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Surprise, Anticipation, and Sequence Effects in the Design of Experiential Services

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The most salient or peak aspect of a service experience often defines customer perceptions of the service. Across two studies, using the same novel form of a scenario-based experiment, we investigate the design of peak events in a service sequence by testing how anticipated and surprised peaks influence customer perceptions. Study 1 captures the immediate reactions of participants and Study 2 surveys participants a week later. In both studies, we find a main effect for the temporal peak placement, confirming the positive influence of a strong peak ending. When assessing the peak design strategies of surprise and anticipation, we find in Study 1 that surprise and anticipation moderate the temporal peak placement (e.g., early peak vs. late peak) on overall customer perceptions, with the surprise peak at the end of an experience yielding the strongest effect. In Study 2 we see that the remembered experience of a surprise peak positively affects customer perceptions compared to an anticipated peak regardless of the temporal placement of the peak. We also find that the infusion of a surprise peak ending has a lasting effect that amplifies the peak-end effect of remembered experiences. Drawing on these findings, we discuss the role of surprise, anticipation, and sequence effects in experience design strategy.

Key words: service design; peak-end effect; surprise; anticipation; experience design

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1. Introduction

A new view of service operations strategy emphasizes the design and delivery of *experiences* that evoke customer emotions in a profound way (Dasu and Chase 2013, Voss et al. 2008). As Voss et al. (2008) noted, traditional operations management research and practice tends to focus on *tangible* service-design issues to improve efficiency rather than the *intangible* implications of the experiential services. However, customers often subjectively evaluate experiences through emotional or psychological lenses (Chase and Dasu 2001). Hence, service designers need a user-centric and holistic approach to experiential design that considers the emotional response to customer touch points throughout the service delivery process (Dasu and Chase 2013, Pullman and Gross 2004, Roth and Menor 2003, Zomerdijsk and Voss 2010).

We are interested in examining this intangible side of experiential service design, in particular, the use of design strategies whose objective is to garner an emotional response from customers. Using the *service-as-theater* metaphor, we liken experience design to the directing of a theatrical play in which designers choreograph the performance (Stuart and Tax 2004, Voss et al. 2008). Customers respond to parts of the performance in ways that achieve desired effects on customer perceptions, emotions, and ultimately loyalty behavior (Chase and Dasu 2001, Dixon and Verma 2013). We propose that *a priori* knowledge (and associated feelings of *anticipation*), or lack thereof (feelings of *surprise*), of upcoming experiential elements can play a significant role in the overall evaluation and emotional response customers have about the service experience (Arnould and Price 1993, Pullman and Gross 2004). Therefore, the purpose of this

research is to explore the effects that customer surprise and anticipation have on customer evaluations of experiential services under different sequence designs.

Research has shown that individuals evaluate experiences in a fluid manner; their perceptions fluctuate over time as the experience evolves depending on sequence profiles, with particular aspects weighing more heavily than others (Ariely and Carmon 2000, Arnould and Price 1993, Redelmeier and Kahneman 1996). As a decision-making heuristic, people use the highest (i.e., peak) point, the end state, and the general trend of the profile to judge the entire experience (Ariely 1998, Baumgartner et al. 1997, Redelmeier et al. 2003). Knowing these behavioral economics insights, service designers can engineer sequences to influence customer evaluations positively. Other design elements that have received little attention from operations management scholars, but that have direct relevance to the design of experiences, involve pre-experience communication, specifically, whether a service firm either withholds information about a future peak experience to elicit feelings of surprise or informs customers in advance to build anticipation. Both of these design strategies, surprise and anticipation, have the potential to influence emotions positively, and in turn, customer perceptions of the overall experience. However, this can only be achieved if operations managers who schedule the service process (i.e., sequence profiles) work closely with marketers to successfully implement these design strategies (Dixon et al. 2014, Kwortnik and Thompson 2009).

Surprising customers by delivering the unexpected can instigate delight when the associated emotional response is positive (Berman 2005, Oliver et al. 1997, Westbrook and Oliver 1991). In other words, positive surprise can make an ordinary service extraordinary—and even delightful. For example, a standard service that offers a new feature can produce a positive surprise, such as a taxi driver who gives a tour of the city while providing transportation. Or a service may surprise customers with an unexpected gift or upgrade (Chun and Hiang 2016, Pine and Gilmore 2000). Service scholars and managers agree that infusing the element of surprise into service design is one means to creating a positive and memorable experience (Oliver et al. 1997). The challenge for service designers is to think of ways to go beyond simply exceeding expectations to instead deliver the unexpected to customers (Berry et al. 1994, Pine and Gilmore 2000).

Anticipation, on the other hand, requires service designers to influence customer expectations before the experience through marketing communication. For example, a music festival's website might list

the bands that will perform and heavily promote a big-name artist. Or a leisure cruise may follow up a reservation with information sent to customers about the highlights of the trip to build anticipation. When anticipation is positive, it evokes savoring (e.g., Bryant et al. 2011, Elster and Loewenstein 1992, Loewenstein 1987), which involves imagining what is in store when looking forward to an event and the consequent enjoyment one feels (Bryant et al. 2011). Although savoring can raise expectations, research shows that positive anticipation creates an overall experience that customers view more positively (Chun 2009).

In this research, we compare these design strategies, surprise and anticipation, in the context of time-elapsing, multi-segment experiential services. Although there are different conditions under which we could examine surprise and anticipation (e.g., positive vs. negative surprise or savoring vs. dreading an event) and varying combinations of service sequence profiles (e.g., positive vs. negative trends, spread effect), we focus our study on only positive instances of surprise and anticipation. Also, we examine the case in which a sequence has a definite peak relative to other neutral events as perceived by customers. Research on peak effects has shown that the temporal placement of peaks influences their impact on overall evaluations (Diener et al. 2001, Redelmeier et al. 2003). In general, the findings suggest that peak events that are placed closer to the end are more salient (e.g., Ariely 1998); however, some research shows that early peaks can also be strategically influential based on moderating factors (e.g., Dixon and Verma 2013; Just et al. 2015). We propose hypotheses to test if surprise and anticipation moderate the effects of temporal peak placement on service evaluation.

Using an online storyboard experiment across two studies, we explore the impact that peak positioning in a sequence has on the customer experience if the peak is designed to be a surprise or anticipated by customers. To do so we first integrate literature from various research domains to develop our hypotheses. Then we describe the storyboard experiment, including the development process, and results. We conclude with a discussion of our findings, research limitations, and managerial implications.

2. Literature Review and Hypotheses

In this section, we review the following concepts: sequence effects, surprise, and anticipation. Leveraging the extant research on these topics, we develop theory-based hypotheses for how the design strategies of surprise and anticipation will impact customer perceptions dependent upon the temporal placement of the peak.

