until the site was done working.

All participants then received the same fictional profile of their "perfect match," such that each profile returned was labeled with an artificially generated "compatibility score" of 96.4%; we varied the photograph associated with that profile to be favorable, average, or unfavorable.

3.5.2. Results and Discussion. As in the previous experiments, we observed a main effect of wait time such that participants rated the service as less valuable when they waited 30 seconds ($M = 2.84$, $SD = 1.22$) than when they waited 15 seconds ($M = 3.21$, $SD = 1.16$), $F(1, 152) = 5.93$, $p < 0.05$. Not surprisingly, we observed a main effect of outcome, such that participants were most satisfied when their match was accompanied by an attractive photo ($M = 3.39$, $SD = 1.30$), followed by an average photo ($M = 3.08$, $SD = 1.12$) and then an unattractive photo ($M = 2.61$, $SD = 1.06$), $F(2, 152) = 7.14$, $p < 0.01$; participants attributed the favorability of their outcome not to their own personality but to the ineffectiveness of the service. Most importantly, we observed the predicted interaction of transparency and outcome favorability, $F(2, 152) = 4.42$, $p < 0.05$; as can be seen in Figure 8, the impact of transparency varied as a function of the outcome, with participants valuing transparent service more for both average and favorable outcomes, but actually valuing it less for unfavorable outcomes. There were no other significant main effects or interactions, Fs < 0.66, ps > 0.49.

We broke these analyses down by outcome favorability to examine how the impact of operational transparency varied by outcome. For favorable outcomes, our results were similar to the previous experiments. At 15 seconds, waiting with transparency ($M = 4.06$,

Figure 8 Perceived Value of Service by Waiting Time, Outcome, and Waiting Condition (Experiment 5)



$SD = 1.28$) was seen as marginally more valuable than instantaneous service ($M = 3.34$, $SD = 1.32$), $t(62) = 1.72$, $p = 0.09$; waiting for 15 seconds in the blind condition ($M = 3.05$, $SD = 1.04$), on the other hand, was not different from instantaneous, $t(64) = 0.74$, $p = 0.46$. After 30 seconds, neither the blind ($M = 3.11$, $SD = 1.60$) nor transparent conditions ($M = 3.42$, $SD = 1.12$) were different from instantaneous, ts < 0.56, ps > 0.58.

This pattern of results stands in striking contrast to those for unfavorable outcomes. Waiting for 15 seconds with operational transparency only to receive an unfavorable outcome led to significantly *lower* value perceptions ($M = 2.47$, $SD = 0.76$) than instantaneous ($M = 3.24$, $SD = 1.20$), $t(62) = 2.40$, $p < 0.05$, whereas the blind condition ($M = 3.23$, $SD = 1.09$) was again not different from instantaneous service, $t(60) = 0.02$, $p = 0.98$. At 30 seconds, this pattern intensified, where the blind condition ($M = 2.58$, $SD = 1.07$) was marginally worse than instantaneous, $t(59) = 1.80$, $p = 0.08$, and the transparent condition was even less valued ($M = 2.10$, $SD = 1.12$), $t(58) = 2.97$, $p < 0.01$.

Thus, while a 15-second wait with transparency for favorable outcomes led to the very highest ratings of value, waiting with transparency for unfavorable outcomes led to the very worst value perceptions. For average outcomes, although the pattern of results is similar to that of favorable outcomes, none of the t-tests are significant, ts < 1.08, ps > 0.28.

These results demonstrate an important boundary condition for the benefits of operational transparency. When a service demonstrates that it is trying hard and yet still fails to come up with anything but poor results (in this case, an unattractive dating option), people blame the service for this failure and rate it accordingly. In contrast, for both positive and average outcomes, the impact of operational transparency is similar to that observed in Experiments 1 and 2: The labor illusion leads people to rate the service more highly if they perceive it as engaging in effort on their behalf than if it does not. In short, no amount of effort can overcome consumers' natural inclination to dislike services that perform poorly; given at least decent outcomes, however, creating the labor illusion leads to greater perceived value.

