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Hotel Lighting to Enhance Guest Safety and Security

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Abstract

Appropriate lighting can contribute to an improvement in public safety and security that is critical for achieving and maintaining a competitive posture anticipated to result in lodging industry prosperity and vitality. This survey elicited ratings from a convenience sample of managers and employees in a variety of metropolitan lodging environments regarding the importance level of lighting used to accentuate hotel properties' image, and their perceptions of how well the lodging properties performed in providing lighting in specific areas. The survey identified five major lighting areas, and six subcategories, resulting in identifying 30 dimensions that are related to lighting areas of emphasis. Respondents were queried regarding perceived importance and performance of existing safety and security lighting at hotel entries, paths and walkways, exterior stairs and paths of egress, parking lots/garages, dumpster/trash areas and recreation areas. The gap analysis between importance and performance indicated where the lighting needed to be improved or which areas were illuminated more than was needed. The findings suggest that research should be conducted to explore how re-lamping of existing fixtures may result in energy-savings and cost-savings through energy usage monitoring systems able to isolate energy usage and energy conservation within hotel properties.

Keywords

Hotel, Lodging, Safety, Security, Lighting, Guest, Survey, Performance

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1. Introduction

Public safety and security have emerged as major issues in the lodging and hotel industry. The American Hotel and Lodging Association (AHLA) has indicated that public safety and security issues are among their top subject areas of interest. Public safety and security in the lodging industry can be considered from various, crucial standpoints including compliance with building safety codes and the prevention of bacterial contamination within hotel facilities (Olsen, 1998). Attention to safety and security may lower hotel crime statistics and ensure employee and visitor safety and security (Enz, 2009). Since failures in these areas may result in great risks and associated liabilities to hotel and lodging facilities, the lodging industry should commit to facilitating public safety and security.

Improving safety and security is a viable value creation strategy. Lighting is one of the most practical and effective ways to improve all types of lodging and hotel properties' safety and security at night. Properties may be under-illuminated, indicating "need" or over-illuminated, indicating "waste", perhaps considering possible "light pollution" (unnecessary brightness or glare, light where it is not wanted, or that strays from its intended purpose, (Rea, 2000) and ways to minimize its effects on surrounding areas. Our long-term goal is to increase safety and security of lodging and hotel properties. Moreover, the harvesting of the maximum amount of daylight for the following areas is a long-term

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goal: "front of house" (areas where the lodging guests may visit), "back of house" (areas exclusively used by lodging employees), and exterior lighting (exterior property areas, parking lots, recreational areas, stairwells, walking paths, grounds, sidewalks, pathways, tunnels, etc.).

Many hotels consist of older construction, with features which are sometimes historic, with correspondingly aging, energy-wasting or damaged lighting systems. Some properties have been re-lamped (new light bulbs were installed in existing light fixtures) over the years utilizing more energy-efficient light sources. These retrofits may produce a lower quality and lower quantity of light than originally specified. Conversely, other properties may no longer meet codes or industry recommendations due to over-lighting and over-consumption of energy by today's standards. Some areas of lodging properties have been de-lamped (light bulbs were removed from light fixtures) over time to save money but with potentially unsafe and unsecure results. Appropriate and ongoing maintenance and improvement of lighting systems, for both old and new hotels, will always be issues at busy hotel and lodging properties.

Lighting consumes the greatest portion of lodging properties' annual operating budgets. In typical hotel or motel properties, lighting, space heating, water heating, and cooling represent 75 percent of the total energy consumption. Lighting alone makes up approximately 23% of properties' electricity consumption, resulting in the second largest electrical energy use, next to cooling, in the lodging industry (EnergyStar, 2007). It is possible that those figures could be reduced through good lighting practices.

