Technology In Hotels: Invest Where it Counts

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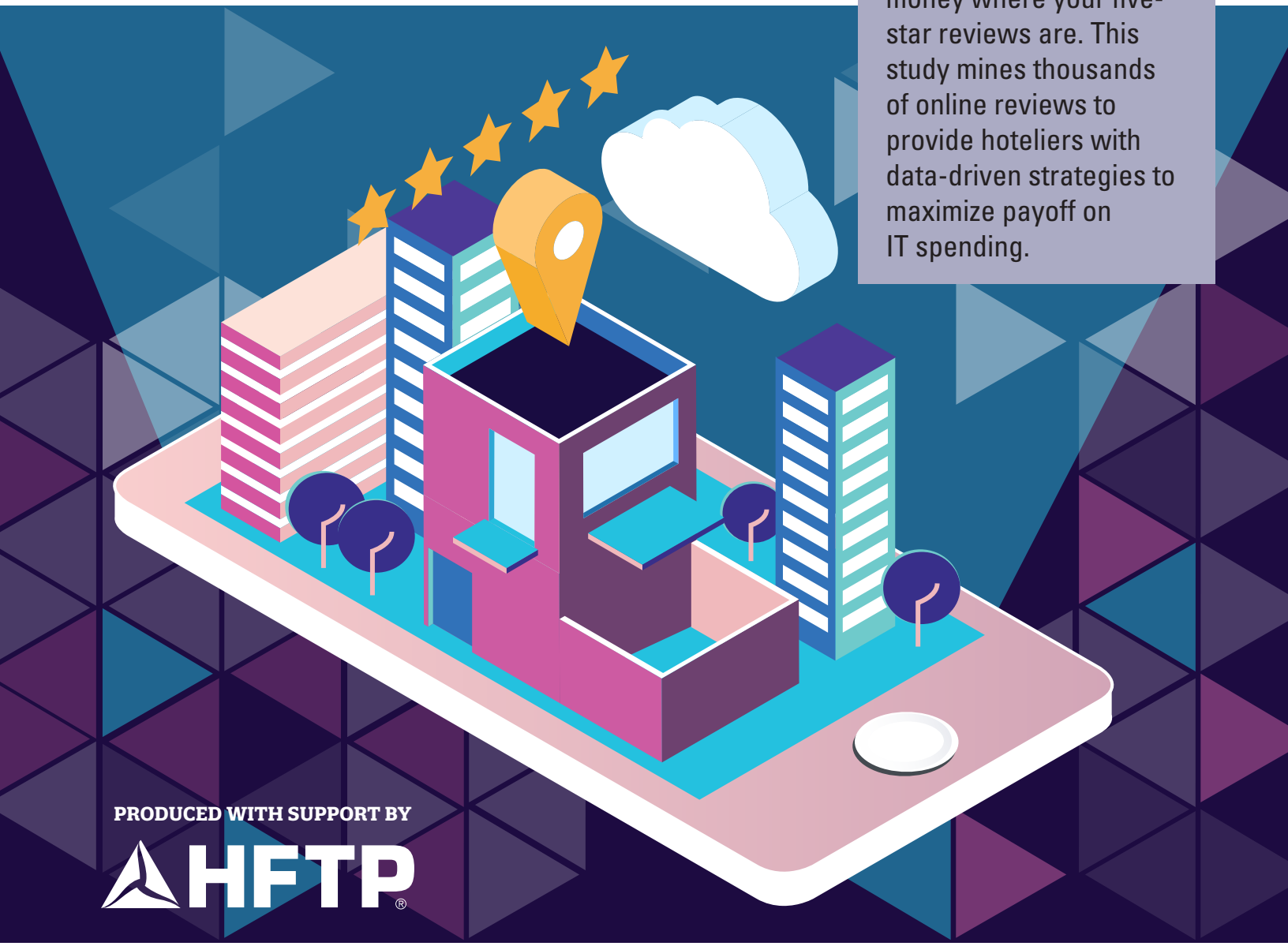
Want to give your guests the tech amenities they want? Put your money where your five-star reviews are. This study mines thousands of online reviews to provide hoteliers with data-driven strategies to maximize payoff on IT spending.



