An approach of environmental design in LEED hotels by comparing visual and verbal experiences.

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Abstract

The goal of this paper is to highlight those actions that can change the experience of the customer during their staying by the design in the guestroom. The research carried out chose hotels located in the United States and Europe in order to find out and compare strategies of each one.

The research covered ten case studies, which were chosen by obtaining LEED certification. Once we obtained their design actions developed for getting indoor air quality, the research compared which of them were influential on the customer experiences during their stay by reviewing TripAdvisor reviews and pictures of customers.

The results show us how the LEED certified hotels have a relation between the design action of LEED and the customer's experience in rooms. In additions, the paper reveals a group of emotional codes in terms of comfort, relaxing and visual relations between built and natural environments.

Keywords

emotional design; indoor environmental quality; LEED certification; TripAdvisor reviews; guest room design

1. Introduction

The hotel's rooms represent almost 70% of the total built surface of the hotel (Forster Associate, 1993). This percentage may change depending of the type of hotel (skyscraper, hotel of 4-7 floors or tourist resorts). 10% of customer purchases are driven by guestroom design (Dubé L. & Renaghan L.M., 1999) and 9% were driven by the following attributes: HVCA, aesthetics, overall, size, cleanliness, comfort, kitchenette, work equipment and entertainment. In Dubè`s research, the customer gave their opinion during the stay or at the point of purchase decision. That means that the experience was not finished, leaving the possibility to change their opinion during the rest of stay. In any case, some of the attributes defined in 1999 by Dubè continue to be useful for defending the hypothesis that emotional guestroom design is more important than functional guestroom design, such as, size, comfort and entertainment.

During the last decades, architects and interior designers have been studying the guestroom through functional design features (Rutes, W.A., Penner R.H., &, Adams, L., 2001). The relation between optimal dimension, amenities and room types is the goal for architects to design a guestroom. Technical and constructive aspects are important too for designing, interchangeably the type and room's dimension (Rutes W.A., FAIA, & Penner R., 1985).

On this line of spatial and technical aspects, U.S. Green Building Council organization is promoting sustainable actions to offer professionals a guideline, in order to get a sustainable certification for the building. Leadership in Energy and Environmental Design (LEED) is the title of the certificate and is becoming a kind of marketing brand in the hospitality industry. We still do not know how the LEED certificate may impact on the business benefits (Walsman M., Verma R. & Muthulingam S., 2014). However, LEED certification continues to be the most proper certificate for sustainable designing in the

U.S. hospitality industry. Some of the most important chain hotels in the world, such as, Marriot, are promoting the LEED certification in their hotel by creating the first LEED Volume Program. So far, this company has thirty hotels with awards and has introduced the first LEED green Hotel Prototype.

LEED certification is based in point schedule by six categories (sustainable sites, water efficiency, energy & atmosphere, material & resources, indoor environmental quality and innovation. In this research, we will put the focus on the indoor environmental quality aspect because by studying its parameters of design, the researcher can understand that this is the more related category regarding the design and customer's experience inside the guest room. These parameters are increasing ventilation, thermal comfort-design, and daylight and views, among others.

If LEED certification give us the benefit and certainty during and after the hotel's construction for being a sustainable hotel, that benefit is opening new lines of research for knowing the customer's experience in a LEED certification hotel. Could a LEED hotel increase the customer experience? Or does a green hotel not always mean a successful experience for the customer? Professionals in the hospitality industry are convinced that the most important thing is the customer experience. Three of the head officers of the most important chain hotel in the world defended that idea during the lecture series in the fall semester of 2014 at the School of Hotel Administration at Cornell University. Mr. Ronald T. Harrison said, "the most important for Marriot is people;*"* Mr. Kevin Jacobs said during his lecture, "we are passionate about delivering the best experience to our guest*"*; and Samantha Sugarman showed the goals for facilities and design analysis in Four Seasons hotels, which are "specific style of design, don't dictate a style, every hotel has their style and want great experience." All of them considered the customer experience as the principal concern in the hospitality industry.

So far, we know that LEED certification become a metric for sustainable hotels in the U.S. and the chain hotels are focusing on the customer experience for improving their benefits. The scientific researchers conducted studies about the customer experience and its impact in the hospitality industry; in addition they applied different methodological approaches.

The volume of customer reviews on the TripAdvisor website for the final purchasing decision, represents an important tool for potential customers (Melián González S., Bulchand Gidumal J., & López Valcárcel B., 2014). The electronic word-of-mouth called eWOM (Cantallops A.S., Salvi F., 2014) is more effective than communication marketing in the hotel sector (Litvin S.W., Goldsmith R.E., & Pam B., 2008; Gretzel, U., & Kyung Hyan Y., 2008).

The eWOM can be manipulated for anyone, and the authenticity of the comments can be false (Mayzlin D., Dover Y., & Chevarlier J., 2012). The impact of the TripAdvisor reviews directly affects the reputation of the hotel and changes the booking of hotels (Anderson K., 2012). Due the possibility for false reviews and a decrease in the percentage of real reviews, the researcher applied a methodology for increasing the indicator about the truthfulness of customer's reviews. Thus, the study continues using the impact of reviews on TripAdvisor as a source.

