Appendix C: Social Media and Media Analysis Toolkit

In an effort to help U.S. airports understand how to perform social media and media analysis and transform these data into actionable knowledge to enhance customer experience, this toolkit presents an in-depth illustration of social media and media analysis on six U.S. airports.

Although the study was conducted with real data on six U.S. airports, these airports were selected primarily for illustrative purposes to demonstrate how social media and media analysis can be conducted on airports. Therefore, all six airports are anonymous. It should be emphasized that conducting social media and media analysis requires multiple judgment calls regarding data timeframe, data inclusion and exclusion criteria, customer experience criteria, sample size, source of data, etc. When making those judgments, airports should be guided by their specific circumstances, needs, and objectives.

A. Social Media and Media Analysis Process

Understanding how to analyze the airport's social media and other media data (such as publicly disseminated materials) is the first step in the creative benchmarking process. This appendix provides an overview of the social media and media analysis process.

Social media provides an abundant database of customer-generated, publicly available content that can reveal consumers' preferences, attitudes, and behaviors. Online review forums (e.g., Yelp, Skytrax, Google reviews) and social media platforms (e.g., Facebook, Twitter) contain rich sources of customer insights that far exceed any traditional methods of gathering customer feedback (e.g., surveys, focus groups, mystery shoppers, comment cards). In particular, social media data stands out by its volume, timeliness, content, diversity, social impact, and interactivity (Dumbill, 2013). The availability of data of different airports on social media also allows convenient benchmarking analysis of the content on the airport's own and the competitive airports' social media sites.

Social media data is any information (e.g., comments, ratings, views, shares, hashtags) that can be collected from social media sites. Social media analysis involves the process of scraping, pre-processing, analyzing, and interpreting of social media data for business insights or decision-making. The analysis strategy of the social media data can vary based on business needs. For instance, analysis of the pattern of likes and shares provides understanding of customer engagement and can inform an organization's marketing strategies (Tuten & Solomon, 2017). Although there are pros and cons to the nature of data collected from social media sites (Table C-1), a well-planned social analysis strategy and cautious interpretation of the results can benefit organizations in many ways. For instance, social media analysis has been used to optimize social media strategy, monitor brand image, identify target customers, inform marketing strategies, conduct competitor analysis, and enhance customer experience (Moe & Schweidel, 2017).

Table C-1. Pros and Cons of Social Media Data

SOCIAL MEDIA DATA	
Pros	**Cons**
• Timely • High-volume of data available	• Restricted source of data of customers who use social media sites • Less reviews from senior travelers

• Expression of bi-modal feelings (extremely angry or happy) due to anonymity and impulsivity • Diverse audience and viewpoints • Unprompted response and representative of the real experience • Comments expressed in multiple media formats (text, image, video, emoticon) • Ability to follow-up with the customers • High Impact	• Expression of bi-modal feelings may not represent average experience • Less information on actionable recommendations or expected outcomes • One person's view may not represent average experience

The following steps illustrate the social media analysis conducted on six U.S. airports.

Step 1: Identification of airports in this study

To illustrate the social media and media analysis process, six (U.S.) airports were selected based on the following criteria:
   a) Size: Airports were selected to represent small, medium, large, and mega airports
   b) Region: Diversity of geographic regions was represented by selecting one airport each from Northeast, Southeast, Northwest, Southwest, North, and Midwest.
   c) Industry recognition: Selected airports received ranking among the top 10 in customer experience or customer satisfaction in the last 5 years
   d) Generalizability: Selected airports tended to reflect features and experiences that are more common across most other airports, as opposed to features that are exceptional, unique, or specific to a particular airport. This helped ensure the relevance of illustrated analyses for most airports.

Step 2: Identification of the customer experience evaluation criteria

The six selected airports were evaluated using customer experience criteria which were developed based on the guiding question "What specific activities do passengers engage in while at the airports?" Five essential and core activities (see Table C-2) and four value-add activities (see Table C-3) were identified. These nine activities cover the most important behaviors and needs of airport customers, while also capturing the unique activities related to specific customer segments, or specific situations (i.e., fulfilling specific needs). While these customer experience criteria can be applied in most airports, airports are strongly encouraged to identify and select criteria that best meet their own customer experience needs, challenges, and objectives.

Table C-2. Customer Experience Criteria – Core Activities

Essential Criteria	
Criteria	*Definition*
Wayfinding	Activities related to getting from point A to point B; effectiveness of the maps, signs, and visual cues.
Queuing/Waiting	Activities related to standing in lines or waiting idly for an event to happen.
Interacting with Employees	Activities related to interaction (face-to-face, phone, email, text, or virtual) with any employee of the organization.
Seeking Information	Activities related to actively or passively obtaining information (from employees, electronic displays, signs, radio, apps, or any electronic sources) of the organization or the surrounding area for a purpose.
Fulfilling Basic Needs	Activities related to delivering on basic customer expectations, and provision of basic acceptable level of service in areas of hygiene, comfort, and safety.

Table C-3 Customer Experience Criteria – Value-add Activities

Value-add Criteria	
Criteria	*Definition*
Fulfilling specific needs	Activities and amenities to meet the needs of specific customer groups (e.g., nursing mothers, kids, physically or mentally challenged individuals, people with pets).
Leisure	Enjoyable activities related to entertainment and relaxation, including fine dining and shopping experiences.
Sense of Place	The extent to which the environment creates feelings, thoughts, and emotions that distinguish this place from other places and gives this place a unique identity.
Handling Crisis Situations	Activities related to handling customers' experiences in unexpected, uncertain, or inconvenient situations.

Step 3: Data collection

a. Social media analysis

The social media analysis was conducted June 1 to August 31, 2019. Summer tends to be the busiest travel season, which leads to an increase in social media reviews, and the selected timeframe allowed gathering of recent and relevant content. The three-month timespan was deemed sufficient to gather enough comments for a thorough data analysis. When selecting the social media platform for gathering data, the main criterion was the availability of data for all six airports, i.e., the number of available comments for the selected time period. In addition, the selected social media platform contained both star ratings and narrative comments. Star ratings are a proximation of an overall evaluation of the airport experience, and the narrative comments provide additional details for an in depth understanding of the customer experience. Combined, both data sources offer unique insights during data analysis.

Social media data was imported using a web-scraping technique onto the R data platform. The selector gadget widget and Google Chrome were used to select and web scrape content on the social media site. Once the data was imported into R, comments were separated into subsets for each of the selected customer experience criteria. Subsets were constructed by creating a code that would recognize keywords associated with each criterion (See Appendix F, item D, for the list of keywords). If a keyword was detected in the comment, that comment was placed into that criteria's subset. When a comment contained multiple keywords, it was pulled into all relevant criteria subsets. Using the total comment data set, which had over 170 comments, and nine subsets for the customer experience criteria, comments were sentiment analyzed in IBM Watson natural language processing tool.

b. Media analysis

Data collection for the media analysis started with identifying the media sources to be used. Since Google is the most common search engine in the U.S., Google was used to search and include suitable media data. Consistent with the social media analysis, the initial timeframe selected was June 1 to August 31, 2019. However, during the data collection effort, the timeframe was expanded to one year, August 31, 2018 to August 31, 2019, to account for the lack of contextually relevant articles within the initial timeframe and to meet the minimum number of articles as described below.

The Google search engine allows data to be collected in two distinct categories – formal media and informal media. Formal media consists of articles from sources such as national and local

news stations and newspapers written by professional reporters. Informal media consists of news blogs and blogs which vary in the content covered or in expertise and experience of the author. Including these two different types of media sources allows for a larger sample and enables comparison between different types of media which may influence customer perceptions. Only articles that impacted or had the potential to impact customer experience or customer perception of the airport and articles related to passenger satisfaction and airport initiatives were included. Articles that were not specifically about the airport or an event at the airport were excluded from the search. For example, if an article mentioned the airport in passing or because someone significant flew in to the airport, it was not included. Similarly, articles related to weather warnings, road closures, etc., were not included.