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DEFINING TECHNOLOGY TERMS

While it may not be totally fair to compare the love of technology to the love depicted in Elizabeth Barrett Browning's famous sonnet "How Do I Love Thee?", the use of technology in today's world is real and will only increase. For some of our guests, it is not the love for technology, but the necessity of having technology that enables them to stay productive on business trips, to connect with loved ones back home or simply to use technology for entertainment during their travels. In the hotel world, from one-star hotels to five-star hotels, technology is everywhere in different capacities and different applications both for the front- and back-of-the-house. Some technologies are invisible to the guests while others are guest-facing. The amount of resources spent on hotel technology is substantial *(see IT Spending in the Lodging Industry)*, so much so that the *Uniform System of Accounts for the Lodging Industry, 11th Revised Edition* has a separate schedule on Information and Telecommunication (IT) Systems. So, the one burning question remains: If hotels spend such huge amounts on IT, do we know if we are giving the guests what they want?

Normally, surveys are widely used to collect guest satisfaction data. However, this method looks at only one point in time, that is, when the survey is administered. To carry out a longitudinal survey to include multiple years may not be feasible. However, with social media, such data are readily available. Online review channels provide tourists a direct way to express their opinions from anywhere and at any time. These dynamic activities have allowed for the collection of voluminous and real-time data (i.e., big data) from a number of social networks. Recent industry reports also confirm that big data in social media make a great impact on enhancing not only firms' brand images, sales and decision-making processes, but also their service innovations *(McKinsey & Company, 2015).*

Therefore, in order to include a more representative set of data, this study used actual hotel guests' reviews from TripAdvisor of the time period of November 2001 to July 2015, with a total of 520,668 reviews of 488 hotels in New York City. New York City was selected for this study because of the number and also the variety of hotels included in the sample. And, most importantly, the city ranked as the second largest market in the United States in 2018 with $12 billion in total revenue *(STR, 2019)*. It was just behind the highest grossing market, Las Vegas at $14 billion *(STR, 2019).* Of the 520,668 reviews available, those that did not mention any technology terms were excluded. Thus, this research analyzed a total of 116,388 reviews as the final dataset through business intelligence techniques such as data mining and text mining.

Step One: Defining Technology Terms

To analyze unstructured text data, the method of text mining is used and the proper words that need to be mined have to be identified. First, in reviewing the literature, there were a number of studies that grouped hotel technologies, but the first one performed on guest-facing technologies was done by Cobanoglu, Berezina, Kasavana and Erdem in 2011. Their study classifies guest technologies into four main types: in-room technology, comfort technology, business essential and internet access *(See Guest-facing Technologies on page 4)*. In-room technologies consist of services that entertain customers in the guest room; comfort technologies are amenities that provide guests with the conveniences for a more comfortable stay; business essentials are services used by guests especially for business related activities; and internet access is classified as the last group of technologies.

Then, our team performed an analysis of all websites of major hotel companies and logged any guest-facing technologies that were mentioned. A total of 295 distinct terms were identified. For instance, fax was one of the terms; but fax, facsimile and faxes were all counted as "fax" as a distinct term. Since the last categorization study was performed in 2011 and some of the newly adopted technologies in hotels such as artificial intelligence (AI), voice-recognition system (e.g. Alexa, Chrome cast, Amazon echo dots, etc.) and virtual reality (VR) were not included in the 2011 study, this current study modified the "internet access" group into "communications technologies" and added a last category of "new technologies." The *Technology Types* chart on page 4 summarizes the five groups and a sampling of the technologies under that category. With the terms of the five groupings of technologies determined, the second step is to select a software for data mining.

