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Guests' Reactions to In-Room Sustainability Initiatives: An Experimental Look at Product Performance and Guest Satisfaction

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Keywords
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Article

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As green initiatives and sustainability continue to become a larger part of the discussions regarding hotel design, hotel development, and hotel operations, it is important to take into account guests' reactions to hotel design and guests' desire for and reaction to sustainable, or green, initiatives in hotels. Studies dating back less than a decade have explored the financial impact of sustainable initiatives in hotels and have reported mixed results on the direct financial benefit for hotel developers and operators (Butler 2008; Clavier-Cortes et al. 2007; Singal 2014). That said, I have seen several studies showing that using green technologies in hotels can have a long-term positive impact on a firm's bottom line (Butler 2008; Nicholls and Kang 2012; Segarra-Ona et al. 2012; Zhang, Joglekar, and Verma 2012a, 2012b; Zhang et al. 2014), and a connection has been shown between a firm's financial performance and its engagement in sustainability initiatives (Singal 2014). As the cost of green technologies continues to decrease and economies of scale kick in for operations, production, and construction, the adoption decisions for many firms are now more straightforward (Nicholls and Kang 2012; Sanchez-Ollero, Garcia-Pozo, and Marchante-Mera, 2014; Zhang, Joglekar, and Verma 2012a, 2012b). This is the case because more recent studies have shown that firms perform better in the long run when they adopt and use sustainability initiatives and track and report on their progress and outcomes (Clavier-Cortes et al. 2007; Cvelbar and Dwyer 2013; Mihalič, Žabkar, and Cvelbar 2012; Segarra-Ona et al. 2012; Singal 2014).

A Look at Sustainability in Action

Research on sustainability can be classified on the following three dimensions: economic, environmental, and social (Cvelbar and Dwyer 2013; Mihalič, Žabkar, and Cvelbar 2012). As alluded to above, each dimension has costs and benefits for firms, consumers, and the environment in both the short and long term.

Economic Factors

Common economic factors that are examined are revenue, profit or margin, return on assets or investment, debt ratios, cash flow, and hotel-specific metrics such as RevPAR, occupancy, credit rating, and room rates (Cvelbar and Dwyer 2013; Mihalič, Žabkar, and Cvelbar 2012; Singal 2014). Much of the research has focused on modeling, benchmarking, and creating frameworks for strategic resource allocation decisions to analyze and quantify the input–output relationship behind sustainability initiatives in the hotel sector (cf. Clavier-Cortes et al. 2007; Peiro-Signes et al. 2014; Sanchez-Ollero, Garcia-Pozo, and Marchante-Mera 2014;

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Segarra-Ona et al. 2012; Wu, Teng, and Huang 2013; Zhang, Joglekar, and Verma 2012a, 2012b). Recently, Singal (2014) reported a positive relationship between investments in environmental initiatives and firm performance in the hotel sector. Likewise, in an importance-performance analysis, Cvelbar and Dwyer (2013) found that Eastern European hotel operators viewed the economic elements of sustainability to be the most important, but reported that the performance of the economic elements was lower compared with both the environmental and social elements they assessed. This shows that, despite progress, mixed financial outcomes still exist across the hotel industry when it comes to the economic benefits of sustainability for a firm (cf. Singal 2014).

Environmental Factors

Environmental factors can be looked at in terms of consumption by communities, firms, and consumers, considering elements such as energy and water usage (conservation), recycling waste and reusing products, pollution, and the use of pesticides. The research in this domain examines the relationship between sustainability practices and the influence of such practices on the environment (Cvelbar and Dwyer 2013; Mihalič, Žabkar, and Cvelbar 2012; Wu, Teng, and Huang 2013). One such study by Nicholls and Kang (2012) examined the reported adoption of twenty-one "green practices" among lodging operators and found that a large majority of operators engaged in practices such as recycling batteries and oil, using energy efficient light bulbs, and donating old furniture and fixtures to be reused by others, while a smaller percentage of operators engaged in practices such as using key-card–activated guest room power, organically produced linens and towels, sustainably grown wood in furniture and fixtures, carpet and other finishings that come from recycled materials, and bulk products in bathrooms in place of the mini bottles and soaps. From this research, it seems that the most widely used practices that were adopted could be described as low-hanging fruit, while the least widely used practices appeared to come at a greater financial cost or would require a greater level operational planning to execute. These findings are consistent with two importance-performance analyses conducted by Cvelbar and Dwyer (2013) and Wu, Teng, and Huang (2013) examining environmental factors, showing that not all environmental initiatives are created equal in the eyes of the operators and owners.