How else might poor lighting cost hotel and lodging facilities? Liability issues regarding accidents and criminal incidents occurring on properties due to poor lighting may additionally result in lawsuits costing millions of dollars (Thermie Programme Action, 1995; E Source Customer Direct, 2014). Energy wasted for unnecessary over-lighting or due to the use of inefficient lighting may also take money from the pockets of hotel facility managers. Many guests now seek to book rooms at sustainable properties and energy-efficiency has become a competitive advantage factor (Ecogreen: Energy solutions http://www.ecogreenhotel.com). Further, poor lighting may negatively influence hotel employees' morale and also signal problems to hotel guests. For some, the perception of light's influence is subtle and nuanced. Some may find it difficult to identify and separate lighting as an area of concern. Indeed, employees or guests may not realize that light has contributed to their overall satisfaction or dissatisfaction with hotel and lodging properties. However, after experiencing poor lighting, both groups may believe that a property does not care about their well-being or their planet's well-being and may even discontinue their affiliation or patronage. Therefore, the topic of safety and security lighting will have direct applicability to hotel and lodging facilities. Safety and security lighting has a significant impact on the success of hotel or lodging facilities. Combating the challenges of safety and security lighting and will result in well-being improvements at three levels: to humans (employees and guests), to finances (maintenance and energy costs) and to sustainability (energy-consumption and green practices). The use of lighting in the hotel industry is also important to showcase the brand and assist guests in locating the property.

Research Significance

The current study focuses on the illumination of key areas at hotel and lodging properties which are critical to public safety and security based on our preliminary study: front and rear entrances, sidewalks/pathways, recreational areas, parking areas, and building grounds. Concerns for properly lighting these areas are commonly raised in the lodging industry (Enz, 2009). It is understood that many aspects of exterior safety and security concerns can be resolved by utilizing appropriate lighting quality and quantity (Salmon et al., 2003). Quality addresses people's perceptions, feelings and impressions created by lighting (DiLaura, et al., 2011). Quantity addresses the measurable amount of light incident on a stair step or a human face, and the overall light uniformity levels which may be compared to industry recommendations, such as those established by the Illuminating Engineering Society of North America (DiLaura, et al., 2011) or codes and laws, such as the National Electrical Code or Life Safety Code. Economic analyses, energy consumption analyses and the like, may also fall into the quantity category. However, the installation and maintenance of safety and security lighting, which address illumination quality and quantity as well as the initial and maintenance costs for materials and energy, are complex tasks for hotels and lodging properties. The consideration of hotel properties' quality and quantity of safety and security lighting and the issues surrounding installation and maintenance are indeed complex and nuanced. Lighting is important to ensure employees' and guests' safety and security. Safety is defined as freedom from danger (i.e. falling down stairs) and Security is defined as freedom from fear or worry (i.e. of being mugged) (O'Shea & Rafferty, 2009).

For lighting for safety, the illumination of horizontal planes is critical (floors, stair treads, stepping stones, ramps). For lighting for security, the illumination of vertical planes is critical (recognize faces, read signage, insert key into entry door after hours).

The purpose of this study is to describe and compare the perceptions held by hotel employees concerning the level of security and safety lighting that exists in their hotel property. Moreover, to determine the level of importance these hotel employees place on lighting design in their hotel properties. The specific objectives of the current study are 1) to explore perceptions managers and employees of their properties' existing lighting conditions; 2) to raise awareness of the importance of appropriate lighting related to public safety and security issues; 3) to identify and analyze gaps between importance and business unit performance of existing exterior lighting at lodging and hotel property entrances and exits; and 4) to investigate factors affecting the perceptions of safety and security at night for lodging and hotel properties.

There is a need to describe the perceptions held by hotel personnel related to lighting design in order to determine baseline perspectives of how lighting has enhanced security and safety of employees and guests in lodging properties. This study attempts to identify the gaps related to the importance of proper lighting design and how well the employees feel that a hotel is doing in providing adequate lighting design to optimize security and safety features within the hotel property. This information could give credence to the future renovations and the re-lamping existing lighting fixtures aimed to reduce energy costs, promote conservation of resources, yet provide the optimal light benchmarks for interior and exterior surroundings. Sustainable resources can be cost-effective with the use of energy-conserving and cost-efficient bulbs. In addition, the reduction of energy costs can be realized with the pairing of daylight harvesting with electric light usage during specific periods of the day.

2. Literature Review

Sustainability challenges in lighting have loomed with the decision to re-lamp existing light fixtures with the new technology of compact fluorescent bulbs (CFB), or light emitting diodes (LEDs), which ultimately add value to the guest experience. It is sensible to address the lighting issues, challenges, and placements at a time where guests' safety, guests' feeling of living in a secure environment, and guest's well-being are of the utmost concern to hoteliers. The U.S. Environmental Protection Agency (EPA) has initiated the Sustainable Hospitality program that has direct linkages to lodging, food and beverage operations, sporting events, restaurants, events, meetings, and venues. These components affect the environment regarding energy and water consumption, waste management, recycling, and reused products that are developed for consumption and post-consumption disposition. By controlling these potential system energy leakages, the lodging industry may remain competitive if stopgap measures, employed standards, and benchmarks to reduce unwarranted resource waste are readily employed (U.S. Environmental Protection Agency's (EPA), 2014, Sustainable Hospitality, Region 4: Pollution Prevention (P2) and Innovation).