DEFINING TECHNOLOGY TERMS

GUEST-FACING TECHNOLOGIES

In-room Technologies

- VoIP Service
- Voice-mail / Messaging
- Fitness System
- Pay-per-view (PPV) Movies
- Game System
- Universal Battery Charger

Comfort Technologies

- Electronic Safe
- Guest Control Panel
- In-room PC
- Mobile Access to Hotel Website
- Electronic Key Card
- Flat Panel HDTV

Business Essentials

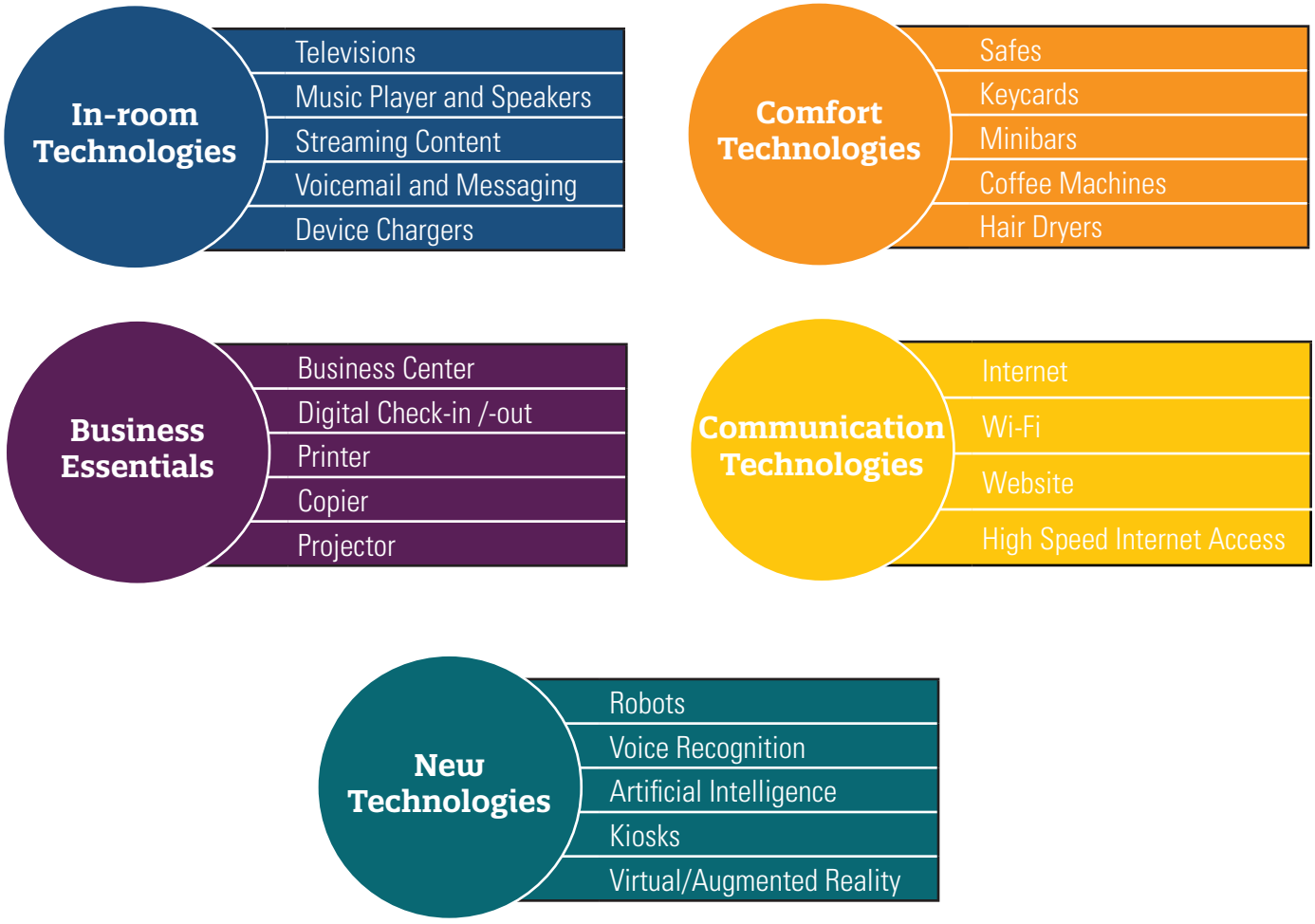
- Business Center
- Express Check-in /-out
- In-room Telephone
- In-room Alarm Clock
- Easily Accessible Electronic Outlets

Internet Access

- High-speed Internet Access
- Wireless Internet Access in Public Areas

5 Categories of Technology Types in Hotels

Below are the categories of technology types and a sampling of the technologies under each category.