4. General Discussion

We demonstrated that the labor illusion is positively associated with perceptions of value in online self-service settings, even though signaling the effort being exerted by the service through operational transparency increases service duration (Experiment 1). In addition, we have shown that individuals can prefer waiting for service to instantaneous delivery—provided that the delayed experience includes operational transparency (Experiment 2). Moreover, we addressed alternative accounts for the labor illusion effect, including enhanced information, credibility, and uncertainty (Experiment 3); established perceived effort and reciprocity as the drivers of the link between transparency and perceived value; and demonstrated that the increases in perceived effort that accompany transparency exert an impact on perceived value independent of labor quantity (Experiments 3 and 4). Operational transparency is a driver not only of perceived value but also of satisfaction and repurchase intentions (Experiment 4). Finally, we demonstrated that outcome favorability serves as a boundary condition on the labor illusion effect (Experiment 5). These insights connect to literature on increasing the tangibility of service. Fitzsimmons and Fitzsimmons (2006), for example, advocate seeking increases in service tangibility to remind customers of their purchases and make the experience

memorable. Our results suggest that engaging in operational transparency may be one way a firm can increase the tangibility of service as it shapes perceptions of service effort, enhances feelings of reciprocity, increases service valuation, and drives satisfaction and repurchase intentions.

Although we have demonstrated that perceived effort and reciprocity are significant mediators of the impact of operational transparency on perceived value, prior work has highlighted the importance of quelling uncertainty (Osuna 1985) and directly promoting perceived quality (Zeithaml 1988) in enhancing value perceptions. Although we eliminated a role for uncertainty by designing progress bars into both our experimental and control conditions, it is likely that operational transparency may reduce uncertainty through the revelation of information about the service process. As such, service experiences fraught with uncertainty may benefit from the implementation of operational transparency, both in terms of its capacity to promote perceptions of effort and reciprocity as well as through its potential to reduce feelings of uncertainty. With regard to perceived quality, as noted in Experiment 1, the multi-item scale with which we measured perceived value throughout this paper incorporates a question about perceived quality, and our results are similar if we substitute evaluations of quality for the multi-item scale. As such, our results are consistent with the notion that operational transparency improves perceived quality *and* perceived value.

It is also likely that the mechanisms that link operational transparency to increases in perceived value vary by the specific nature of the service context. In the contexts we explore in our paper—online search engines—adding additional customers has little or no marginal impact on the speed of service or the quality of results, because searches occur in parallel and the same results are returned to all customers. In more customer-intensive services such as the delivery of health care and financial and legal consulting, in contrast, increasing the number of customers can both increase wait times and decrease service quality (Anand et al. 2011). A growing stream of the operations literature explores the trade-off between service quality and duration in such contexts. In a recent paper, Alizamir et al. (2010), for example, analytically demonstrate and propose a model addressing the trade-off that firms face in queuing contexts between taking time to accurately serve customers and increasing congestion and delays for those in the queue. When customers are not served with sufficient quality, they may re-enter the system, thus further increasing congestion (de Véricourt and Zhou 2005), or choose not to engage with the service at all (Wang et al. 2010). Empirical investigations have also noted this trade-off: Banking employees facing excess demand compensate by working faster and cutting corners, leading to erosion of service quality (Oliva and Sterman 2001); increased system load in hospitals boosts service rates to unsustainable levels, and the resulting overwork increases patient mortality (Kc and Terwiesch 2009). Take the example of restaurants that offer an open kitchen or offer a "kitchen table," where customers can view the action. Although we would expect that the effort chefs appear to be exerting would positively affect customer perceptions of value, it seems likely that the extent to which those chefs are entertaining and engaging may also influence customer experiences and drive value perceptions. To the extent that this specialized service slows down customers' getting their food in a reasonable amount of time, however, we might expect customer perceptions to become more negative. We suggest that perceived effort may be a dominant mechanism when the output of the service process is important and the perceived link between effort and the quality of the output is high. Such is typically the case when the service output is tailored to suit the needs and preferences of an individual customer, as in most pure and mixed service contexts (Chase 1981).

Exploring the role of operational transparency on service value perceptions in additional contexts is a promising future direction. Opportunities exist in both tangible technology-mediated contexts where customers observe the machinery at work (e.g., automated car washes) and non-technology-mediated contexts where customers consume the service but do not directly observe the service creation process (e.g., print media, quick oil change). In particular, contexts in which waiting is both inevitable and a familiar pain point for consumers may be ideal locations to institute operational transparency. For example, many consumers have been baffled when checking in for a flight or into their hotel room, with a customer service agent who seems to type roughly 30,000 words in order to complete the check-in process while the consumer wonders what information the employee could possibly be entering. The United States Postal Service has experimented with customer-facing terminals that show the steps being completed by postal service employees at each stage of a customer transaction—increasing operational transparency and demonstrating value as it is created.

