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An Examination of Customers' Attitudes about Table Top Technology in Full-Service Restaurants

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Abstract

This paper examines the influence of customer-facing technology in full-service restaurants. As a new addition to the service experience, tabletop devices offer the customer more control over the dining experience, and also increase customer participation in the service process, which has the potential to upset the traditional exchange between service providers and customers in restaurants. To examine how customers react to the use of tabletop devices, this study examines 1,343 point-of-sales transactions from 20 units of a full-service casual dining restaurant chain and matches customer in-restaurant transactions to their reactions to tabletop devices used during their meals. Results show that over 70% of the customers who used tabletop devices reported positive affect toward the device, with approximately 79% of customers reporting that the device improved their experience, citing convenience, ease of use, and credit card security as some benefits of using the technology. Approximately 80% of the customers who used the device reported that they would return to the restaurant because of the positive affect. The results also indicate that likeability of the device and tip percentage were positively and significantly connected to customer reports of the devices having a positive effect on experience and on desire to return. In addition, when customers reported increased return intentions, likeability of the device was higher regardless of reports of the device improving restaurant experience, showing that the introduction of tabletop devices had a positive effect for most—but not all—customers.

Keywords

service management; self-service technology; service operations management; restaurants

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Introduction

Whether you consider check-in kiosks at an airport, Automatic Teller Machines, or the ability to pay with your credit card from the back of a taxi, customer-facing technology is being utilized by increasing numbers of service providers and their customers each day. The addition of new technology is changing the service dynamic and hence requiring researchers and service providers alike to revisit traditional models of customer service management. The interaction between service providers and their customers has been extensively studied by information systems, communication, management, and marketing scholars for decades (cf. Brown and Lam 2008; Dong, Sivakumar, Evans and Zou, 2015; Hong, Liao, Jiang and Hu 2013; Susskind, Kacmar and Borchgrevink 2003; Venkatesh, Thong and Xu, 2012). Through this research empirical models have been developed and tested to better describe how consumers and service providers interact in service-based organizations.

There is also research emerging that considers customer engagement and the use of self-service technology (Collier and Kimes 2013), the use of social media (Sashi 2012), and customer participation in the service-delivery process (Dong, et al. 2015; Gallan, Jarvis, Brown and Bitner 2013), highlighting the multidimensional nature of service delivery and how the service experience is evolving with the introduction of new technology for both customers and service providers. The research to date on customer-service provider interaction and related models has yet to fully account for the addition of customer-facing technology that is layered into the service experience, in particular, technology that does fully replace the traditional customer-service provider exchange.

With the addition of customer-facing technology and more customer participation in the service experience (Dong et al. 2015; Gallan, et al. 2013), the service dynamic is changing and will likely influence how service-based employees and their customers interact (Lee 2015). To

better understand this new component of the service dynamic, we set out to examine a set of restaurants and their customers where customer-facing technology has been layered into the traditional full-service restaurant exchange.[1] This technology, in this form, has not traditionally been included in these types of service-based interactions and offers us a chance to examine how customers react to the use of newly developed customer-facing technology layered into a traditional service experience.[2]

As noted above, the traditionally understood dynamic of the exchange between service providers and their customers will likely change with a new layer of participation from customers (Collier and Kimes 2013; Dong et al. 2015; Gallan et al. 2013; Setia, Venkatesh, and Joglekar 2013; Bharadwaj, Sawy, Pavlou, and Venkatraman 2013; Venkatesh et al. 2012). There are several elements of the exchange which will be impacted by the introduction of technology, and there will likely be both positive and negative outcomes as a result for both the service providers, their customers, and the business itself.

Technology and the Customer Experience

From a customer experience perspective there are four elements of *order-to-payment* technology that can influence the relationship between a customer and the service provider. First, the technology must be consistent with the brand image and espoused organizational standards to ensure that customers and the company are aligned as the technology is adopted and

[1] A full-service restaurant exchange is defined as a transaction where a customer is seated in the restaurant and is served by wait staff at the table. Full service differs from limited service (like Fast Food) by design as the staff in limited service operations perform fewer services for their customers.

[2] The technology that we are examining here differs from other forms of SST technology because it does not remove an entire element of the service exchange between the customer and the operator. While the customer can use the table-top technology to perform some tasks in the service episode without the service staff, the food and beverage products are still prepared and delivered in the traditional way, service remains co-created by customer and the service providers during the consumption of the service experience (Heidenreich, Wittowski, Handrich, Falk 2014). This differs from other forms of customer-facing technology such as on-line or ATM banking or self-checkout in retail or grocery store settings where a layer of personal interaction between the customer and the service provider has been entirely removed (for example, see Lee 2015).

implemented. Next, any marketing activities that reach customers prior to their experience with the technology must be congruent with the customers' needs and expectations to ensure that the stage is set properly for the adoption and use of the new technology (Benhima, Reilly, Naamane, Kharbat, Kabbaj, and Esqualli 2014). Third, the actual services that are offered need to be customer-centric (Dai and Salam 2014; Dong et al. 2015; Giebelhausen, Robinson, Sirianni and Brady 2014; Lee 2015; Setia et al. 2013). This is an area of research that has received some attention examining how customers view the convenience of self-service technology (Collier and Kimes 2013) and convenience in the consumption of online services (Dai and Salam 2014). Lastly, service quality management processes must be in place to ensure a seamless delivery of service through the new technology (Benhima et al. 2014; Giebelhausen et al. 2014) in order to deliver a consistent experience for customers, create value and develop loyalty, and lead to positive word-of-mouth for the brand and/or service (Dai and Salam 2014; Lee 2015). In sum, companies adopting new technologies need to ensure that all parties engaged in its use (i.e., staff, customers, and managers) understand how it affects the operation and how it affects the customer experience. Given these four practical elements of technology adoption and use, there are several theoretical perspectives that help explain how technology adoption and use applies to our current research.