Step Two: Using Readily Available Software – XLMiner

XLMiner was used in this study as it is a comprehensive data and text mining add-in for Excel based on statistics, machine learning and AI. XLMiner offers various data analysis tools (data exploration, visualization, prediction, neural networks, classification, regression trees, association rules, nearest neighbors, etc.) to help users to understand and gain insight into a variety of data.

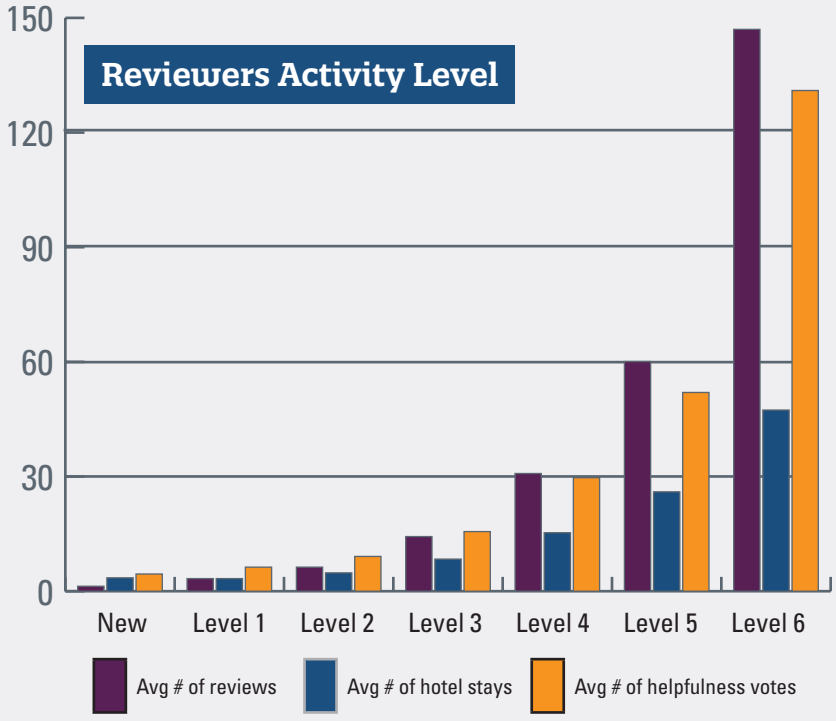
A total of 520,668 reviews of 488 hotels in NYC was initially gathered from *Tripadvisor.com*. The review text, review rating, travel type, hotel class, hotel name and reviewer information were extracted from each review. As the pre-processing step (e.g., data exploration, data cleaning and preprocessing), the reviews with no review rating or review text were removed from the dataset, resulted in 405,000 remaining reviews. Then, text mining was performed by capturing and quantitatively measuring technology-related terms based on the pre-developed *technology terms*. After the text mining process, reviews without any technology mentioned in the text was removed from the data, resulting a final count of 116,338 reviews that were used in this analysis.