A lower limit of 20 articles was set so that the data analysis would lead to meaningful insights. While the news articles for all the identified airports met this criterion, blog articles were limited for some of the selected airports even after expanding the timeframe to one year. The range for the number of blog articles in one year for the airports varied from 1 to 20 articles. Once the text data from the media articles was recorded, it was analyzed using IBM Watson natural language processing tool.

Step 4: Data analysis and results interpretation

Once the benchmarking airports/organizations have been identified, the next step is to collect social media comments from online review forums (e.g., Yelp and Google reviews) over a defined period of time, web-scrape the data and analyze it using qualitative methods and sentiment analysis. This includes collecting star ratings (ranging from 1 to 5 stars, with 5 being the best rating) associated with each customer review.

Prior to collecting social media data, several decisions need to be made:

- Identify the social media platforms that would be the most helpful for gathering relevant and available data.

- Examine social media review websites that have profiles of the identified organization. A website is considered suitable for analysis if a large enough amount of comments and ratings are available for the timeframe of interest (e.g., 6 months). Some organizations have several locations, each with their own review profile, and the location with the most reviews should be selected.

  In general, Yelp and Google Reviews tend to have the largest amount of comments and ratings and are good sources for gathering benchmarking data. Google Review's main benefit is that there is often a large sample size, consisting of a variety of customer segments and demographics. One limitation to using Google reviews is that posts do not have to have a qualitative comment associated with the rating, which may limit the sample size and the richness of the data. Yelp, on the other hand, does require comments to accompany customer ratings. Yelp also has a large number of comments for organizations across all industries and is used by a variety of customers.

  For certain industries and benchmarks, social media reviews that are more targeted compared to Yelp or Google Reviews should also be included. One example of an industry-specific social

media platform to consider is TripAdvisor for organizations in the travel and entertainment industries such as Disney. These reviews are often longer and followed a prompt.

- Once specific social media pages are selected for the organization and location, data is imported into a programming tool for analysis. Appendix F, Item B, provides tools that could be used in the creative benchmarking process. For example, RStudio (R) is a programming language and free software environment for statistical computing. R offers several packages for web scraping for social media analysis, and the 'rvsest' package was used to web scrape comments, ratings, and posting dates. The CSS syntax that needed to be specified in the 'rvest' functions was found by using the SelectorGadget Google Chrome Extension.

The social media and media analysis in the study produced three types of results for interpretation:
   a. Customers' star ratings from review sites
       i.   Customer star rating on overall airport experience
       ii. Customer star rating on each customer experience criteria

   b. Sentiment score
       i.   Sentiment scores on overall airport experience
       ii. Sentiment scores on each customer experience criteria

   c. Emotions scores

Sentiment analysis and emotions analysis both quantify the customers' emotional engagement in their narratives and reveal their emotional responses to particular events mentioned in the comments or to the overall airport experience. Sentiment analysis derives the attitude of the customers by determining to what extent their comments or reviews are positive, negative, or neutral. It targets the level of the general feelings or impressions. Emotion analysis, on the other hand, focuses on the specific articulate emotions. It can further detect and recognize the more sophisticated types of feelings such as joy, anger, disgust, sadness, and fear. Understanding how people feel about and evaluate their experience provides additional key pieces of information to better understand the customer experience.

The three different scores were collected and recorded in a spreadsheet in order to calculate overall average scores for each. In social media analysis, ratings and sentiments were analyzed for each airport overall and for each customer experience criteria within each airport. This allowed comparisons to be made between and within airports to see areas of strengths and weaknesses. In media analysis, sentiment scores and emotions scores were broken down for comparison by the type of media source (informal media and formal media). Since the raw sentiment scores range from -1 to 1, they were normalized and converted to a scale of 1-5 for ease of interpretation and comparison.

a. Customers Star Ratings

On the chosen social media platform, each comment was accompanied by a rating scale in which the customer assigns a number between 1 to 5 to represent how satisfied they were with their experience, with 1 being the least satisfied and 5 being the most satisfied. The rating for each comment (represented by the number of stars) was extracted from the social media platform. The average rating for each airport during the 3-month timeframe was calculated to indicate the overall

satisfaction with the airport. The average rating for each customer experience criteria was also calculated to indicate the customers' satisfaction with each customer experience criteria. This allowed comparison across and within airports on how they performed on overall customer experience and specific customer experience areas.

b. Sentiment Score

The sentiment analysis in this study was performed using IBM Watson natural language processing tool. The sentiment score was used in both the social media and media analysis. Sentiment scores are calculated using a textual review where the content is analyzed and classified as either positive or negative based on the presence of specific words that the software algorithm labeled as more positive, more negative, or more neutral. The scores are computed on a scale ranging from -1 to +1, with a score of -1 being very negative and a score of +1 being very positive. Any score above 0 is viewed as positive sentiment, while any score below 0 is viewed as negative sentiment. Identifying sentiment scores as positive or negative can expand on the information provided by the customer star ratings. Ratings reveal areas of high or low satisfaction, while sentiments provide information on the valence of the experience. By capturing the strength of the sentiment, airports can quickly identify more extreme (negative or positive) comments or articles for further analysis.

c. Emotions Scores

Also analyzed in IBM Watson natural language processing, emotions scores are calculated through a text-based analysis, similar to sentiment analysis, in which the software's algorithm identifies words. **IBM Watson can analyze the entire social media organizational profiles by copying and pasting the URL into the system**. Rather than identifying each word as positive or negative, the software identifies each word as representing one of five key emotions: joy, anger, disgust, sadness, and fear. These emotions are considered the most basic and broad representation of emotions all people experience. The results also indicate how strongly words in the text represent each emotion. For example, a word that would contribute to a higher anger score is "furious", while a word that would still represent anger, but not as strongly, is "irritated". The same can be said for "satisfied" and "delighted" as being indicative of joy but to a different degree. The emotions scores range from 0 to 1, with higher scores indicating a stronger presence of the emotion in the text.

Data Cleaning and Organization

Using R as an example: once data is imported, it is cleaned and subsetted into several data frames in R to prepare for the analysis. Data cleaning is done using the 'stringr' and 'rebus' packages in R to remove extraneous spacing and information, and to separate the social media reviews into a data frame with each element (comments, rating, and dates) in its own column.

With the cleaned data in the data frame format, subsets are created in order to calculate Specific Experience Scores in the Benchmarking Formula. Using the overall data frame for each organization, subsets can be made to separate out comments that are relevant to the benchmarking criteria of interest. Keywords related to each criterion are identified (see Appendix F, item D, for an example) and used to filter the comments into subsets for each criterion.

It should also be noted that R is case sensitive so after the initial data import, the 'stringr' and 'rebus' packages can be used to temporarily change the upper or lower casing of the comments

so that the R code wouldn't fail to recognize keywords due to deviations from the coding's upper case, lower case, or a combination of the two.

d. Organizational Customer Experience Practices

Each airport's customer experience strategy and practices were examined, with the same approach detailed in the report *Evaluating the Traveler's Perspective to Improve the Airport Customer Experience: Findings Report on Creative Benchmarking*. Each airport was evaluated based on whether or not it has the following 7 customer experience practices. A-level organizations have 7-6 practices in place; B-level organizations have 5-4 practices in place; and C level organizations have less than 4 practices in place.

1) **Active social media presence:** Whether or not the airport directly manages one or more of its own social media online accounts (e.g., Facebook, Twitter, Instagram). Having dedicated personnel monitor these platforms and respond to comments is an effective form of customer service, but also serves as a way for organizations to better understand their customers and their customers' experiences. Activities include posting new content, responding to comments or questions, and any online activities that interact with customers. This information can be obtained by reviewing the airport's social media pages.

2) **Emphasis of customer experience in organizational mission, vision, or core values:** Whether or not the airport included any verbiage related to customers or the customer experience in its organizational mission, vision, or core values. Publicly acknowledging the airport's focus on its customers in its mission, vision, or core value statements indicates the airport's commitment to this goal. This information can be obtained by reviewing the airport's mission and vision statements on its website.