TripAdvisor gives the customer the possibility to insert their reviews and upload pictures of their travel before or after their stay at the hotel. The pictures taken inside the guestroom become irrevocable proof that the customer stayed at the hotel and give us information of their behaviours and memories (Harper D., 2002). In addition, it is a form of evidence that the reviews were written after the stay. Pictures in the form of postcards have been used in tourism for representing an ideological discourse in modern tourism (Albers P.C., & W.R. James, 1988) representing icons, customs or landscapes of the places to visit. The new technologic trends in smartphones and cameras give the customer the possibility to capture any moment during the stay. Often, customers use photography to spark strong memories, among others reasons (Pullman M., & Robson S., 2007). Thus, the researcher studied the pictures taken inside the room, knowing that the pictures uploaded represent positive or negative memories from the customer's experience. Regarding what kind of pictures the customer takes during the stay, the research concluded

those highlight important design elements. In other research where a photographic approach was applied through websites, researchers discovered the subject of the pictures reflecting the customer's behavior (Donaire J.A., Camprubí R., & Galí N., 2014; Chalfen R.M., 1979). This research is focused on what they captured and not how they were made.

The current research is carrying out a new approach based on emotive design for the hospitality industry, putting in evidence the customer's comments and pictures as the new approach for the hospitality design. Often, architects and interior designers are able to design hotels without any background knowledge about the customer's experience. The hospitality industry, based in the guest experience, must focus more on the emotive design in hotels and public spaces (Lo K.P.Y., 2009, 2011; Masoudi A., Cudney E., and Paryani K., 2013; Pullman M., & Robson S., 2007; Jüttner U., Windler K., Schaffner D., and Maklan S., 2013).

The emotional design in guest rooms means working on designing for emotive status, such as, functional, satisfactory or memorable experience (Lo K.P.Y., 2007). Each status is defined by different emphases on its design (Barsky J., & Nash, L., 2002). It is, therefore, how we can achieve a memorable experience in LEED hotels. LEED certificate represents the top level for sustainable actions for buildings in U.S. That means that the hotel or chain of hotels wants to communicate a clear message to its guests. Having a message or theme is one of the conditions to achieve a memorable experience.

The research analyzed those designs that the customers emphasized through comments and pictures on TripAdvisor's website. Using this approach we will be able to recognize positive or negative design aspects in LEED hotels.

The emotional design has been studied and put into practice by other disciplines that use object or symbols (Norman D.A., 2002, 2004; kim H., & Lee w., 2014). The hospitality industry is becoming a trend sector for applying new methodologies in interaction with the human behaviors. Recently, researchers are searching new approaches for understanding the customers' behaviors using eye tracking (Robson S., & Noone B., 2014).

This research highlights the opportunity for using the emotional design in the hospitality industry because it is a sector based in human experiences. The success of guestroom design must be understood as those spaces are able to offer many experiences to the customers. The idea of designing many rooms within a room (Siguaw A.J., & Enz C.A., 1999) is the basis for thinking that a guestroom is not only a functional space or a satisfactory experience. The real loyalty of customers in a guestroom of a hotel is when the expectation of the room design is exceeded and memorable experiences are reached through it (Skogland, I., & Siguaw, J. A. 2004). If that emotional guest room is applied in LEED hotels improving its commitment with the environment and energy, we can break old concepts in the hospitality industry and add value to guestroom experience in hotels.

2. Material and methods

In order to obtain results that can be used or put into practices by professionals in the hospitality industry, the material and methods applied were collected directly from resources used by professionals or real customers.

The stages used to obtain material and the methodologies applied in this study were mainly based in two phases. In every one of them, the goals were different, which means each phase used different methodologies. The first stage of the study was representative, collecting data from different sources. The second stage focused on creating groups of emotional design codes in LEED hotels.

2.1. Data collecting

This study, which aims to discover the keys of the design, was necessary to establish a comparison between the case studies. The researcher studied hotels that received the higher level of LEED certification located in the U.S. and Europe. As a first conclusion, it was important to know that the geographical place of hotels is an indicator that may change the customer experience because of the design.

2.2. Case studies

The first task in this stage was building a database with all the LEED hotels in U.S. and Europe until December of 2014. The LEED hotels were filtrated by LEED's categories (Silver, Gold and Platinum) with the purpose to choose only those hotels with top LEED level certificate. U.S. has three hotels with LEED Platinum certificate and eighty-three hotels LEED Gold. However, Europe does not have hotels LEED Platinum, it has with eight hotels LEED Gold and one hotel with LEED Silver.

If the first parameter was based in those hotels, which got a sustainable certificate of LEED, the second parameter was about the experience of the customers in those hotels LEED. The study chose the website TripAdvisor as source for measuring the customer experience. Each customer has the possibility to valuate their experience by different ways. One of them is the traveler rating and another one is the rating summary. The study used both ratings for choosing the five case studies most representative in U.S. and Europe. The election was made in those hotels with a value 5 in "Rating Summary" RS for rooms and the value higher of the indicator TR. The indicator TR was calculated between the total number of "Traveler Rating" and those who chose "excellent" between the five options of experiences.

The data collected at this stage shows us how the numbers of LEED hotels in the U.S. are much higher than in Europe. Table 1 shows three hotels of LEED Platinum certification and eighty-four of LEED Gold, contrasting the nine hotels of LEED certification in Europe. The second aspect highlighted about the hotels in Europe is that there are not any hotels with a value "5" rating for rooms.