2.1. Sequence Effects

A person's memory has been likened to photo-taking, i.e., people tend to take snapshots of important aspects of an experience and use those to evaluate the overall event (Fredrickson and Kahneman 1993). Studies show that neither the average nor the integration of the intensity (i.e., pleasure or pain) of individual moments are good predictors of summary evaluations of an experience (e.g., Ariely and Carmon 2000, Kahneman et al. 1993, Redelmeier et al. 2003). Instead, summary evaluations are best described by what Ariely and Carmon (2000) call static and dynamic characteristics of sequence intensity profiles. Static characteristics are the intensity of points within a sequence, most notably the intensity at the end and the salient or peak intensity (Fredrickson 2000, Kahneman et al. 1993). Dynamic characteristics include the positioning of events over time, such as the trend and rate of change. Behavioral research shows that static and dynamic intensity characteristics allow decision makers to consolidate information into simple statistics used to evaluate sequences (e.g., Ariely and Zauberman 2003, Dixon and Verma 2013, Guyse et al. 2002, Loewenstein and Sicherman 1991). In this study, we refer to these statistics of sequence intensity as *sequence effects*.

Sequence effects are often correlated with one another since the placement of a peak segment can influence intensity trends (Chapman 1996). Some research finds a preference for improving sequence-intensity profiles, suggesting that a peak placement which creates an upward trend is preferred compared to a downward or flat trend (Ariely 1998, Loewenstein and Prelec 1993, Loewenstein and Sicherman 1991). Other research shows that *when* a person evaluates a sequence moderates the preference for peak placement. Using the language of economists, Kahneman et al. (1997) and Soman (2003) called the intensity of a segment its utility. They identified three types of utility: predicted (formed before the experience), experienced (derived during the experience), and remembered (constructed after the experience). We measure remembered utility as a summary assessment of the experience, which we call *overall utility*.

Kahneman et al. (1997) stated that it is not the actual utility of an event that matters most, but the remembered utility (overall utility), with memories coming from the sequence effects of experienced utility profiles. However, Dixon and Verma (2013) pointed out that predicted sequences are of particular interest to service designers because designing occurs before the experience. Furthermore, they found evidence that sequence effects of predicted utility profiles influenced customer behaviors. Knowing this, service designers should take into consideration not only what customers take away from the actual

service experience (experienced utility), but also what customers expect from the experience (predicted utility). The former is typically the purview of service operations, whereas the latter is the purview of service marketers (Kwortnik and Thompson 2009). Knowing that predicted utility can be used for sequence-based design presents additional questions about sequence effects that we test. In particular, we are interested in knowing how the overall perception of a service experience is impacted if the predicted utility of a peak event is known or unknown beforehand. A peak event that is concealed by design is a *surprise peak*; if it is known beforehand (i.e., promoted by the designer) it is an *anticipated peak*. We next review the concepts of surprise and anticipation and propose hypotheses that guide our empirical research.

2.2. Surprise

The business goal of delighting customers requires that they experience the unexpected and feel positive surprise (Berman 2005, Oliver et al. 1997). Surprise is a basic human emotion (Plutchik 2001) that is short lived (Schutzwohl 1998, Vanhamme and Snelders 2001) and either pleasant or unpleasant depending on the followed emotion (Kim and Mattila 2010, Lindgreen and Vanhamme 2003, Vanhamme and Snelders 2001). The process of experiencing surprise begins when a person evaluates their surrounding environment and compares it to his or her schema (Meyer et al. 1997, Schutzwohl 1998, Vanhamme 2000). Schemas are “complex knowledge structures . . . which can be regarded as informal, unarticulated theories about objects, situations, and events” (Meyer et al. 1997, p. 253). A person uses schemas as a reference point to compare to observed events. If a discrepancy is sufficient, mental processing is interrupted as attention is placed on understanding the unexpected occurrence, and a feeling of surprise is experienced (Meyer et al. 1997). A schema update may be made that revises expectations, resulting in the chance that a similar event will no longer be considered surprising in the future (Schutzwohl 1998, Vanhamme 2000). This conceptual underpinning of surprise means that service designers need to go above and beyond customer expectations to provide surprising moments that delight customers (Pine and Gilmore 2000). Research confirms the link between surprise and important marketing outcomes such as customer satisfaction and word-of-mouth intensity (e.g., Derbaix and Vanhamme 2003, Kim and Mattila 2010, Vanhamme 2000, Vanhamme and Snelders 2001).

Vanhamme and Snelders (2001, 2003) considered several theoretical explanations for the influence of surprise on satisfaction that are relevant to our study:

the amplification property, response contagion, and category accessibility. The amplification property states that a surprising element during the service experience will result in a stronger evaluation by customers than if that same positive design element was not surprising (Vanhamme and Snelders 2003). With response contagion, the arousal from a positive surprise magnifies subsequent positive feelings experienced during the service sequence (Lindgreen and Vanhamme 2003). Category accessibility suggests that the surprising element of a sequence leaves a strong impression on a person's memory, making it easily recalled when forming later judgments about the experience (Lindgreen and Vanhamme 2003, Westbrook and Oliver 1991). Taken together, the use of surprise has the potential to positively influence customer perceptions and to make the memory of the experience more lasting (Pine and Gilmore 2000).

Our study builds on the idea that surprise results from the unexpected occurring, namely a schema discrepancy. As customers consider inputs from an experienced event, they make comparisons to schemas; when divergence is present, surprise is experienced (Meyer et al. 1997, Vanhamme 2000). Given that the emotion related to surprise has an amplification property, we expect surprising vs. non-surprising elements of a service sequence to result in stronger post-evaluations (Vanhamme and Snelders 2003). Additionally, the arousal associated with surprise should enhance emotions, amplifying how one views future elements of a service, positively influencing memory recall, and impacting customer reactions and judgments about the service experience (Lindgreen and Vanhamme 2003, Vanhamme and Snelders 2001, Westbrook and Oliver 1991). We propose that from a customer perspective, a surprise peak at the beginning of a sequence will result in the highest overall utility:

H1. *When employing a surprise design strategy, customers perceive a beginning peak to have a higher overall utility than a middle peak and an end peak, in that order.*

2.3. Anticipation

The positive feelings that people experience when anticipating consumption can enhance the overall experience—the planning, dreaming, consuming, and remembering process. The emergence of the affect-as-information paradigm (Schwarz and Clore 1983) indicates that positive emotions are not merely the outcomes of evaluative processes during and after consumption—but also influence decision making. For example, Shiv and Huber (2000) found that customers who anticipated the satisfaction from their choices as opposed to just making a decision

engaged in mental imagery production and chose differently, focusing on alternatives with more vivid mental attributes. Similarly, Kwortnik and Ross (2007) proposed an experiential-decision model based on their finding that customers making choices for experiential products (e.g., vacations) reported feeling positive decision emotions aroused by imagery processing, fantasy, and anticipation. Furthermore, these decision emotions not only influenced preferences, but also yielded their own utility; i.e., the process of deciding, rather than being effortful and arduous, is often a pleasurable aspect of the overall consumption process. Furthermore, the process of selecting can be autotelic; i.e., the pleasure is in the doing, not necessarily in the outcome of the process. So, the thoughtful conjuring of a future experience provides in-the-moment positive emotions (Csikszentmihalyi 1991).

