Hotel Guests’ Reactions to Guest Room Sustainability Initiatives

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Abstract
This study employs an empirical procedure to address a key issue regarding energy-saving manipulations to hotel guest rooms. That issue is how guests will react to changes that are intended to save energy—or whether the conservation efforts can be subtle enough that they will not interfere with the guest experience. The study involved the following experimental conditions: reduced television power levels and alterations in bathroom lighting in the guest rooms of the Statler Hotel, which is the 150-room, four-diamond property operated by the Cornell School of Hotel Administration as both a commercial hotel and as a student teaching laboratory. The study tested four power levels for the guestroom liquid crystal display (LCD) televisions, and also compared guests’ reactions to the existing compact fluorescent lamps (CFLs) in the bathrooms and to light emitting diodes (LEDs) which replaced the CFLs in some rooms. Guests were asked for their assessments of several aspects of the room. They noticed no differences in the televisions, regardless of power level, and they were likewise equally pleased with LEDs and CFLs. This study points to the likelihood that hoteliers can confidently reduce power to LCD television sets (or replace old sets), and they can at minimum replace incandescent bulbs with CFLs for considerable savings, or take a further energy conserving step and use LED lighting. This study indicates that guests either do not notice or are supportive of such energy-conservation measures. One other hopeful finding is that many respondents said that they would be willing to pay more to support a hotel’s sustainability initiatives.

Keywords
hotels, sustainability initiatives, energy savings, guest rooms

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by Alex M. Susskind and Rohit Verma

EXECUTIVE SUMMARY

This study employs an empirical procedure to address a key issue regarding energy-saving manipulations to hotel guest rooms. That issue is how guests will react to changes that are intended to save energy—or whether the conservation efforts can be subtle enough that they will not interfere with the guest experience. The study involved the following experimental conditions: reduced television power levels and alterations in bathroom lighting in the guest rooms of the Statler Hotel, which is the 150-room, four-diamond property operated by the Cornell School of Hotel Administration as both a commercial hotel and as a student teaching laboratory. The study tested four power levels for the guestroom liquid crystal display (LCD) televisions, and also compared guests’ reactions to the existing compact fluorescent lamps (CFLs) in the bathrooms and to light emitting diodes (LEDs) which replaced the CFLs in some rooms. Guests were asked for their assessments of several aspects of the room. They noticed no differences in the televisions, regardless of power level, and they were likewise equally pleased with LEDs and CFLs. This study points to the likelihood that hoteliers can confidently reduce power to LCD television sets (or replace old sets), and they can at minimum replace incandescent bulbs with CFLs for considerable savings, or take a further energy conserving step and use LED lighting. This study indicates that guests either do not notice or are supportive of such energy-conservation measures. One other hopeful finding is that many respondents said that they would be willing to pay more to support a hotel’s sustainability initiatives.
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The authors are grateful for the support of Philips Hospitality Americas in underwriting this study.
As green initiatives and sustainability continue to become a larger part of the discussions regarding hotel design and development processes, it is important to take into account guests’ reactions to hotel designs, as well as guests’ desire for sustainable or green initiatives in hotels.

To date, studies that have explored the financial impact of using sustainable initiatives in hotels have reported mixed results on the direct financial benefit for hotel developers and operators.\(^1\) That said, we do know that the cost of using green technologies in hotels is decreasing and that using green technologies can have a long-term positive impact on a firm’s bottom line.\(^2\) In that regard, the cost green technologies will decrease as economies of scale in production and construction kick in.\(^3\) This is a typical pattern for technologies of all kinds. One of the authors remembers paying nearly $5,000 for his first laptop computer in 1995; fifteen years later that same $5,000 could purchase seven laptops of higher quality and performance (without adjusting for inflation).

While technological innovation is important, the other side of the equation—the guest—is equally if not more important to understand the position of sustainable technology in our industry. Several studies have examined how hotel guests...

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2 Butler, op.cit.