The next step of the research chose those hotels with high LEED certification and higher RS value. The ten final case studies were filtered between those fourteen case studies selected before (table 1) with the highest value of TR of every continent (table 2).

Table 1. Rating Summary in guestroom on TripAdvisor website of the LEED certified hotels

	Category LEED certificate		**RS in rooms (Val. 0-5)*. TripAdvisor**				
	In order of high range	No. Hotels	No. Hotels				
			Val. 5	Val. 4.5	Val. 4	Val. 3.5	Val. E**
U.S.	Platinum	3	***1***	2	0	0	0
	Gold	84	***8***	28	8	3	37
	Silver	***	***	***	***	***	***
Europe	Platinum	0	0	0	0	0	0
	Gold	8	0	***5***	1	1	1
	Silver	1	0	1	0	0	0

Source. Own elaboration

Note. * Ranges of values of the customer experience in the room.

** Numbers of hotels without values because it is not on the TripAdvisor website.

*** The study does not collected data from Silver LEED hotels because of the high numbers of Gold LEED hotels.

The range of values on the indicators TR was between 0.7 and 0.88, instead of European cases where the range was between 0.27 and 0.70. That minimum value means that the European hotels have lower excellent ratings than American hotels. Once the study chose the five U.S. and five European hotels, the next steps was to find out if the range of values of TR (Traveler Rating) in Rooms has any relation with the LEED value of Indoor Environmental Quality (EQ).

Table 2. Traveler Rating value on TripAdvisor website of the LEED certified hotels

	Category LEED certificate		Rating Summary in ROOMS (Val. 0-5)*. TripAdvisor		Traveler Rating. TripAdvisor		
		No. Hotels	Val. 5	Val. 4.5	No. Excellent	No. Total reviews	TR Val.
	Platinum	1					
U.S.			**Id.1**	-	536	*606***	***0.88***
	Gold	8					
			Id.2	-	253	*323***	***0.78***
			Id.3	-	370	*457***	***0.81***
			Id.4	-	230	*324***	***0.71***
			Id.5	-	456	*519***	***0.88***
			Id.6	-	16**	22	0.73
			Id.7	-	89**	101	0.88
			Id.8	-	92**	131	0.70
			Id.9	-	2691**	*3190*	0.84
Europe	Gold	5					
			-	**Id.1**	72	*258***	***0.28***
			-	**Id.2**	369	*577***	***0.64***
			-	**Id.3**	208	*297***	***0.70***
			-	**Id.4**	128	*276***	***0.46***
			-	**Id.5**	95	*210***	***0.45***

Source. Own elaboration

Note. * Ranges of values of the customer experience in the room.

** The contrast of the values is higher or lower than the average value.

*** Value within the average range (200 to 600 reviews).

The research considered does a comparative study with values of total reviews higher or lower than the average value in the U.S. hotels. This decision was applied to the five U.S. hotels with Id.1 - Id.5 and the five hotels in Europe with Id.1-Id.5.

2.3. Correlation between TripAdvisor rating and LEEDs actions

The actions of the category Indoor Environmental Quality (IEQ) in LEED certificates are designed to find a climate balance in buildings from the natural resources (air, light or raw materials), to benefit human comfort (Olgyay, V., 1963). Each hotel may get fifteen of sixty-nine total points in the IEQ category, these values are calculated by the version 2.2 of LEED certification. Currently, LEED certification uses version 4, and the total point in the six categories are one hundred ten points, instead of sixty-nine. One of the questions posed by the study during the data collection process was to think about a new indicator for customer experience in LEED hotels. It would mean a correspondence value between IEQ (sustainable design) and TR and RS indicators (customer experience by TripAdvisor).
As aforementioned, the TR indicator was calculated from the total number of reviews and excellent experiences, and the RS indicator is the value given by customers about the quality of rooms. Before attempting to find out the relation between them, the study will show the criteria for getting the fifteen IEQ values, as follows: *EQc1. Outdoor air delivery monitoring; EQc2. Increased ventilation; EQc3.1 Construction IAQ management plan - during construction; EQc3.2 Construction IAQ management plan - before occupancy; EQc4.1 Low-emitting materials - adhesives and sealants; EQc4.2 Low-emitting materials - paints and coatings; EQc4.3 Low-emitting materials - carpet systems; EQc4.4 Low-emitting materials - composite wood and agrifiber products; EQc5 Indoor chemical and pollutant source control; EQc6.1 Controllability of systems – lighting; EQc6.2 Controllability of systems - thermal comfort; EQc7.1 Thermal comfort – design; EQc7.2 Thermal comfort – verification; EQc8.1 Daylight and views - daylight 75% of spaces; EQc8.2 Daylight and views - views for 90% of spaces.*

The hotels obtains different points to get the Platinum (52-69 points), Gold (39-51 points), Silver (33-38 points) or Certified (26-32 points) certification according to the total sum among the six categories. The IEQ value obtained is the percentage of the total possible points that were distributed to the IEQ category. As seen below, the study shows the values of IEQ, RS and TR. Table 3 is contrasting these three indicators to find out if there are some links between sustainable design and customer experience.