Theoretical Framework

Several theoretical frameworks have been used to describe how technology impacts the customer-service provider exchange (see for instance Dong et al. 2015; Giebelhausen et al. 2014; and Venkatesh et al. 2012). As a culmination of research on consumers' adoption and use of technology, *The Unified Theory of Acceptance and Use of Technology* (Venkatesh, Morris, Davis and Davis 2003), suggests that behavioral intentions to use a specific technology emerges

from consumers' expected benefit from the technology (performance expectancy), ease of use of the technology (effort expectancy), and the perceived importance and value of the technology to others (social influence). Hence, consumers' behavioral intentions to use a technology combined with their belief that support and resources exist to effectively use the technology (facilitating conditions) influence or determine usage. *The Unified Theory of Acceptance and Use of Technology* (*UTAUT*) was expanded by Venkatesh et al. (*UTAUT2*; 2012) to include a dimension of fun or pleasure derived from the use of technology (hedonic motivation), a dimension of cost or price to use the technology, and a dimension of habit, which is defined as consumers' perceptions of past and future behaviors based on exposure to the technology. Additionally, factors of age, gender, and experience with the technology were found to be important moderators of behavioral intention and use in *UTAUT2*, showing technology adoption and its use is a multidimensional experience for the user. These additions to *UTAUT* are consistent with *Script Theory* where past experiences create the platform to understand future experiences, whether they are familiar or new to the user (Leigh and Rethans 1984). As users engage in a new technology, how they react to or view the technology is a function of past experiences, expectations for investment of time and resources, and expected outcomes for performance.

What is important to note here is that when a layer of technology is added to a service process, the traditional or former service delivery parameters become modified. This is particularly important to high-contact services—such as full-service restaurants—where the customers and service providers co-create the service experience with notable customer participation in the process (Dong et al. 2015; Heidenreich, et al. 2014). As a result of the introduction of new technology, it also is likely that role changes will occur for both the customer and service provider in creating and consuming the service experience with the new

layer of technology. These shifts or adjustments in roles are consistent with *Role Theory* (Solomon, Surprenant, Czepiel and Gutman 1985), particularly when the technology replaces or modifies only a portion of the service interaction between the customer and the service provider (Giebelhausen et al. 2014) and its use is voluntary (Barrett, Davidson, Prabhu and Vargo 2015).

As noted above, current research in technology adoption and use has looked at several applications, such as, mobile technology (Scherer et al. 2015; Ventkatesh et al. 2012), banking technology (Curran and Meuter 2005; Curran, Meuter and Surprenant 2003; Setia et al., 2013), and retail self-checkout technology (Lee 2015). With few exceptions (see Giebelhausen et al. 2014), these investigations looked at technology that was designed and implemented to replace (or as an alternative to) the traditional mode of service or technology. What we attempt to do here, is to look at technology that is layered into the service experience *and* does not entirely replace the normal customer-service provider interaction (it is not designed to do so). Specifically, we are interested in examining what effect the layering of a new technology into an existing service process has on the traditional service experience, and hence, expanding the known boundary conditions of *UTAUT2*, *Script Theory* and *Role Theory* into a new context with a new application of self-service technology (Alvesson and Karreman 2007; John 2006).

Through our research questions presented below we are interested in examining how consumers react to the technology and how the technology affects elements of the service process in two main ways. First, we are interested in examining the extent to which the technology affects (improves) the service experience for the customers and their return intentions. This, in effect, is testing to see if elements of *UTAUT2* apply in this new context. Second, we are also interested in looking at how customers' reactions to the technology (in terms of the experience and return intentions) relate to evaluations of the technology (in terms of

affect) and the service experience itself (measured by gratuity paid to the server). To do so we propose and test four research questions:

Research Question 1a: What is the relationship between customers' belief that a tabletop device improves their service experience during a full service meal in the restaurant and their likeability of the tabletop device?

Research Question 1b: What is the relationship between customers' desire to return to the restaurant following a full service meal and their likeability of the tabletop device?

Research Question 2a: What is the relationship between customers' belief that the tabletop device improves the service experience during a full service meal in a restaurant and the tip percentage paid to the server at the conclusion of their dining experience?

Research Question 2b: What is the relationship between customers' desire to return to the restaurant following a full service meal and the tip percentage paid to the server at the conclusion of their dining experience?

Method

Participants and Procedure

To test the proposed research questions above, in two related studies, we captured 23,640 point-of-sales transactions from 20 units of a full service casual dining restaurant chain in ten States located across the Continental United States from July 2014 through September 2014. In addition to the point-of-sales (POS) transactions, we captured 13,476 survey responses from restaurant customers who used a tabletop device during their meal and completed the survey provided to them via email following their meal.

The tabletop device provided by the restaurant is a touch screen device which allows customers to view menu items, play games, sign up for the restaurant's loyalty program, order

food and beverage products, and settle their bill. At the time of the study, there was one device placed on each table and customers were able to opt out of using any or all of the functionality, making this technology a layer added to the traditional restaurant experience. In the restaurants, it is standard practice for the servers to introduce the technology, show customers how to use it, and encourage the customers to use it for all aspects of their meals as they see fit—making the use of the device voluntary (Barrett et al. 2015).

Not all restaurant customers who dined in the restaurant used the tabletop device, and/or completed the survey regarding the tabletop device, we, therefore, had to match each POS transaction to the customers' response on the tabletop device based on multiple record locators contained in the data files. From the quarterly data we were given access to, we matched each customer's POS transaction to his/her use of and reaction to the tabletop device, selecting customers who had used the device for all of the following functions during his/her meal:

(1) view the menu, (2) order food and beverage products, (3) play games on the device, and (4) pay for their meal. Because not all restaurant customers left a tip for their server on their credit card, we excluded records with no charge card tip recorded and, hence, only selected transactions where a tip was recorded within the POS transaction, yielding a final total matched sample of 1,343 responses across the 20 restaurants. Due to the nature of the secondary data we captured, we were not able to measure the respondents' socio-demographic characteristics (such as age, income, education, and sex).

To conduct the study we examined the companies' restaurants in two studies: an initial study and a confirmatory study. The initial study (Study 1) used the responses from 673 customers from 11 restaurants located in 6 States (Mississippi, Nevada, Ohio, Tennessee, Texas and Virginia). The confirmatory study (Study 2) used the responses from 670 customers from 9

restaurants (different from Study 1 restaurants) located in 6 States (Arizona, Maryland, North Carolina, Tennessee, Texas and Virginia).[3]

Dependent Variables. We captured two outcome metrics to determine the extent to which the tabletop device was connected to a positive influence on the restaurant experience for the customers.

Tip percentage was measured as the dollar tip provided by the customer divided by the total sales for the POS transaction (excluding sales tax). Tip percentage relative to total sales measured per transaction allowed us to control for the number of customers at each table. Tip percentage is generally considered a proxy for the customer satisfaction with the service experience in the restaurant. Customers who have more positive in-restaurant experiences (with the food, service, atmosphere, and amenities) would normally provide a higher gratuities for their servers.[4]

Likeability was measured by asking the restaurant customers a single open-ended question: "What did you like/dislike about the table-top device?" To develop a coding scheme for this open-ended question we conducted a pilot study using customers' responses from seven restaurants not included in Study 1 or Study 2 during the month of June 2014. Through the pilot study we captured responses from 306 customers who had used the tabletop device during their

[3] To ensure that the samples in both studies were congruent, we ran a One-way ANOVA with the sample as the factor across our variables to determine if there were any differences based on sample partition that we should account for. The results were non-significant for the study variables showing that each sample was a consistent representation of the restaurants we sampled and partitioned. For *Effect on Experience:* F (1, 1341) = .05, p = .82; for *Return Intent:* F (1, 1341) = 1.72, p = .19; for *Tip Percentage:* F (1, 1341) = 2.04, p = .15; and for *Likeability:* F (1, 1341) = .07, p = .80.