Social Factors

Operators are not done when they consider the economic and environmental elements of sustainability. The last piece of the puzzle, and some would argue the most important piece, are your guests and the other constituents that influence your operating environment (Baker, Davis, and Weaver 2014). These factors mainly consider the relationship with your local community, such as residents and other businesses, government, convention and visitors' bureaus, your guests, and your employees (Cvelbar and Dwyer 2013).

All of these constituents have a stake in what you do, how you do it, and ultimately how well you do it. That is, while economic and environmental factors remain important to hospitality operators, sustainable innovations and the resulting cost savings need to be framed in such a way as to enhance a company's social position in the market place, as the social dimensions of sustainability have been shown to be important (Baker, Davis, and Weaver 2014; Cvelbar and Dwyer 2013). In addition, guests' affinity for or connection to sustainability has been connected to demand for environmentally friendly products and services (Barber and Deale 2014).

Several studies to date have examined how hotel guests or tourists viewed sustainable initiatives and how it might influence their consumer behavior. The first type of studies in the social domain examines phenomena in specific contexts such as countries, regions, states, territories, or cities (cf. Berezan et al. 2013; Han and Chan 2013; Nicholls and Kang 2012; Peiro-Signes et al. 2014; Prud'homme and Raymond 2013; Rogerson and Sims 2012; Sanchez-Ollero, Garcia-Pozo, and Marchante-Mera 2014). Another subset of studies gathers data from broader data sources covering larger regions, industries, or economies (cf. Kang et al. 2012; Peiro-Signes et al. 2014; Singal 2014; Zhang, Joglekar, and Verma 2012a, 2012b). Regardless of the approach that is used to collect data and examine social constituents, we are now seeing some convergence across studies highlighting the strengths and weaknesses of sustainability initiatives, with solid evidence showing that companies' engagement in sustainability initiatives (including certifications) is positively related to guest affect (Baker, Davis, and Weaver 2014; Peiro-Signes et al. 2014).

Some of the arguments highlighted by researchers to frame guests' resistance to environmentally sound alternatives are as follows: a lack of comfort and convenience, problems with accessibility, additional costs, and a lack of information about the products or services (Baker, Davis, and Weaver 2014; Budeanu 2007). Conversely, some studies have shown that guests view environmentally sound alternatives positively when they receive visible, credible information and communication from operators about what they are doing with recycling and conservation programs, products, features, and services (e.g., room health, including indoor air quality that is hypoallergenic and toxin free), through internal certification programs or third-party verification (Abrams 2012; Manaktola, and Jauhari 2007; Segarra-Ona et al. 2012). These guests, for the most part, are willing to engage in recycling programs, towel reuse programs, and the like (Prud'homme and Raymond 2013),

noting some minor inconveniences. However, they still want to pay conventional hotel rates, and resist a "green premium" (Kim and Han 2010). While these are broad-based global reactions to sustainability initiatives in hotels, I am, however, seeing that hotel guests are beginning to report that specific aspects of sustainability initiatives, such as their own behavior (Baker, Davis, and Weaver 2014; Prud'homme and Raymond 2013; Sigala 2014), the purchasing and procurement behavior of a company, and factors of room health are having a greater impact on hotel and brand choice (Abrams 2012). In that regard, guests' personal concern for the environment is connected to a willingness to pay a premium for green practices (Kang et al. 2012) and guests who have reported to value sustainability initiatives also indicated that they were willing to pay more for those experiences to some extent (Sanchez-Ollero, Garcia-Pozo, and Marchante-Mera 2014).

Furthermore, several studies have begun to identify the relationship between green practices and guests' reactions to their service experiences and future purchases or return intentions. In one such study of tourists in Mexico, green practices were shown to be positively related to guest satisfaction and return intentions (Berezan et al. 2013). Likewise Prud'homme and Raymond, (2013) found that guests' own "responsible" behavior was connected to hotel choice factors and ultimately satisfaction with their stay and subsequent return intentions, and Robinot and Giannelloni (2010) found a connection between green practices and guest satisfaction.

Research Questions

What we do not yet know specifically (and empirically) is how guests react to environmentally sound technologies and room features in direct comparison with traditional technologies and room features. With that in mind, in this experimental study, I set out to identify the impact that energy efficient lighting and televisions have on the guest experience in hotel rooms and whether guests are willing to pay a premium for sustainability initiatives that involve their rooms. In so doing, I attempted to identify how guests reacted to two energy efficient room features without being told about them. Through the study, I tested the following eight research questions:

Research Question 1: How will guests view the quality of the television picture between the conditions (control, energy saving low, energy saving medium, and energy saving high)?