Table 3. Relation between Indoor Environmental Quality (LEED design) and customers' evaluation (TripAdvisor)

	Category LEED certificate		LEED, IEQ points		(RS) Rating Summary in ROOMS (Val. 0-5)	(TR) Traveler Rating
		ID.	IEQ*	IEQ Val**	RS Val.	TR Val.
	Platinum	Id.1	13	**18.84**	5	0.88
U.S.						
	Gold	Id.2	12	**17.39**	5	0.78
		Id.3	13	**18.84**	5	0.81
		Id.4	9	**13.04**	5	0.71
		Id.5	10	**14.49**	5	0.88
rs***(U.S.). IEQ-TR		0.451				
Europe	Gold	Id.1	12	**17.39**	4.5	0.28
		Id.2	7	**10.14**	4.5	0.64
		Id.3	7	**10.14**	4.5	0.7
		Id.4	10	**14.49**	4.5	0.56
		Id.5	5	**7.25**	4.5	0.45
rs***(Europe).IEQ-TR		-0.528				
rs*. IEQ-TR**		**0.320**				
rs* IEQ-RS**		**0.606**				

Source. Own elaboration

Note. * IEQ. Total points obtained in the LEED scorecard of Indoor Environmental Quality.

** IEQ Val. Percentage of IEQ points obtained from the total points of LEED certification.

***rs. Correlation Coefficient. IEQ-TR (traveler rating) and IEQ-RS (Rating in rooms).

The analysis shows us how it can be possible to think in a new indicator for sustainable actions and customer experiences. There is a correlation between moderate to strong (rs IEQ-RS=0.60) between those actions to improve the LEED Indoor Environmental Quality and the customer satisfaction in the rooms. It is important to remember that the RS value means customer satisfaction regarding the overall rating for rooms. Instead, the IEQ LEED action does not have an impact (rs IEQ-TR=0.32) on the overall traveler rating and the general customer satisfaction in the hotel.

According the "TR" values of the U.S and European hotels, American hotels with higher scores on IEQ LEED actions correlates to an increase in TR. In contrast, European hotels have a decreasing correlation between IEQ value and TR. Regarding this conclusion, in order to get a more accurate result about the IEQ-TR correlation; the project should in the future examine a higher number of case studies.
After the result put in evidence a strong correlation between IEQ LEED actions and high rating in the rooms, the next step of the study was to find out the reasons for successful experiences in rooms.

2.4. Comparing photographs and experience reviews.

The study used the website TripAdvisor in order to find out emotional codes in room spaces of LEED hotels. The website is configured so that anyone can submit a comment. Therefore, to avoid false reviews from people who did not stay in the hotel, the research used only customer comments with pictures uploaded to the website. Pictures are clear evidence that the travel was made and provide an approach for contrasting associated comments (Pullman M., & Robson S., 2007).

The first step was to identify all TripAdvisor users who uploaded photographs to the website of each hotel. All photographs uploaded were grouped into six to ten categories, depending on the features of case studies (e.g. view from the room, room/suite, pool/beach area, dining, hotel &grounds, bathroom, family/play area, videos, etc). Even though TripAdvisor is a huge bank of travelers' pictures, we chose the pictures from the room/suite and bathroom category in order to continue with the prior analysis. The research designed a database (A) of 217 users who took a total of 553 pictures (table 4).
In some cases, users had inserted demographic information on their TripAdvisor profile about age and gender. This information was linked to the database to accompany information regarding their comments and pictures.

Regarding the customer comments eWOM, the study created a second database (B) with all the reviews from customer photographs. A total of 303 reviews were collected (table 4). The reviews were studied

according to their experience description (Jurafsky D., et al., 2014), by using adjectives of emotion, quantity and function about the elements and spatial relation (table 5).

Once all photographs and comments were coded, the next step was to make a coding cross comparison, in order to find out the emotional codes associated with pictures and eWOM.

Table 4. Summary of data collection (visual and verbal experience) in TripAdvisor of the LEED certified hotels

	LEED certificate		**Users (us)***	**Photographs Database (A)****		**Comments Database (B)****	
		ID.	No. us.	No. in bathrooms	No. in rooms	No. in bathrooms	No. in rooms
U.S.	Platinum	Id.1	47	45	83	20	44
	Gold	Id.2	11	5	26	8	10
		Id.3	29	7	57	8	27
		Id.4	14	21	20	8	13
		Id.5	31	25	62	17	30
	Total U.S.		***132***	***103***	***248***	***61***	***124***
Europe	Gold	Id.1	14	16	15	3	14
		Id.2	23	24	42	10	22
		Id.3	28	11	39	12	26
		Id.4	11	10	25	8	11
		Id.5	9	5	15	4	8
	Total EU		***85***	***66***	***136***	***37***	***81***
	Total		**217**	**169**	**384**	**98**	**205**

Source. Own elaboration

Note. * Users who took pictures in rooms and bathrooms.

** The data collection was made in December of 2014.

The table above shows us two interesting relations (A, B) regarding clients and their experiences and, description of rooms and bathrooms. The first apparent relation is between spaces (A) and total photographs. It seems that for each picture taken of a bathroom, the customers took two or more of the bedroom. The second relation is between numbers of users, reviews and photographs (B) in bathrooms uploaded on TripAdvisor. In some cases the proportion is one to one, in others it changes, representing an inconsistent relation. However, the second relation (B) in rooms is stable, being one to one in comments and, one to two in photographs taken.

A first potential explanation to answer the first relation (A) could be that customers find more elements in the bedrooms to take pictures than in the bathrooms. Therefore, this proportion led us to believe that each space in the hotel must be studied separately. That means, quantitatively speaking, every space has its own emotional basic codes (Groh J.M., 2014).