[4] To ensure that the tipping behavior of our study participants was in line with industry standards we compared the tip percentages from our combined sample (N= 1343) to a recent study conducted by Technomic (Pang, 2014). In their national study of tipping behavior in full service restaurants they found 17 % tipped 10 percent or less, 26 % tipped between 11 and 15 percent, 44 % tipped between 16 and 20 percent, and 13 % tipped 21 percent or more. Our respondents tipping behavior was very consistent: 10 % tipped 10 percent or less, 29 % tipped between 11 and 15 percent, 51 % tipped between 16 and 20 percent, and 10 % tipped 21 percent or more.

meal and completed the requisite survey. Two independent coders classified each statement based on the content of the response provided by the customer. The coders strongly agreed with the classification of each statement, Cohen's $K = .94$, $p < .001$ and $r = .95$, $p < .001$. We revaluated the 14 of the 306 statements that the two coders disagreed with and classified them accordingly.

For the current study two new coders were given the five categories developed through the pilot study to classify the customers' responses. A very high level of agreement emerged, supporting the classification scheme developed in the pilot study (Cohen's $K = .95$, $p < .001$ and $r = .97$, $p < .001$). As with the pilot study data, we examined and reclassified the 37 of the 1343 responses on which the two coders disagreed in both studies.

The resulting final coding scheme consists of five categories of responses from the restaurant customers that are consistent with survey measures and outcomes used in related studies (cf. Collier and Kimes 2013; Curran and Meuter 2005; Dai and Salam 2014; Venkatesh et al. 2012):

1) *Overall Dissatisfaction* – this set of responses was classified based on the customers stating that they missed the contact with the service personnel, the device was in the way on the table, or that the device changed the dynamic of the service experience in a negative way. This category represented a set of strongly negative reactions to the device and the tone of the response indicated that the use of the device during the meal negatively affected their service experience in the restaurant (coded as 1).

2) *Dissatisfaction with Specific Aspects* – this set of responses was classified based on the customers reporting unhappiness with some feature of device, how it is used, or how it was

structured. In this category customers reported wanting more information about how the device worked, complained about charges for the games, complained about a lack of connection to the restaurant's loyalty program, and complained about problems with applying coupons and other issues of functionality. This category of responses was based on negative reactions to the experience with their use of the tabletop device (coded as 2) and showed less overall negative affect compared to Category 1 above.

3) *Neutral/Mixed* – in this category, the responses of the customers reported a neutral reaction to the device, neither negative nor positive. In this category we also included mixed responses where the customers reported both a positive and negative response to the device (coded as 3).

4) *Satisfaction with Specific Aspects* – in this category the customers reported an overall positive reaction to the device citing ease of use, convenience, speed, functionality, control of credit card information, and reduced wait times in placing and receiving orders. Like category 2 above, this category of responses was based on customers' positive reactions to their experience with the use of the tabletop device (coded as 4), but showed less overall positive affect compared to Category 5 below.

5) *Overall Satisfaction* – in this category customers reported that they thoroughly enjoyed using the device, noting it was fun to use, enjoyed the self-service aspect, and that it enhanced their service experience greatly. Similar to category one above, this category was a set of strongly positive reactions to the device and customers reported that the device had a positive effect on their experience in the restaurant (coded as 5).

The coding scheme that emerged was anchored at the top (category 5) and bottom (category 1) of the scale with strongly positive or strongly negative reactions to the device, followed by positive (category 4) and negative (category 2) reactions to specific features of the device on either side of the neutral/mixed responses (category 3). Through the coding scheme several elements of *UTAUT2*, *Role Theory* and *Script Theory* emerged as both positive and negative themes in the customers' responses. Most notably, through the open-ended questions the customers reported elements of performance expectancy, effort expectancy, social influence, facilitating conditions, hedonic motivation, price value, habit and experience, and role and script shifts. A breakdown of the *Likeability* frequency data by category is provided in Table 1 for Study 1 and Study 2 and sample responses we coded from the customers are presented in Table 2.

Independent Variables. The participants' were asked two questions regarding their experience with the tabletop device and how it connected to their dining experience in the restaurant. These questions were created by the tabletop device provider.

Effect on Experience – this question asked the customers if the table device improved their experience in the restaurant in a yes or no format with a "yes" response coded as 2 and a "no" response coded as 1. The coding scheme resulted in a higher value being associated with a more positive experience.

Return Intentions – this question asked the customers if the tabletop device increased or decreased their likelihood to return to the restaurant. The "Increase" response was coded as 2 and the "Decrease" response was coded as 1. The coding scheme resulted in a higher value being associated with an increase in return intentions and is consistent with the construct of *Behavioral Intention* in *UTAUT2*

The correlations and descriptive statistics of the Study 1 variables are presented in Table 3; and the correlations and descriptive statistics of the Study 2 variables are presented in Table 4.

Analyses

To answer the four research questions presented above, multivariate analysis of variance in SPSS version 23 (IBM Corp., 2015) was used to test the mean values of customers' likeability of the tabletop device and the tip percentage they paid to their server (as the dependent variables) compared to the customers' assessment of whether or not the tabletop device improved their experience in the restaurant and whether not they intended to return to the restaurant because of the table-top device. We determined significance in the multivariate models by examining the significance of the Hotelling-Lawley Trace statistic and the *F* values which help determine if there are significant differences between the means of identified groups of subjects on a set of dependent variables (IBM Corp., 2015).

Control Variables

There are several elements/factors of a restaurant experience that have been shown to influence guest affect and consumption behavior (Kimes and Robson 2004), and hence could influence the study participants' reactions to the technology they used during their meal and the variables we measured. To control for these potential influences across both studies, with our study variables (*Tip Percentage*, *Likeability*, *Return Intentions*, and *Effect on Experience*), we examined the relationship between the number of customers in each party (party size), how long they stayed in the restaurant to consume their meal (meal duration), and the day of the week they dined in the restaurant. The analyses revealed that these restaurant meal features were consistent across both samples and did not deviate significantly across the data within both samples. The control analyses for each study are presented below.