Research Question 2: How will guests view the overall quality of the television between the conditions (control, energy saving low, energy saving medium, and energy saving high)?

Research Question 3: How will guests view the visibility of the bathroom lighting between compact fluorescent lighting (CFL) and light-emitting diode (LED) lighting conditions?

Research Question 4: Are differences in guests' reactions to the four television conditions a function of differences in income level and gender?

Research Question 5: Are differences in guests' reactions to the two bathroom lighting conditions a function of differences in income level and gender?

Research Question 6: Is there a relationship between the guests' age and how they view the quality of the television picture and the overall quality of the television?

Research Question 7: Is there a relationship between the guests' age and how they view the visibility of the bathroom lighting?

Research Questions 8: Is there a relationship between guests' age, income, and gender and their willingness to pay more for a hotel stay where the property has sustainability initiatives in place?

Procedure

This test was conducted at the Statler Hotel, a four-diamond, independent property located on the Cornell University campus in Ithaca, New York, which functions as a teaching laboratory for the School of Hotel Administration. The Statler Hotel had just completed a renovation of the hard and soft finishings in its guest rooms.

For this study, I focused on the two dimensions of the rooms outlined in the research questions: the television and the bathroom lighting. The standard guest room was furnished with a thirty-two-inch LCD television and CFL in the light fixtures throughout the room and the bathroom. Each television in the room had a standard setting and three energy saving settings (low, medium, and high). For this study, I modified the energy usage settings on a group of the existing televisions to test how guests would react to the four settings in terms of picture quality and overall quality. In addition, in a second set of guest room bathrooms, I replaced the CFLs with LEDs to test how guests would react to more energy efficient lighting and whether (and how) the changed lighting affected the guests' experience with the room.

In all, I modified eight rooms for this experiment. All of the rooms I used for the experiment were on the western-facing upper floors of the hotel to control for any differences in natural light in the rooms. As a control, I asked the guests two questions about the lighting in the room: (1) "Was there sufficient natural light in the room during the daytime hours?" and (2) "Did the lighting in the room meet your needs?" All respondents indicated that there was sufficient natural light in the room, and 93 percent of the participants indicated that the in-room lighting met their needs. The rooms were set up as follows:

To conduct the television experiment, I left two rooms on the standard setting (control), I set two rooms for the lowest energy efficiency setting (condition 1), two rooms on the medium setting energy efficiency (condition 2), and two rooms on the highest energy efficiency setting (condition 3). To conduct the bathroom lighting experiment, I left four rooms with the standard CFL bulbs in the bathroom, and changed four rooms to LEDs. All bathrooms were located in the interior of the room with no natural light.

Participants

Over a four-month period, guests were randomly selected to be placed in the experimental rooms following check-in. To mask the purpose of the study, I took advantage of the fact that the hotel had just been renovated to ask the guests to evaluate all of the room's features, including bathroom, technology, bed, furniture, closet, amenities, and linens, in addition to the television and bathroom lighting. I collected information on the guests' socio-demographics to help examine any potential extraneous influences. All study participants were eligible to receive a $10.00 food and beverage credit in the hotel as an incentive to complete their survey.

Of the 192 guests who completed the surveys, 37 percent were women. The mean age of the participants was just under forty-one years, ranging from eighteen to seventy-four years (SD = 12.50). More than 80 percent of the sample reported that they earned over US$100,000 per year, with only 3.6 percent reporting that they earned less than US$50,000, and 16.1 percent indicating that they earned between US$50,000 and US$99,000. The participants were also relatively well-traveled; 51 percent indicated that they stayed in a hotel one or two days per month, 27 percent reported that they stayed in a hotel three or four days per month, 18 percent reported that they stayed in a hotel five to eight days per month, and 4 percent reported that they stayed in a hotel more than eight days per month. Exhibits 1 and 2 show the breakdown of the number participants in each of the experimental conditions for the television and lighting groups.

Measurement

To gauge the guests' reactions to the energy saving features of the televisions and bathroom lighting, I asked them to rate various features and outcomes of the products and technology in their rooms. For the bathroom lighting, I had them "rate the visibility created in the room from the bathroom lighting" on a 1 to 7 scale with 1 "being very poor (dim)" to 7 "being very good (bright)." The midpoint of 4 was labeled as "indifferent." I also asked them if "they were happy with the bathroom lighting" using a "yes" or "no" response format. For the televisions I asked the guests, "How would you rate the picture of the television" on a 1 to 7 scale with 1 being "not clear at all" to 7 being "very clear." For "how would you rate the quality of the television overall," I also used a 1 to 7 scale, with 1 being "very poor" to 7 being "excellent." Again, the midpoint of both of these questions, 4, was labeled as "indifferent." In addition, I asked guests in a "yes" or "no" response format whether they "select a hotel or hotel brand based on their commitment to sustainability initiatives," and whether they "are willing to pay more for a hotel stay if the hotel has sustainability initiatives in place." I asked guests to indicate their income in $50,000 increments, beginning with "below $50,000" up to "greater than $200,000," and age was measured continuously, based on guests' response to this question.