Instead, the second relation shows us how the clients are able to discern differences in the hotel bathrooms. Thus, the bathroom becomes a design space able to excite customer, or not. While in the bedrooms the TripAdvisor users always have an emotionally strong response (Melián González S., Bulchand Gidumal J., & López Valcárcel B., 2014).

The second stage of the study was based on discovering groups of emotional design codes in LEED hotels after the data collection stage.

3. Discerning visual design codes.

All the photographs in bathrooms and bedrooms were codified according to the parameters of tangible or intangible elements (table 5-6) and their spatial relation (visual and physical). Below the elements identified in the photographs are listed according to their features. The total of elements coded in bathrooms and bedrooms were 32.

Table 5. Visual elements identified in Photographs taken by customers in bathroom

Bathroom		
A. Elements		**B. Spatial Relation**
Cod.A.1. Tangible		**Cod.B.1**. Physical
01. Bathtub	***05***. Toilet	***01***. Garden
02. Shower	***06***. Flat shower	
03. Mirror	***07***. Toiletries	
Cod.A.2. Intangible		**Cod.B.2**. Visual relation
01. Artificial light		***01***. Outside views
02. Natural light		***02***. Visual relationship to the bedroom

Source. Own elaboration

Table 6. Visual elements identified in photographs taken by customers in bedroom

Bedroom			
A. Elements		**B. Spatial Relation**	
A.1.Tangible		**B.1**.Physical	
01. Bed	***05***. Gift	***01***. Garden	***05***. Kitchen area
02. Furniture	***06***. Food	***02***. Living room	***06***. Corridor-entrance
03. Sofa		***03***. Desk area	***07***. Closet space
04. Blanket		***04***. Massage room	***08***. Dressing room
A.2.Intangible		**B.2**. Visual relation	
01. Artificial light		***01***. Bed facing outside view	***03***. Terrace facing the landscape
02. Natural light		***02***. Living room facing outside view	***04***. Views to outside
		C.3 Technology	
		01. TV , Clock	

Source. Own elaboration

3.1. Spatial syntax according the visual impact of photographs.

By studying photographs, we were able to determine the spaces with a high visual impact. We used the 169 photographs to study the bathroom area and the 384 photographs taken of bedrooms (table 4).

In bathrooms, we identified 308 elements to the 169 photographs. Although not all the spaces had the same effect on the customer's experience, the most interesting endeavor was to discover elements with high visual impact (Pullman M., & Robson S., 2007).

The 63.7% of the photographs taken by customers showed that tangible elements in bathrooms had higher visual impacts.

The table 7 shows that the three tangible elements with the highest visual impact are the bathtub, mirror and vanity. These three elements represent almost three quarters of the total visual impact of tangible elements. The study also showed two strong connections between elements. The first is the mirror (tangible element) and the artificial light (intangible element) with a 62% (Figure 3), and the second is the bathtub and the outside views and natural light (visual relation) with 77% (Figure 1-2).

Figure 1-2. Bathtub-outside views-natural light. Hotel Bardessono. Source. TripAdvisor.

Figure 3. Mirror-artificial light. Hotel Bardessono.

Table 7. Visual Impact of bathroom according photographs taken

Bathroom											
A. Elements						**B. Spatial Relation**					
Cod.A.1. Tangible	**No.***	**%****	**Cod.A.2**. Intangible	**No.**	**%****	**Cod.B.1**. Physical	**No.**	**%****	**Cod.B.2**.Visual relation	**No.**	**%****
01. Bathtub	***45***	***14.6***	***01***. Artificial light	***35***	***11.4***	***01***. Garden	*7*	*2.3*	***01***. Outside views	*28*	***9.1***
02. Shower	*7*	*2.3*	***02***. Natural light	***30***	***9.7***				***02***. Views to the room	12	*3.8*
03. Mirror	***45***	***14.6***									
04. Bathroom vanity	***43***	***14***									
05. WC	*20*	*6.5*									
06. Flat shower	*29*	*9.4*									
07. Toiletries	*7*	*2.3*									
Total	196	**63.7**		65	**21.1**		7	2.3		40	**12.9**
Correspondence Codes A.1.01 (Bathtub) + B.2.01(Outside views) + A.2.02 (Natural light). 33.4%. *The percentage was calculated based on databases work*											
Correspondence Codes A.1.03 (Mirror) + A.2.01 (Artificial light). 26%.											

Source. Own elaboration
Note. *(No. Code / total photographs)

The study also collected a total of 779 elements within the 384 photographs taken of bedrooms. Using the same method as in the bathrooms, we identified the highlighted elements and relationship between them. According to Table 8, the furniture was the tangible code (Cod. C.1.02) most photographed, comprising 20.3% of the total photographs taken. This element consistently appears to be related with others two codes, such as, bed and living room. Bed (Cod. C.1.01) and living room (Cod. D.1.02) are the elements most photographed with 13.7% and 7.6% respectively, after the furniture. Natural light with 20.4% and artificial light with 10.52% were studied in terms of relationship and not as individual elements by themselves (see table 8).