3) **Customer experience leadership presence:** Whether or not the airport has dedicated director-level or senior-level leadership personnel leading and managing initiatives related to customer experience. Customer experience initiatives are the most effective when supported and driven from the top. This information can be obtained by looking at the airport's leadership team information or organizational chart on its website; a position search on LinkedIn; or identifying personnel mentioned in news articles or public relations releases related to customer experience.

4) **Provision of customer experience training to employees:** Whether or not the airport provides training on customer experience knowledge and skills to its employees. This information can be obtained by looking at the airport's news releases; a keyword search of the name of the airport plus customer experience training; or discussion with an airport insider.

5) **Utilization of social media data analytics:** Whether or not the airport collects and analyzes its social media data to understand the customer groups, run predictive analyses, or derive customer experience metrics. Listening to the voices of the customers is key to understanding their needs and expectations, and social media data provides instant access to the customers' pulse. This information can be obtained by looking at the airport's news releases or published articles.

6) **Ranked top 10 in industry customer experience ranking:** Whether or not the airport is recognized among the top 10 in any publicly recognized rankings related to customer experience. This information can be obtained by reviewing the industry specific rankings related to customer experience.

7) **Availability of a mobile app for customers:** Whether or not the airport provides a mobile app for its customers. Although technology could enhance or hinder customer experience depending on the effectiveness of the program; in general, a mobile app helps organizations connect with the customers and tends to be effective in providing information and communicating immediate needs. This information can be obtained by a search in the app store or a review of the app information on the airport's website.

B. Key Findings

Social Media Analysis

The composite score of overall ratings, sentiment scores, as well as the scores of all nine criteria for six selected airports are visually presented as a "palm tree chart" in Figure C-1. The height of the stem represents the overall customer experience score of each airport, which is a composite score of the customer star rating and sentiment score. To indicate the weight of the two, the customer star rating is presented in purple, while the sentiment score is presented in grey. Across the six airports, the overall customer experience ranges from 5.64 to 7.25, out of a maximum score of 10, with the average of 6.44 (see Table C-4 for details).

Airports scored differently among different customer experience criteria, with their scores being represented by the size of the "leaf". Airport #1, #2, #3, and #5 performed relatively equally on all criteria. Different patterns were observed for the two other airports: airport #4 received low scores on handling crisis situations (2.94), and airport #6 received the lowest score on employee interaction (1.64) and handling crisis situations (1.73). As an illustration of the utility of this type of data, these low scores could alert airports in question to direct their attention to the lowest scoring criteria for further analysis.

Overall, the social media analysis results are consistent with the letter grade of airports' customer experience practices (Figure C-2). Airport #1, which received the highest overall social media scores, has also implemented the greatest number of customer experience practices within the organization, receiving a B. In general, airports that invest more in implementing effective customer experience practices tend to see those efforts translate into higher ratings on customer experience.

Figure C-1. Overview of the Overall Customer Experience and Customer Experience Criteria of the Six Airports from Social Media Analysis
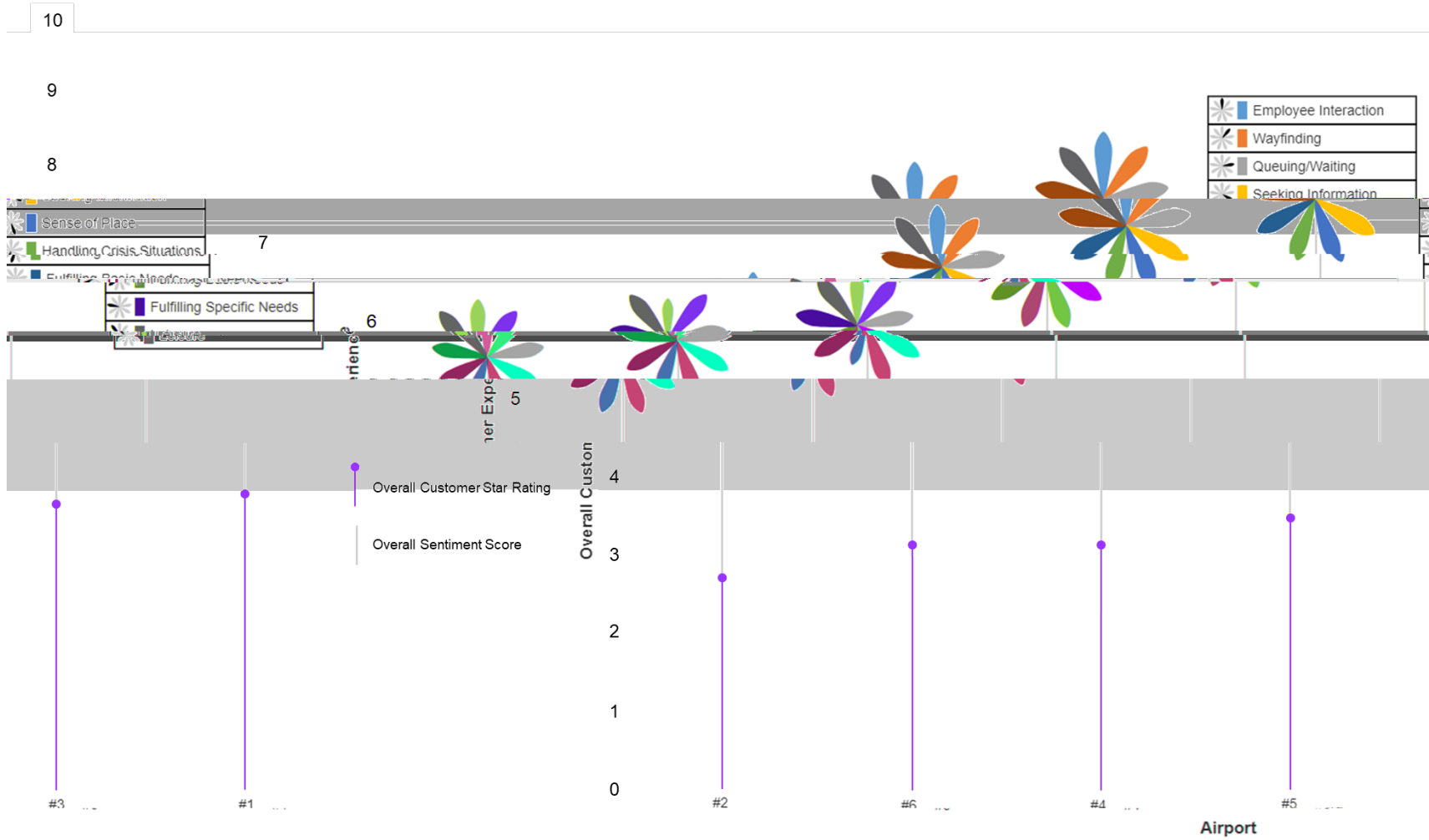
Table C-4. Social Media Analysis Results

Airport	Overall Customer Experience	Customer Experience (Star Ratings)	Customer Experience (Sentiment Score)	Employee Interaction	Wayfinding	Queuing/ Waiting	Seeking Information	Sense of Place	Handling Crisis Situations	Fulfilling Basic Needs	Fulfilling Specific Needs	Leisure
#1	7.25	3.86	3.39	7.63	7.82	7.3	7.95	7.44	7.07	7.25	8.04	7.63
#2	5.64	2.79	2.85	5.58	6	5.57	6.06	5.87	5.73	5.76	5.25	5.94
#3	7.04	3.73	3.31	6.86	7.23	7.13	7.51	7.26	6.87	7.13	7.76	7.32
#4	5.95	3.13	2.81	4.82	6	5.46	6.2	*No score	2.94	5.95	6.52	6.33
#5	6.89	3.55	3.34	6.45	6.65	6.89	6.89	6.89	6.72	6.58	6.29	6.91
#6	5.86	3.17	2.69	2.97	5.99	5.86	5.74	5.89	4.73	5.57	5.86	5.91

Notes:

*Airport #4 has no comments related to the sense of place during the time frame selected for analysis; therefore, an interpretation for this evaluation criterion could not be provided.