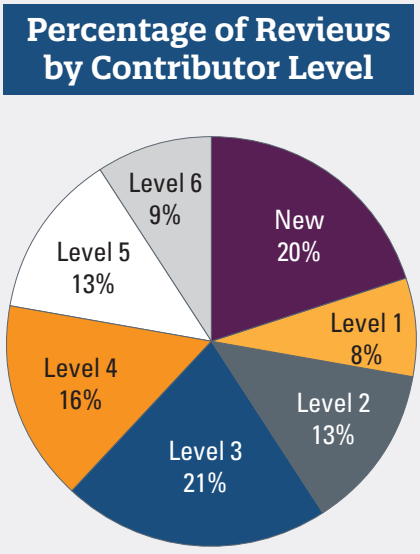
From the data loaded from these 116,388 reviews, technology terms were mentioned 200,219 times. Besides text comments, reviewers were also asked to rate the satisfaction level of their stay in the form of 1 through 5 stars, with 5 being the best rating. Reviewers were also asked the purpose of their stay and the five choices provided were: business, couple, family, friends or solo. TripAdvisor also independently classifies hotels into 1 through 5 stars, with 5 being the best classification. Therefore, using these parameters, the reviews were mined and summary statistics were calculated for three areas: the five types of technology by levels of guest satisfaction; the five types of technology by hotel classification, and the five types of technology by the travel purpose/mode.

The Reviewers' Profile

TripAdvisor classifies reviewers or contributors into "Levels" from 1 through 6, with 6 being the most experienced contributors. In addition, reviewers who are new and have not been rated into levels as yet are designated as "new." In this study, the Level 6 reviewers contributed an average of 147 reviews, had an average of 47.4 hotel stays and also have received an average of 131 helpfulness votes (*See Profile of Reviewers below*). The total percentage of reviews contributed by each of these seven categories of contributors (1 through 6 and new) is also shown below.

Profile of Reviewers





By Guest Satisfaction Ratings

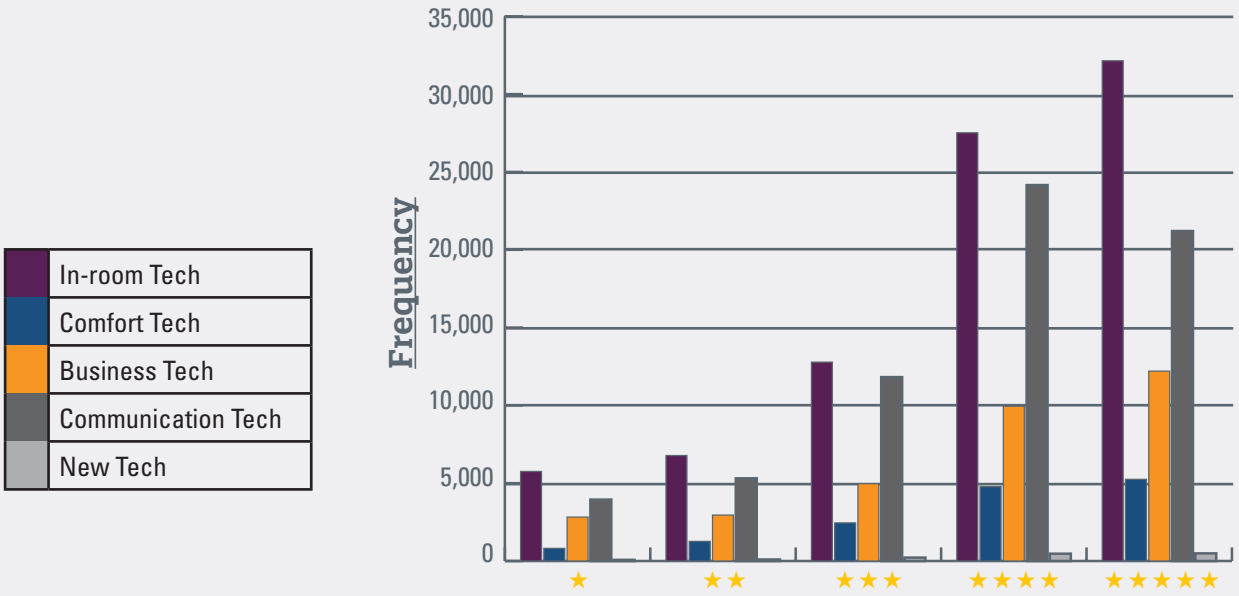
The 200,219 technology terms were first classified according to the guest satisfaction ratings of 1 through 5, with 1 being the lowest and 5 being the highest. The results are summarized in the charts below. If only the count is considered, in-room technologies and communication technology received the largest number at totals of 84,975 and 66,440 respectively. As expected, since new technologies have not been used until the very recent years, they were only mentioned 1,335 times. At the same time, 35.6 percent of the total reviews had a 5 rating and 33.4 percent of the total reviews received a 4 rating. This shows that guests are generally very satisfied with the technology offerings during their stay.