Listed below are the two relations between elements with higher visual impact in bedrooms.
a) C.1.01 (bed) + C.1.02 (furniture) + C.2.01 (artificial Light) +D.2.01 (views). 40.13% (Figure 4)
b) D.1.02 (living room)+C.1.02 (furniture)+C.2.02 (natural light)+D.2.02 (views). 40.1% (Figure 5)

One consideration according the results was the importance of each code's group on the total impact. Although the intangible group (code C.2) had a higher percentage at 30.92%, the visual relation group (code D.2) did have 15.62%. This suggests that outside views are still very important to customers during their vacation. It is important to remember that in bathrooms the highest percentage of visual impact was the bathtub with outside views. However, the visual relation in bedrooms comes from four different places. The views from the living room had 4.5%, view from the bed had 3.21% and views from the terrace had 2.3%. The highest impact was a view to gardens, the city or landscape with 5.64% (Figure 6).

A high visual impact of customers in bedrooms focused on the bed, the living room, and on their visual relation to outside. Also, the natural light was detected on the photographs as an important intangible element in the bathroom and bedroom.

It seems evident there is a relation between hotels with LEED certification and customer experience because the natural light and the views to the outside are elements that correspond to both systems.

Figure 4. Environmental design (a)

Figure 5. Environmental design (b)

Figure 6. Views to outside (city/mountain)

Source. TripAdvisor.

Table 8. Visual Impact of bedroom according photographs taken

Bedroom													
A. Elements						**B. Spatial Relation**						**C. Technology**		
Cod.C.1. Tangible	**No.**	**%***	**Cod.C.2**. Intangible	**No.**	**%***	**Cod.D.1**. Physical	**No.**	**%***	**Cod.D.2**. Visual relation	**No.**	**%***	**Cod.E.1**. Items	**No.**	**%***
01. *Bed*	*107*	***13.7***	***01***. Artificial light	*82*	*10.52*	***01.*** *Garden*	*4*	*0.5*	***01.*** *Bed facing outside view*	*25*	***3.21***	***01.*** *Tv screen, clock, etc*	*26*	*3.33*
02. *Furniture* *Funirture+A.1.01= 99* *Furniture+ B.1.02=59*	*158*	***20.3*** ***12.7*** ***7.6***	***02***. Natural light	*159*	***20.4***	***02.*** *Living room*	*59*	***7.6***	***02.*** *Living room facing outside view*	*35*	***4.5***			
03. *Sofa*	*9*	*1.15*				***03.*** *Desk area*	*21*	*2.7*	***03.*** *Terrace facing the landscape*	*18*	*2.3*			
04. *Blanket*	*1*	*0.13*				***04.*** *Massage room*	*3*	*0.4*	***04.*** *Views to outside*	*44*	***5.64***			
05. *Gift*	*3*	*0.4*				***05.*** *Kitchen area*	*9*	*1.15*						
06. *Food*	*1*	*0.13*				***06.*** *Corridor*	*11*	*1.41*						
						07. *Closet space*	*3*	*0.4*						
						08. *Dressing room*	*1*	*0.13*						
Total	279	**15.51**		241	**30.92**		111	**14.29**		122	**15.65**		26	**3.33**
Correspondence Codes C.1.01 (Bed) + C.1.02 (Furniture) + C.2.01 (Artificial Light). 20% *The percentage was calculated based on databases work.*														
Correspondence Codes D.1.02 (Living room)+C.1.02 (Furniture)+C.2.02 (Natural light)+D.2.02 (views). 28%														

Source. Own elaboration
Note. *(No. Code / total photographs)

Our analysis of customers' photographs in bathrooms and bedrooms, suggested that natural light and views are main actions or elements that can increase customer satisfaction. Moreover, our research suggests that these elements are IEQ criteria in LEED hotels. Those IEQ criteria that refer to the natural light and the views in LEED certificate are *EQc8.1 Daylight and views - daylight 75% of spaces and EQc8.2 Daylight and views - views for 90% of spaces.*

The diagram below shows us those elements and spatial relations with a high visual impact in rooms of hotels. In figure 7, we see which codes have a high visual impact in the bathroom and bedroom. One condition to get a high impact in customers is that tangible elements (bed and bathtub) and living rooms always need to have views to the outside.

According to this study of the customers' visual impact, we could identify three types of user experiences. Those experiences are based on the tangible element of bed (C1.01) as a "sleeping" experience, the bathtub jet/shower sauna (A1.01) as a "relaxing /spa" experience, and the physical space of living room (D1.02) as a "living / welcoming" experience.

If we think in experiences (sleeping, relaxing/spa and living) and not just in spaces or elements distributed in a functional way, we are actually changing the traditional concept of hotels. A hotel room design geared towards an emotional design would improve the current strategies of many hotels that only use technology (free wifi or tv flat screen) as added value in rooms. (Gilmore J. H., & Pine II B. J., 2002).

The research highlighted the importance of getting a memorable experience while the sleeping, relaxing in the living area and taking a shower. If technology does not enhance these experiences within the room, it could negatively affect the overall customer experience (Lo K.P.Y., 2007; Van Hoof H. B., et al. 1995; Siguaw J.A., & Enz C.A., 1999).