Study 1

Study 1 Control Variables

Party size. The average party size across the sample for Study 1 was 2.49 customers, ranging from 1 to 12. The One-away ANOVA with party size as the factor was significant for *Tip Percentage*: F (7, 665) =5.16, p =.000, showing smaller party sizes on average left a larger percentage tip for their server (r = -.17, p = .000). We believe this could be a function of several things: (1) smaller parties received better service in the restaurants, (2) some customers in larger parties were free riders by not contributing their fair share to the tip, or (3) customers in larger parties were less comfortable applying the same percentage to a larger bill. The relationship between party size and *Likeability* was not significant (F (7, 665) =1.12, p =.35). Because the *Return Intent* and *Effect on Experience* questions were measured dichotomously we ran a X^2 test with each dichotomous variable treating party size as a factor to determine if there were significant differences across the party sizes. The test revealed no significant differences for *Return Intent* and *Effect on Experience* (X^2 [7] = 11.01, p = .14, X^2 [7] = 13.02, p = .10, respectively).

Meal duration. The use of this specific technology has been shown to reduce table turn time by around 30% (Printz 2014). In this case, dining duration was negatively, but not significantly correlated with *Likeability* (r =-.02, p = .70) and was negatively and significantly correlated with *Tip Percentage* (r = -.11, p = .005), showing shorter dining times were connected to a larger tip for the servers. As with party size above, because the *Return Intent* and *Effect on Experience* questions were measured dichotomously we ran a *t-test* with each dichotomous variable as the grouping variable and meal duration as the dependent variable to determine if meal duration was connected to *Return Intent* and *Effect on Experience*. The t-tests revealed no

significant differences for meal duration for both the *Return Intent* and *Effect on Experience* variables (t [671] = -.06, p = .95; and t [671] = 1.04, p = .30, respectively).

Day of week. To check for any effects by day of the week we ran the study variables as dependent variables with day-of-the-week as the factor in a One-way ANOVA to determine if there were any effects. We found no significant effects for the study variables by day-of-the week for *Tip Percentage* (F [6, 666] = 1.70, p =.12) or *Likeability* (F [6, 666] = .47, p =.83). Again, because *Return Intent* and *Effect on Experience* questions were measured dichotomously we ran a X^2 test with each dichotomous variable treating the day of the week as a factor to determine if there were significant differences across the days of the week. The test revealed no significant differences for *Return Intent* and *Effect on Experience* (X^2 [6] = 1.97, p = .92, X^2 [6] = 1.42, p = .97, respectively).

Based on the analysis of the control variables for Study 1 we found that a higher tip percentage was significantly connected to smaller party sizes and shorter meal durations. No other study variable was significantly connected to the operating characteristics identified above, showing the customers in the restaurants responded similarly to the study questions in Study 1, regardless of the structural differences in how and when they consumed their meals in the restaurants.

Study 1 Results

Multivariate Analysis

The multivariate model fit the data quite well indicating that customers' reactions to the tabletop device were connected to varying levels of why/how they liked the tabletop device and the tip they left for their server. For the *Effect on Experience* variable the Hotelling Trace Statistic was significant for the model (.02) with an F statistic of F (2, 668) = 6.96, p = .001, η^2 =

.02. Likewise, for the *Return Intent* variable, the Hotelling Trace Statistic was significant in the model (.05) with an *F* statistic of F (2, 668) = 15.83, $p < .001$, $\eta^2 = .05$. The interaction between *Effect on Experience* x *Return Intent* was also significant in the multivariate model (Hotelling Trace Statistic = .01, F [2, 669] = 4.02, $p = .02$, $\eta^2 = .01$). Correlations and descriptive statistics of the Study 1 variables are presented in Table 3. To further explain the significant multivariate effects in the model the between subject effects are detailed below.

Between Subjects Effects

Likeability. Restaurant customers' perceptions that the tabletop device improved their experience in the restaurant was significantly related to their *Likeability* of the tabletop device in the model (F [1,669] = 13.60, $p = .000$, $\eta^2 = .02$) showing that restaurant customers who reported that they liked the device overwhelmingly reported that the tabletop device improved their experience in the restaurant ($M = 3.85$, $SD = .71$, $N = 532$ and $M = 2.04$, $SD = 1.07$, $N = 141$, for improved experience and did not improve experience responses, respectively).

Restaurant customers' perceptions that the tabletop device influenced their desire to return to the restaurant was significantly related to their likeability of the tabletop device in the model (F [1,669] = 31.55, $p = .000$, $\eta^2 = .05$) indicating that restaurant customers who reported that they liked the device overwhelmingly reported that the tabletop device was connected to their desire to return to the restaurant ($M = 3.85$, $SD = .71$, $N = 543$ and $M = 1.88$, $SD = .93$, $N = 130$, for increased return intentions and decreased return intentions, respectively).

Effect on Experience x Return Intentions. For *Likeability*, the interaction effect for *Effect on Experience* x *Return Intentions* was significant in the model (F [1,669] = 8.05, $p = .005$, $\eta^2 = .01$), showing that when customers reported increased return intentions, their likeability of the

device was higher regardless of their reports of the device improving the experience in the restaurant. A graph of this interaction effect is presented in Figure 1.

Tip Percentage. Restaurant customers' perceptions that the tabletop device improved their experience in the restaurant was not significantly related to the percentage tip that they left for their server following the restaurant experience in the model (F [1,669] = .55, p = .46, η^2 = .001).

Restaurant customers' perceptions that the tabletop device influenced their desire to return to the restaurant was significantly related to the tip that they left for their server following the restaurant experience in the model (F [1,669] = .41, p = .52, η^2 = .001). Specifically, restaurant customers who tipped their servers more, reported that the tabletop device was connected to their desire to return to the restaurant (M = 16.15, SD = 4.64, N = 543 and M = 14.41, SD = 4.09, N = 130, for increased return intentions and decreased return intentions, respectively).

Effect on Experience x Return Intentions. Based on the nonsignificant relationship between *Tip Percentage* and *Effect on Experience* in the model above, the interaction effect for *Effect on Experience* x *Return Intentions* was not significant in the model (F [1,669] = .02, p = .88, η^2 = .000) for *Tip Percentage*.