Figure C-2. Airport Customer Experience Practices and Overall Customer Experience Score from Social Media Analysis
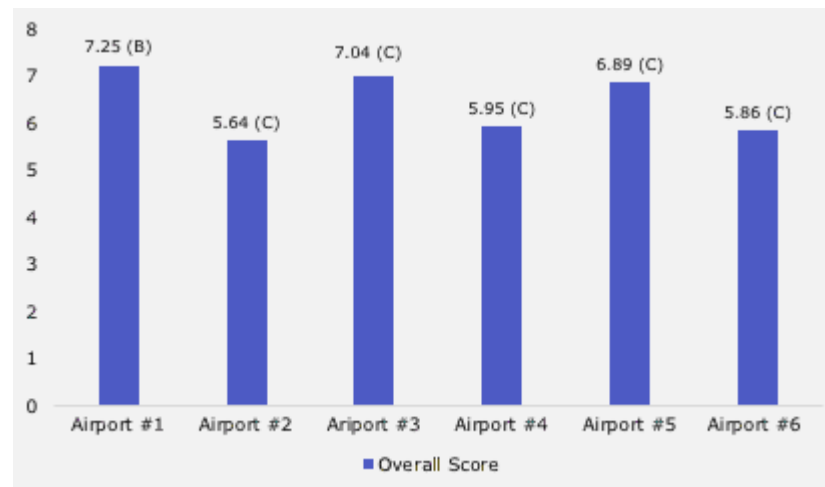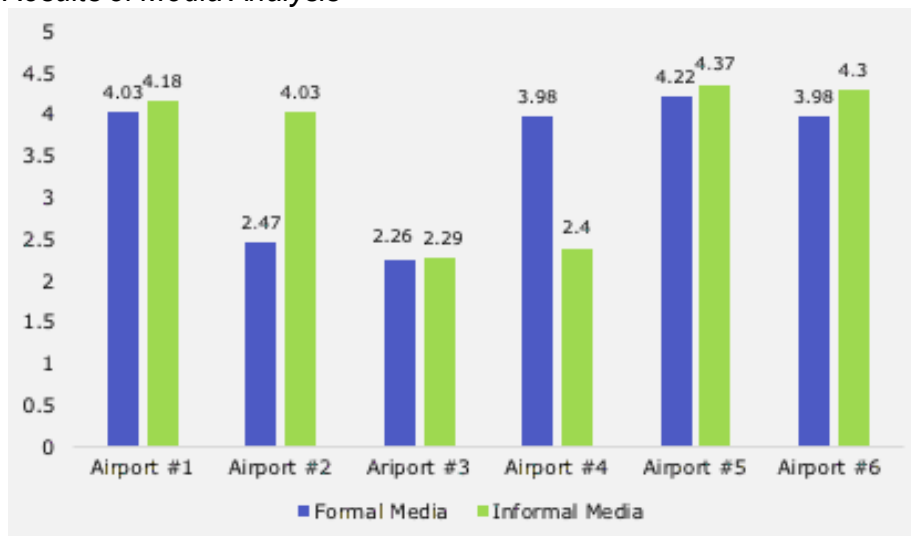
Media Analysis

Besides social media, other publicly disseminated online materials, such as news articles and blogs, can also provide insights on how the airport brand is recognized and perceived through the eyes of the general public. While social media stems directly from customers, other online media sources provide information from the customers' perspectives on how airports are perceived in the local community and beyond. For instance, online news (formal media) and blogs (informal media) may offer a different perspective on customer experience, even when reporting on the same airport event. Compared to social media data, these media sources tend to differ in the scope of their coverage and have longer time intervals between publications. Therefore, an effective analysis should cover more than one single source of data to obtain a more comprehensive understanding of the perceptions of the airport customer experience.

Analysis of formal and informal media yielded different results (Figure C-3), indicating the potential customers may have or from different perceptions of the airport based on the type of media they write or read. As shown in the figure, the results of airport #4 and airport #2 showed the largest discrepancies. For airport #4, the formal media received higher sentiment scores than informal media, with a discrepancy of 1.58 between the two sources. The results of airport #2 showed the opposite pattern. The informal media received higher sentiment scores than the formal media, with a discrepancy of 1.56 between the two sources. These differences suggest that airports can effectively manage these perceptions through media partnerships, press releases, and publication and that, in doing so, they have a choice of which media outlet, formal or informal, to approach.

*Figure C-3. Results of Media Analysis*

Emotions Analysis

The discrepancy in Airport #2's low formal media sentiment score (2.47) compared to its high informal media score (4.03), was further investigated with the emotions analysis. The results of the emotions analysis for the formal media scores revealed that not only were the negative emotions more prevalent in media articles, but that the most dominant emotion was sadness (See Figure C-4). To understand what was causing this emotion, more thorough review of the media articles was conducted. In this analysis, it was discovered that a fatal workplace accident happened during the data analysis timespan and that this accident was highly covered in the

formal media sources but was not covered at all by the informal media. It was determined that the emotions associated with the formal media articles that covered this incident strongly influenced the overall sentiment of the formal media sources. This example illustrates how social media and media data can be skewed by events that are not within the control of the airports. Analysts should consider this important limitation and pay special attention to the sources of particular emotion when performing social media and media analysis.

Figure C-4. Results of Emotion Analysis for Airport #2
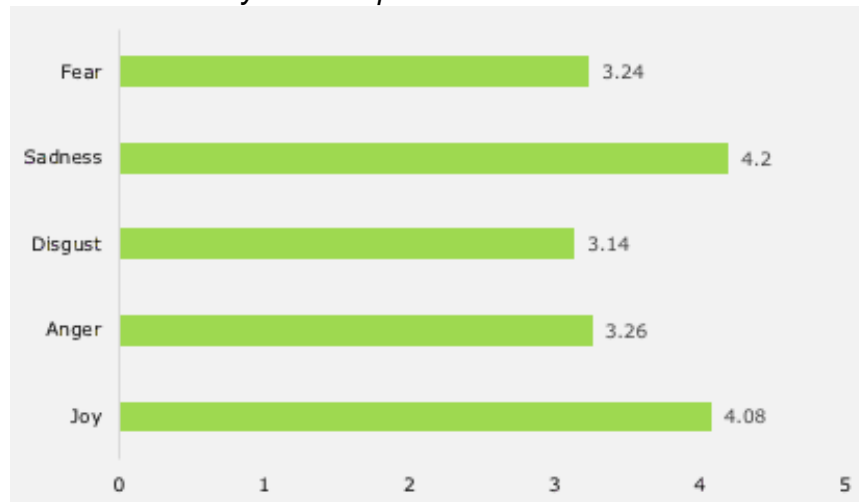
C. High-level Recommendations

With social media and media analysis, airports can have the power to stay ahead of the competition and improve the customer experience. At a high level, airports are encouraged to utilize social media analytics on customer experience, incorporate it in the organization's strategies, and enhance the airport brand through media engagement and partnership.

1. Move from media presence to media analytics.

Maintaining a media and social media presence through official websites, press releases, social media accounts, and interacting with customers on these sites is important, but does not take advantage of the full potential of social media data. Airports need to be more proactive in analyzing and making sense of the social media data, strategically listen to the voices of the customers, and transform these data insights into actions. In general, social media and media analysis, when interpreted carefully, can help airports achieve the following:

- o Better understanding of the airport's customer experience from the customers' perspectives
- o Better understanding of specific needs and preferences of the customers in any specific areas
- o Better understanding of public thoughts and reactions to customer experience initiatives or events at the airport
- o Ability to evaluate customer experience practices and inform planning of future initiatives with analysis overtime
- o Assessment of the airport's standing compared to other competing airports, identifying areas of strengths and weaknesses

Based on the information available, in the current study, only one out of six airports is currently using social media and media analytics to generate real-time alerts and inform appropriate departments about issues that need to be addressed at the airport, and this airport happens to score the highest on all customer experience evaluation criteria. Social media analytics will become the next trend in the airport sector, and it is expected that airports that use social media and media analytics to support, drive, and evaluate their customer experience initiatives stand to gain a substantial competitive advantage in meeting their customer satisfaction goals.