3 Ibid.
or tourists viewed sustainable initiatives and how it might influence their consumer behavior. Some of the arguments that are put forward by consumers against using or favoring environmentally sound alternatives are a lack of comfort and convenience, problems with accessibility, additional costs, and a lack of information about the products or services. 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 programs and sustainable products, features, and services. These guests, for the most part, are willing to engage in recycling programs, towel reuse programs, and the like, noting some minor inconveniences. However, they still want to pay conventional hotel rates, and they resist a “green premium.” These are global reactions to sustainability initiatives in hotels.

What we do not yet know specifically (and empirically) is how guests react to environmentally sound technologies and room features in direct comparison to traditional technologies and room features. With that in mind, in this experimental study, we set out to identify the impact that energy efficient lighting and televisions have on the guest experience in hotel guest rooms. In so doing we attempted to identify how guests reacted to specific energy efficient room features.

Research Questions

We tested the following seven research questions:

**RQ1** How will guests view the quality of the television picture between the conditions (control, energy saving low, energy saving medium, and energy saving high)?

**RQ2** How will guests view the overall quality of the television between the conditions (control, energy saving low, energy saving medium, and energy saving high)?

**RQ3** How will guests view the visibility of the bathroom lighting between the CFL and LED lighting conditions

**RQ4** Are differences guests’ reactions to the four television conditions a function of differences in income level and sex?

**RQ5** Are differences guests’ reactions to the two bathroom lighting conditions a function of differences in income level and sex?

**RQ6** 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?

**RQ7** Is there a relationship between the guests’ age and how they view the visibility of the bathroom lighting?

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For this the experiment we modified eight rooms. All of the rooms we used for the experiment were on the west-facing upper floors of the hotel to control for any differences in natural light in the rooms. The rooms were set up as follows.

For the television experiment, we left two rooms on the standard setting (control), we set two rooms for the lowest energy efficiency setting (condition one), two rooms on the medium setting energy efficiency (condition two), and two rooms on the highest energy efficiency setting (condition three). To test the bathroom lighting in the same eight rooms, we 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 and placed in the experimental rooms following check-in. To mask the purpose of the study, the guests were asked 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. We 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. On average we received six surveys per room, for each of the four months of the study.

Of the 192 guests who completed the surveys 37 percent were women. The mean age of the participants was 40.77, ranging from 18 to 74 years (standard deviation = 12.50). More than 80 percent of the sample reported that they earned over $100,000 per year, with only 3.6 percent reporting they earned less than $50,000, and 16.1 percent indicating they earned between $50,000 and $99,000. The participants were also relatively well-traveled; 51 percent indicated they stayed in a hotel 1 or 2 days per month; 27 percent reported they stayed in a hotel 3 or 4 days per month; 18 percent reported they stayed in a hotel 5 to 8 days per month; and 4 percent reported they stayed in a hotel more than 8 days per month. Exhibits 1 and 2 show the breakdown of the number participants in each of the experimental condition for the television and lighting groups.

Measurement
To gauge the guests’ reactions to the energy saving features of the televisions and bathroom lighting, we asked them to rate various features and outcomes of the products and technology in their rooms. For the bathroom lighting we had them “rate the visibility created in the room from the bathroom lighting” on a one to seven scale with one “being very poor (dim)” and seven “being very good (bright).” The
midpoint of four was labeled as “indifferent.” We also asked them if “they were happy with the bathroom lighting” using a “yes” or “no” response format. For the televisions we asked the guests “how would you rate the picture of the television” on a one to seven scale with one being “not clear at all” and seven being “very clear.” For “how would you rate the quality of the television overall,” we again used a one to seven scale, with one being “very poor” and seven being “excellent.” Once more, the midpoint of both of these questions, four, was labeled as “indifferent.” Additionally, we 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.” We asked guests to indicate their income in $50,000 increments, beginning with “below $50,000” up to “greater than $200,000.” Age was measured continuously, as we asked each guest for their age.

