

ENVIRONMENTAL PSYCHOLOGY AS A COMPLEMENT TO
RESTAURANT REVENUE MANAGEMENT: EFFECTS ON
MEAL DURATION AND TABLE TURNS

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ABSTRACT

Environmental psychology complements restaurant revenue management. This paper reviews the literature on restaurant revenue management and environmental psychology. Hypotheses are derived and tested on the effects of environmental cues on meal duration and table turns. The results of a survey of 153 restaurants show that environmental cues such as music, lighting, and color significantly affect meal duration and table turns. Implications of environmental psychology for small business owners/managers are discussed.

INTRODUCTION

Revenue management developed in the airlines as yield management (Cross, 1997). It involves the management of demand in order to maximize sales revenues from existing capacity (Cross, 1997). It has spread to other industries and is widely used in the communication, hotel, and shipping industries (McGill and Van Ryzin, 1999). Revenue management also can be applied in small business. Kimes et al. (1998) developed a framework for applying revenue management in restaurants. It involves methods which present customers with cues that affect their meal duration i.e., the time that they spend seated at a table in a restaurant. The net effect of these methods is to reduce and make meal duration more predictable and to increase the number of table turns. This allows a restaurant to seat more customers in a given period of time and thus to increase revenue generation.

Environmental psychology complements restaurant revenue management as a tool that owners/managers of restaurants can use to affect meal duration and table turns. Environmental psychology is based on a stimulus-organism-response (SOR) framework and examines how stimuli elicit behavioral responses. It has been applied in retail stores to study the effects of the physical context of a business acting as a cue that affects customers' behavior. There is no large sample empirical evidence on the effects of environmental psychology on meal duration and table turns in restaurants.

The purpose of this study is to examine whether environmental psychology in the form of cues such as lighting, colors, and music would have significant effects on meal duration and table turns in restaurants. This paper reviews the literatures on restaurant revenue management and

environmental psychology to derive hypotheses. Next, the results of a survey that tests the hypotheses are presented. Lastly, the implications of these results for small businesses are discussed.

LITERATURE REVIEW

Revenue management manages demand in order to maximize sales revenues from a business's existing capacity (Kimes and Chase, 1998; Cross, 1997). There are several conditions that facilitate the practice of revenue management in a business. First, a business's outputs should be perishable (Weigand, 1999). For example, the airlines have a perishable product (i.e., a flight on a given date and time to a given destination flies only once). Second, a business should have primarily fixed capacity (Weatherford and Bodily, 1992). For example, the airlines have fixed capacity in their investment in their fleet of airplanes. Given fixed capacity, one means that small businesses might use to improve profitability is to increase the amount of revenue generated from fixed capacity.

A framework for applying revenue management in restaurants has been developed (Kimes et al., 1998). Restaurants have perishable outputs, i.e., the time that a seat can be filled by a customer, and they have fixed capacity that is difficult to expand, i.e., the number of seats (Kimes et al., 1998). The framework proposes methods restaurants can use to manage their demand and pricing in order to maximize revenues. One method for managing demand is to manage meal duration (Kimes, Barrash, and Alexander, 1999). Meal duration is the length of time that a customer occupies a seat in a restaurant. A restaurant can establish standard operating procedures that, among other things, present customers with cues in an effort to control the time that customers spend at a table. For example, during busy periods, waiters may clear a customer's table as soon as the customer finishes his or her entree and present the customer with the check. This standard operating procedure functions as a cue to discourage customers from lingering at their tables (Kimes et al., 1998). Predictable meal duration facilitates decision making with respect to reservations and seating. A smaller variance in meal duration facilitates the ability of the restaurant's owner/manager to predict actual meal duration. Information about meal duration is useful in deciding which reservations to accept and at what times to accept them. Further, meal duration information supports better seating decisions (e.g., which parties to seat and when they should be seated). Meal duration information can be used to take actions to minimize the time that seats in a restaurant sit empty. These actions will function to increase the revenue that a restaurant generates from its fixed capacity. Further, decreasing meal duration allows a restaurant to serve more customers in a given period of time, which in turn increases revenue generation.