Ricaurte, Verma, and Withiam (2012) indicated that energy consumption benchmarks for water and electricity may be predicated on the monthly consumption data and the potential energy savings emanates from the EPA's Energy Star guidelines. The goal of energy efficiency is to use less inputs of scarce renewable resources instead of implementing a conservation program that affects service to the guests. Ricaurte (2012) contends that hotels that desire to reduce their carbon footprint have started to insource and generate renewable energy onsite. These hotels are ecologically and may employ pre-cycling, recycling, reducing, and reusing guest amenities. Ricaurte (2012) indicates that the standardizing of measurements for energy-consumption through Energy Star and Portfolio Manager may have far-reaching implications for the magnitude of the hotel property's environmental footprint. The linkage to lighting may come into play when designers are considering new construction and renovations which must follow industry guidelines for lighting applications, types of lamps used, and the Energy Star savings potentials realized if applications are adapted. Lighting for public spaces in hotel sis necessary, costly, and adds to the servicescape and image of the interior atmosphere of the hotel. The linkage of EPA's Energy Star and Portfolio Manager for buildings to the hotel is consistent with the mass-customized guidelines for energy (electricity) management for lodging facilities, improved energy-efficiency and performance, benchmark energy use, green buildings, financing strategies and conservation incentives (Energy Star, 2014). Ricaurte (2012) endorses the U.S-centric measurement as a reliable third-party site to collect data for all industries to compare their energy usage on a per square foot basis, or a per room-night basis. There is a tremendous benefit to hoteliers when adopting these standards.

Houdré (2008) asserts the importance of environmental impacts on the community is grave; hotel properties must continually seek alternatives and opportunities to minimize waste and maximize efficiency in all departmental entities. The workforce must be engaged to care, be forward-thinking, model, and communicate conservation initiatives to their guests. The sustainable development strategy at the Willard InterContinental has generated profit, improved the quality of life of people, and sustained the planet (Three Ps Initiative). Hoteliers, employees, and guests do care about the standards related to sustainability development that ultimately reduce cost of energy to the hotel chain Ricaurte (2012). These aspect of energy conservation align with the corporation's core values of being accountable and empowering the

employees and guests to be partners in this lighting program. Ricaurte (2012) emphasizes the importance for hoteliers and staff to monitoring sustainability within their properties, (e.g., conservation standards, eco-friendly initiatives of asking the guest to conserve water and electricity). Moreover, software programs may be used to monitor new industry and governmental (EPA) standards that could bridge the knowledge gap between standards and common industry practices to preserve and conserve these precious natural and energy resources.

The importance of energy (electricity and water) conservation through technology that would be primarily to facilitate guest comfort, (e.g., using in-room sensors for HVAC (Ecogreen: Energy Management Systems for Hotel Guest Rooms, 2014)). There are unique applications for in-room sensors for operating televisions and regulating lighting usage during occupancy and minimizing lighting (e.g. providing nightlights only) when the room is unoccupied. This strategy affords guests safety when entering the room. Sensors are activated, providing illumination as the guest enters and begins to locate the main lights' switches. American Hotel and Lodging (AHLA) established the eco-friendly Good Earthkeeping program which partners with guests in linen and towel reuse and allows guests to designate linen and towel change intervals. This energy and water conservation program may have significant energy and cost savings for the hotel property. The AH&LA formed the Green Task Force, composed of environmentally-conscious hotel executives operating properties on a nationwide basis (AHLA, 2014).

Daylight harvesting and LED lighting arrangements (ecogreenhotel.com) Moreover, the harvesting of the maximum amount of daylight for the following areas is a long-term goal for many lodging properties: front of house, back of house, exterior lighting (exterior property areas, parking lots, recreational areas, stairwells, walking paths, grounds, sidewalks, pathways and tunnels. Light emitting diodes (LED), lighting at dusk (sundown), or before sunrise may be considered. Digital Lumens (2011) introduced a new innovation that uses a sensor to assess the available amount of daylight and automatically adjust the electric light output to the desired benchmark level and re-adjusts electric lighting throughout the day. The dual "smart lighting" (light bulb and daylight harvesting) arrangement has the potential of rendering significant cost-savings using ambient light as a regulator. Moreover, according to Green Proving Ground Program (2014) daylight harvesting requires that an Integrated Daylighting System (IDS) be in place to measure the prevailing natural light against predetermined lighting set-points, which in turn sends an electronic signal to the dimming ballasts to control electric light levels. This system can be a direct applied to exterior lighting for brand signage, outside security and safety lighting (entrances, rear doors, outside stairwells, level parking lots, or tier parking garages, tunnels, recreational areas), and directional lighting at walkways and paths.