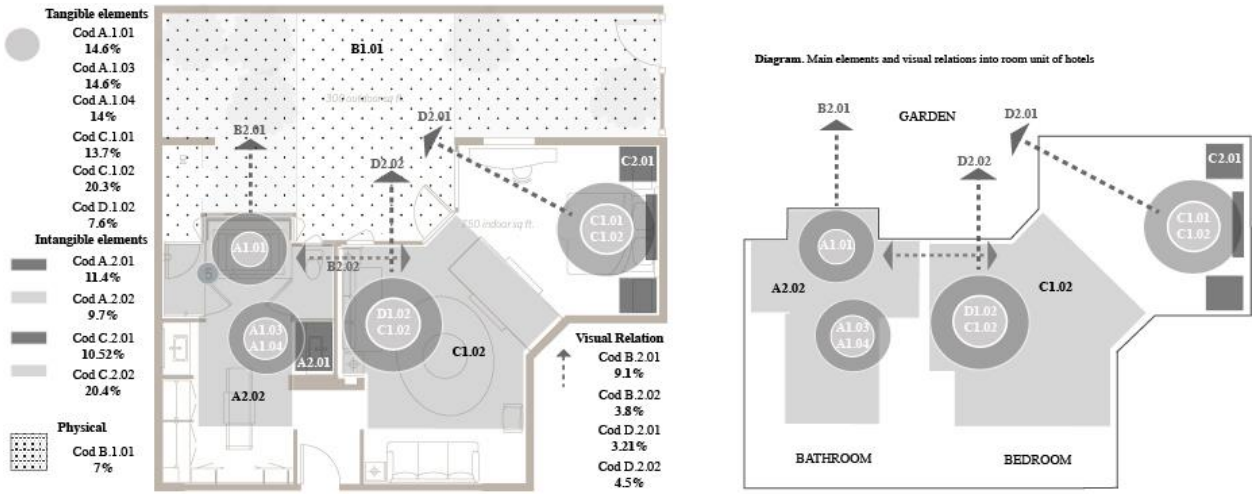

Figure 7. Spatial syntax in bathroom and bedroom. Tufa suite (Hotel Bardessono Napa). The figure represents an example to show the high impact by customers in hotel's rooms.
Source. Own elaboration.

4. Verbal codes in memorable experiences.

The next phase was to figure out which customer's comments made reference to those elements identified as keys to getting a memorable experience in the previous step, and which comments represented a positive emotion.

We studied the comments of 217 TripAdvisor users, obtaining a total of 291 codes between bathrooms and bedrooms. These codes gave us more information about the elements studied previously by the visual impact, and others features which were not photographed. In order to discover how positive the experience was, the study was able to detect those memorable experiences by identifying related adjectives with the elements studied.

The codes studied in this phase that had high visual impacts were: in the bathroom: A.1.01 (Bathtub) + A.1.04 (Bathroom vanity) + B.2.01 (Outside views) + A.2.02 (Natural light), A.1.03 (Mirror) + A.2.01 (Artificial light); in the bedrooms codes C.1.01 (Bed) + C.1.02 (Furniture) + C.2.01 (Artificial Light) + D.1.02 (Living room) and C.2.02 (Natural light) +D.2.02 (views).

In bathrooms, the clients get a memorable experience level when they take a shower in a bathtub with jets. 19.6% of comments regarding the bathtub used adjectives like amazing, relaxing or wonderful. The second highest positive emotion was connected to the views of attractive places (port, mountain, sea, or city) reaching 19.6% of customer emotions in bathrooms. Finally, the third positive emotion was the perception of the bathtub's size. 13% of customers considered the soaking tub as "huge" when it had dimensions of a “Champagne Bath Tub/Spa” (e.g. 6” l x 36” w x 25” h).

If we compare the results between the elements of visual impact method and customers’ comments, we can conclude that the bathtub or soaking tub (Cod A.1.01) and the views to outside (Cod B.2.01) are the elements to consider in the design of the bathroom that will most likely result in a memorable customer experience.

A visual connection between the bathtub and the bed, an outdoor bathtub, a flat shower separated from the bathtub, or a vanity with two sinks are some of the elements in bathrooms that increase positive emotions (see table 9).

Comparatively, the elements in the bedrooms were beds, views to the outside, furniture and the living room area. The artificial light and natural light were not analyzed due the low percentage of customers'

comments. Nevertheless, the results of the elements studied were high enough to find out how customers achieve memorable experiences in bedrooms.

The visual relation (Cod D.2) was the code group most commented by customers in bedrooms. The "views" represented the most positive emotions for clients. However, even though the bed element (Cod. C1.01) was most commented with 41.4% of the total, its percentage of memorable adjectives (fantastic, incredible, etc) was not higher than the "views" codes. 28.7% of customers think that the view to the outside from the bed or the living rooms (see table 8) is necessary for getting a positive emotion. The bed, with 17.7%, was the second element most commented that was connected to a positive emotion. The reason for positivity was an especially high level of comfort. The bed's size and normal conditions of comfort each resulted in 9.9% to get a positive emotion.

In the living area of bedrooms, the fireplace element was the most commented by customers with 5.5% of customer's positive emotions, using adjectives like excellent, fantastic or lovely. 5% of customers appreciated décor or a modern style as a way to make them feel like they were far away or made them feel at home.