The rate of revenue generation from fixed capacity in restaurant can be measured by revenue per available seat hour (Kimes, 1999; Kimes et al., 1998). Revenue per available seat hour is equal to the revenue generated over a given period of time divided by the number of seat hours available during that same time period (Kimes, 1999). This measure provides an indicator of the rate at which revenue is being generated from existing capacity. As table turns increase and meal duration decreases, revenue per available seat hour increases (Kimes, 1999).

Another method that may affect table turns and meal duration and thus function as a complement to restaurant revenue management is the application of environmental psychology to restaurants. Environmental psychology applied to business has been labeled as atmospherics (Turley and

Milliman, 2000). As such it has been defined as the intentional control and structuring of environmental cues (Kotler, 1973). Atmospheric addresses the role of environmental cues (i.e., the physical context) of a service setting in which consumption takes place such a retail store. The environmental cues of a business can be classified into external variables (e.g., size, color of building, entrances, signs), interior variables (e.g., color schemes, lighting, music, cleanliness), layout and design variables (e.g., space design and allocation, waiting areas, traffic flow), and point -of-purchase variables (e.g., displays, signs) (Turley and Milliman, 2000).

Environmental psychology is based on a stimulus-organism-response (SOR) perspective (Mehrabian and Russell, 1974). Stimuli from the environment give rise to primary emotional responses in people. These primary emotional responses then give rise to behavioral responses. Behavioral responses are classified as either approach or avoidance. In a retail context, approach behavioral responses are behaviors such as desire to stay, explore the environment, and communicate with others (Bitner, 1992; Donovan and Rossiter, 1982). Avoidance responses are behaviors such as desire to leave, remain inactive in an environment, and avoid interaction with others (Bitner, 1992; Donovan and Rossiter, 1982). These behavioral responses in a retail setting may influence the amount of time and money customers spend in a store (Donovan and Rossiter, 1982).

Empirical research has provided evidence on the affects of the environmental cues of retail businesses on customers' behavioral responses. Interior and layout and design variables affect customers' behaviors. Up beat music resulted in significantly faster shopping traffic flow times in a supermarket than slower tempo music (Milliman, 1982). Background music significantly affected the time and money customers spent in a wine store located within a restaurant (Areni and Kim, 1993).

The interior variable of lighting affects customers' behavior. Brighter lighting was associated with significantly higher levels of handling and examining merchandise in a wine store than with softer lighting (Areni and Kim, 1993). Colors also provide a stimulus that affects customers' behavior. In general, warm colors (e.g., red, yellow) stimulate higher levels of arousal than cool colors (e.g., green, blue). A blue colored store had a higher simulated purchase rate than a red store (Bellizzi and Hite, 1992).

Environmental psychology can be applied to complement revenue management to affect table turns and meal duration and hence revenue per available seat hour. Variables related to the physical context of a restaurant can be used as cues to influence customers' behaviors. For example, a restaurant with a layout and design such as a kitchen that is open to the view of customers provides a stimulus that can contribute to higher levels of primary emotional response in customers (Roboson, 1999). A primary emotional response may result in either approach or avoidance behaviors that may influence the time that customers take to complete their meal. Similarly, interior variables in a restaurant such as lighting, music, and colors may elicit approach or avoidance behaviors (Roboson, 1999). These relationships between cues and behavioral responses may be different in most restaurant settings than in retail settings because dining is different than shopping. For instance, bright lights elicit an approach behavior in retailing but would be assumed to elicit an avoidance behavior in restaurants.

In a field study located in a single restaurant, Milliman (1986) found that customers spent significantly more time at their tables and more money on bar drinks while listening to slow music than while listening to fast music. Thus, from a restaurant revenue management perspective, both meal duration and number of table turns will be affected.

For purposes of this research, high levels of environmental cues were defined as bright lights, bright colors, loud music, fast music, open kitchen design, and a noisy setting.

Hypothesis One: Higher levels of environmental cues will be negatively associated with meal duration.

Hypothesis Two: Higher levels of environmental cues will be negatively associated with the range of meal duration.