3. Methods

The central hypothesis is that appropriate levels of lighting can contribute to an improvement in public safety and security that is critical for achieving and maintaining a competitive posture anticipated to result in lodging industry prosperity and vitality. The survey research design was adopted to elicit responses from the managers and employees in a variety of metropolitan lodging environments. The respondents were asked to give their perceptions in rating the importance level of lighting used to accentuate the hotel properties image, and their perceptions of how well the lodging properties performed in providing adequate interior and exterior lighting in specific areas of the property. Demographic questions (gender, age, education, and work years in the industry) and types of hotels were also collected as percentages as shown in Table 1 and Table 2.

Table 1. Types of properties.

Items	Percentage
Chain-affiliation	
Independent	28.7
Chain-affiliated	71.3
Location*	
Urban	16.7
Suburban	17.5
Airport	5.6
Interstate/motorway	19.8
Resort	2.4
Small Metro/Town	38.1
Class	
Luxury	7.1
Upscale	25.5
Mid-Price	62.2
Economy/Budget	5.1
Room size	
less than 50 rooms	6.5
51-100 rooms	64.2
101-150 rooms	8.6
151-250 rooms	4.4
251-350 rooms	10.9
351-600 rooms	5.4
Segments*	
All-suite Living areas a.k.a. Residential Hotel	13.4
Bed & Breakfast Inn	9.0
Standard hotel/motel	48.5
Boutique	11.2
Conference/Convention Center	16.4
Destination resorts (e.g. golf, ski, spa, etc.)	1.5

Note * Respondents selected all that apply

Table 2. Demographic profile of respondents.

Items	Percentage
Gender	
Male	30.1
Female	69.9
Age	
18-29	68.0
30-39	12.6
40-49	8.7
50-59	8.7
60 or more	1.9
Education level	
Less than high school	4.8
High school	12.5
Some college	44.2
College graduate	29.8
Graduate education	8.6
Working period in the hospitality industry	
Less than 1 year	23.1
1 year or more to less than 3 years	27.9
3 years or more to less than 5 years	17.3
5 years or more to less than 10 years	15.4
Over 10 years	16.3

The survey instrument was developed using professional experience in the lighting and lodging hospitality management fields. The questionnaire consisted of the following major lighting areas:

(a) exterior and interior lighting for the hotel properties front and rear entrances for guests and employees, (b) surrounding walkways and sidewalks, (c) recreational area lighting, (d) covered and uncovered guest and employee parking areas surrounding the property, and (e) internal and external stairwells. The questionnaire was developed as a result of many iterations and was pilot-tested for clarity and understandability. A five-point Likert type scale was used to measure importance, whereby 1 = least important to 5 = most important. For the performance measure, a five point scale was used, the scale of 1 = low performance to 5 = high performance.

The Importance and Performance Analysis, developed by Martilla and James (1977), was adopted to determine the perceptions related to internal and external lighting in facilitating security and safety of guests and employees. Paired sample t-tests were conducted to find whether there is a significant difference between the perceived importance and perceived performance of the lighting attributes.

4. Results

A self-administered survey was used to examine perceptions of lighting. Participants completed a questionnaire regarding employee's lighting perceptions of hotels where they worked. The survey identified five major lighting areas, and six subcategories, resulting in identifying 30 dimensions that are related to lighting areas of emphasis. This questionnaire queried respondents regarding perceived importance and performance of existing safety and security lighting at hotel entries, paths and walkways, exterior stairs and paths of egress, parking lots/garages, dumpster/trash areas and recreation areas (basketball courts, courtyards, pools and spas, etc.). This survey was conducted with a convenience sample of hotel employees in four U.S. states and Washington D. C. The researchers personally contacted and surveyed hotel and lodging employees. As presented in Table 1, the majority of the hotels were chain-affiliated (71.3%) and mid-priced hotels (62.2%). The major location of the hotels was small towns (38.1%), followed by Interstate/motorway (19.8%), suburban (17.5%), and urban (16.7%). Almost half of the properties (48.5%) were in the standard hotel/motel segment.