However, to have more meaningful comparison, especially when we are looking at satisfaction amongst these five technologies, perhaps percentages of how such terms were distributed amongst the ratings in each technology category would be a better representation. Therefore, the number of reviews in each category of rating of each type of technology is divided into the total number mentioned of each technology. For instance, the 5,755 in-room technologies with a rating of 1 is divided into the total number of in-room technologies review of 84,975 in order to obtain the 6.8 percent. Similarly, the 32,145 in-room technologies reviews with a rating of 5 is divided into the total number of in-room technologies review of 84,975 in order to obtain the 37.8 percent. When the 4 and 5 ratings are aggregated, all five technologies had aggregated 4s and 5s totaling up to a low of 67.3 percent for business technologies (30.2 percent for 4s and 37.1 percent for 5s) to a high of 70.9 percent (34.7 percent for 4s and 36.2 percent for 5s) for new technologies. If only the highest rating of 5s is considered, in-room technologies at 37.8 percent topped both raw number comments and percentages.

With almost 85,000 reviews on in-room technologies, hotels should pay more attention and review its in-room technologies periodically to make sure the technologies are in good working order so as to keep their competitive edge in guest satisfaction.

Tech Features Mentioned by Guest Satisfaction Ratings

REVIEW RATING	IN-ROOM	COMFORT	BUSINESS	COMM.	NEW
★	6.8%	5.6%	8.6%	5.9%	5.5%
★★	8.0%	8.7%	9.0%	8.0%	7.4%
★★★	15.0%	16.8%	15.1%	17.8%	16.2%
★★★★	32.4%	32.8%	30.2%	36.4%	34.7%
★★★★★	37.8%	36.1%	37.1%	31.9%	36.2%



By Types of Hotels

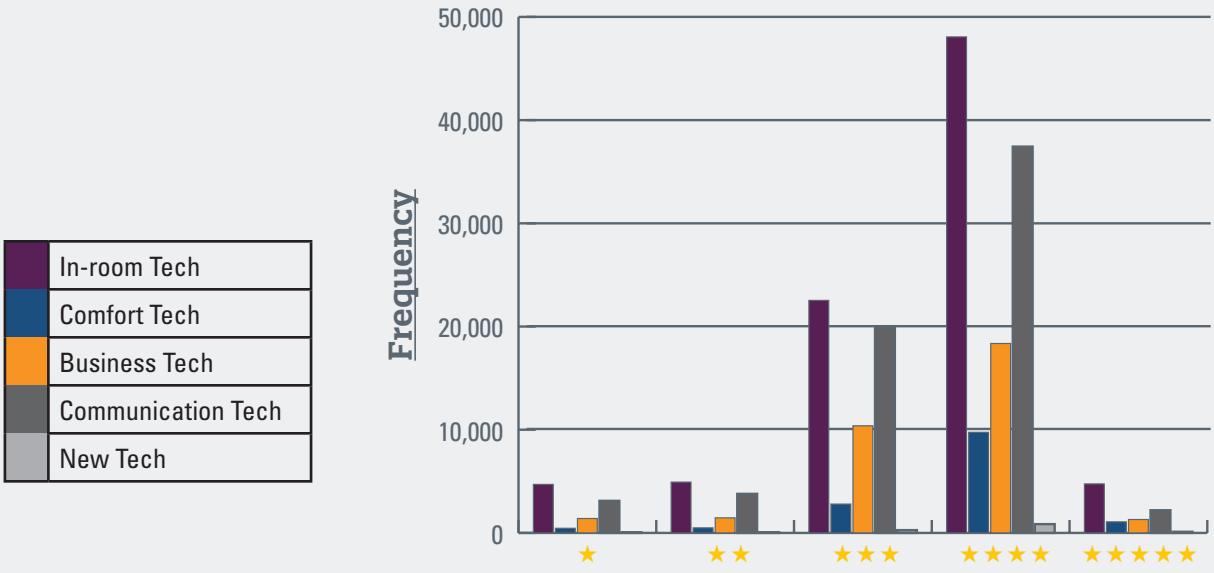
The same 200,219 terms were then reclassified by hotel class. While the guest satisfaction ratings were supplied by the guests, the hotel ratings of 1 through 5 (with 5 being the best hotels) were provided by TripAdvisor. The tables below show the results. With the total number of reviews for each technology now reclassified, most technology reviews can be found for four-star hotels at 114,453 reviews, or 57.2 percent of the grand total; followed by three-star hotels at a distant 27.9 percent (less than half of the four-star properties). In the extreme two ends of one-star and five-star hotels, reviews mentioning technology were less than 5 percent each.