4.1. What Is the Optimal Combination of Operational Transparency and Wait Time?

Our results demonstrate that customer perceptions of value may be enhanced by operational transparency in the service delivery process, even when transparency requires waiting. However, our experiments highlight a crucial consideration in determining just how much waiting—whether operational

transparency is salient or not—is optimal: In the online travel simulation in Experiment 1, the positive benefits of transparency began to decline after 30 seconds, whereas with the online dating simulation in Experiment 5, the decline began even earlier, at 15 seconds. Although there may be a number of reasons for this difference (people may be more impatient to find a mate than a flight, for example), we suggest that one critical factor relates to consumers' expectations. Online dating websites such as Match.com search through their own database of user profiles and return results quickly, whereas travel websites such as Kayak and Orbitz search through the databases of other airlines—meaning that in the real world, consumers are used to searches for flights taking longer than searches for mates. In short, it is very likely that consumers' experiences with and expectations for the time a service should take to deliver results is related to the point at which operational transparency is most effective. Google, for example, has acclimated its users to returning results in fractions of a second, and thus it is very unlikely that consumers would be happy after a 30 second wait; still, our results suggest that they would be happier if Google told them exactly what it was searching through while they waited for their results. Managers seeking to implement operational transparency would be wise to consider their customers' previous experiences and then experiment with different waiting times.

Although one means by which these expectations are set is likely previous experience, another likely input is the amount of effort that consumers must exert to initiate the search process (Norton et al. 2011). By their very nature, self-service settings require consumers to perform a greater share of the work than do face-to-face service settings (Moon and Frei 2000). Problematically, research suggests people tend to claim more credit than they deserve in such collective endeavors (Ross and Sicoly 1979); in addition, customers have been shown to take credit for positive service outcomes in self-service realms while blaming the company for negative outcomes (Meuter et al. 2000). Operational transparency has the potential to alter customer perceptions of the co-productive proportionality of service transactions conducted in technology-mediated contexts: the labor illusion may help firms regain credit for doing their fair share of the work. From a practical standpoint, we suggest that another key input into determining the optimal level of waiting and transparency lies in considering (and possibly altering) the labor in which customers engage to more closely match the labor purportedly provided by the service. Finally, the amount of time that customers spend on a given service is likely variable—for example, people may spend either minutes or days preparing their online tax forms—such that a consideration of customer heterogeneity should inform the level of waiting and transparency.

4.2. Reduce Delivery Time or Increase Operational Transparency?

Understanding the relationships between service duration, transparency, and perceived value enables managers to better understand how to optimize their service processes to promote customer satisfaction and loyalty. These findings shed light on the hidden costs of strategies employed by an increasing number of firms to infuse technology into service operations. In many contexts, the longer customers wait for service, the less satisfied they become (Davis and Vollmann 1990); accordingly, many managers invest considerably to reduce service duration as much as possible. These very strategies, which are designed to enhance the technical efficiency of service—reducing costs while increasing speed and convenience—may counterintuitively erode consumer perceptions of value and satisfaction with the services they create (Buell et al. 2010). Although it is tempting to focus exclusively on objective dimensions like service duration, which can be easily modeled and measured, we suggest that managers should also consider how the manipulation of subjective dimensions—like perceived effort exerted by the service provider—influences customer value perceptions, which drive willingness to pay, satisfaction, and repurchase intentions (Heskett et al. 1997, McDougall and Levesque 2000). Companies thus need to invest in increasing the technical efficiency of services and simultaneously invest in initiatives that infuse additional meaning into each transaction—and into their relationships with their customers.

Assuming service outcomes are average to favorable, there are several instances when increasing operational transparency may be preferable to investing in the reduction of service delivery time. First, pruning the inefficiencies from an already streamlined process can be an expensive and difficult task; in such cases revealing aspects of the process itself to customers instead may result in a considerable cost savings. Second, when service delivery times are already very short, reducing delivery times further may be counterproductive, though increasing transparency may still boost value perceptions. Third, in some cases, the service process may incorporate aspects that customers would appreciate observing. For example, the Spanish bank BBVO has recently redesigned its ATM machines so that customers making withdrawals can see a visual representation of currency being counted and organized, as the machine performs each task. In other cases, however, reducing service delivery times may be preferable to increasing operational

transparency. First, our results suggest that the benefits of operational transparency decrease as wait time increases: If wait times are lengthy, reducing them may be more beneficial than implementing operational transparency. Second, reducing wait times may be preferable when service outcomes are subjectively unfavorable: Experiment 5 demonstrated that when outcomes are unfavorable, increasing operational transparency has negative effects on customer value perceptions. Finally, there are many processes that are inherently unappealing or visibly inefficient due to poor design.