The idea that people can derive utility from anticipating future consumption describes the behavior of savoring. Economists studying intertemporal choice identified savoring as a challenge to the assumption of positive discounting—or the preference for more immediate pleasure in economic behavior (Loewenstein 1987). In contrast, people sometimes exhibit a preference for delayed consumption of something pleasurable (e.g., a vacation or a good bottle of wine) because anticipation increases the pleasure of the future use. Indeed, positive psychology research shows that people who have the ability to savor good things in life enhance their happiness and subjective well-being (Jose et al. 2012).

Anticipation is a forward-looking effect that gives customers some degree of control over an uncertain future by permitting imagined pleasure in the present (Csikszentmihalyi 1991, Elster and Loewenstein 1992). Gollier and Muermann (2010, p. 1272) proposed that decision makers have an incentive to manipulate their beliefs about the future to enhance the pleasure of “dreaming and savoring the good things that could happen to them”—or to reduce potential disappointment. Elster and Loewenstein (1992) offered two mechanisms for the savoring role in affecting present utility as a multiplier of hedonic experience: consumption and contrast effects. Anticipatory savoring—deriving immediate pleasure from the anticipation of a future pleasurable event—is a consumption effect, whereas a comparison between the present and an anticipated better future is a contrast effect. Which effect dominates depends on such factors as the person's current state, the relevance of the future event in comparison to the present, and how vividly one can imagine the future event. Elster and Loewenstein (1992) suggested, for example, that luxury products such as vacations are more likely to trigger a consumption effect because they tend to be

vivid and less relevant as a comparison to one's current state. So the fantasy of a dream vacation in the future provides utility, even if that vacation is little more than a dream.

The act of savoring can have a magnifying property where the thoughts of future events play out before the event happens additionally, the closer the savored event gets, the more intense savoring becomes (Elster and Loewenstein 1992). Empirical research supports the conceptualization of savoring anticipated future experiences as a forward-looking consumption effect that yields preferences for improving sequences over time (Loewenstein and Prelec 1993). For instance, in the context of lotteries, people prefer to delay finding out if they have won to enhance positive anticipatory emotions; i.e., the hope and thrill they experience while waiting (Kocher et al. 2014). Nowlis et al. (2004) found that delayed consumption produces greater enjoyment for products that are pleasurable and vivid (e.g., chocolate). Finally, in a series of studies, Chun (2009) reported that customers who take the time to savor future consumption mindfully and have sufficient information to do so, experience enhanced expectations—but also evaluate the experience more positively.

To establish our second hypothesis, we recognize that research finds individuals favor sequences that improve over time (Ariely 1998, Loewenstein and Sicherman 1991, Varey and Kahneman 1992, Zauberman et al. 2006) and those that have strong finishes (Chase and Dasu 2001, Redelmeier et al. 2003). We propose that when using a service design strategy that is intended to build anticipation, customers prefer to delay the peak until later in the sequence to increase the time spent savoring. Furthermore, they will experience the highest utility when there is a strong anticipated ending:

H2. When employing an anticipation design strategy, customers perceive an end peak to have a higher overall utility than a middle peak or a beginning peak, in that order.

In sum, service designers make many decisions that influence the emotional responses and perceptions of customers (Chase and Dasu 2001, Cook et al. 2002, Dasu and Chase 2013, Dixon and Verma 2013, Pullman and Gross 2004). One such decision is whether to conceal or reveal the peak to thereby inspire surprise or anticipation, respectively, and what evaluative differences arise if the placement of the peak event varies over time. We build on previous research to empirically examine the effect of a surprise or anticipatory peak on overall evaluations of a service sequence.

3. Research Approach and Methodology

To explore the hypotheses, we designed an online scenario-based experiment that takes people through a hypothetical service experience. We conducted the same experiment across two studies. In the first study, we surveyed subjects directly after participating in the scenario to assess their perceptions. We conducted a second study to see if the results would hold when participants provided their perceptions a week after taking part in the scenario, thereby determining what design strategy and sequencing resonated after time had passed. In this section, we describe our research method, including the scenario context and the design and piloting of the storyboards.

3.1. Study Context

We asked participants to imagine that they were going to take a bus tour in a city they have never visited. We designed the tour with five stops; unknown to participants, four of these stops were intended to be neutral (i.e., a city park, a monument, a neighborhood where a movie was filmed, and an author's childhood home), and one of the stops was designed to be a clear peak (i.e., a famous restaurant owned by a celebrity). Please see Appendices A and B for an example of the peak stop and a neutral stop.

The city tour context has several attributes appropriate for our research questions. First, it is made up of discrete events that a tour operator can schedule in a variety of orders. Second, a tour operator can identify or design a peak stop. Third, a tour operator can choose to either: (1) promote the peak segment to evoke anticipation, or (2) withhold information about the peak to elicit surprise. Fourth, the tourism industry is a service context where surprising customers is more feasible given customer visits are typically less frequent (Crotts and Magnini 2011). Lastly, the inherent experiential nature of a tour makes it a setting for which manipulating surprise and anticipation for a peak event is relatively straightforward.

3.2. Scenario-Based Experiment

Service operations studies that use empirical methods are on the rise (Gupta et al. 2006, Smith et al. 2007). Many of these studies use experimental techniques to address questions related to service design (e.g., Dasu and Rao 1999, Li et al. 2013, Seawright and Sampson 2007, Victorino et al. 2012, 2013). Compared to observational research, experimental studies provide control over potential confounding factors that could influence results (Seawright and Sampson 2007), resulting in high levels of internal validity (Boyer and Swink 2008, Victorino and Dixon 2016).

We designed a scenario-based experiment where we varied service sequences and peak design strategies. Scenario-based experiments, “deploy varying versions of a descriptive vignette to convey scripted information about specific levels of factors of interest that are hypothesized, upfront, to influence judgments, preferences or decisions” (Rungtusanatham et al. 2011, p. 9). Scenario-based experiments have been widely used in many business disciplines including studies of ethics (Weber 1992) as well as marketing (Wason et al. 2002). There has been a growing interest in this method’s use in operations and supply chain management to understand the preference, judgment formation, and decision-making processes of managers (Rungtusanatham et al. 2011). In the domain of service management, scenario-based approaches have been used to assess customer responses and preferences such as elicited emotions and satisfaction (Victorino and Dixon 2016).