Study 1 Discussion

The first study revealed a few notable findings. First, *Likeability* of the device, as presented here, was strongly connected to customers' reports of the device improving their experience in the restaurant with 79 percent of the respondents indicating the tabletop device improved their experience in the restaurant. Similarly, *Likeability* was strongly connected to

customers' reported behavioral intentions to return to the restaurant, with 80.70 percent of the respondents indicating they would return to the restaurant due to the technology. In response to Research Question 1a and 1b, these results indicate that the added layer of tabletop technology into the restaurant service experience has a positive effect overall on the guest experience with the reported positive features and outcomes outweighing the negative nearly three-to-one. The results for the connection between *Tip Percentage* and customers' reports of *Effect on Experience* and *Return Intent* were mixed. The test of Research Question 2a did not reveal a significant effect, showing that the customers' responses to the *Effect on Experience* question was not connected to the tip they left for their server. *Tip Percentage* in the test of Research Question 2b, was, however, significantly related to reports of *Return Intent*, showing that customers' reported behavioral intentions to return to the restaurant were associated with a higher tip of 1.75 percent of their bill. Lastly, the interaction effect between *Effect on Experience* and *Return Intent* was significant for *Likeability* showing that when *Likeability* is high, *Return Intent* is high regardless of their reports of *Effect on Experience*, showing that the connection between customers' *Likeability* and *Return Intent* is the key driver of the relationships tested here.

Study 2

Study 2 Control Variables

Party size. The average party size across the sample was 2.60 customers, ranging from 1 to 12. The One-away ANOVA with party size as the factor was significant for *Tip Percentage*: F (9, 660) =2.43, p =.000, showing smaller party sizes on average left a larger tip percentage for their server (r = -.13, p = .001). The relationship between party size and *Likeability* was not significant: F (9, 660) =.62, p =.79, showing no difference in device likeability across both

samples. Because the *Return Intent* and *Effect on Experience* questions were measured dichotomously we ran a X^2 test with each dichotomous variable treating party size as a factor to determine if there were significant differences across the party sizes. The test revealed no significant differences for *Return Intent* and *Effect on Experience* (X^2 [9] = 10.03, p = .35, X^2 [9] = 7.20, p = .62, respectively).

Meal duration. In this case, dining duration was negatively, but not significantly correlated with *Likeability* (r =-.04, p = .30) and was negatively and significantly correlated with tip percentage (r = -.09, p = .02), showing again that shorter dining times were connected to a larger tip for the servers. As with party size above, because the *Return Intent* and *Effect on Experience* questions were measured dichotomously we ran a *t-test* with each dichotomous variable as the grouping variable and meal duration as the dependent variable to determine if meal duration was connected to *Return Intent* and *Effect on Experience* . The t-tests revealed no significant differences for meal duration for both the *Return Intent* and *Effect on Experience* variables (t [668] = 1.56, p = .12; and t [668] = 1.10, p = .27, respectively).

Day of week. To check for any effects by day of the week we ran the Study 2 variables as dependent variables with day-of-the-week as the factor in a One-way ANOVA to determine if there were any effects. We found no significant effects for the study variables by day-of-the week for *Tip Percentage* (F [6, 663] = .87, p =.52) or *Likeability* (F [6, 663] = .89, p =.50). Because *Return Intent* and *Effect on Experience* questions were measured dichotomously we ran a X^2 test with each dichotomous variable treating the day-of-the-week as a factor to determine if there were significant differences across the days of the week. The test revealed no significant differences for *Return Intent* and *Effect on Experience* (X^2 [6] = 6.07, p = .42, X^2 [6] = 3.40, p = .76, respectively).

As with Study 1, the control variables revealed that a higher tip percentage was significantly connected to smaller party sizes and shorter meal durations. No other Study 2 variable was significantly connected to the operating characteristics identified above, showing the customers in the restaurants responded similarly to the study questions across the sample, regardless of the structural differences in how and when they consumed their meals in the restaurants.

Study Two Results

Multivariate Analysis

The multivariate model fit the data quite well indicating that customers' reactions to the tabletop device were connected to varying levels of why/how they liked the tabletop device and the tip they left for their server. For the *Effect on Experience* variable the Hotelling Trace Statistic was significant in the model (.07) with an *F* statistic of F (2, 665) = 23.16, p = .000, η^2 = .07. Likewise, for the *Return Intent* variable, the Hotelling Trace Statistic was significant in the model (.05) with an *F* statistic of F (2, 665) = 17.65, p = .000, η^2 = .05. The interaction between *Effect on Experience* x *Return Intent* was also significant in the model (Hotelling Trace Statistic = .01, F [2, 665] = 3.38, p = .04, η^2 = .01). Correlations and descriptive statistics of the Study 2 variables are presented in Table 4. A discussion of the specific effects in the multivariate model are discussed below.

Between Subjects Effects

Likeability. Restaurant customers' perceptions that the tabletop device improved their experience in the restaurant was significantly related to their likeability of the tabletop device in the model (F [1,666] = 45.90, p < .000, η^2 = .06) and showed that restaurant customers who reported that they liked the device also reported that the tabletop device improved their

experience in the restaurant (*M* = 3.83, *SD* = .76, *N* = 533 and *M* = 1.96, *SD* = 1.14, *N* = 137, for improved experience and did not improve experience responses, respectively).

Restaurant customers' perceptions that the tabletop device influenced their desire to return to the restaurant was significantly related to their likeability of the tabletop device in the model (F [1,666] = 28.12, $p < .000$, $\eta^2 = .04$) and revealed that restaurant customers who reported that they liked the device reported that the tabletop device was connected to their desire to return to the restaurant (*M* = 3.80, *SD* = .80, *N* = 559 and *M* = 1.71, *SD* = 1.01, *N* = 111, for increased return intentions and decreased return intentions, respectively).

Effect on Experience x Return Intentions. As in Study 1, for *Likeability*, the interaction effect for *Effect on Experience* x *Return Intentions* was significant in the model (F [1,666] = 6.48, $p = .01$, $\eta^2 = .01$), showing that when customers reported increased return intentions, their likeability of the device was higher regardless of their reports of the device improving the experience in the restaurant. Figure 2 provides a visual representation of the interaction effect.

Tip Percentage. Restaurant customers' perceptions that the tabletop device improved their experience in the restaurant was not significantly related to the percentage tip that they left for their server following the restaurant experience in the model (F [1,666] = .16, $p = .69$, $\eta^2 = .00$).

Restaurant customer's perceptions that the tabletop device influenced their desire to return to the restaurant was significantly related to the tip that they left for their server following the restaurant experience in the model (F [1,666] = 6.01, $p = .01$, $\eta^2 = .009$) showing that restaurant customers who tipped their servers more, reported that the tabletop device was connected to their desire to return to the restaurant (*M* = 15.94, *SD* = 4.72, *N* = 559 and *M* =

13.01, *SD* = 3.54, *N* = 111, for the increased return intentions and decreased return intentions, respectively).