Exhibit 1:
Television Conditions.

	N	Percentage
Control	49	25.5
Low	46	24.0
Medium	57	29.7
High	40	20.8

Note. N = 192.

Exhibit 2:
Lighting Conditions.

	N	Percentage
LED	112	58.3
CFL	80	41.7

Note. N = 192. LED = light-emitting diode; CFL = compact fluorescent lighting.

Analyses

To test the eight research questions proposed above, the mean values of television picture quality (Research Question 1) and overall television quality (Research Question 2) were treated as the dependent variables and compared with the four television conditions (control, low, medium, and high) using one-way analysis of variance. The mean values of the visibility of the bathroom lighting (Research Question 3) was treated as the dependent variable and compared to the two bathroom lighting conditions (LED and CFL) using independent t-tests. To answer Research Question 4 and Research Question 5 (regarding whether income or gender was related to guests' reactions), the mean values of television picture quality, overall television quality (Research Question 4), and the mean values of the visibility of the bathroom lighting (Research Question 5) were compared to the respondents' income levels using one-way analysis of variance, and to their gender, using independent t-tests.

The main effects were examined to determine whether there was a notable difference in guests' reactions to the dependent variables based on the experimental condition they were placed in. For the independent variables with more than two categories (i.e., television conditions and income level) the significance of the mean differences across each condition were examined using a post hoc Duncan's multiple range test. This procedure examined the differences for a quantitative dependent variable (in this case, television picture quality, overall television quality, and visibility of bathroom lighting) by single-factor independent variables (in this case, the television conditions and income level). A correlation analysis was used to examine the relationship between television picture quality, overall television quality, and the guests' age (Research Question 6), and the relationship between the visibility of the bathroom lighting and the guests' age (Research Question 7). To further examine the relationships among the variables, I ran a series of regression analyses to examine each television condition and each lighting condition controlling for age, income, and gender. To do so, I created a dummy-coded variable to account for each TV condition and each lighting condition. Lastly, to tests guests' willingness to pay for sustainability initiatives in their rooms, I examined the guests' reported willingness to pay for such initiatives relative to their socio-demographic profile (age, gender, and income characteristics; Research Question 8).

Results, Discussion, and Study Implications

The study revealed that the hotel guests were pleased with the televisions and bathroom lighting overall. Across all four conditions for the televisions, the guests reported a mean of 5.99 ($SD = 0.93$) for the picture quality and a mean of 6.05 ($SD = 0.89$) for overall television quality. For the bathroom lighting visibility, across the CFL and LED conditions, the guests reported a mean of 5.90 ($SD = 1.19$). Likewise, 93 percent of the guests reported that they were satisfied with the bathroom lighting in both conditions. I discuss the specific effects for each dependent variable below. The correlations among the dependent variables are presented in Exhibit 3.

Television Picture Quality

The test of Research Question 1 revealed no statistical differences across the four television conditions, indicating that the guests evaluated the picture quality consistently regardless of the energy setting used.[1] The control condition had the highest mean ($M = 6.09$, $SD = 1.26$), followed by medium energy saving condition ($M = 6.04$, $SD = 0.65$), the low energy saving setting ($M = 5.98$, $SD = 0.77$), and the high energy saving setting ($M = 5.82$, $SD = 0.97$). These results show that the energy saving features of the televisions did not diminish the guests' perceptions of picture quality.

Exhibit 3:
Correlations among Age and the Dependent Variables.

	(1)	(2)	(3)	(4)
(1) Bathroom lighting	—			
(2) TV picture quality	.16*	—		
(3) TV overall quality	.10	.88**	—	
(4) Age	.03	−.11	−.15*	—

Note. $N = 188$ using listwise deletion.
*Correlation is significant at the .05 level (two-tailed). **Correlation is significant at the .01 level (two-tailed).