This perhaps suggests that guests who stay at three- and four-star hotels pay more attention to technologies and therefore write more about them. Indeed, when a guest stays at a one-star hotel, the expectation of technology may not be too high and thus less than 5 percent of the technology terms in this study were from one-star hotels. On the other hand, when a guest stays at 5-star hotels, personal guest service, hotel ambience, food and beverage selections and quality, amenities or even the view from the guest room are probably more important than technology; so again, technology was not mentioned much at five-star properties.

When the data of the five types of technologies were analyzed, within comfort technologies, four-star hotels had the highest percentage reported at 66.9 percent. These are technologies such as safe deposit boxes, security, coffee machines, microwave, refrigerator or energy control (*Refer to The Five Categories of Technology Types in Hotels on page 4 for a more detailed sampling of technologies*). And for three-star hotels, business technologies led the most counts at 31.6 percent. If a hotel is a three-star property, more attention to the business technologies might be in order. However, for four-star properties, each category has at least a 55.8 percent technology term count. Therefore, it is undeniable that guests at four-star properties value the technologies they experienced to the extent that they would mention all types of technology fairly equally in their reviews.

Tech Features Mentioned by Hotel Class

HOTEL CLASS	IN-ROOM	COMFORT	BUSINESS	COMM.	NEW
★	5.5%	3.1%	4.2%	4.7%	4.2%
★★	5.8%	3.4%	4.4%	5.7%	4.9%
★★★	26.5%	19.2%	31.6%	30%	19.9%
★★★★	56.6%	66.9%	55.8%	56.3%	62.8%
★★★★★	5.6%	7.4%	4%	3.3%	8.2%



By Travel Purpose/Mode

As hotels do classify their guests as business or pleasure clients and that hotel rooms are offered at different rates from single rate to double, and some rooms are even packaged with breakfast offerings or perhaps kids under a certain age are offered complimentary breakfasts, noting the purpose of travel of guests and whether they are traveling alone or with someone may help hotels to better understand their guest profiles. As mentioned, TripAdvisor provides five classifications in this one area: business, couple, family, friends and solo. When the same 200,219 technology terms were reclassified using these five classifications, only 165,881 terms were captured. This means that some reviewers did not indicate their purpose or mode of travel and thus those reviews, together with the technology term counts could not be included in this analysis. The results are summarized in the tables below.

Although not every one of the 116,338 reviews provided their purpose or mode or travel, those that did, still commented most on in-room technologies at 70,256 times and communications technologies at 54,940 times. One might expect business travelers, who need technology to connect for work, would comment the most regarding all five types of technology. Especially in business and communication technologies. However, it turns out that couples travelers posted 61,714 technology terms, family posted 38,075 terms, and business travelers only posted 32,979 terms. And, a quick examination of business travelers showed most of the terms they posted were on in-room technologies (13,772) and then communication technologies (11,645). Within the 27,626 total business technologies terms reported, 37.8 percent were posted by couples, 24.2 percent by family travelers, and only 18.5 percent of the business technology terms were from business travelers.