Analyses

To test the seven research questions proposed above, the mean values of television picture quality (RQ1) and overall television quality (RQ2) were treated as the dependent variables and compared to 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 (RQ3) was treated as the dependent variable and compared to the two bathroom lighting conditions (LED and CF) using independent t-tests. To answer Research Question 4 and Research Question 5 (regarding whether income or gender influenced guests’ reactions), the mean values of television picture quality, overall television quality (RQ4), and the mean values of the visibility of the bathroom lighting (RQ5) 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 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 among the 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). Last, a correlation analysis was used to examine the relationship between television picture quality, overall television quality, and the guests’ age (RQ6), and the relationship

The tests involved determining guests’ reactions to different power levels for LCD televisions and to either CFLs or LEDs in bathroom lighting.
On balance, guests were pleased with their rooms and did not remark on the different television power levels or lighting treatments.

between the visibility of the bathroom lighting and the guests' age (RQ7).

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 = .93) for the picture quality and a mean of 6.05 (SD = .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, 93.2 percent of the guests reported that they were satisfied with the bathroom lighting across both conditions. Let’s examine the specific effects for each dependent variable.

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. The control condition had the highest mean (Mean = 6.09, SD = 1.26), followed by medium energy saving condition (Mean = 6.04, SD = .65), the low energy saving setting (Mean = 5.98, SD = .77), and the high energy saving setting (Mean = 5.82, SD = .97). These results show that the energy saving features of the televisions did not diminish the guests’ perceptions of picture quality.

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. The medium energy saving condition had the highest mean (Mean = 6.23, SD = .63), followed by low energy saving condition (Mean = 6.02, SD = .77), the high energy saving setting (Mean = 5.95, SD = .92), and the control group (Mean = 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.

7 The one-way ANOVA results revealed no significant differences among the means for the television picture quality variable ($F[3,184] = .64, p = .59$).

8 The one-way ANOVA results revealed no significant differences among the means for the overall television quality variable ($F[3,184] = 1.21, p = .31$).
Bathroom Lighting Visibility

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.9 The LED lighting condition had the highest mean (Mean = 5.94, SD = 1.27), and CFL lighting condition was rated slightly lower (Mean = 5.84, SD = 1.08). Statistically, the guests found the LED and CFL bathroom lighting comparable.

Socio-Demographics—Television Ratings

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

Income and picture quality. We did find significant differences among the respondents’ reactions to picture quality based on their income levels.10 Those earning between $150,000 and $199,000 had the lowest mean (Mean = 5.56, SD = 1.25), followed by those making greater than $200,000 (Mean = 5.84, SD = .94), which were statistically significantly lower than those making less than $50,000 (Mean = 6.00, SD = .00), those making $100,000 to $149,000 (Mean = 6.15, SD = .64) and those making $50,000 to $99,000 (Mean = 6.55, SD = .51). Across all four conditions, this shows that the guests who earned more money reported that the picture quality was lower. We can speculate that the higher-income guests may be accustomed to more expensive technology than that found in this hotel, but our survey did not ask for this information.

Income and overall quality. Similarly, we found significant differences among the respondents’ reactions to overall television quality based on their income levels.11 Those making greater than $200,000 had the lowest mean (Mean = 5.77, SD = .78), followed by those earning between $150,000 and $199,000 (Mean = 5.93, SD = 1.35), which were statistically significantly lower than those making less than $50,000 (Mean = 6.00, SD = .00), those making $100,000 to $149,000 (Mean = 6.15, SD = .64) and those making $50,000 to $99,000 (Mean = 6.55, SD = .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.

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9 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).
10 The one-way ANOVA results revealed significant differences among the means for the television picture quality variable based on reported income level (F[4,183] = 6.48, p < .001).
11 The one-way ANOVA results revealed significant differences among the mean ratings of the television overall quality variable based on reported income level (F[4,183] = 4.50, p = .002).

Notes: * Correlation is significant at the 0.05 level (2-tailed). ** Correlation is significant at the 0.01 level (2-tailed). a. Listwise N = 188

Picture quality and overall quality by respondent gender. Women rated the picture quality significantly higher than men did (women, mean = 6.27, SD = .59; men, mean = 5.82, SD = 1.05).12 Women also rated the overall television quality significantly higher than men did (women, mean = 6.27, SD = .59; men, mean = 5.91, SD = 1.01).13 We can think of no practical reason why women would rate the television quality higher than men, but we must suggest that 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, but not significantly, related to their ratings of television picture quality (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 in 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 and favoring it.

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 sex.