A convenience sample was facilitated through personal contact with these hotel managers and the completed surveys were kept confidential. Responses were aggregated and reported by major lighting categories and subcategories. The final tally consisted of 103 usable responses out of 108 total surveys, representing a 98% response rate. The majority of the respondents were between 18 and 29 years of age (69.9%) and had some college education or more (81.6%). Sixty nine percent of the respondents were female and almost half of the respondents had worked in the hospitality industry for more than 3 years.

The questionnaire asked participants to identify their perceptions relative to the importance of lighting and how well they felt the hotel's had performed in 30 lighting dimensions. The participants indicated the importance (five-point Likert type scale, 1 to 5, variety of descriptors) they placed on t exterior lighting and how they perceived lighting had performed at hotel and lodging properties in providing for the safety and security of guests.

Importance and Performance Analysis

Table 3. Ranking the importance and performance of lighting areas.

	Mean	Std. Deviation
Importance		
front entrance	4.81	0.49
exterior stairs	4.70	0.61
parking lot	4.63	0.70
recreational area	4.60	0.62
sidewalk/pathway	4.60	0.69
rear entrance	4.59	0.56
Performance		
front entrance	4.61	0.62
exterior stairs	4.41	0.91
recreational area	4.29	0.87
parking lot	4.28	0.85
sidewalk/pathway	4.13	0.92
rear entrance	3.92	1.01

Importance and performance of each lighting area are presented in Table 3 presents. All importance attributes have average scores higher than four, indicating they are perceived as important to enhance customers' safety and security. The three most important lighting areas were front entrance, exterior stairs, and parking lot. The ranks and scores of performance in Table 3 hotels as a whole did well in using lighting to optimize guest safety and security. The top three areas in terms of lighting performance were front entrance, exterior stairs, and recreational area. The least performing area was rear entrance.

A paired t test was conducted to assess significant differences between importance and performance of hotel lighting in six different areas. The results in Table 4 revealed that the differences in all six hotel lighting areas were found to be statistically significant. In each area, the importance score was higher than the performance score (Table 4). The largest gap was found in the rear entrance lighting (mean difference = .67), indicating the needs for improvement.

Table 4. Differences between importance and performance – Paired t test.

	Importance		Performance		Difference (I - P)	t	Sig.
	Mean	Std. Deviation	Mean	Std. Deviation			
Front entrance lighting	4.81	0.49	4.61	0.62	0.19	3.62	0.0005
front entrance-provide safe environment	4.81	0.57	4.65	0.67			
front entrance-reduce security threats	4.81	0.59	4.64	0.68			
front entrance-reduce hiding places	4.81	0.51	4.49	0.78			
front entrance-give sense of security	4.81	0.55	4.62	0.65			
front entrance- adequate illumination	4.82	0.58	4.61	0.73			
Sidewalk/pathway lighting	4.60	0.69	4.13	0.92	0.44	5.10	0.0000
sidewalk/pathway-provide safe environment	4.67	0.74	4.21	0.98			
sidewalk/pathway-reduce security threats	4.68	0.69	4.09	1.01			
sidewalk-not cast deep shadows	4.44	0.89	4.12	0.99			
sidewalk/pathway-increase face recognition	4.51	0.87	4.04	1.15			
sidewalk/pathway-adequate illumination	4.65	0.79	4.16	1.02			
Parking lot lighting	4.63	0.70	4.28	0.85	0.34	3.77	0.0003
parking lot/garage-provide safe environment	4.64	0.78	4.28	0.97			
parking lot/garage-reduce security threats	4.57	0.79	4.29	0.92			
parking lot/garage-give sense of security	4.69	0.74	4.26	0.94			
parking lot/garage-light of exit ways	4.56	0.83	4.27	0.87			
parking lot/garage-adequate illumination	4.68	0.60	4.23	0.99			
Exterior stairs lighting	4.70	0.61	4.41	0.91	0.26	3.03	0.0033
exterior stairs-provide safe environment	4.70	0.65	4.35	1.09			
exterior stairs-reduce security threats	4.73	0.71	4.35	1.07			
exterior stairs-prevents criminal activity	4.64	0.75	4.20	1.08			
exterior stairs-enhance safety	4.74	0.63	4.53	0.92			
exterior stairs-adequate illumination	4.67	0.67	4.49	0.95			
Recreational area lighting	4.60	0.62	4.29	0.87	0.31	4.45	0.0000
recreational area-provide safe environment	4.77	0.60	4.53	0.84			
recreational area-reduce security threats	4.69	0.67	4.29	1.01			
recreational area-glare shielding light	4.53	0.84	4.40	0.86			
recreational area-conserve energy	4.34	0.94	3.96	1.30			
recreational area-adequate illumination	4.69	0.68	4.29	1.10			
Rear entrance lighting	4.59	0.56	3.92	1.01	0.67	6.93	0.0000
rear entrance-provide safe environment	4.75	0.66	4.09	1.21			
rear entrance-reduce security threats	4.79	0.56	4.23	1.12			
rear entrance-motion detectors	4.22	1.17	3.27	1.67			
rear entrance-enhance safety	4.54	0.79	3.87	1.30			
rear entrance-adequate illumination	4.69	0.69	4.16	1.14			