Hypothesis Three: Higher levels of environmental cues will be positively associated with the number of table turns.

METHODS

The sample used in this survey research was generated from a list of 949 full service restaurants provided by a New England state chapter of the National Restaurant Association. Each restaurant was given a number and a sample of 589 restaurants was then drawn through the use of a table of random numbers. The data were collected by the use of a semi-structured questionnaire. The questionnaire mailing methods are based on Dillman (2000) Total Design Method procedures with four timed, hand-signed mailings. Five hundred and eighty-nine questionnaires were mailed. A total of 254 replies were received for an overall response rate of 43%. Of the 254 responses, 153 were usable responses from full service restaurants. No evidence was found that there were any significant differences between early and late responders.

Measures

The full service status of a restaurant was measured through a question that asked respondents if their restaurant was a full service restaurant. The question used the definition of a full service restaurant from the 1997 U.S. Economic Census (U.S. Census Bureau).

Questionnaire items for environmental cues were generated from literature in environmental psychology and used seven point response scales. The stem used for these questionnaire items was "Please indicate for each of the following which best describes your main dining area". The item responses were factor analyzed (Principal Components with Oblimin rotation) and a two-factor solution explained 62% of the variance. The scale for the variable Interior Layout (Eigenvalue = 2.3, Cronbach's alpha = .60) included four items: Lighting (anchors "Bright room lighting" & "Intimate table lighting"), Colors (anchors "Bright colors" & "Subdued colors"), Kitchen open (anchors "Open kitchen" & "Hidden kitchen"), and Noise (anchors "Noisy" & "Quiet"). The scale for the variable Music (Eigenvalue = 1.4, Cronbach's alpha = .82) included two items: Level (anchors "Soft music" & "Loud music") and Pace (anchors "Slow music" & "Fast music").

Respondents provided the information for the dependent variables the number of table turns and meal duration in open-ended questions. Respondents were asked the number of table turns that their restaurant had in a typical weekend dinner period. Respondents were asked the length of meal duration they considered to be typical short, average, and long meal durations in their restaurants. The variable Range of Meal Duration was computed by subtracting short meal duration from long meal duration. The range of meal duration was used as a surrogate measure for the variance of a restaurant's meal duration time.

RESULTS

Sixty-seven percent of the sample was male and 33% was female. The average age of the restaurants was 3.3 years with average sales in 2002 in the \$600,000 to \$799,000 range. The average number of seats in the sample of restaurants was 124, serving an average of 182 dinners with an average of 4.7 paid employees. Descriptive statistics for the dependent and independent variables are shown in Table 1.

Table one about here

The hypotheses were tested using simple regression. Hypothesis one, higher levels of environmental cues will be negatively associated with meal duration, was partially supported. The variable Interior Layout was not significantly associated with average meal duration (3.10, $p = .09$), see table 1 panel A. Music was significantly and negatively associated with average meal duration (7.54, $p = 00$) with an adjusted R^2 of .06, see table 2 panel A.

Table two about here

Hypothesis two, higher levels of environmental cues will be negatively associated with the range of meal duration, was partially supported. The variable Interior Layout was significantly and negatively associated with the range of meal duration (4.00, $p = .05$) with an adjusted R^2 of .11, see table 2 panel B. Music was not significantly associated with meal duration, see table 2 panel B.

Hypothesis three, higher levels of environmental cues will be positively associated with the number of table turns, was partially supported. The variable Interior Layout was significantly and positively associated with the number of table turns (6.62, $p = .01$) with an adjusted R^2 of .13, see table 2 panel C. Music was not significantly associated with table turns, see table 2 panel C.

DISCUSSION AND CONCLUSIONS

There has been no prior large sample empirical evidence on the effects of environmental psychology in a restaurant setting. This study provides evidence that environmental cues are

complementary to restaurant revenue management strategies. Specifically, environmental cues can be employed to help reduce the variation in and length of meal duration and to increase table turns.