2. Incorporate social media and media analytics into your airport's strategy.

Airports are encouraged to incorporate social media analytics as part of a broader customer experience strategy. By connecting social media and media analytics to strategic goals, different departments and customer experience programs can benefit from the analytical insights, supporting the achievement of the airport's customer experience vision. Planning to conduct social media and media analyses involves different steps, including identifying talent that can do this, providing employees with access to data analytic insights, and potentially giving employees autonomy to make decisions based on these insights.

It is important to reach an agreement on the goals that can be achieved through implementing an airport social media and media analytics process. These agreed upon goals can facilitate initiatives and objectives implementation in the future if they are agreed upon by the senior management and communicated clearly to different levels of management throughout the airport.

3. Enhance the airport brand through media engagement and partnership

Customer experience can be shaped prior to passengers' arriving at the airport through building the airport brand. The brand of the airport is the general public's perception of the airport, and can be shaped by the airport. The brand also guides customers' expectations on the level of service and the customer experience at the airport. When such expectations are met or exceeded, customers report higher levels of happiness and satisfaction. Airports can partner with the media to disseminate information that is useful or provides comfort to their local customers. The media analysis of one airport revealed high negative emotions with a lot of media coverage on partnering with a restaurant under controversy. While such stories are not directly related to the customer experience at the airport, monitoring media coverage related to these can help airports construct or refine their strategies around media partnerships and shape public perception to minimize any negative impact. Media especially can be useful for reaching out to specific groups that are not active on social media (for example, elderly) or handling controversies. Through strategically sharing stories with the media that highlight important initiatives, improvements, or new programs, airports can impact the sentiments of the local and traveling public. This requires building successful media partnerships and having effective media management processes in place.

On social media sites, beyond responding to comments, airports can use social media for branding, messaging, promoting initiatives, and even gauging the public's reception of new or proposed programs. This is an excellent opportunity for airports to promote the image of the airport that they want customers to see. Furthermore, airports can handle controversies through their social media channels and help explain and ease the tension regarding rising public issues related to the airport. Social media management is a great way to immediately tackle sensitive issues and minimize negative impact to customer perception.

In addition, airports can improve or build their brand and image through their websites. Publications managed by the airports to showcase accomplishments, advertise events, provide updates on changes and renovations, or reveal new initiatives can be informative and influential in forming customer perceptions.

Recommendations on Social Media and Media Analysis

Below are recommendations to airports that are utilizing social media and media analysis, and these recommendations aim to help airports effectively use this technique in gaining customer experience insights.

1. Understand the customers through multiple data sources

Different sources of data help airports draw more comprehensive conclusions based on the different nature of these sources of information. Depending on the issue at hand, airports need to decide whether to use social media or media data (or both), or other traditional forms of data from surveys or focus groups. Customer experience is a complicated issue, and involves multiple parties other than the customers themselves. Therefore, it is also good practice to collect and utilize data from the organization's leadership team and employees to fully understand customer experience. Triangulation of the various sources of data provides more in-depth understanding of customer experience, and allows airports to target the complex issue from multiple angles.

2. Know what to look for in the results.

One of the greatest advantages of social media and media analysis is that it is highly customizable to the specific and unique needs of individual airports. Although the decision on what to look for and analyze depends on the customer experience needs of the airport, below are some suggestions on what airports could consider when interpreting the results:

  a. Inconsistencies in data metrics (between different data sources, i.e., social media vs. media, informal vs. formal, sentiment vs. ratings, across evaluation criteria, during different time periods): This can help implement more targeted interventions.
  b. High or low scores in particular areas: This can help identify what initiatives are particularly beneficial or detrimental and aid future resource allocation.
  c. Emerging, persistent, or frequent themes in comments and narratives: This brings to the forefront specific areas that need immediate attention and aids prioritization of goals.
  d. Distribution of scores across different emotions: This can help determine the specific changes that will arouse positive emotions as well as the training needs of employees to achieve the goal of creating positive customer experiences.
  e. Changes in scores over time: This can assist with program planning and preliminary evaluations as it casts light on whether implemented or proposed initiatives are resonating with customers.

3. Understand the limitations.

It is important to understand that social media and media analysis is not without limitations, and understanding what those are will ensure appropriate usage of this data. Some limitations include:

  o *Sample size:* The sample size is largely determined by the date range and sometimes limited by the availability of articles for a particular airport. For instance, the number of

articles that were available for the media analysis of informal media data for some airports in the illustration was too low to allow much interpretation. While expanding the source base is one way to overcome this limitation, the results always need to be interpreted with the limitation of sample size in mind.

- o *Range restriction:* The feedback and information from social media can only be obtained from people who have accessibility to or prefer to use media platforms. Although large amounts of data can be obtained through media and social media, this cannot be automatically considered an all-inclusive source of data or feedback.

- o *Subjectivity:* Articles on media or social media are written by individuals and what they write represents their point of view rather than an objective representation of what took place at the airport. As such, this point needs to be kept in mind while interpreting the results. It should be noted, however, that although single viewpoints may not represent objective reality or even the average customer viewpoint, once that perspective is publicly available, it is possible it will influence others' perceptions. Social media in particular lends itself to the possibility that individual experiences, even if exaggerated or inaccurate, can be shared and gain media attention. This is a phenomenon that airports should keep in mind when interpreting social media and media data.

- o *Data interpretation:* It is important to understand that the inferences drawn upon analyzing data might not represent the complete reality of what happened at the airport. Advancements in technology may provide us with more accurate tools but analysts need to interpret results with caution by staying aware of the limitations of the analytical techniques used.

4. **Identify and use metrics from social media and media analysis.**

Results from social media and media analysis can be used as metrics or key performance indicators (KPIs) to evaluate the airport's performance on customer experience. Example metrics could be the customer star ratings, sentiment scores, emotion scores, number of social media posts, number of shares and likes, etc. These social media and media metrics would be a helpful supplement to traditional airport KPIs. It is recommended to identify which social media/media analysis results can serve as the appropriate metrics for the targeted customer experience areas. In addition, these metrics can serve as an early alarm for emerging issues. For example, a sudden drop in scores can alert airports of a particular "pain point" that needs to be resolved promptly.

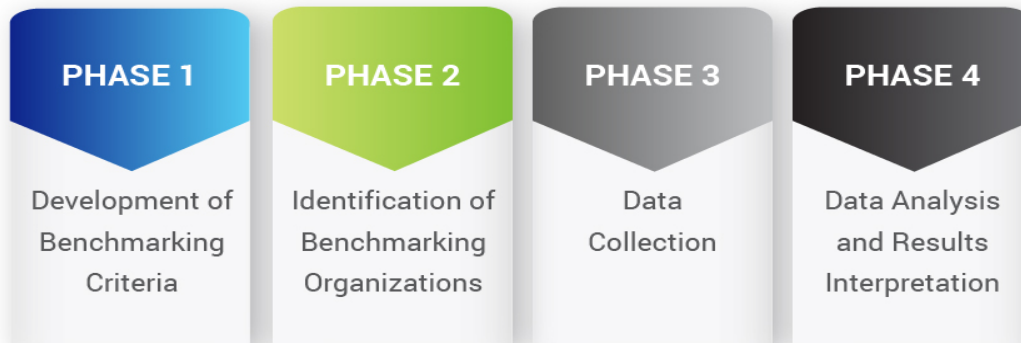5. **Benchmark with other airports and learn from best practices.**

Social media data allows airports to compare their standing on customer experience to other competing airports. It can also help airports identify areas where they are not fulfilling customer expectations or where they are falling behind their industry peers. It is recommended that in addition to monitoring and analyzing the airport's own social media and media, airports also analyze a few competitors' social media. Insights from the benchmarking can inform the airport on potential customer experience initiatives that are successfully implemented at other airports, or serve as an alarm for any potential issues that have first shown up in other airports.