Some may propose that since business travelers stay so often in hotels that they may not post reviews unless it is something is so good that far exceeds their expectations or something very bad happened. On the contrary, when couples or family travel for leisure, they might have more time to relax, visit their own social media sites, and might like to share their experience more. Thus, these two groups post more reviews than the other three groups.

Tech Features Mentioned by Travel Purpose or Mode

PURPOSE OF TRAVEL	IN-ROOM	COMFORT	BUSINESS	COMM.	NEW
Business	19.6%	18.3%	18.5%	21.2%	21.4%
Couple	37%	41.2%	37.8%	36.3%	38.6%
Family	22.9%	21.3%	24.2%	22.8%	21%
Friends	12.4%	11.4%	12.1%	11.5%	10%
Solo	8.1%	7.8%	7.4%	8.2%	9%

The Takeaways

So, what can we take away from all these tables and numbers and over 200,000 technology terms?

In-room Technology Is King. First, the technology crown goes to in-room technologies in the hotel business, followed by communications technologies in all analyses. Thus, when it comes to guest-facing technologies, hotels may want to put more emphasis in in-room choices. At the very least, hotels need to make sure current in-room technologies are in good working conditions so more 4 and 5 star guest ratings can be guaranteed. However, hotels also should be mindful about the needs and preferences of their guests. Best Western Hotels and Resorts had very good guest feedback from a texting platform, but not so much with Alexa communication. Some hotels found that guests disconnected the device in their rooms *(Wroten, 2019)*.

No Time to Rest on Laurels. Second, per the guest satisfaction ratings, there is not much difference between the five type of technologies across the ratings. And, with most of the ratings being 4s and 5s, this may signify that guests are generally more satisfied than less satisfied with hotel guest-facing technologies. This, however, does not mean that hotels can stop investing in this regard. With the new technologies category having the highest percentages in 4s and 5s (70.9 percent as opposed to in-room technologies totaling at 70.2 percent), hotels need to keep technologies in the forefront so as not to be behind.

Four-Star Hotels and Technology. Third, the 57.2 percent total of technology counts in four-star hotels is also a strong indicator that guests at this category of hotel pay attention to and like to comment on the technologies they experience. In this analysis, although in-room and communication technologies still garnered the highest counts, comfort technologies in four-star hotels accounted for 66.9 percent of all the comfort technologies terms. Thus, four-star hotels may want to also ensure their comfort technologies are up to par, if not exceeding the expectations of their guests.

Traveling Couples and Families. Again, regarding comfort technologies, the highest occurrence was noted in four-star hotels (66.9 percent) and by couples (41.2 percent). In addition, couples wrote the most in technology reviews (61,717 out of 165,881). Young ones have iPads and tablets to play games, teenagers have their smart phones, parents have smart phones, tablets and laptops. Thus, when families travel, their use of guest-facing technologies are very high, and therefore, they also post on social media regarding their technology experiences during their stays. Accordingly, if hotels want to attract couples and families as their clientele, do highlight *all* technology offerings in *all* advertising, pre-arrival marketing pieces and especially stress the comfort technologies the hotels offer.

Technology Is Here and It Is Real. Finally, as HFTP members, all we need is to take one look at the growth of HITEC into Europe and Dubai to know that that is a great indicator that technology is here to stay, and it is real. A panel of CEOs at the Americas Lodging Investment Summit (ALIS) earlier this year also echoed the same sentiment *(Wroten, 2019)*. And, it is important for hotels to not only focus on guest-facing technologies but also to work and train their staff to use technology to their advantage (*Miller, 2019*). There are also countless of technologies we use on a daily basis in the back-of-the-house that are important for our work efficiency. From accounting software to property management systems, we simply cannot do without technology.

Let us, as in an industry, stay smart, embrace technologyand let technology work for the enjoyment of our guests. ■

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