The regression analyses controlling for each energy setting condition and the socio-demographic variables confirmed the results of the ANOVAs above showing that picture quality was not adversely affected by the energy saving settings, $R^2 = .11$, $F(6, 181) = 3.83$, $p < .001$. The regressions did reveal however that the highest energy saving setting (condition 3) was perceived significantly lower than the other two conditions and the control ($p = .05$); this suggests that it may be wise to carefully monitor the usage of the highest energy saving setting until additional improvements to the technology emerge. In addition, women rated the picture quality higher than men, while those with higher incomes rated the picture quality the lowest. See Exhibit 4 for a summary of the regression results.

Overall Television Quality

Likewise, the test of Research Question 2 revealed no statistical differences across the four television conditions, indicating that the guests evaluated the overall quality of the televisions consistently regardless of the energy setting used.[2] The medium energy saving condition had the highest mean ($M = 6.23$, $SD = .63$), followed by low energy saving condition ($M = 6.02$, $SD = 0.77$), the high energy saving setting ($M = 5.95$, $SD = 0.92$), and the control group ($M = 5.93$, $SD = 1.20$). As with picture quality, these results show that the energy saving features of the televisions did not affect the guests' perceptions of overall television quality.

The regression analyses controlling for each energy setting condition and the socio-demographic variables confirmed the ANOVA results, showing that overall quality was not adversely affected by the energy saving settings, $R^2 = .09$, $F(6, 181) = 2.96$, $p = .009$. The regressions did not reveal any differences among the four energy saving settings, suggesting that the perceived overall TV quality was consistent across each condition regardless of the energy setting used. The only variable that emerged as significant in the regression model was income ($p = .04$), showing those who reported a higher income reported a lower level

Exhibit 4:

Regression Results for TV Picture Quality.

	Coefficients				
	Unstandardized Coefficients		Standardized Coefficients		
Model	*B*	*SE*	β	*t*	Significance
1 (Constant)	7.086	.314		22.582	.000
TV condition 1 low energy savings	−0.024	.186	−.011	−0.130	.897
TV condition 2 medium energy savings	−0.194	.180	−.097	−1.082	.281
TV condition 3 high energy savings	−0.389	.197	−.171	−1.974	.050
Income	−0.004	.002	−.246	−2.520	.013
Age	0.006	.007	.081	0.915	.361
Gender (female = 0, male = 1)	−0.374	.150	−.197	−2.492	.014

Note. Dependent variable: TV picture quality rating.

Exhibit 5:

Regression Results for Overall TV Quality.

	Coefficients				
	Unstandardized Coefficients		Standardized Coefficients		
Model	*B*	*SE*	β	*T*	Significance
1 (Constant)	6.808	.306		22.229	.000
TV condition 1 low energy savings	0.161	.182	.078	0.888	.376
TV condition 2 medium energy savings	0.178	.175	.092	1.015	.312
TV condition 3 high energy savings	−0.069	.192	−.032	−0.359	.720
Income	−0.003	.001	−.203	−2.054	.041
Age	0.000	.007	.004	0.048	.962
Gender (female = 0, male = 1)	−0.235	.147	−.128	−1.603	.111

Note. Dependent variable: overall TV quality rating.

of perceived quality. See Exhibit 5 for a summary of the regression results.

Bathroom lighting. The test of Research Question 3 revealed no statistical differences across the two bathroom lighting conditions, indicating that the guests evaluated the bathroom lighting consistently regardless of the type of lighting used.[3] In addition, when asked, 93 percent of the respondents indicated they were satisfied with the bathroom lighting. The LED lighting condition had the highest mean (M = 5.94, SD = 1.27), and CFL lighting condition was rated slightly lower (M = 5.84, SD = 1.08). Statistically speaking, the guests found the LED and CFL bathroom lighting comparable.

The regression analyses controlling for each lighting condition and the socio-demographic variables concurrently confirmed the results of the ANOVAs above showing that overall lighting visibility was not different for the CFL or LED lighting setups, R^2 = .26, F(4, 186) = 17.91, p = .001. The regressions did, however reveal differences in how the socio-demographic groups reacted to the lighting. Men rated the visibility lower than women (p < .001), older respondents rated the visibility lower than younger guests (p < .001), and those who earned a higher income rated the visibility lower (p < .001). See Exhibit 6 for a summary of the regression results. The influence of the socio-demographic variables upon the dependent variables is further detailed below.

Socio-Demographics—Television Ratings

The test of Research Question 4 revealed that guests' ratings of television picture quality and overall quality of the televisions varied significantly based on their income level and gender.

Income and picture quality. I did find significant differences among the respondents' reactions to picture quality based on

Exhibit 6:

Regression Results for Visibility of Lighting in Bathroom.