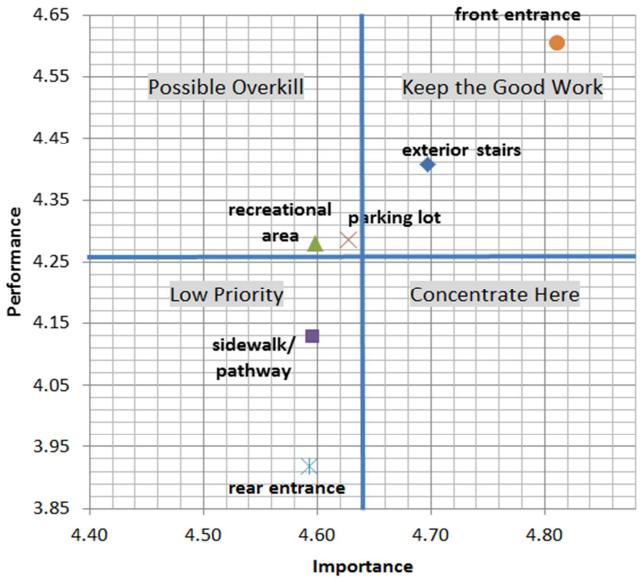

Figure 1. Important and performance analysis.

In order to better understand gaps and issues in hotel lighting, this study focused on using the Importance-Performance Analysis (IPA) that was originally proposed by Martilla and James (1977). IPA is useful as a planning tool and very popular in literature and practice and in the hospitality and tourism industry. Respondents expressed their perceptions by rating how important external and internal lighting in the five lighting areas were and how well the hotel properties performed in providing adequate lighting for their guests. As shown in Figure 1, the uniqueness of this technique is that it provided a graphical representation of the mean values of each dimension plotted on a graph. The y-axis represented performance, from top to bottom, high performance to low performance ratings. The x-axis represented importance, from left to right, low importance to high performance. The mean importance and performance for each area are plotted on the Importance-Performance Grid, coordinates x-importance mean value, and y-performance mean value.

The Importance-Performance matrix is divided into four quadrants which are used to generate suggestions for managers by differentiating between them. The first quadrant was quadrant A, keep up the good work (High importance/High performance). Front entrance and exterior stairs lighting fell in this quadrant (Figure 1). The second quadrant was quadrant B, possible overkill (Low importance/High performance). Recreational area and parking lot were in this quadrant, indicating hotels tend to overly emphasize the lighting of these two areas. The third quadrant was quadrant C, low priority (Low importance/Low performance). Sidewalk/pathway and rear entrance lighting were situated in this quadrant. The last quadrant is quadrant D, concentrate here (High importance/Low performance). Hotel lighting areas in this quadrant need to be improved with top priority, but no areas fell in this quadrant.

5. Discussion and Conclusion

The explanation of the quadrants are sensible and indicate to what extent the perceptions of the respondents relative to importance (expectations) are related to the perceptions of the respondents relative to how well the hotel properties provided (performance) the necessary lighting requirements. According to Martilla and James (1977), with some model adaptation, the following descriptions of the quadrants are offered. The grand mean for the 30 dimensions for importance and performance will be the numerical values for designating the grid lines for the x- and y-axis. Martilla and James (1977) contend that the median value for the importance and performance sub dimensions may also considered in the designated x-and y-grid lines. The intention is to align resources through a better utilization of funds to optimize guest safety and security.