Service interactions provide an ideal setting for scenario-based experiments because they are a familiar context and thus participants can easily imagine themselves in the described scenario (Dabholkar 1996). There are many benefits to using scenario-based experiments that align well with our research objective of studying experiential service design issues; for example, scenarios minimize memory bias and consistency issues that can be associated with self-reporting that is reliant on recall (Smith and Bolton 1998, Smith et al. 1999). Scenarios are also able to reflect and test nuanced phenomena that are dynamic and intangible (Victorino and Dixon 2016). Perhaps most importantly, is the enhanced level of internal and statistical-conclusion validity that is gained in the controlled setting and reduction of random noise in the measured variables of interest because participants engage in a common experience (Cook and Campbell 1979). In addition to mitigating issues of controlling variables that may be difficult to control in field settings, scenarios offer an efficient mechanism for reflecting events that may transpire over an extended period (Bitner 1990). Lastly, the scenario method has been empirically shown to have ecological validity (Bateson and Hui 1992). We also conducted extensive rounds of pilot work to develop realistic scenarios as a countermeasure for addressing some of the external validity issues of scenario-based methods (Bitner 1990). While we recognize that there are limitations to using a scenario-based method, we believe its benefits are in alignment with the service variables that we are interested in studying.

To further enhance the mundane realism of the experiment and participant engagement, we also included visual imagery to accompany the written vignettes (Bateson and Hui 1992, Victorino and Dixon 2016). Recent work by Aslanzadeh and Keating (2014)

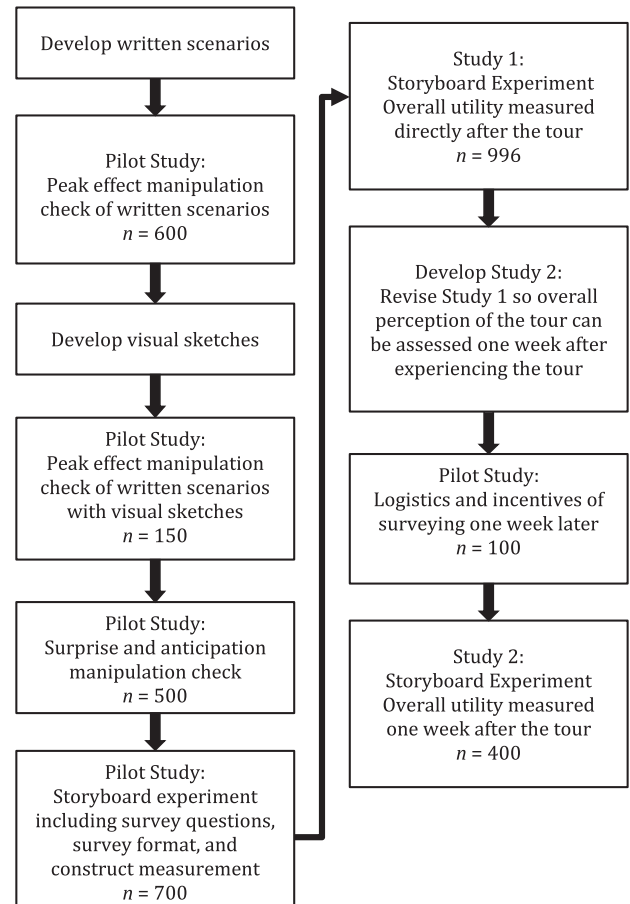
employed a similar narrative structure with a comic-strip format. The technique of storyboarding that we use has been described as an effective way to study service design (Bitner 1990, Harris et al. 2003). In addition, research by Bateson and Hui (1992) has shown that visual-based methods such as the use of photographic slides and video elicit similar psychological and behavioral responses as real service settings.

3.3. Experimental Design

We used a multi-phase design process (depicted in Figure 1) to create the scenarios and ensure that manipulations were effective and that confounds were minimized. To reduce bias based on previous experience and sentiment toward an actual location, both the city and tour were hypothetical; i.e., no city name was used and the storyboard illustrations were purposefully not unique to any actual location.

In the first phase of the experimental design process we developed written scenarios to depict the tour stops. We described each stop using a similar structure. All scenarios began with a statement that gave an overall picture of the stop, for example: “You stop

Figure 1 Experiment Development Process



at a park within the city.” Then each description had three brief paragraphs noting the nature of the stop and what the customer observes in chronological order. Each concluded with a statement saying that the person makes their way back to the bus. The descriptions were similar in length, between 159 and 164 words. The focus of testing in early rounds of piloting was to ensure the intended event was indeed a peak on average and that the other events were comparatively neutral on average. We then worked with a graphic artist to develop sketches to illustrate the five events using three images for each stop after which we ran further rounds of piloting for the completed storyboards (illustrations and narrative) to again validate the scenarios.

The storyboard experiment was a 3 (peak placement: early, middle, end) × 2 (design strategy: surprise, anticipation) between-subjects design. Peak placement was manipulated by changing the order of the stops: participants saw the peak either first (early peak), third (middle peak), or last (end peak) out of the five stops. Other stops were assigned randomly. The surprise and anticipation conditions were manipulated based on what participants were told about the peak prior to starting the simulated tour. Similar to promotional materials, respondents saw a list of the tour’s stops; in the anticipation condition, they read about the peak before starting the tour. The description included the following information; “The stop at the city building clearly stands out above the other stops as the highlight of the tour. The building is now a restaurant and a meal is provided as a part of the tour. The restaurant is owned by a famous celebrity who is often there to greet customers. Live music is performed and the restaurant serves innovative, award winning food all while providing a great experience.” In the surprise condition, the stop was merely listed as a city building, hiding the fact that the building was a restaurant owned by a celebrity. Table 1 depicts the six experimental conditions to which participants were randomly assigned.

We used the same storyboard scenario experiment in two studies with different sets of participants. The two studies were programmed as online surveys using Qualtrics. Participants were asked to imagine going on a bus tour of a city they had never visited.

Table 1 3 × 2 Between-Groups Experimental Design

Experimental scenarios	Peak placement	Design strategy
Scenario #1	Beginning	Surprise
Scenario #2	Middle	Surprise
Scenario #3	End	Surprise
Scenario #4	Beginning	Anticipation
Scenario #5	Middle	Anticipation
Scenario #6	End	Anticipation

They next saw a list of the five stops in random order. Participants in the surprise vs. anticipation conditions saw the varying descriptions of this stop as previously noted. Next, participants were asked for perceptions of the five stops to establish their expectations. Then the tour commenced; they saw the four neutral stops in a random order and the peak stop according to their assigned peak placement condition; each stop was on its own page. In the first study, the focus was to obtain the immediate reaction of participants to the overall city tour. The second study, however, asked participants a week later for their overall impressions of the tour. The follow-up work of Study 2 served as a robustness check to ensure that the results from Study 1 were not just a function of a recency effect. In both studies, participants provided demographic information, noted their previous tour experience, and answered other preference questions.

4. Study 1: Hypotheses Testing

In this section, we describe the details and results of Study 1, while the following section describes Study 2. All information that remains constant across the two studies such as the description of the independent and dependent variables is covered within the review of Study 1. In both studies, we recruited participants using Amazon Mechanical Turk (MTurk: www.MTurk.com); participants came only from the United States and Canada. MTurk has been employed in many studies and shown to be a reliable method of participant recruitment (Buhrmester et al. 2011, Paolacci et al. 2010).