Similar to Study 1, because of the nonsignificant relationship between *Tip Percentage* and *Effect on Experience* described above, the interaction effect for *Effect on Experience* x *Return Intentions* was not significant in the between subjects model (F [1,666] = .19, p = .66, η^2 = .000) for *Tip Percentage*.

Study 2 Discussion

The second study was conducted to offer a confirmation of the findings from Study 1. To do so we collected responses from a different set of customers from nine other restaurants in the company. With Study 2 we were able to replicate the results of the first study, showing that the variables we measured consistently captured consumers' reactions to the device, how it was connected to their experience in the restaurant, and their behavioral intentions to return to the restaurant. Specifically, we confirmed that *Likeability* was connected to customers' reports of the tabletop device improving their experience in the restaurant (Research Question 1a) and *Likeability* was strongly connected to customers' reported behavioral intentions to return to the restaurant (Research Question 1b) showing that the added layer of tabletop technology into the restaurant service experience has a positive effect overall on the guest experience with the reported positive features and outcomes outweighing the negative nearly three-to-one across both studies (see Table 1); the interaction effect between *Effect on Experience* and *Return Intent* for *Likeability* confirms the central role that *Likeability* and *Return Intent* play in consumers' reactions to new technology. As in Study 1, *Tip Percentage* was only significantly connected to

Return Intent, suggesting that *Tip Percentage* is a less potent measure of customers' specific reactions to this technology layered into the restaurant experience.

General Discussion

With the increased prevalence of technology in service-based organizations, this paper extends the current research on technology use and adoption by testing the impact of layering new customer-facing technology into a traditional service setting. Using two samples of restaurants and their customers, we examined how a new technology influenced customers' perceptions and behavior extending the boundaries of *UTUTAT2*, *Role Theory*, and *Script Theory*. Below we will first discuss the practical implications of our findings, move into a discussion of the theoretical implications, and conclude with a discussion of our studies' limitations and our suggestions for future research in this area.

Practical Implications

Across both studies over 70 percent of the customers who used the tabletop device during their meal reported positive affect toward the device with approximately 79 percent of customers reporting that the tabletop device improved their experience in the restaurant. Most importantly, from a behavioral standpoint over 80 percent of the customers who used the device reported that they would return to the restaurant (see Table 1). The interaction effects presented in Figure 1 and Figure 2 confirm a strong connection between *Likeability* and *Return Intent* highlighting the connection between customers' affect toward technology and repurchase or reuse intentions (Vinkatesh, et al., 2012). These findings extend the existing research on technology in service episodes by measuring elements of consumer behavior specifically connected to the use of customer-facing technology, actual purchasing behavior (i.e., a POS transaction), and return

intentions. Our dependent variables— *Likeability* of the device and *Tip Percentage*—were positively and significantly correlated with customers' reports of the tabletop devices showing a positive effect on their experience in the restaurant and their desire to return to the restaurant, wholly consistent with a study reported by the National Restaurant Association where consumers responded favorably to the addition of technology in restaurant experiences, such that 79 percent of customers reported that technology options increase convenience and 70 percent indicated that technology options speed up service and improve order accuracy (NRA 2014). *Tip Percentage* was not, however, as strongly connected to reports of an improved restaurant experience due to the use of the technology. In hindsight, this might be expected as gratuities are normally associated with the guests' reactions to the service delivery, not specific elements of the environment such as a layer of technology or other restaurant design features.

Our findings build on the existing research on self-service technology and order to payment systems by measuring and explicating elements of consumer behavior specifically connected to the use of an added layer of customer-facing technology (cf. Collier and Kimes 2013; Dia and Salam 2014; Farquhar and Rowley 2009; Tan, Benbasat, and Cenfetelli 2013). It is important to note that this technology does not replace the need for a server in the restaurants; the technology increases the potential of the customer to further participate in the co-creation of the service experience and offers those who are willing to use the devices another dimension to their service experience. This is an important distinction from previous studies of this type.

What we found was that while the large majority of customers found the tabletop devices to be a useful addition to the service experience, slightly more than 20 percent did not. This group of customers should not be ignored; our findings provide some insight into how to deal with customers who are less keen on the using the technology. First, in full service restaurant

settings (or any service-based setting for that matter) operators need to be sure that their espoused service standards remain in force as noted in the service process (Susskind, et al. 2003). That requires service staff to determine, in each and every service transaction, exactly to what extent their customers are interested in using the layer of technology and offering them support to use it effectively.

From our studies it was clear that the customers who reported they did not like the tabletop device, either for reasons of affect or due to some element of functionality, should be given the option to not use the technology or to discontinue its use at any point in the service episode before any negative affect begins to take its toll. This will require operators to train their staff to monitor each customer transaction to ensure that the customers get the service they expect, regardless of their involvement with the technology. While our data shows that a minority of users did not like the tabletop technology, it is important to also recognize that a learning curve may take place over time with the adoption of the technology (Heidenreich, Wittkowski, Handrich, and Falk 2014; Heidenreich and Handrich 2015). Wang, Harris, and Patterson (2013) found that over time, customers will get familiar with customer-facing technology, learn how to use it, see the benefits from it, and become satisfied with it. Once satisfied with the technology they will use it regularly (habitually). A similar example of this adoption phenomenon in practice comes from the airline industry. About 15 years ago airlines started to introduce self-check-in kiosks at airports. When they rolled out these systems, they had staff standing by to assist passengers and walk them through the process of self-check-in. This extra attention, early on, helped build self-efficacy of the passengers, which then led to satisfaction, which then led to habit (much like what Wang, et al. 2013 demonstrate). Just as you would train service providers to identify customers who are not comfortable using the

technology as noted above, it is also useful to offer extra support to customers to ensure you do not lose users or potential users for the wrong reasons. Remember at airports today you can still buy a ticket at the counter and check in without using any self-service technology; however, in two recent studies of global travelers, fifty percent of passengers reported that they desired more self-service options (beyond just checking in) and seventy three percent of customers reported that they would be more likely to choose a service provider who offered them greater control over their travel through self-service technologies (Koronowski 2011). These recent findings highlight the differences between service content (what is available) and service delivery (how you receive it) (Scherer, Wunderlich and Wangenheim 2015; Tan et al. 2013).