4.3. Labor Illusion or Operational Transparency

Importantly, we have drawn a distinction in our work between the labor illusion—customers' perceptions of the effort exerted by a service provider—and operational transparency—revelation of the actual operations that underlie a service process. In some cases, of course, the two are one and the same: If it takes an online travel website 15 seconds to search through all airlines, then showing customers which airlines the site is searching and returning results in 15 seconds constitutes true operational transparency. Our results demonstrate, however, that even when the actual operations might take much less time, providing consumers with the *illusion* of labor can still serve to increase value perceptions, provided participants believe that they are seeing the website hard at work. Thus, one view is that increasing actual operational transparency is an effective strategy, but another view is that managing *perceptions* of operational efforts—the labor illusion—is effective as well. At least two caveats apply to this possibility, however. First, our results raise an ethical dilemma: the fact that firms *can* induce the labor illusion does not mean that they therefore *should* induce it. Whereas operational transparency involves firms being clearer in demonstrating the effort they exert on behalf of their customers—an ethically unproblematic strategy—inducing the illusion of labor moves closer to an ethical boundary. Indeed, the fact that consumers are generally skeptical of marketers' efforts to persuade them to buy their products and utilize their services (Friestad and Wright 1994) raises the second caveat to the implementation of the labor illusion. Although operational transparency is likely a safe strategy because actual transparency requires honesty, firms who attempt to induce the labor illusion must take care that their customers do not become aware of the attempt—suspicion of manipulation can erode the impact of effort on quality perceptions (Morales 2005)—or face the consequences of being caught in an unethical practice.

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References

Alizamir, S., F. de Véricourt, P. Sun. 2010. Diagnositc accuracy under congestion. Working paper, Duke University, Durham, NC.

Anand, K. S., F. M. Paç, S. K. Veeraraghavan. 2011. Quality-speed conundrum: Tradeoffs in customer-intensive services. *Management Sci.* **57**(1) 40–56.

Bartlett, M. Y., D. DeSteno. 2006. Gratitude and prosocial behavior. *Psych. Sci.* **17**(4) 319–325.

Becker, G. 1965. A theory of the allocation of time. *Econom. J.* **75**(299) 493–517.

Buell, R. W., D. Campbell, F. X. Frei. 2010. Are self-service customers satisfied or stuck? *Production Oper. Management* **12**(6) 679–697.

Cachon, G. P., P. T. Harker. 2002. Competition and outsourcing with scale economies. *Management Sci.* **48**(10) 1314–1333.

Carmon, Z., J. G. Shanthikumar, T. F. Carmon. 1995. A psychological perspective on service segmentation models: The significance of accounting for consumers' perceptions of waiting and service. *Management Sci.* **41**(11) 1806–1816.

Chase, R. B. 1981. The customer contact approach to services: Theoretical bases and practical extensions. *Oper. Res.* **29**(4) 698–706.

Chase, R. B., S. Dasu. 2001. Want to perfect your company's service? Use behavioral science. *Harvard Bus. Rev.* **79**(6) 78–84.

Cronin, Jr., J. J., S. A. Taylor. 1992. Measuring service quality: A reexamination and extension. *J. Marketing* **56**(3) 55–68.

Curran, J., M. Meuter. 2005. Self-service technology adoption: Comparing three technologies. *J. Services Marketing* **19**(2) 103–113.

Dabholkar, P. 2000. Technology in service delivery: Implications for self-service and service support. T. A. Swartz, D. Iacobucci, eds. *Handbook of Services Marketing and Management*. Sage Publications, Thousand Oaks, CA, 103–110.

Dabholkar, P., R. Bagozzi. 2002. An attitudinal model of technology-based self-service: Moderating effects of consumer traits and situational factors. *Acad. Marketing Sci. J.* **30**(3) 184–201.

Dabholkar, P. A. 1996. Consumer evaluations of new technology-based self-service options: An investigation of alternative models of service quality. *Internat. J. Res. Marketing* **13**(1) 29–51.

Davis, M. M., T. E. Vollmann. 1990. A framework for relating waiting time and customer satisfaction in a service operation. *J. Services Marketing* **4**(1) 61–69.

de Véricourt, F., Y.-P. Zhou. 2005. Managing response time in a call-routing problem with service failure. *Oper. Res.* **53**(6) 968–981.

Fitzsimmons, J. A., M. J. Fitzsimmons. 2006. *Service Management: Operations, Strategy and Information Technology*. McGraw-Hill Irwin, Boston.

Friestad, M., P. Wright. 1994. The persuasion knowledge model: How people cope with persuasion attempts. *J. Consumer Res.* **21**(1) 1–31.

Heskett, J., E. Sasser, L. Schlesinger. 1997. *The Service Profit Chain*. Free Press, New York.