Quadrant A: Keep up the Good Work The hotel property is meeting the expectations of the respondents in addressing the importance of front entrance and exterior stairs lighting with a high degree of effort (performance). The efforts of maintaining adequate external lighting in these areas will help in the customer satisfaction (delight) of the hotels' guests. The personal perception relative to safety at hotel sites may improve customer loyalty in repurchase intentions and word-of-mouth endorsement for hotel properties.

Quadrant B: Possible Overkill According to the respondents, the hotel property is doing more than is needed in providing lighting in recreational area and parking lot to enhance safety and security of their guests and employees. There are possibilities to place less emphasis in these areas and devote needed resources to dimensions in Quadrant C-Low Priority and in Quadrant D-Concentrate Here. Reinvent, innovate, rethink, redirect, or reconsider how the alignment of scarce resources, monies, human capital, can be used to improve the selected items that may be designated for dimension in Quadrant C-Low Priority and Quadrant D-Concentrate Here.

Quadrant C: Low Priority The respondents perceived low importance and low performance in sidewalk/pathway and rear entrance. There are opportunities for these areas to be revisited, reinvented, and emphasized. The strategy of routing (revert) some of these dimensions to Quadrant D-Concentrate Here may impact cost reduction measures and improve guests' perceptions of the care and safety conditions extended by hotel brands.

Quadrant D: Concentrate Here The respondents felt that these dimensions were of high importance, however, the hotel properties efforts (performance) were in need of improvement and attention. While some of these dimensions may, over time, revert to Quadrant B-Keep up the Good Work, this study did not find a lighting area that needs immediate improvement.

Researchers found that there were significant gaps between how important employees thought lighting was for some areas in their hotels and how well the lighting in those areas of their hotel performed. The gaps between importance and performance indicated where the lighting needed to be improved or which areas were illuminated more than was needed.

The findings indicated that the gaps were relevant to: rear entrance motion detectors, rear entrance enhanced safety, rear entrance provides a safe environment, recreational areas provide a safe environment, sidewalks with enhanced face recognition, sidewalks reducing security threat, sidewalks providing adequate illumination, parking lots providing a sense of security, and parking lots providing adequate illumination. The findings imply that external lighting for rear entrances, sidewalks, parking lots, front entrances, and recreational areas are important and that the employees hold safety and security light in high regard.

The gap analysis mean differences may be used to justify the application of specific new lighting strategies that meet the needs of a particular hotels' (cost-saving) conservation programs, and provide optimal expanded external and internal lighting for improved safety and security for guests and employees.

There are additional insights that may be gleaned from the ratings for importance (expectations) and performance. With the determination of the mean difference for each of the sub-dimensions (expectations minus performance), one may infer to what magnitude the respondent's perceived expectations were met by the performance (effort), in adequate external and internal light for the guests and employees. The negative signs associated with some of the mean differences may provide a signal for performance improvements and innovations in the specific category area. The results of the gap analysis may provide insights into hotel managers' beliefs as to what is really important to their guests, suggestions of areas for lighting improvements, and situations where conservation best practices may be explored. There are potential issues related to phenomena such as "light pollution" that may affect the hotel and lodging sites as well as adjoining properties. Light pollution may reduce guests' or nearby homeowners' levels of comfort. Conversely, the glare from adjacent properties' signage may have an adverse effect on hotel guests. Nearby lighting may diminish the visibility of a hotel's own signage. Adjacent lighting used for advertising of other businesses may upstage the subtle illumination of an historic lodging building landmark.

Response rates for surveys, especially from hotel and lodging employees, are historically low. Also, by location or segment, the corresponding numbers of completed surveys may be unbalanced (for example more urban hotel employees may reply than non-urban hotel employees.) This situation may result in challenges for statistical analyses.

The findings indicate that research should be conducted to explore how re-lamping of existing fixtures may result in energy-savings and cost-savings through energy usage monitoring systems able to isolate energy usage and energy conservation within hotel properties. Further research should be conducted to determine the advantage of daylight harvesting and electric light usage for specific on-peak and off-peak periods.

List of Definitions

Light Pollution: unnecessary brightness or glare, light where it is not wanted, or that strays from its intended purpose (Rea, 2000)

Safety: freedom from danger (i.e. falling down stairs) (O'Shea & Rafferty, 2009)

Security: freedom from fear or worry (i.e. of being mugged) (O'Shea & Rafferty, 2009)

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