For illustration and inspiration purposes, below are several customer experience practices drawn from the analysis of the six airports, organized by the customer experience criteria, which showcase what airports can potentially learn from their peers:

1. Wayfinding:
   a. Implemented color-coded scheme (Airport #1)
2. Queuing/Waiting:
   a. A new checked baggage inspection system (Airport #5)
3. Interacting with Employees
   a. Volunteer ambassador program (Airport #1, #3)
   b. Numerous desks and kiosks providing assistance on a variety of customer needs (Airport #3)
4. Seeking Information:
   a. A 24-hour switchboard for customer enquiries (Airport #5)
   b. Volunteer ambassador program (Airports #1, #3)
   c. Active radio program (Airport #3)
5. Fulfilling Basic Needs:
   a. Addition of more flights (Airport #3, #4, #5)
   b. Addition of more restaurants (Airport #3, #4)
6. Fulfilling specific needs:
   a. A service animal relief area (Airport #3, #5)
   b. Picnic zones (Airport #5)
   c. A visual assistance service for disabled passengers (Airport #3, #5)
   d. Assistance for autistic travelers (#3)
   e. A business center (Airport #5)
   f. Nursing rooms throughout the airport (Airport #1)
7. Leisure:
   a. An art space showing the works of local and regional artists (Airport #5)
   b. Opening new restaurants with global and also local cuisine options (Airport #1)
8. Sense of Place:
   a. Partnering with local art institutions to showcase community artists (Airport #1)
   b. An airport mascot and official ambassador (Airport #5)
9. Handling Crisis Situations:
   a. Regular emergency drill procedures (Airport #3)

Appendix D: Creative Benchmarking

The approach to creative benchmarking consists of four phases:

PHASE 1	PHASE 2	PHASE 3	PHASE 4
Development of Benchmarking Criteria	Identification of Benchmarking Organizations	Data Collection	Data Analysis and Results Interpretation

Phase 1. Development of the Benchmarking Criteria

Creative benchmarking begins with the identification of main customer experience criteria to serve as the basis for benchmarking. See Tables C-1 and C-2 in Appendix C for essential and value-add criteria that may be used by airports for benchmarking.

Phase 2. Identification of Benchmarking Organizations

In choosing other organizations or industries for comparison, airports should choose those that match the objectives of comparison they are interested in. For example, if an airport is interested in benchmarking its queuing/waiting against another organization, then they need to select an organization that excels in managing this aspect.

A selected organization can map on some or all performance or success indicators, such that some aspects can be primary and others can be secondary or supplementary for the purpose of comparison with a particular airport. The more an organization/industry resembles the airport's, the easier it will be to make meaningful comparisons.

Phase 3. Data Collection

Data can be retrieved from a variety of sources utilizing a range of qualitative and quantitative methods (Figure D-1). To gain richer insights and a greater degree of confidence in the interpretation of the results, a variety of data sources should be utilized in the creative benchmarking exercise. This includes data collected from the customers' perspective, employees' perspective, and the organization's perspective for a more thorough and meaningful interpretation of the benchmarking results.

Figure D-1. Data collection sources

To assist with the data collection effort, a sample data summary table is provided in Appendix E. The data summary table captures quantitative data; however, it is also important to keep notes on the qualitative information and insights while researching the organizational practices.

➢ ***Data from the employees' perspective***

Employee experience is a key determinant of the customer experience; therefore, voices from the employees should be taken into consideration to examine the organization's customer experience practices. Glassdoor.com and Indeed.com are two of the world's largest job and recruiting sites and both provide an extensive database of company reviews provided anonymously by employees. Data was collected on employees' overall review of the selected organization from Indeed, which indicates employee satisfaction (ranges from 1 to 5, with 5 being most satisfied); as well as the percentage on whether the employees will recommend the company to a friend (ranges from 0% to 100%) from Glassdoor. The recommendation rate is similar to a net promoter score, in that the better experience one has, the more likely they are to promote and recommend the business to friends and family. The net promoter score is one of the most robust and widely used metrics of customer experience.

➢ ***Data from the organization's perspective***

Organizational policies and practices directly impact the customer experience, and thus are taken into consideration within the creative benchmarking process. In order to maximize the usability of the creative benchmarking tool, the airport and the benchmarked organization/s need to be evaluated on whether or not it has key customer-centric practices implemented. However, the effectiveness of each implemented practice is also important, and should be considered when interpreting the benchmarking score. Information from the organization's perspective can be collected by conducting an online search and review of the organization's website, publications, news articles, and media posts. In particular, seven organizational strategies and practices have been identified as critical to customer experience, and consequently included in the creative benchmarking (Figure D-2).

Figure D-2. Organizational strategies and practices critical to the customer experience

> ➤ *Data from the customers' perspective: Social Media Analysis*

Refer to Appendix C, Step 4, for details on collecting social media comments, web-scraping the data and analyzing it using qualitative methods and sentiment analysis.

Phase 4. Data Analysis and Results Interpretation

> ➤ *Sentiment Analysis*

Once these data frames are created, a sentiment analysis can be conducted on each of them in order to obtain **Total Experience Indicators (TEI)** and **Specific Experience Indicators (SEI)** for the benchmarks of interest.

TEI captures the experience and the emotions of the customers, measured by the overall sentiment from social media reviews, whereas SEI captures the experience and emotions of the customers on a specific CX criterion, measured by the expressed sentiment from social media reviews related to the selected criteria. A sentiment analysis is a textual review in which a comment is classified as either positive, negative, or neutral based on the presence of specific words that the software has assigned as more positive or more negative. These words are

averaged for the entire comment and a score is made, typically on a scale of -1 to 1, with -1 being highly negative and positive 1 being highly positive. For ease of comparison and interpretation, all scores are transformed and normalized to a 100-point scale. Scores above zero are labeled as positive and scores below zero are labeled as negative. Having both the numerical score and the positive or negative label is helpful in the analysis.

Several software tools can be used to conduct sentiment analysis, and IBM Watson natural language processing tool is another example that can be used in the analysis.

> ➢ *Creative Benchmarking Formula*

After collecting chosen qualitative and quantitative data on each targeted organization, an algorithm is used to produce the Customer Experience Benchmarking Index. This method mathematically combines different types of data to provide an effective indicator of the level of customer experience, thus allowing meaningful comparisons between airports and organizations in other industry sectors. Due to the fact that there could be numerous customer experience data on each organization, the selection of data points in this benchmarking formula is based on the availability of such data across organizations, the ease of data collection and analysis, applicability to customer experience practices in airports, and the data's impact on customer experience. Airports are encouraged to be creative in adjusting this formula to best meet their unique customer experience needs.

The Customer Experience Benchmarking Index is composed of three components:

  i.   A score on the organization's overall customer experience;
  ii.   A score on the organization's specific customer experience;
  iii. A letter grade on the organization's customer experience strategy and practices.

When benchmarking with other organizations, all components of the Benchmarking Index should be examined individually for insights in each area; and more importantly, viewed holistically to gain a rounded understanding of the potential strengths and weaknesses, as well as best practices and lessons to learn. For instance, when a benchmarked organization scores comparably or worse on overall customer experience but excels on the specific customer experience, directing attention to that specific area will allow airports to more efficiently learn from the best.