Theoretical Implications

Through our two studies we were able to add to the theory in the area of self-service technology use and adoption in three main ways. First, we were able to extend the boundary conditions of *UTAUT2*, *Script Theory*, and *Role Theory* by examining the influence of a new technology type that is used in a new context or in a new way (Alvesson and Karreman 2007; John 2006). In this case we examined customers' reactions to a layer of technology added to a traditional service experience. In contrast to previous studies in this domain—such as Venkatesh, et al. 2012 who examined a standalone technology or a technology that is designed to replace an existing technology— we uncovered how elements of *UTAUT2*, *Script Theory*, and *Role Theory* applied to this new technology. As the first study of its kind, we found that layers of technology added to a traditional service experience required the users to rethink/confirm their existing expectations and beliefs as they co-created and navigated through their service experiences.

Second, through the collection of open-ended responses from our study participants we were able to test the presence or absence of *UTAUT2, Script Theory*, and *Role Theory* dimensions among users. This data collection approach differed from other studies in this area because our study participants were asked an open-ended question to gauge their perceptions of the technology, rather than a set of scaled questions to represent each dimension or element of a model. Specifically, we found that this layer of technology differentially affected the service scripts that customers use in full-service restaurants and the roles they take and assign to their service providers (some positively and some negatively). From one viewpoint, customers reported that the addition of the tabletop technology changed or modified their service experience by adding convenience, saving time, offering a sense of security, and/or making the experience more pleasurable and enjoyable. These positive reactions highlighted changes or shifts in customers' expected service scripts and the roles that they play along with their servers in co-creating a service experience; that is customers willingly accepted modifications to existing scripts and roles. Conversely, in some cases customers reported that they missed the traditional interaction with servers, did not like having to order and pay for elements of their meal, and found the technology interfered with their service experience. All of these reported negative reactions represent a violation of the expected/traditional scripts and roles on which customers rely and a rejection of the script and role changes introduced through the technology (Heidenreich et al., 2014; Heidenreich and Handrich 2015).

Lastly, consistent with accepting or rejecting script and role changes, we also found that all of the elements from *UTAUT2* emerged through our two studies (except for age and sex which we could not measure in this study). Through the customers' positive and negative open-ended responses we were able to confirm the presence of the elements of performance

expectancy, effort expectancy, facilitating conditions, social influence, price-value relationship, hedonic motivation, and experience and habit. These findings highlight how existing theory can be applied to a new context and capture elements that were (and were not) congruent with customers' perceptions; representing an import step in the theory development process.

Limitations, Suggestions for Future Research, and Conclusion

While this study offers insights into how an added layer of technology affects the service dynamic, it comes with a few limitations. First, these two studies were conducted using 20 units from a single multiunit restaurant company. The size of both samples was large enough to provide confidence in any statistical conclusions we draw here, but the generalizability of these findings is limited. Full-service restaurants represent a common type of service organization in our economy, but differ from other types of service-based organizations. Future research should look at how customer-facing technology and increased customer participation in service experiences in other restaurant companies and other service-based businesses is connected to desirable outcomes for the customer, the employees, and the business as a whole. Second, due the nature of the secondary data we examined, there were several variables we would have liked to measure, but could not. Specifically, we would have been interested in looking at customers' socio-demographics, customers' evaluation of other parts of the restaurant experience, such as the food, service delivery, ambiance, and servers' reactions to the technology, the customer experience, and their work as servicer providers. Lastly, the questions asked of the customers were not created by us (the researchers), therefore several of the questions were not asked in an ideal fashion for academic research. For example, the questions on return intentions and effect on experience were asked in a binary fashion; we could have captured more variance using scale-based measurement with these variables instead. These additional pieces of information and

improvements to the data collection process will likely add richness to the interpretation of the findings we present here and further expand our understanding of the influence of self-service technology on the customer experience.

In conclusion, as customer participation in service experiences and the related use of technology becomes more prevalent in service-based experiences, business owners, their staff and their customers should continue to learn more about how technology can be used to add value to service experiences.

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Table 1

Frequency of Responses for the Categorical/Interval Study Variables for Study 1 and Study 2

Study 1:
Categories of Likeability

	Frequency	Percent
Overall Dissatisfaction	54	8.00
Dissatisfaction with a specific aspect	104	15.50
Neutral/Mixed	36	5.30
Satisfaction with a specific aspect	432	64.20
Overall Satisfaction	47	7.00

Improve Experience

	Frequency	Percent
No	141	21.00
Yes	532	79.00

Return Intention

	Frequency	Percent
Decrease	130	19.30
Increase	543	80.70

N= 673

Study 2:
Categories of Likeability

	Frequency	Percent
Overall Dissatisfaction	73	10.90
Dissatisfaction with a specific aspect	82	12.20
Neutral/Mixed	35	5.30
Satisfaction with a specific aspect	430	64.20
Overall Satisfaction	50	7.50

Improve Experience

	Frequency	Percent
No	137	20.40
Yes	533	79.60

Return Intention

	Frequency	Percent
Decrease	111	16.60
Increase	559	83.40

N= 670

Table 2 – Samples of Customers Likeability Statements by Category

Category 1 – Overall Dissatisfaction
"I did not like the time it took away from my conversation with my friends."
"I honestly didn't pay attention to it, y'all kinda need to get over yourselves."
"In the way on the table and didn't show my free birthday bowls so had to pay for mine, money could've been better spent by hiring an assistant at the food bar."
"It takes longer to use this then asking the server."
"Do not like it, would prefer to have the waiter come take my order."
"I prefer having human contact. I don't enjoy engaging a machine when I could speak to a person."
Category 2 – Dissatisfaction with a Specific Aspect
"I dislike the fact that I was charged for the games. I didn't realize it was charging me until I had already used it. It won't happen again!"
"Waitress said that they worked "sometimes"
"Did not notify of initial game charge."
"I didn't like the way the picture showed how to scan a credit card. It took several tries before getting it right. I would think about reviewing the picture demonstration."
"It's a pain to have to give your reward card to the server while sliding your credit card through a separate machine. If the device can't read my reward card, I'd rather just give both to my server and let them handle everything."
"Did not figure taxes correctly on the receipt."
"Needs to be direction that this is the way we order."
Category 3 Neutral/Mixed
"Didn't know what it was at first, but like being able to pay the bill when I was ready to leave."
"It made payment easier and I did not have to give my card to a stranger. I dislike how distracting the display is."
"It is relatively easy to use. I had a little trouble ordering a dessert as I didn't realize I had missed the last step to actually order it until I went back to look at the ticket. I was able to finish our order, other than that it was fine."
"I like the fact that we were able to place an order, see your ticket and pay. I did not like the fact that we got charged for the games played."
"I liked how simple and easy it was to use. I disliked the small card swipe. It felt weird putting my card in halfway instead of the whole way through."
Category 4 – Satisfaction with a Specific Aspect
"Being able to split the bill was easy. Nothing to dislike."
"Easy payment and ordering; no need to wait for waiters in rush time."
"Convenience."
"Better control about your bill."
"It's very convenient."
"It was Easy to use. Splitting the check saved me time and money ordering."
"It was easy to use."
"That I didn't have to leave my table to pay my ticket."
"That I could pay when I was ready and not wait for the waitress to bring us the check."
Category 5 – Overall Satisfaction
"I loved it. It made our first experience at the restaurant even better."
"Fun to use, easy to see options available from the restaurant."
"It was so fun and the games were awesome."
"My girl and I loved it; the games were fun and I really like the way to pay with the tablet."
"Incredible technology."
"I loved the tablet. What an ingenious idea."
"Yes, it was great."
"Loved how easy and convenient it was to use."
"It was very user friendly. I love how it was easy to understand. It didn't take me long to figure out how to pay for my food at all."
"It was really cool to have at the table. It made the wait really interesting. Really fun games."
"It was fun to be able to play games at the table while waiting on the order."
"LOVED how fast I could pay after eating."