4.1. Data Collection and Sample

In 2014, we recruited a sample of 1271 participants for Study 1 of which we removed 275 because they either failed an attention test question or took less than 10 minutes to complete the survey. This left a sample of 996 for analysis. The final sample represented a range of demographics; 58% of participants were 35 years old or less and 33% were between 36 and 55 years old. Almost two-thirds of the participants were female. The majority of the sample had some college experience. Income levels varied with approximately 45% making \$40K or less.

4.2. Dependent Measures

To test the interaction of sequence effects and surprise/anticipation strategy, we examined participants’ emotional responses using measures derived from prior research on human emotions (e.g., Plutchik 2001, Richins 1997, Russell and Pratt 1980, Russell et al. 1981). Adapting a previously tested scale, we measured pleasure using the following items:

satisfied, happy, pleased, joyful, delighted, and bored (reverse-coded) (Bigné et al. 2005, Russell and Pratt 1980). Three of these items, happy, pleased, and joyful are also included within the Consumption Emotions Set (CES) developed by Richins (1997) to measure the emotion of joy. In addition, we measured feelings of surprise with the following items: surprised, astonished, and amazed (Richins 1997). “Surprised” is also an item used to measure arousal (Bigné et al. 2005, Russell et al. 1981). Lastly, we included “excited” as an additional arousal item (Russell et al. 1981). In sum, the following 10 items were used to measure customer emotions: satisfied, happy, pleased, joyful, delighted, and bored (reverse-coded), surprised, astonished, amazed, and excited; each item was measured using a 7-point anchored Likert scale asking the participant to rate the feeling they have about the tour experience. The measurement items are listed in Appendix C. In Study 1, these questions were asked shortly after the participants viewed all the stops.

Next, we ran a principal component analysis (PCA) for the 10 items. All items loaded on the same factor (with factor loadings that were greater than 0.70), which we labeled as “overall utility.” The reliability of the items ($\alpha = 0.963$) was above the traditional cut-off value (Nunnally 1967). The 10-item overall utility measure was used as the dependent variable.

4.3. Independent Variables

The two independent variables: (1) peak placement (three levels: beginning, middle, or end) and the (2) design strategy (two levels: surprise or anticipated peak) were checked to ensure that the peak event was perceived as being significantly better than the neutral stops. We measured utility of individual stops using the 10-item overall-utility scale after the respondent experienced each of the stops. The average utility of the peak event ($M = 5.94$) compared to the average utility of the other four neutral stops ($M = 3.43$) was significantly different $t(990) = 59.80, p < 0.01$, indicating that respondents perceived the peak event as intended, compared to the other stops. The peak event was also significantly different ($p < 0.01$) than each of the neutral stops, individually.

To test the manipulation of the surprise condition, we asked participants after they experienced the entire city tour (all five stops) whether they were “...surprised by the experience at the city building (restaurant).” Participants in the surprise condition were more surprised ($M = 6.24$) than those in the anticipation condition ($M = 4.65$), $t(944) = 17.621, p < 0.01$. Similarly, to test the manipulation of the anticipation condition we asked participants at the end of the tour the question: “At the start of the tour, I was looking forward to the city building (restaurant).” Those in the anticipation condition felt greater

anticipation on average ($M = 5.90$) than those in the surprise condition ($M = 3.11$), $t(994) = 30.54, p < 0.01$.

4.4. Analysis and Results

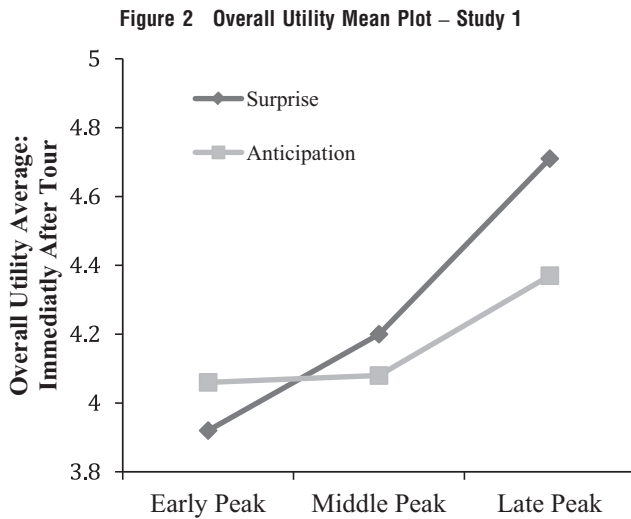
To test our hypotheses, we performed a 3 (peak placement: early, middle, and late peak) \times 2 (design strategy: surprise and anticipation) between-subjects analysis of variance (ANOVA) using as a dependent variable the 10-item overall-utility scale that was presented after the participants had seen all stops. Table 2 gives summary statistics for the six conditions. The main effect for peak placement was significant $F(2, 990) = 15.664, p < 0.01$, indicating that a difference was found for overall utility across the three peak placement groups. However, the main effect for design strategy was not significant $F(1, 990) = 1.625, p > 0.05$, indicating that the design strategies of surprise and anticipation did not independently affect overall utility.

Looking more closely at the main effect for peak placement, we first compared the descriptive statistics among the three conditions. The late peak resulted in the highest overall utility, the middle peak had a lower rating, and an early peak had the lowest rating. Independent t -tests revealed that a late peak had a significantly different overall utility ($p < 0.01$). However, the difference between the utility ratings for an early and middle peak was not significant.

Next, we examined the interaction between peak placement and design strategy. The interaction effect was marginally significant $F(2, 990) = 2.89, p < 0.10$. Figure 2 displays the means for the surprise and anticipation conditions across the three peak placement levels. We performed two 1 (surprise or anticipation) \times 3 (peak placement: early, middle, or late peak) between-group ANOVA tests. The data were split by design-strategy conditions (i.e. surprise or anticipation). We first analyzed the surprise condition. Although significant, $F(2, 494) = 14.592, p < 0.05$, the data fail to support H1 because the overall utility ratings were not in the theorized direction: participants in the surprise condition did not prefer the early peak as hypothesized. Instead, when the peak is a

Table 2 Descriptive Statistics – Study 1

	M	SD	n
Early peak	3.99	1.36	341
Surprise	3.92	1.27	171
Anticipation	4.06	1.22	170
Middle peak	4.15	1.33	319
Surprise	4.20	1.26	163
Anticipation	4.08	1.40	156
Late peak	4.53	1.23	336
Surprise	4.71	1.26	163
Anticipation	4.37	1.19	173



surprise, we found the lowest average overall utility attributed to an early peak, a middle peak received a higher average overall utility compared to an early peak, and a late peak yielded the highest overall utility. Examining pairwise comparisons between these groups, we find that the late peak was significantly different from both the middle peak and the early peak ($p < 0.01$). Only a marginally significant difference ($p < 0.10$) was found for an early vs. a middle peak.