Coefficients					
	Unstandardized Coefficients		Standardized Coefficients		
Model	*B*	*SE*	β	*t*	Significance
(Constant)	7.100	.327		21.733	.000
Lighting condition (CFL = 0, LED = 1)	0.021	.152	.009	0.138	.890
Gender (female = 0, male = 1)	−0.754	.168	−.307	−4.482	.000
Age	0.034	.007	.358	4.587	.000
Income	−0.009	.002	−.442	−5.345	.000

Note. Dependent variable: visibility of lighting. LED = light-emitting diode; CFL = compact fluorescent lighting.

their income levels.[4] Those earning between $150,000 and $199,000 had the lowest mean (M = 5.56, SD = 1.25), followed by those making greater than $200,000 ($M$ = 5.84, SD = 0.94), which were statistically significantly lower than those making less than $50,000 ($M$ = 6.00, SD = 0.00), those making $100,000 through $149,000 ($M$ = 6.15, SD = 0.64) and those making $50,000 to $99,000 ($M$ = 6.55, SD = 0.51). Across all four conditions, this shows that the guests who earned more money reported that the picture quality was lower. I can speculate that the higher income guests may be accustomed to more expensive technology than that found in this hotel, but the survey did not ask for this information.

Income and overall quality. Similarly, I found significant differences among the respondents' reactions to overall television quality based on their income levels.[5] Those making more than $200,000 had the lowest mean (M = 5.77, SD = 0.78), followed by those earning between $150,000 and $199,000 ($M$ = 5.93, SD = 1.35), which was statistically significantly lower than those making less than $50,000 ($M$ = 6.00, SD = 0.00), those making $100,000 to $149,000 ($M$ = 6.15, SD = 0.64), and those making $50,000 to $99,000 ($M$ = 6.55, SD = 0.51). Similar to the picture quality finding above, this shows that the guests who earned more money reported that the overall television quality was lower.

Picture quality and overall quality by respondent gender. Women rated the picture quality significantly higher than men[6] (women, M = 6.27, SD = 0.59; men, M = 5.82, SD = 1.05). Women also rated the overall television quality significantly higher than men[7] (women, M = 6.27, SD = 0.59; men, M = 5.91, SD = 1.01). I can think of no practical reason why women would rate the television quality higher than men, but this finding does raise implications for product marketing if this significant difference reflects the population as a whole.

Age and picture quality and age and overall quality. The test of Research Question 6 revealed that guests' age was negatively related to their ratings of television picture quality, but not significantly so (r = −.11, p > .05), and was negatively and significantly related to their rating of overall quality of the televisions (r = −.15, p < .05). The correlation matrix is reported as Exhibit 3. These findings show that younger respondents rated the picture quality higher and overall quality higher; however, only overall television quality was significantly related to age. This may be a function of younger guests' having more experience with and exposure to newer technology.

Socio-Demographics—Bathroom Lighting Ratings

The test of Research Question 5 revealed that guests' ratings of the visibility from the bathroom lighting varied significantly based on their income level and gender.

Income and visibility. There were significant differences in the respondents' reactions to and mean rating of the visibility of the bathroom lighting variable based on their income levels.[8] Those earning between $150,000 and $199,000 had the lowest mean (M = 5.27, SD = 1.15), followed by those earning more than $200,000 ($M$ = 5.42, SD = 1.41). Guests reporting their income in those higher income categories rated the visibility of the bathroom lighting statistically significantly lower than those making less than $50,000 ($M$ = 6.00, SD = 0.00), those making $50,000 to US$99,000 (M = 6.26, SD = 0.86), and those making $100,000 to $149,000 ($M$ = 6.71, SD = 0.46). It may be that those with higher incomes are accustomed to better lighting overall and as such were more critical of the bathroom lighting overall.

Gender and visibility. Women rated the visibility of the bathroom lighting significantly higher than men[9] (women, M = 6.49, SD = 0.50; men, M = 5.54, SD = 1.33). An additional Mann–Whitney U-test (U = 4,104, p = .62) revealed that there was not a disproportionate distribution of women guests to either lighting condition, suggesting that overall women favored the lighting more than men.

Exhibit 7:

Regression Results for Guests' Willingness to Pay for Sustainability Initiatives in Hotel Rooms.

	Coefficients				
	Unstandardized Coefficients		Standardized Coefficients		
Model	*B*	*SE*	β	*t*	Significance
1 (Constant)	0.605	.153		3.961	.000
Income	−0.001	.001	−.074	−0.742	.459
Age	0.009	.004	.214	2.290	.023
Gender (female = 0, male = 1)	−0.232	.082	−.226	−2.821	.005

Note. Dependent variable: willingness to pay for sustainability initiatives.