Table 3

Study 1: Correlations and Descriptive Statistics of the Study Variables

	M	SD	(1)	(2)	(3)	(4)
(1) Effect on Experience [a]	1.79	.41	-			
(2) Return Intent [b]	1.81	.39	.91**	-		
(3) Likeability	3.47	1.09	.68**	.71**	-	
(4) Tip Percentage	15.82	4.60	.15**	.15**	.14**	-

Notes:
[a] "Decrease" was coded as 1, "Increase" was coded as 2;
[b] "No" was coded as 1, "Yes" was coded as 2;
** Correlation is significant p =.01 level (2-tailed);
N=673 from 11 restaurants

Table 4

Study 2: Correlations and Descriptive Statistics of the Study Variables

	M	SD	(1)	(2)	(3)	(4)
(1) Effect on Experience [a]	1.80	.40	-			
(2) Return Intent [b]	1.83	.37	.82**	-		
(3) Likeability	3.45	1.14	.67**	.68**	-	
(4) Tip Percentage	15.45	4.67	.19**	.23**	.13**	-

Notes:
[a] "Decrease" was coded as 1, "Increase" was coded as 2;
[b] "No" was coded as 1, "Yes" was coded as 2;
** Correlation is significant p =.01 level (2-tailed);
N=670 from 9 restaurants

Table 5

Correlations and Descriptive Statistics of the Study Variables with Both Samples Combined

	M	SD	(1)	(2)	(3)	(4)
(1) Effect on Experience [a]	1.79	.41	-			
(2) Return Intent [b]	1.82	.38	.87**	-		
(3) Likeability	3.46	1.11	.67**	.66**	-	
(4) Tip Percentage	15.63	4.64	.17**	.18**	.14**	-

Notes:
[a] "Decrease" was coded as 1, "Increase" was coded as 2;
[b] "No" was coded as 1, "Yes" was coded as 2;
** Correlation is significant p =.01 level (2-tailed);
N=1343 from 20 restaurants.

Figure 1

Study 1 Interaction Effects for *Likeability* with *Effect on Experience* x *Return Intentions*

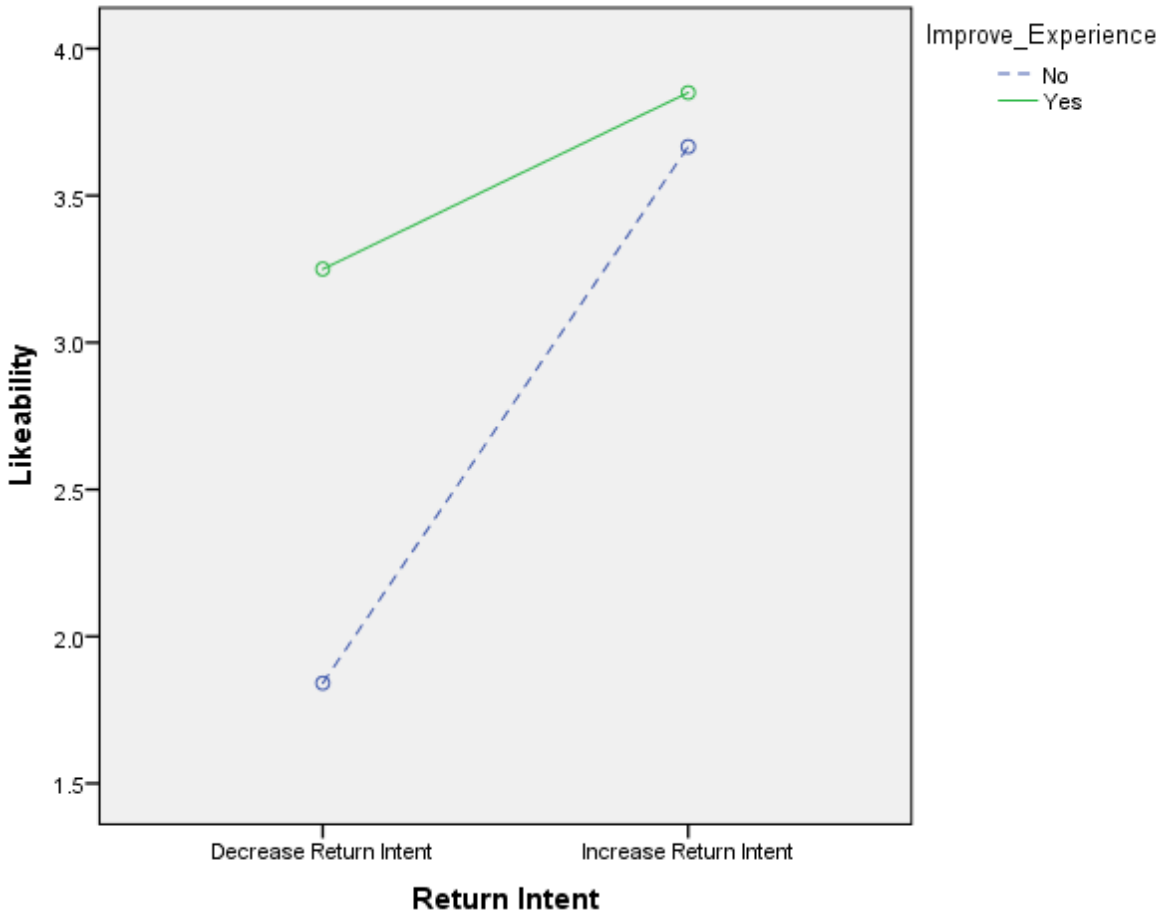

Figure 2

Study 2 Interaction Effects for *Likeability* with *Effect on Experience* x *Return Intentions*