Higdon, E. 2009. US online banking forecast, 2009 to 2014. Report, Forrester Research, Cambridge, MA.

Ho, T.-H., Y.-S. Zheng. 2004. Setting customer expectation in service delivery: An integrated marketing-operations perspective. *Management Sci.* **50**(4) 479–488.

J.D. Power and Associates. 2008. 2008 Independent travel Web site satisfaction study. Report, J.D. Power and Associates, Westlake Village, CA.

Kahneman, D., J. L. Knetsch, R. Thaler. 1986. Fairness as a constraint on profit seeking: Entitlements in the market. *Amer. Econom. Rev.* **76**(4) 728–741.

Kc, D. S., C. Terwiesch. 2009. Impact of workload on service time and patient safety: An econometric analysis of hospital operations. *Management Sci.* **55**(9) 1486–1498.

Kruger, J., D. Wirtz, L. Van Boven, T. W. Altermatt. 2004. The effort heuristic. *J. Experiment. Soc. Psych.* **40**(1) 91–98.

Li, L. 1992. The role of inventory in delivery-time competition. *Management Sci.* **38**(2) 182–197.

Li, L., Y. S. Lee. 1994. Pricing and delivery-time performance in a competitive environment. *Management Sci.* **40**(5) 633–646.

Maister, D. H. 1985. The psychology of waiting lines. J. D. Czeipel, M. R. Solomon, C. F. Surprenant, eds. *The Service Ecounter*. Lexington Books, Lexington, MA, 113–123.

McDougall, G. H. G., T. Levesque. 2000. Customer satisfaction with services: Putting perceived value into the equation. *J. Services Marketing* **14**(5) 392–410.

Meuter, M., A. Ostrom, R. Roundtree, M. Bitner. 2000. Self-service technologies: Understanding customer satisfaction with technology-based service encounters. *J. Marketing* **64**(3) 50–64.

Mohr, L. A., M. J. Bitner. 1995. The role of employee effort in satisfaction with service transactions. *J. Bus. Res.* **32**(3) 239–252.

Moon, Y., F. Frei. 2000. Exploding the self-service myth. *Harvard Bus. Rev.* **78**(3) 26–27.

Morales, A. C. 2005. Giving firms an "E" for effort: Consumer responses to high-effort firms. *J. Consumer Res.* **31**(4) 806–812.

Nah, F. F.-H. 2004. A study on tolerable waiting time: How long are Web users willing to wait? *Behav. Inform. Tech.* **23**(3) 153–163.

Napoleon, K., C. Gaimon. 2004. The creation of output and quality in services: A framework to analyze information technology-worker systems. *Production Oper. Management* **13**(3) 245–259.

Norman, D. A. 2009. Designing waits that work. *Sloan Management Rev.* **50**(4) 23–28.

Norton, M. I., D. Mochon, D. Ariely. 2011. The IKEA effect: When labor leads to love. Working paper, Harvard Business School, Boston.

Oliva, R., J. D. Sterman. 2001. Cutting corners and working overtime: Quality erosion in the service industry. *Management Sci.* **47**(7) 894–914.

Osuna, E. E. 1985. The psychological cost of waiting. *J. Math. Psych.* **29**(1) 82–105.

Parasuraman, A., V. A. Zeithaml, L. L. Berry. 1985. A conceptual model of service quality and its implications for future research. *J. Marketing* **49**(4) 41–50.

Piper Jaffray & Company. 2009. Pay to play: Paid Internet services. Report, Piper Jaffray & Company, Minneapolis.

Ross, M., F. Sicoly. 1979. Egocentric biases in availability and attribution. *J. Personality Soc. Psych.* **37**(3) 322–326.

Soman, D., M. Shi. 2003. Virtual progress: The effect of path characteristics on perceptions of progress and choice. *Management Sci.* **49**(9) 1229–1250.

Sweeney, J. C., G. N. Soutar. 2001. Consumer perceived value: The development of a multiple item scale. *J. Retailing* **77**(2) 203–220.

Taylor, S. 1994. Waiting for service: The relationship between delays and evaluations of service. *J. Marketing* **58**(2) 56–69.

Wang, X., L. G. Debo, A. Scheller-Wolf, S. F. Smith. 2010. Design and analysis of diagnostic service centers. *Management Sci.* **56**(11) 1873–1890.

Yeung, C. W. M., D. Soman. 2007. The duration heuristic. *J. Consumer Res.* **34**(3) 315–326.

Zeithaml, V. A. 1988. Consumer perceptions of price, quality, and value: A means-end model and synthesis of evidence. *J. Marketing* **52**(3) 2–22.