Age and visibility. The test of Research Question 7 revealed that guests' age was not significantly related to their ratings of lighting visibility in the bathrooms ($r = .03$, $p > .05$), showing only a weak association between age and perceived lighting quality in the bathroom. The correlation matrix is reported as Exhibit 3. Age did not have a significant influence on guests' ratings of the bathroom lighting.

Guests' Willingness to Pay for Sustainable Initiatives?

To test Research Question 8, I asked the study participants whether they would be willing pay more for a hotel room with sustainability initiatives in place. The short answer is "maybe," as 45 percent of the guests I asked would be willing to pay more. To dig a little deeper, I ran a set of regression equations to examine whether any socio-demographic influences were at play here. The regression analyses controlling for age, income, and gender showed some differences in willingness to pay more for sustainability features in their rooms, $R^2 = .07$, $F(3, 178) = 4.62$, $p = .004$. Women indicated that they were willing to pay more than men ($p = .005$), and older guests were willing to pay more than younger respondents ($p = .02$). Income was not a significant influence in the regression model. See Exhibit 7 for a summary of the regression results.

Study Summary

In summary, through this study I was able to demonstrate that energy saving technologies in hotel rooms were not viewed differently from more typical room features by the hotel guests I surveyed. The televisions and bathroom lighting products were favorably evaluated overall, even those that conserved energy, showing that it is possible to substitute energy saving technologies in guest rooms without interfering with the guests' experience. This is evidenced by the results of the experiments I conducted in the rooms, along with some of the additional information I collected from the study participants.

Guests seemed pleased overall with both forms of bathroom lighting. Ninety-three percent of the guests who participated in the study indicated that they were happy with the quality of the bathroom lighting in their room. That speaks well to both LEDs and CFLs. Although LEDs are more energy efficient than CFLs, both types of lightings are far more energy efficient than traditional incandescent lighting. Hotel operators thus can select either of these as appropriate when they upgrade their lighting to these newer technologies. This finding is particularly important with the gradual phase-out of incandescent lighting.

Likewise, through the regression analyses I revealed that the highest energy efficient LCD television setting was viewed less favorably than the regular setting and the other two energy saving settings. While the difference was small in magnitude, this shows that guests could identify at least some difference. Operators should be aware of this and be cautious with the use of that particular energy saving setting. With new LED technology currently in televisions, we will continue to see improvements in television viewing quality in concert with greater energy savings. Replacing old televisions with LCD televisions will save on utility expenses, and as I discuss below, the cost of LCD televisions has steadily decreased over the past few years.

These findings run contrary to the idea that energy efficient technologies detract from the guest experience. Beyond that, however, this is the first study to my knowledge that has specifically tested how guests react to specific technologies in a controlled experiment. Therefore, I encourage further studies in this domain, and specifically note that the guests had overwhelmingly positive experiences with the energy saving television settings and bathroom lighting.

Financial Implications

Because I have demonstrated that guests reacted positively to the energy efficient technologies in their rooms, the next step is to demonstrate the financial benefit for hotel operators to adopt such technologies. While I did not measure

energy consumption in each of the experimental rooms per guest stay to test energy consumption scientifically, it would be wise to quantify how these technologies can improve energy consumption patterns for hotel operators. Other studies have found that hotels' efficiency improves with sustainability programs (Zhang et al. 2014).

To offer some additional insight into this idea, I gathered some basic information from the product manufacturer of the televisions in the rooms to produce a "back of the envelope" estimate of the cost savings possible by implementing these more energy efficient products and technologies in a hotel such as the one I studied. Let us take a 150-room hotel with 80 percent annual occupancy operating 365 days a year. Say that all televisions run six hours per day in each room, at an electricity cost of $0.10 per kilowatt hour, which is approximately the average U.S. cost per kilowatt hour for 2010.[10] Using those numbers, the electricity cost savings for the televisions using the most efficient setting is estimated at $6,000 per year. This is money that can go straight to the bottom line for an operator. The lighting technologies are also likely to deliver similar cost savings for operators. I urge researchers conducting future studies to better quantify these effects.

Do Guests Care About Being Green?