All of the hypotheses in this study were supported by the findings; however, the detailed results provide insight regarding specific cues that affect the revenue management variables of meal duration and table turns. Brighter lights and colors, an open kitchen, and a noisier setting (i.e., Interior Layout) did not appear to affect average meal duration but they did serve to decrease the range of meal duration and they increased the number of table turns. A decrease in the range or variance in meal duration facilitates restaurant owners predicting the value of actual meal duration. This information increases the accuracy of predictions of table availability for reservation decisions. A higher frequency of table turns means that more customers can be served given the fixed capacity of a finite number of tables in a restaurant.

Increases in the volume and tempo of music (i.e., Music) appeared to have different effects from those of Interior Layout. While louder and faster paced music decreased average meal duration, it did not seem to affect the variance in mealtime (i.e., range) or the number of table turns. With respect to meal duration, however, the effect of Music was smaller in magnitude than the effect of Interior Layout on the other dependent variables, range of meal duration and table turns, suggesting that Interior Layout may be a more important factor in restaurants. Future studies should examine the interior layout cues and musical cues to explore possible relationships with other factors such as type of restaurant, etc.

Implications for Practice (“so what?”)

In practice, this study confirms that owners and managers of a restaurant should examine the fit between their goals for table turns and meal duration and the environmental cues present in their restaurant. They may be able to change certain aspects of their business such as the color, lighting, and music to better fit their goals. At the margin, they may be able to reduce meal duration and increase table turns to increase their sales revenue while not decreasing their customers' level of satisfaction.

In fact, environmental psychology presents small business owners and managers of any type small business with an opportunity to improve their revenue management practices. The owner/manager should walk up to the front door of his or her business, and step inside while observing how the environmental cues of his/her business may stimulate customers. Do the physical surroundings present customers with cues that stimulate them to come in, stay, and explore the services and merchandise, and spend money? Do these cues and the business's goals for customer service times match, i.e., are cues signaling customers to leave when the business wants them to linger (e.g., a bookstore)? Adopting the perspective of a customer and continually seeking input from customers and front line associates regarding the effectiveness of various levels of environmental cues are critical activities for the small business owner.

Small business owners/managers should use a checklist consisting of external items (e.g., size, color of building, entrances, signs), interior items (e.g., color schemes, lighting, music, cleanliness), layout and design items (e.g., space design and allocation, waiting areas, traffic

flow), and point-of-purchase items (e.g., displays, signs). They should then assess the match between business goals for customer service times (e.g., desire customers to linger, such as in a bookstore, or to pass through quickly, such as in a convenience store) and the use of environmental cues (e.g., lighting, music, colors). In this way, the physical context and environmental cues provided by a business setting become more than just upkeep but a means of attracting customers and an opportunity to improve the business.

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Table 1
Descriptive Statistics for the Dependent and Independent Variables

Variable	Theoretical Range	Actual Range	Mean	Median	Standard Deviation
Average Meal Duration	NA	15.00 - 150.00	64.01	60.00	28.83
Number of Table Turns	NA	0.50 - 19.00	3.10	3.00	3.00
Range of Meal Duration	NA	20.00 - 190.00	58.67	50.00	31.39
Interior Layout	1.00-7.00	1.00 - 7.00	2.88	2.75	1.31
Music	1.00-7.00	1.00 - 7.00	3.20	3.25	1.44

Table 2
Simple Regression Analysis

Panel A: Dependent Variable - Average Meal Duration

Independent Variables	Regression Coefficient	t for coefficient	F for Equation	Adj R ²
Interior Design	-.28	-1.76*	3.10*	.05
Music	-.25	-2.75***	7.54***	.06

Panel B: Dependent Variable - Range of Meal Duration

Independent Variables	Regression Coefficient	t for coefficient	F for equation	Adj R ²
Interior Design	-.32	-1.99**	4.00**	.11
Music	-.02	-0.20	0.41	.00

Panel C: Dependent Variable - Number of Table Turns

Independent Variable	Regression Coefficient	t for Variable	F for Equation	Adj R ²
Interior Design	.39	2.57***	6.62***	.13
Music	.15	1.62	2.61	.02

Level of significance *** = $\leq .01$; ** = $\leq .05$; and * = $\leq .10$