For an anticipated peak, the overall utility means were in the predicted direction, in support of H2. A late peak was perceived as having the highest overall utility compared to a middle peak and an early peak, $F(2, 496) = 3.076, p < 0.05$. Pairwise comparisons show that an anticipated late peak is significantly different than ratings of a beginning or a middle peak ($p < 0.05$). However, the difference in utility ratings for the early and middle peak conditions was not significant.

We did a follow-up analysis to understand better the influence that a surprise strategy has compared to an anticipated one concerning peak placement. We ran independent t-tests for respondents assigned to the early, middle, or late peak conditions and compared the use of surprise to anticipation. We found no significant difference between the conditions of surprise and anticipation for both the early peak and middle peak ($p > 0.05$). However, we did find a significant difference ($t(334) = 2.532, p < 0.05$) between surprise and anticipation in the late peak condition, with surprise yielding the higher overall utility compared to anticipation. Therefore, a surprise peak appears to amplify the peak-end effect (i.e., late peak), as participants perceived it more positively compared to an anticipated peak ending.

To explore whether these results were moderated by individual-difference factors, we focused our

analysis on participants assigned to the late peak condition ($n = 336$). Using a series of two-way ANOVA tests, with overall utility as the dependent variable and design strategy as the primary independent variable, we examined seven respondent background variables including: age, gender, education, income, previous experience on a city tour, surprise preference, and anticipation preference. Results for each of these tests are presented in Table 3. All of the tests within the late peak condition support a main effect for design strategy, suggesting that the use of a surprise vs. an anticipation strategy positively influences overall utility ratings independently when used for a late peak. Moreover, the results were robust across respondent background variables; however, a marginal significance ($p < 0.10$) was found for educational background. In addition, all interaction effects between design strategy and the demographic variables were non-significant, which suggests that the difference in overall utility ratings was not influenced by these individual-difference factors. We next examined if a participants' previous experience with city tours, which would indicate an established schema, affected overall utility ratings within the end-peak condition. Results for both the interaction and main effect were not significant, further indicating that the

Table 3 Respondent Background Analysis for a Strong Ending – Study 1

ANOVA test	Significance
<i>Dependent variable = overall utility</i>	
Age	
A. Design strategy (surprise/anticipation)	$p < 0.05$
B. Age (35 years old or less/over 35 years old)	n.s.
A × B	n.s.
Gender	
A. Design strategy (surprise/anticipation)	$p < 0.05$
B. Gender (male/female)	n.s.
A × B	n.s.
Education	
A. Design strategy (surprise/anticipation)	$p < 0.05$
B. Education (some college or less/college or more)	$p < 0.10$
A × B	n.s.
Income	
A. Design strategy (surprise/anticipation)	$p < 0.05$
B. Income (\$40K or less/more than \$40K)	n.s.
A × B	n.s.
City tour experience	
A. Design strategy (surprise/anticipation)	$p < 0.05$
B. City tour experience (yes/no)	n.s.
A × B	n.s.
Surprise utility	
A. Design strategy (surprise/anticipation)	$p < 0.05$
B. Surprise utility (aversion/preference)	$p < 0.01$
A × B	n.s.
Anticipation utility	
A. Design strategy (surprise/anticipation)	$p < 0.05$
B. Anticipation utility (aversion/preference)	$p < 0.01$
A × B	n.s.

n.s. represents findings that were non-significant, $p > 0.10$.

differences in overall utility were due to the design strategy. In contrast to the demographic characteristics, we found significant main effects based on an individual's disposition for surprise or their preference for anticipation. However, these effects were in predictable patterns; e.g., those participants who had a disposition for surprise had higher overall ratings if they were in the surprise condition.

5. Study 2: Follow-Up Testing

To corroborate the findings of Study 1 and assess what is recollected of the overall experience after a week has passed, we completed another study. In 2016, we launched Study 2 and collected a new sample of participants. We incentivized these participants to complete the survey one week after they had taken the hypothetical tour. To make direct comparisons to Study 1, we utilized the same storyboard scenarios and MTurk to recruit participants, we retained the same independent and dependent variables, and we performed similar statistical analyses as in Study 1.

5.1. Data Collection and Sample

When participants were recruited for Study 2, they were told that there would be two parts to the study separated by one week; they were paid separately for each part with a higher payout for the second part to encourage more complete responses. As with Study 1, in Study 2, participants were randomly assigned to one of 6 conditions (peak placement with 3 levels: early, middle, and late peak; design strategy with 2 levels: surprise and anticipation), introduced to the tour, shown all five stops based on the order of their assigned condition, and finally asked to answer demographic questions. One week later, using an MTurk research platform called TurkPrime, we sent a message to participants inviting them to participate in Part 2 of the study. Participants were reminded that one week prior, they were asked to imagine a bus tour and that they had seen drawings and read descriptions of different tour stops. They were then asked to think back to the tour and to evaluate the overall tour with the same 10 item scale used in Study 1. The purpose of Part 2 was not to quiz participants on what they recalled, but instead to measure their overall perception of the experience one week later.

In Study 2, we removed 36 participants who failed the attention test question or who finished the survey in less than 7 minutes.¹ Eighty percent of participants returned one-week after exposure to the scenarios, leaving a final sample of 400. The demographics of this sample were similar to that of Study 1: 53% female, 60% 35 years of age or less, 43% making \$40k

or less, and majority with some college experience. The loading of the 10-item overall-utility scale into a single factor ($\alpha = 0.89$) and manipulation checks of surprise ($t(400) = 9.16, p < 0.001$) and anticipation ($t(400) = 17.48, p < 0.001$) were consistent with Study 1.

5.2. Analysis and Results

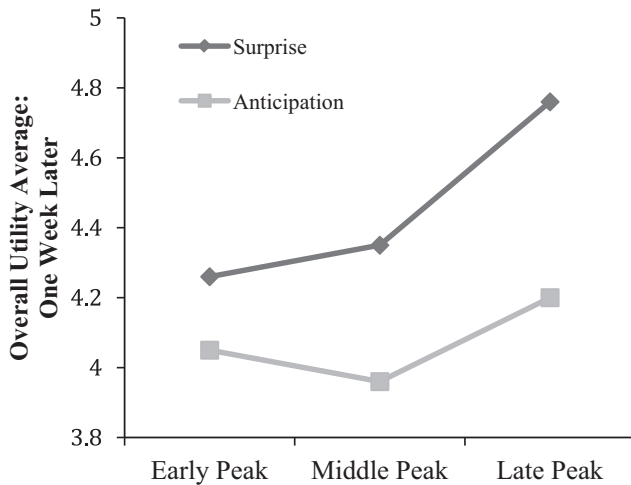
As in Study 1, we performed a 3 (peak placement: early, middle, and late peak) \times 2 (design strategy: surprise and anticipation) between-subjects analysis of variance (ANOVA) using the participants' responses to the overall-utility scale provided one week after their exposure to the scenario tour. Table 4 shows summary statistics for the six conditions. The main effect for peak placement remained significant $F(2, 394) = 3.023, p \leq 0.05$, as expected. Thus, a difference was found for overall utility across the three peak placement groups. Independent *t*-tests resulted in the late peak again having the highest overall utility compared to the middle and early peak conditions ($p < 0.01$), and the early and middle peak were not significantly different from one another. In this regard, the results of Study 2 support those of Study 1. Figure 3 displays the means for the surprise and anticipation conditions across the three peak placement levels.