To better understand how guests make decisions about consuming sustainable hotel products, I asked our study participants about their preference for green or sustainable hotels. When asked whether a guest would choose a particular hotel or hotel brand based on the hotel's commitment to sustainability initiatives, only 30 percent of the respondents indicated they would do so. As noted above, however, when asked whether they would be willing to pay more for a hotel stay if the hotel had sustainability initiatives in place, 45 percent of guests from this sample indicated that they would be willing to pay a higher room rate for sustainability initiatives in hotels, which were favored by women and older guests. In a study of tourists visiting island destinations in Southeast Asia, 79 to 95 percent of guests (depending on the destination) indicated that they would be willing to pay a tax to support environmentalism at their destination (Dodds et al. 2010). Tourism in Southeast Asia is obviously a different scenario than the issues presented here, but nevertheless as noted, guests remain open to surcharges to support sustainability initiatives in a wide variety of settings. This is particularly true for guests who report a higher personal regard for the environment (Kang et al. 2012) and for guests who assign a higher value to green initiatives (Sanchez-Ollero, Garcia-Pozo, and Marchante-Mera 2014). This suggests that it is possible to specifically market to this subset of consumers to offer green services and collect a premium for doing so. How hoteliers might accomplish this requires additional attention and research, but consumers in the retail market are consistently paying more for organic products and products produced by local farmers and manufacturers (Lee et al. 2010). As the cost of green technology continues to decrease, the actual upfront cost to operators and developers may be far lower than currently believed (Butler 2008), particularly when guests take an active role in the process during their visits (Sigala 2014).

While the connection between hotel performance and environmental management has yet to be fully quantified, current research shows that in the long term, sustainability initiatives add value to firm performance (Clavier-Cortes et al. 2007; Singal 2014), and sustainability initiatives continue to be viewed as important to owners, guests, and the communities in which they operate (Cvelbar and Dwyer 2013; Mihalič, Žabkar, and Cvelbar 2012).

Limitations

This study's limitations include the fact that I conducted the experiment in a single 4-star, full-service teaching hotel in a relatively small university community. While this procedure allowed close control of the elements of study design and execution, it would be valuable to test guests' reactions to sustainability initiatives using a larger sample of hotels across different segments, geographic locations, and socio-demographic groups. A broader test of these elements would allow us to better generalize the results across the hotel industry. Second, this study was cross-sectional. It would be valuable to track guests' reactions to sustainability initiatives over time. Since I collected the data for this experimental study, there have been vast improvements in how sustainability is tracked and monitored in the hotel industry (cf. Peiro-Signes et al. 2014), and there has been a positive shift in attitudes of some groups of consumers toward sustainability in many industries, not just the hotel business (Berezan et al. 2013; Robinot and Giannelloni 2010). Longitudinal studies will help us better track how the industry evolves in this important domain.

The results of this study are promising for hotel operators and the companies that produce technology and products for the hotel industry, but these findings concurrently show that hotel guests are still not fully ready and/or committed to seeking out hotels that focus more on sustainability. As noted above, only 30 percent of our study participants reported that they seek out hotel brands that focus on sustainability and offer green products and services as part of the hotel experience, and slightly less than half (45%) of the participants indicated that they would be willing to pay a premium for such services. Given these findings and the research of Baker, Davis, and Weaver (2014) and Barber and Deale (2014), it is the job of operators, educators, and product innovators to continue to provide hotel guests with sustainability initiatives that do not diminish the quality of the experience in hotels and find more ways to deliver these products to guests.

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Notes

1. The one-way analysis of variance (ANOVA) results revealed no significant differences among the means for the television picture quality variable, $F(3, 184) = .64$, $p = .59$.
2. The one-way ANOVA results revealed no significant differences among the means for the overall television quality variable, $F(3, 184) = 1.21$, $p = .31$.
3. The one-way ANOVA results revealed no significant differences among the means for the visibility of the bathroom light variable, $F(1, 189) = .34$, $p = .56$.
4. The one-way ANOVA results revealed significant differences among the means for the television picture quality variable based on the reported income level, $F(4, 183) = 6.48$, $p < .001$.
5. The one-way ANOVA results revealed significant differences among the mean ratings of the television overall quality variable based on the reported income level, $F(4, 183) = 4.50$, $p = .002$.
6. The *t*-tests revealed significant differences between the women's and men's mean rating of the television picture quality variable, $t(186) = 3.30$, $p < .001$.
7. The *t*-tests revealed significant differences between the women's and men's mean rating of the television overall quality variable, $t(186) = 2.68$, $p = .006$.
8. The one-way ANOVA results revealed significant differences among the mean rating of the visibility of the bathroom lighting variable, $F(4, 186) = 15.87$, $p < .001$.
9. The *t*-tests revealed significant differences between the women's and men's mean rating of the visibility of the bathroom lighting variable, $t(189) = 5.77$, $p < .001$.
10. The nationwide average as of February 2011 was 9.93 cents per kilowatt hour, higher on the east and west coasts, and generally lower in the south (U.S. Energy Information Administration 2011).

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