Calculation of the Customer Experience Benchmarking Index:

  i.   <u>Overall Customer Experience score</u> - indicates the overall level of customer experience of the organization. The score ranges from 1 to 5, with higher scores indicating better levels of customer experience.

$$\text{Overall Customer Experience score} = \frac{\text{TEI} \times \text{ReviewRating} + \text{EmployeeRating} \times \text{NPS} \times 100}{200}$$

- **Total Experience Indicator (TEI)** – Captures the experience and the emotions of the customers, measured by the overall sentiment from social media reviews. Normalized to a scale of 0-100, higher scores indicate better performance.
- **Review Rating** – Ratings provided by the customers when submitting reviews or comments on social media platforms. Most platforms (e.g., Google review, Yelp) collect a rating between 1 and 5, higher score indicates a more positive experience.
- **Employee Rating** – Employees' rating of the organization on Glassdoor. Employee experience is a key indicator of customer experience. Ranges from 1 to 5, higher score indicates higher satisfaction with the organization.
- **Net Promoter Score (NPS)** – The extent to which an employee recommends the company to a friend. NPS is based on the principle that the better experience people have, the more likely they are to promote the business to friends and family. The NPS is one of the most valid and recommended customer experience metrics.

ii.   Specific Customer Experience score - indicates the specific level of a customer experience criteria. The score ranges from 1 to 5, with higher scores indicating better levels of customer experience in the criteria area.

$$\text{Specific Customer Experience Score} = \frac{SEI \times ReviewRatingSpecific}{100}$$

- **Specific Experience Indicator (SEI)** – Captures the experience and emotions of the customers on a specific customer experience criterion, measured by the expressed sentiment from social media reviews related to the selected criteria. Normalized on a scale of 0-100, higher scores indicate better performance.
- **Review Rating Specific** – Average customer review ratings on comments related to the selected customer experience criteria.

iii.   Customer Experience Letter Grade: each organization is evaluated based on whether or not it has the following 7 practices. A-level organizations have 7-6 practices in place; B-level organizations have 5-4 practices in place; and C level organizations have less than 4 practices in place.

When comparing organizations to airports, the customer experience benchmarking index should be interpreted carefully and used as a guide in determining where the airport stands on customer experience in comparison to the selected organization. The process of collecting data for the index, analyzing, comparing, and learning from customer experience practices from another organization, can provide more valuable information than the end result index itself.

Appendix E: Sample Data Summary Table for Creative Benchmarking

	Total Experience Indicator		Specific Experience Indicator			Customer Ratings		Employee Rating		Organization's CX strategy and practices							CX Benchmarking Index		
	TEI (Total Experience Indicator)	TEI Normalized	Specific Experience	SEI (Specific Experience Indicator)	SEI Normalized	Review Rating	Review Rating Specific	Employee Rating	NPS (Net promoter score)	Active social media presence	Emphasize CX in mission, vision, or core values	CX Leadership presence	Provide CX trainings to employees	Utilize social media data analytics	Ranked top 10 in industry CX ranking	Availability of a Mobile App for customers	Overall CX Score	Specific CX Score	CX Organizational Practices
	Overall sentiment analysis	0-100	Name of the specific experience for benchmarking	CX criteria sentiment analysis from social media analysis	0-100	Average overall customer rating on social media platform	Average customer rating on comments related to CX criteria.	Indeed.com average employee rating. 1-5	Glassdoor.com % of employees recommending org to friends	Yes or No	Yes or No	Yes or No	Yes or No	Yes or No	Yes or No	Yes or No	(TEI* ReviewRating + EmployeeRating* NPS*100)/200	SEI*ReviewRatingSpecific/100	CX practices: A= 6-7. B= 4-5 C= 3 or less
Organization 1																			
Organization 2																			
Organization 3																			
Organization 4																			
Own airport																			

Appendix F: Social Media and Media Analysis Resources and Guides

A. Social Media and Media Analysis Guidelines

The table below identifies important questions to consider before and during the social media and media analysis process. Recommendations and suggestions provided can guide interested airports through the process and help ensure that the results are customized to the customer experience goals of each airport.

Guiding Question	Considerations
When do you need to start the social media or media analysis process?	Social media and media analysis can be an effective tool to gauge the perceptions, opinions, and attitudes of the users towards your organization and its services. Therefore, you can use it at different phases of the organization's growth or the services' implementation cycle (before, during, and after) to assess the ongoing perceptions of the effectiveness of your operations.
Which type of analysis is more suitable for you?	Different segments of users contribute to different media sources and cover different aspects of your organization or services. Throughout this report, we provided an illustration of two sources: social media and media (news/blogs). The former is more focused on day-to-day interactions with your services, while the latter is more events or incidents focused. Accordingly, you can choose the depth (by looking at multiple sources) and breadth (by examining multiple options within the same source) that suit your objective of analysis the most. Generally, the more input, the better understanding of users' feedback on your services.
How can you get the best use of social media analysis?	Be strategic about it. An airport that integrates social media and media analysis as a part of its customer experience practices into the airport strategy is more able to make sure that the results of this analysis will be used effectively for the benefit of the airport departments. Plan ahead for the objective of your analysis and target the initiative or service with relevant analyses and keywords that cover this area.
How should you collect data for social media and media analysis?	Data collection can be implemented using different methods (e.g., manual collection or by a software program such as RStudio). Choose the appropriate method according to your organization's capability and resources. It is more important to collect the relevant data rather than being delayed by an effort of making it happen through a particular method.
How much data should you collect and for how long?	These decisions will need to be made by the airport and will depend on criteria being evaluated, access to social media platforms, and availability of social media or media data. For example, a larger airport with a higher volume of online data interested in using social media data to assess reactions to a recent change at the airport may be able to limit their search to more recent posts, whereas a smaller airport may be required to expand their timeframe simply to have access to enough data to gain meaningful insights.
Which online resource should you use for obtaining data?	An airport located at a specific geographical location might have a different source of news, customer feedback or reviews than the one used in your area. A diligent effort to search for airport-specific media websites may lead to obtaining a higher number of relevant news articles that can help you better assess the public feedback. Social media resources can be either a common one (for example, Google reviews, Facebook, Twitter, Instagram) or one that is specific to a geographical location. Finding the source with more comprehensive and relevant updates will provide a better understanding of social media information for your airport.

After collecting the relative narrative data, what next steps could be taken to analyze it further?	An analysis for the sentiment of the collected text and the emotions involved within this text can be done using one of the text analyzing services, such as IBM Watson.
How does IBM Watson determine which words are positive and negative?	The algorithm looks at each word and the strength of how positive, negative, or neutral a text is perceived depends on not only the number of positive or negative words but also the strength of how positive or negative the words are. Words that are more neutrally positive would be something like "good" while a strongly positive word would be "fantastic." Alternatively, a more neutrally negative word would be similar to "annoyed" while a strongly negative word would be "outraged." By assigning a numerical representation to show how positive or negative text is we can better compare across text and see areas of strengths and weaknesses.
What should happen after analyzing the text and identifying the key findings and recommendations?	An ongoing analysis should take place to monitor the progress of customers' perceptions and sentiment about your services over time. If problems are not solved, the ongoing analysis will become most valuable in identifying the airport's emerging issue that needs to be immediately addressed.

B. Tools for Creative Benchmarking

The table below identifies tools that could be used in the creative benchmarking process. This is only a sample of available tools, as there are many commercially available products with similar capabilities. The tools listed here were selected because they are either free (RStudio, Python), or have free demos available (IBM Watson, MeaningCloud).

Tool	Description	Link
RStudio	An open-source software for statistical computing and graphics that enables users to analyze data, which can be used to scrape online data and provide insights on the data's content. Several packages R can be used to conduct a sentiment analysis.	https://www.rstudio.com/
Python	Another open-source programming language and system that can be used for many applications including sentiment analysis.	https://www.python.org/
IBM Watson	A natural language processing software that looks at text comments and contributes to the creation of a sentiment score.	https://www.ibm.com/watson/services/natural-language-understanding/
MeaningCloud	A program that can be used for customer experience management and social media analysis, specifically through the analysis of unstructured customer feedback	https://www.meaningcloud.com
SelectorGadget	An open source point and click tool that is used to extract CSS syntax by clicking on the elements that will be imported in the web scrapping.	https://selectorgadget.com/

C. Data Sources Used in Social Media Analysis

The table below provides information on data sources commonly used in social media analysis. This is only a sample of available social media platforms. Airports interested in creative

benchmarking are encouraged to consider which data sources would yield the most useful and relevant information for their organization.