In contrast to Study 1, the main effect for design strategy was significant $F(1, 394) = 9.621, p > 0.01$, indicating that the design strategies of surprise and anticipation independently affected overall utility when measured one week later. In particular, the surprise condition resulted in a higher utility ($M = 4.453$) compared to the anticipation condition ($M = 4.069$). In addition, the interaction effect was no longer significant; however, using pair-wise comparison, we again see that participants in the surprise-late peak condition rated overall utility significantly higher than those in the anticipated-late peak condition, $t(134) = 2.64, p < 0.01$; those in the middle peak condition showed a moderate difference, $t(130) = 1.842, p < 0.10$; and those in the early peak condition were not significantly different $t(136) = 0.945, p > 0.10$ across the surprise and anticipation conditions.

Table 4 Descriptive Statistics – Study 2

	M	SD	<i>n</i>
Early peak	4.14	1.29	136
Surprise	4.26	1.14	63
Anticipation	4.05	1.31	73
Middle peak	4.14	1.21	130
Surprise	4.35	1.05	61
Anticipation	3.96	1.31	69
Late peak	4.51	1.29	134
Surprise	4.76	1.18	76
Anticipation	4.20	1.25	58

Figure 3 Overall Utility Mean Plot – Study 2



6. Conclusions and Implications

Service operations scholars argue for a customer-centric behavioral approach when studying and designing service experiences (Chase and Dasu 2001, Cook et al. 2002, Roth and Menor 2003, Voss et al. 2008). Building from behavioral research, our study highlights the importance of the peak and end effects within a sequence of events. We conclude by discussing the theoretical and managerial implications of our studies. We also offer a number of fruitful opportunities for future research that can extend and build knowledge about designing and scheduling peak experiences within service sequences.

6.1. Discussion

We extend behavioral research on sequence effects by examining the influence of the peak when it is designed to be a surprise or an event that is anticipated by customers. Our two studies confirmed the power of a strong ending. Both of the tested design strategies, surprise and anticipation, resulted in a predominant end effect; i.e., an end-peak event led to higher overall utility for both the surprise and anticipation conditions. In general, customers perceived an early peak to have the lowest utility and a late peak to have the highest utility. These findings corroborate behavioral research which shows a preference for a strong finish (Chase and Dasu 2001, Dixon and Verma 2013, Redelmeier et al. 2003)

Analysis of the surprise and anticipation design strategies revealed differences within the surprise condition that countered our theoretically derived prediction: customers preferred a surprise ending to a surprise beginning. The strength of a strong ending surpassed any influence a surprise beginning may have on amplifying customer views of the rest of the experience. Within the anticipation condition, we

found differences that were in line with our prediction: customers preferred an anticipated ending to an anticipated beginning, consistent with research on savoring. When made aware of an impending delight experience, consumers reported stronger positive emotions (overall utility) when they were afforded more time to anticipate the peak event.

In Study 1, when comparing surprise to anticipation across the peak-placement conditions, independently, we found that a surprise peak ending yielded higher overall utility compared to an anticipated peak ending. When measured immediately after the experience, as was done in Study 1, none of the other placement conditions (i.e., early or middle) resulted in a significant difference between the design strategies. Moreover, we found that the positive effect of ending on a surprise high note was robust across demographic variables as well as an established schema of previous experience with a similar service.

In Study 2, which was run with a new set of participants who reported their overall experiences a week after participating in the experiment, we found that those who were in the surprise conditions rated their experience to have higher overall utility compared to those in the anticipation conditions. The main effect that emerged one week later was, again, more predominant the later the peak occurred. From a managerial perspective, our results suggest that contrary to one of our hypotheses, the end effect has a stronger influence on customer perceptions of service experiences than either surprise or anticipation. Service designers should, therefore, prioritize peak placement and sequencing over pre-experience design efforts to elicit surprise or build anticipation. This finding underscores extant research on the importance of the sequencing of events. Service research has touted the importance of delighting customers, but our research shows that *when* a customer is delighted may be more important than if the customers are truly surprised by the delight. Only when we placed the peak late in a service sequence did we see a significant difference in utility across peak event strategies (i.e., surprise or anticipation).

Interestingly, the primary difference between Study 1 and 2, the finding that a surprise peak compared to an anticipated peak leads to a higher rating measured one week later, suggests that, in addition to just peak placement, the influence of a surprise peak resonates with customers. Much of the research in behavioral science about sequence effects concludes that peak effects are functions of *memories* of peak events (e.g., Redelmeier and Kahneman 1996). With that in mind, Study 2 as opposed to Study 1, gave participants time to develop memories of their simulated experience. Our findings suggest that while peak event strategies (surprise vs. anticipation) do not independently

impact the perception of experienced utility as measured in Study 1, they do influence *remembered* utility or memories of an experience as measured in Study 2. In fact, these results indicate that a surprise peak will amplify the peak-end effect of remembered utility—a finding new to research on sequence effects.

Although our research would suggest that the use of surprise positively influences customer utility, it is important to note from an operational standpoint that service designers may find it difficult to maintain a surprise peak strategy (Oliver et al. 1997). Once a surprise is used, it is difficult to conceal again, as customers are likely to share their experience with others, be it in person or through online forums, diminishing the element of surprise. Additionally, repeat customers would no longer be surprised by the peak. Interestingly, though, if a surprise becomes known, then we are effectually switching to an anticipation strategy, with customers looking forward to and anticipating the peak. If it is not feasible to schedule the peak for the end, then our findings would suggest that the spoiling of a surprise peak does not really matter. Recall that a surprise peak compared to an anticipated one did not have a significant effect on customer perceptions when the peak was placed at the start or the middle of a sequence. However, if it is feasible to schedule the peak for the end, the strength of the end effect alone surpasses the design strategy of surprise or anticipation, compared to a middle or early peak. Thus, even if a surprise were spoiled, service designers would still be better off scheduling a surprise peak for the end even if some customers are anticipating it.