Table 9. Relation between Verbal codes and visual impact in memorable experiences

Bathrooms									**Bedrooms**					
A. Elements						**B. Spatial Relation**			**C. Elements**			**D. Spatial Relation**		
Cod.A.1. Tangible	**No.**	**%**	**Cod.A.2**. Intangible	**No.**	**%**	**Cod.B.2**. Visual relation	**No.**	**%**	**Cod C.1**. Tangible	**No.**	**%**	**Cod.D.1**. Physical	**No.**	**%**
01*. Bathtub			***01*. Artificial light***	*2*	***4.3***	***01*. Outside views**	***9***	***19.6***	**01. Bed**			***02. Living room***		
Huge	*6*	***13***							Two beds	*5*	***2.8***	Spacious	3	***1.7***
Outdoor bathtub	*3*	***6.5***							Bed lines	*2*	***1.1***	Separated to the bed-sofa	4	***2.2***
Visual conection with the bed or tv	*3*	***6.5***							Size/ large/ huge	*18*	***9.9***	Comfrotable + sofa in window	7	***3.9***
Separated to the shower	*2*	***4.3***							Comfortable	*18*	***9.9***	Flat tv screen	3	***1.7***
Hut tube** MEMORABLE	***9***	***19.6***							***Comfort** MEMORABLE***	***32***	***17.7***	Modern style and décor	9	***5.0***
03*. Mirror (tv in mirror &watch the entire body	*6*	***13.0***										**Fireplace** MEMORABLE**	10	***5.5***
04*. Bathroom vanity (two separated sinks)	*6*	***13.0***										**Cod.D.2.** Visual Realation		
												01-02-03. Outside Views	18	***9.9***
												Outside Views MEMORABLE**	52	***28.7***
Total	35	**76.1**		2	**4.3**		9	**19.6**	**Total**	75	**41.4**		106	**58.6**

Source. Own elaboration

Note. * The codes corresponds with visual impact codes (table 7 and 8)

** Adjectives used (fantastic, incredible, amazing, relaxing, wonderful, etc.)

5. Conclusions

The study analyzed LEED hotels in Europe and in the U.S. to figure out if the design of sustainable actions and customer's satisfaction had a relation between them. The room was the space chosen to study the correspondence between sustainable design and satisfaction. Using a method based on the photographs taken by real customers we coded all the elements with a visual impact in bathrooms and bedrooms. Once we categorized them, we could find out which of them had higher visual impacts. In the bathrooms, the bathtub or jetted tub, the mirror and the vanity, which had 14.6 %, 14.6% and 14% respectively, were the elements highlighted by customers. In addition, the design of the bathroom with a bathtub beside a window facing the outside with a wonderful landscape, garden, or urban scene was

considered by customer as a positive emotion, making it a memorable experience in almost 20% of clients. In bedrooms, high visual impact was mainly concentrated on four elements: the bed, furniture, natural light and views with 13.7%, 20.3%, 20.4% and 15.65% respectively. A comfortable bed and an attractive view to the outside were the most rated by customers. All these elements were coded in order to identify and categorize them according their own features, such as, tangibility, intangibility, visual relation, physical relation or technology.

Once the results were studied, we discovered that there was a correspondence between sustainable design criteria and customer satisfaction. The data suggested than a customer's experience may change in the hotel if some of these criteria are not present. The natural light and views are those two essential elements for obtaining a LEED certificate in IEQ category with high visual impact. The views to the outside in bathrooms represented 9.1% and natural light represented 9.7%. These percentages in bedrooms are higher, in which the view was 15.65% and natural light was 20.4% of customers. The IEQ category in LEED certification establishes two criteria regarding views and natural light, which are *EQc8.1 Daylight and views - daylight 75% of spaces and EQc8.2 Daylight and views - views for 90% of spaces.* Both criteria provide building occupants with a connection between indoors spaces and the outdoors through the introduction of daylight and views.

If the photographs show what elements have a visual impact to the customers in the guestroom during their stay, the second aim was to find out if a sustainable design has the ability to make customers feel positive emotions in rooms. The research suggested that design in rooms could produce positive emotions in customers. In addition, according the study, the customers could get a memorable experience through the design (Lo, K.P.Y., 2007). To get information about the positive customer emotion and design, we studied all comments posted on TripAdvisor website. All comments with positive adjectives were classified and put in relation with the design's elements studied previously. A main outcome of this method was that customers experienced most of the positive emotions and memorable experiences in three different elements of the room (one in bathroom and two in the bedroom). These elements were the bathtub, bed and fireplace. However, the study also discovered that without comfort and views to outside, the customers did not achieve a memorable experience. 19.6% of customers described their experiences in the bathtub with views to outside as an amazing moment. More than 45% of customers thought that the size and comfort of the bed was very important to get a memorable experience. This percentage increased when the room offered views to the landscape, representing 38.6% of positive emotion in bedrooms and 19.6% in bathrooms (table 9).

The strong correspondence between the customer rating in rooms of LEED hotels on TripAdvisor website reinforces the hypothesis that sustainable actions are related to customer satisfaction (table 3, IEQ-RS=0.60). This result and the outcomes previously shown highlight the possibility of considering a new indicator of sustainable design that is able to measure positive emotion in hotels.

Moreover, this study shows a code series that compares elements of design and the emotional charge of customers in hotels. The challenge of this research is discovering all emotional codes through the design in hotels, in order to build an indicator and emotional guidelines of design able to predict the customer's experience. In this study, we focused on visual impact and comments codes of design and customer experience. Nevertheless, we realized during the process that a code series related with human well-being, physical perception of spaces and use of technology also existed., It would be interesting to study these elements as well, in order to be able to predict memorable experiences in hotels by using an emotional design.

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