Income and visibility. There were significant differences among the respondents’ reactions to mean rating of

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12 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).
13 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).
One hopeful finding is that 45 percent of guests from this sample indicated that they would be willing to pay a higher room rate for hotel sustainability initiatives.

the visibility of the bathroom lighting variable based on their income levels. Those earning between $150,000 and $199,000 had the lowest mean (Mean = 5.27, SD = 1.15), followed by those earning greater than $200,000 (Mean = 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 (Mean = 6.00, SD = .00), those making $50,000 to $99,000 (Mean = 6.26, SD = .86) and those making $100,000 to $149,000 (Mean = 6.71, SD = .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.

**Sex and visibility.** Women rated the visibility of the bathroom lighting significantly higher than men did (women, mean = 6.49, SD = .50; men, mean = 5.54, SD = 1.33). An additional Mann-Whitney U test (U = 4104, *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.

**Age and visibility.** The test of Research Question 7 revealed that the 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 was not a significant influence on guests’ ratings of the bathroom lighting.

**Conclusion**

In conclusion, through this study we were able to demonstrate that having energy saving technologies in hotel rooms was not viewed differently by the hotel guests we surveyed compared to products that were less energy efficient. The televisions and bathroom lights products were favorably evaluated overall, showing that it is possible to substitute energy saving technologies without interfering with the guest experience. This is evidenced by the results of the experiments we conducted in the rooms, along with some of the additional information we 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 LED and CFL lighting. Although LED technology is newer and more energy efficient than

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14 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).

15 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).
CFL technology, both types of lighting 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.

Likewise, while not statistically significant, some of the energy efficient LCD television settings were viewed more favorably than the regular, control settings which did not capitalize on energy efficiency. This shows that the LCD televisions at all of the available settings provided the guests with a quality picture and a quality viewing experience. With the 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, as we discuss below, and we note that the cost of LCD televisions has become quite reasonable.

These findings run contrary to the idea that energy efficient technologies detract from the guest experience. Beyond that, however, this is the first study that has specifically tested how guests react to specific technologies. As the first to conduct an empirical study of this kind, we encourage further studies, and report that guests’ experience with the televisions and bathroom did not vary across the control and experimental groups.

Financial Implications

Because we 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 we 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 influence energy consumption patterns for hotel operators.

To offer some insight into this idea, we gathered some basic information from the product manufacturer of the televisions in the rooms to produce a “back of the envelope” estimate the cost savings possible by implementing these more energy efficient products and technologies in a hotel such as the one we studied. Let’s 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 $.10 per kilowatt hour, which is approximately the average U.S. cost per kwh for 2010.16 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. We 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 we asked our study participants about their preference for green or sustainable hotels. When asked whether they would choose a particular hotel or hotel brand based on the hotel’s commitment to sustainability initiatives, only 30 percent of our respondents indicated they would do so. There’s slightly better news on pricing. 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. In a recent study of tourists visiting island destinations in Southeast Asia, 79 to 95 percent of guests (depending on the destination) indicated they would be willing to pay a tax to support environmentalism at their destination.17 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.

How hoteliers might accomplished 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.18 As the cost of green technologies continues to decrease, the actual upfront cost to operators and developers may be far lower than currently believed.19 But the connection between hotel performance and environmental management has yet to be quantified.20

These results are promising for hotel operators and the companies that produce technology and products for the hotel industry, but these findings show that hotel guests are still not fully ready and or committed to seeking out hotels that focus more on sustainability. It is the job of operators, educators, and product innovators to continue to provide hotel guests with sustainability initiatives that do not diminish their experience in hotels and find ways to better communicate the benefits of these initiatives as they deliver these products to guests.

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16 The 12-month nationwide average as of February 2011 was 9.93 cents per kilowatt-hour, higher on the east and west coasts, generally lower in the south. U.S. Energy Information Administration. Table 5.6.B. Average Retail Price of Electricity to Ultimate Customers by End-Use Sector, by State, Year-to-Date through November 2010 and 2009, February 14, 2011; www.eta.doe.gov/cneaf/electricity/epm/tables_5_6_b.html.


19 Butler, op. cit.

20 Clavier-Cortes et al., op. cit.
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