If an end peak can be a surprise, our research shows that surprise led to an intensified perception of the peak and a stronger end effect on overall utility. This finding suggests that peak effects are not only influenced by the scheduling of the event (i.e., placement) but also on the expectations that are set (i.e., surprise offers no information to form expectations for the peak, while anticipation provides information in an attempt to create expectations). In other words, to optimize the customer experience of a surprise end-peak, marketing has to work with operations. This supports the call from academics for better coordination of marketing and operations efforts in service innovation, design, and delivery (Dixon et al. 2014, Kwortnik and Thompson 2009).

6.2. Future Research Directions

Despite the compelling findings from this research, we acknowledge there are limitations to our work that could be addressed in future studies. First, we designed storyboard scenarios to reflect a realistic tour experience and included visual imagery to

enhance participant immersion with the intention of mitigating some of the external validity limitations of scenario-based research. However, future research should examine similar constructs in a field-based setting to test if these results replicate in a real service environment. Second, we recognize there is complexity in evoking anticipation that involves aspects that were not examined in our study such as timing, desire, anxiety, authenticity, and realism. Although we found support for our anticipation manipulation, we concede that providing participants a description of the peak event immediately before the experience might not have evoked an intense level of anticipation. Future research that explores additional dimensions and boundary conditions of anticipation as it might moderate sequence effects will help to further unravel the impact of this design strategy on the consumer experience.

Given that this is, to our knowledge, one of the first studies to experimentally investigate how surprise or anticipation influences the peak moment of a service, there are several promising areas for future research. First, our study focused solely on the use of positive instances of surprise and anticipation; studies that examine negative cases of surprise and anticipation would be beneficial. For example, one could consider how different techniques for building anticipation and sequences of savoring vs. dread impact the customer experience. It also would be interesting to explore the antecedents of anticipation and surprise to better understand the driving mechanism behind these design strategies.

Other interesting questions center on the use of surprise and anticipation. For example, research could examine the possibility of anticipating a surprise; thus leveraging a combination of the two design strategies. Using the context of our study, the tour operator could promote that a particular stop would feature a positive surprise—but not divulge the specifics of the surprise. Future work could examine how this hybrid design strategy impacts customer perceptions compared to an outright anticipation or surprise strategy. As noted, a challenge for surprise is that today's surprise becomes tomorrow's expectation. Research is needed to examine the effect of repeat surprise tactics, as well as how customers who may be privy to a surprise based on word-of-mouth may be affected. Regarding anticipation, a risk associated with this design strategy is that the promoted peak might fail to meet the set expectations, which become so high that the experience does not live up to it. Studying the impact of different forms of marketing used for anticipation and also varying the outcome of the anticipated peak experience (exceeds, meets, or fails) would offer insight into how to use anticipation as a design strategy.

Furthermore, future research could examine different sequence profiles that could include low points compared to neutral and or high points, mini-peaks, and other effects (e.g., trend effect or spread effect); or research could assess variation between events that comprise the service experience. For example, does minimal variation between the utilities for events dampen the impact of a peak-end effect as the peak is less salient compared to the other events?

Lastly, to add breadth to our understanding of how surprise and anticipation strategies influence the peak, future work that examines other service contexts or uses other empirical methods is needed. Tourism services are typically more hedonic and experiential in nature and have high customer involvement. It would be interesting to see if these results hold or differ for other service types. Furthermore, the effects of anticipation may be more subtle than those of surprise—and harder to capture in an imagined setting. Future work that uses field studies where individuals savor an event that would be experienced by the participant is encouraged.

6.3. Conclusion

The idea that “perception is reality” is entirely true for services. To heighten customers’ overall perceptions of the experience requires operations management scholars to pay more attention to the intangible and experiential side of service design decisions (Dasu and Chase 2010). Understanding the behavioral implications of design choices will ensure that the delivered service inspires the intended emotional response from customers (Dasu and Chase 2010, Pullman and Gross 2004, Voss et al. 2008). Our study provides evidence that the use of surprise as a design strategy has a greater effect on customer emotions when the peak is scheduled later in the service experience. However, there is still much to learn about behavior-based design issues, especially from an operations management perspective. We believe that our methodology, a storyboard experiment, opens up a number of opportunities for investigating the important softer side to service experience design and delivery topics. We implore researchers to continue examining these types of experiential design issues.

Acknowledgments

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Appendix 1: Peak Scenario

You stop at a building in the city. The building houses a restaurant. As a part of the tour you will stop to have a meal.

The restaurant has won awards from food critics and city magazines. It is owned and operated by a famous celebrity. It is normally difficult to get reservations, but the tour company has already made arrangements.



The dining area is busy. As you are seated, the celebrity owner comes to your table and shakes the hands of members from your tour and welcomes you to the restaurant. The owner describes some of the innovative items featured on the menu.



You order a signature dish and a specialty beverage. The food arrives in a timely manner and those around you comment positively on their selections. As you finish, a live band plays music that you recognize.



As you leave, the owner gives each member of the tour a memento with the restaurant’s logo on it.

Appendix 2: Neutral Scenario

You stop at a historic monument established in honor of the early settlers of the city.

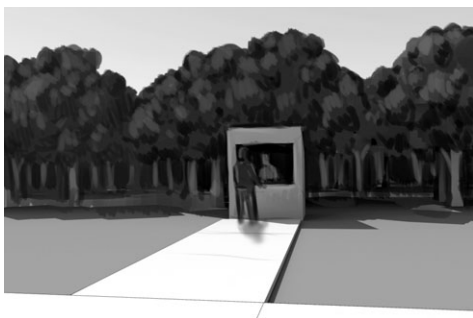
The guide explains that the monument was erected some time ago and stands to preserve the early history of the people of the city; however, it is in an area that would be difficult to find on your own, requiring the bus to take several turns onto small roads.



The monument stands at the center of a stone courtyard. As you approach the courtyard you see that the monument is a four-sided column made of grey stone. On one side there is a plaque that discusses the monument’s purpose and lists some of the influential early settlers.



You see that beyond the courtyard is a small grassy area and an information booth. The employee at that the booth’s window is selling books about the early settlers, other small souvenirs, and bottled water.



After looking around the monument you make your way back to the bus.

Appendix 3: Dependent Variable Measurement Items

How do you feel about the overall tour?

Not very happy	1	2	3	4	5	6	7	Very happy
Not very bored	1	2	3	4	5	6	7	Very bored
Not very surprised	1	2	3	4	5	6	7	Very surprised
Not very joyful	1	2	3	4	5	6	7	Very joyful
Not very amazed	1	2	3	4	5	6	7	Very amazed
Not very delighted	1	2	3	4	5	6	7	Very delighted
Not very satisfied	1	2	3	4	5	6	7	Very satisfied
Not very astonished	1	2	3	4	5	6	7	Very astonished
Not very pleased	1	2	3	4	5	6	7	Very pleased
Not very excited	1	2	3	4	5	6	7	Very excited

Note

¹In Study 1, we removed participants that completed the survey in less than 10 minutes; however, in Study 2 we removed participants who completed the survey in less than 7 minutes because the survey was shorter in length.

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