Data Source	Description	Link
Facebook	The social media network of Facebook allows organizations to create pages through which they can post updates on their services/products. Also, a section of "Reviews" on an organization's Facebook page can allow users to post their reviews of the company or its services/products. However, some organizations administering Facebook pages do not enable the reviews option to be available on their pages.	https://www.facebook.com/
Twitter	The social media network of Twitter enables organizations to create a business account through which they can post updates on their services/products. Users can also express their feedback either through replying back to company posts or by independently posting updates (i.e., tweets) mentioning the company. This mention can take place either in the form of having the company reference mentioned as a part of a text sentence, or it can sometimes be expressed in the form of a topic (i.e., hashtag) that is represented by the symbol of # (e.g., #CelebrityCruises).	https://www.twitter.com/
Google Reviews	Based on the navigation service of Google Maps, users can review locations that they visit which makes Google reviews a good source to look into when assessing a location for its services/products. However, the way it works is that it needs to be connected to a location on Google Maps or by searching for it in the Google search engine, so that you can find the reviews posted by users for that location. This can sometimes be confusing if you want to collect organization-wide reviews instead of reviews related to a specific location or branch of a specific organization. But alternatively, you can look for a location that is best known for this organization with a large number of user reviews and use this location as a basis for collecting representative data on that organization.	
Yelp	As a crowd-sourced review forum, Yelp enables you to find user reviews on different businesses and locations in one place.	https://www.yelp.com/
TripAdvisor	With a focus on travel-related content, TripAdvisor provides users with a platform to post reviews on hotels, flights, cruises and travel-related services.	https://www.tripadvisor.com/
Glassdoor	Through Glassdoor you can find reviews of companies posted by its employees. This can be a good source of an employee-point-of-view of the company, with indicators of how much would they recommend others to work at this place.	https://www.glassdoor.com/
Google News	A news source that aggregates news articles from thousands of magazines and publishers related to	https://www.google.com/

	specific topics. This portal provides updates from both news publishers in addition to blogs. This can be accessed through searching for the airport name on Google, and on the results page, you select the news tab below the search field. You will have another option on the right named "Tools," upon clicking it another option will show below the search field mentioning "All news." By clicking this option you can choose to show "Blogs" search results only.	

D. Keywords for Categorization into Customer Experience Criteria

Employee Interaction Keywords

answered questions, assist, assisted, assisting, assistance, call, called, customer experience, customer service, email, employee, employees, friendly, help, helped, helpful, helping, inform, knowledgeable, people, polite, rude, rushed, said, say, service, staff, timely, workers, professional, smile, solve problems, mean, face, disappointed, upset, positive experience, speak to, refused, disgruntled, treated, racist, worker, nothing open, option, options, communicate, communicating, communicated, explain, explained

Wayfinding Keywords

access, busy, concierge, confused, confusing, difficult, direct, direction, directions, disorganize, driving, easier, easy, figure out, find, finding, get around, get lost, get to, got to, guidance, guide, identify, layout, location, lost, map, navigate, navigation, organized, pointed, see, show, sight, sign, signage, signs, straight forward, transition, unclear, walk, walking, way, wherever

Queueing & Waiting Keywords

busy, crowd, crowded, duration, efficient, expected wait, fast, hours, how long, line, lines, lining, long, organized, queue, queues, queuing, quick, quickly, seat, sit, sitting, slow, stand, standing, time, wait, waited, waiting, slowly, patient, patience, slowly, TSA, minutes, later, security, feet, meters, move, moving, get to, go through, screening, takes time, jam, packed, waiting areas, check point, a breeze, short lines, long lines, hold, interval, hold-up, delay

Information Seeking Keywords

all you need, app, ask, asked, cell phone, clear, convenient, cooperative, desk kiosk, easy, navigation, easy to find, easy to find info, easy to find info, easy to navigate, easy to seek info, find, finding, frequent, friendly, gate change, gate staff, guide, hard to get, hear, heard, helpful, helpful, helpful staff, info, inform, information, kiosk, kiosk staff, message, monitor, monitors, navigate, obtain, organized, organizing, quick, quick to find, read, reading, see, seek, sign, signage, clear signage, frequent signage, signs, staff, unfriendly, useful info, website

Sense Of Place Keywords

art, arts, artwork, beautiful, bright, building, clean, color, comfortable, decoration, design, emotion, environment, feel, feelings, modern, nice, place, plant, plants, sculpture, setting, wow, cozy , fresh, beautiful, singing, cool, shopping, clear cut, pleasant, favorite, experience, smoothness, fairly clean, convenient, smell, interesting, interesting things, see, fountains, renovated, new, lively, pleasant, favorite, inside space, layout, art installations, lovely, pretty, gem, thrilling, amusing, impressed, overwhelming, airy, bright, quaint, style, piano, rocking chairs, spacious, local, hospitality, nostalgia, laidback, sleek, cool sense, pleasantly, surprised, surprise, light, fountain

Crisis Keywords
accident, accidents, alarm, ambulance, attack, blood, change, changed, chaos, crash, crisis, damage, disruption, emergency, fight, fire, for cover, harm, horrific, ill, illness, incident, injure, injured, landing, media, medical, medical, attentat, medical help, panic, people running, police, rush, safe, safety, shelter, shooting, sick, sudden, terrorist, threat, traffic, tragedy, unexpected, unlawful, violence, violent
Basic Needs Keywords
ac , air conditioned, air conditioning, air, available, basic, bathroom, cell phone lot, charge, charging locations, clean, cleaning, cleanliness, cold, comfort, comfortable, dirty, electricity, electronic, electronic devices, facilities, filthy, floor, functioning, garbage, garbage can, heat, hot, long, lines for the bathroom, long wait for the bathroom, outlet, power, pray, restroom, restrooms, safe, seat, seating, secure, temperature, toilet, uncomfortable, warm, water, wifi, wi fi, wi-fi, working
Specific Needs Keywords
accessible, amenities, assist, assistance, assistive device, autism, autistic, blind, braille, breastfeeding, cane, caregiver, cat, cats, changing table, chaperone, child, children, convenient, diaper, directing, disability, disabled, dog, dogs, easy to get around, easy to use, elevator, emotional support, family, family bathroom, flickering lights, good layout, handicap accessible, handicapped, help, helped, helpful staff, helps you, illness, kid, kids, leg braces, loud noises, medication, medicine, mom, monorail, nursing, paralyzed, pet, physical, propel pushed the wheelchair, ramp, seizure, seniors, sensitive, sensitivity, service dog, shuttle service, special, special needs, support, train, tram, walker, wheelchair, you can count on
Leisure Keywords
activities, activity, art, art, bar, beer, bench, brew, burger king, chair, clothes, coffee, comfortable, cool, dine, dining, dinning, drinks, dunkin donuts, eat, eateries, eating, entertain, entertainment, fast food, food, food court, food options, food selection, fun, gift, gift shop, gift shops, good food, internet, lounge, mcdonalds, menu, movie, music, perform, performance, piano, play, play area, plenty, price, pricing, quality, relax, relaxing, restaurant, restaurants, sandwich, selection, shop, shopping, shops, singing, snack, souvenir, souvenirs, spa, starbucks, variety, wendys, wifi, wi-fi, wine

E. R Codes

The code used in the airport social media analysis in Appendix C is presented below as an illustration.

Libraries
```
library(rvest);library(selectr);library(xml2);library(stringr);library(jsonlite); library(rebus);
library(xlsx); library(xlsxjars); library(rJava); library(stringi)
```
Step 1: Command F - Type "airport" in the Find box, hit the "All" button. Put your airports name in the Replace box, hit the "All button" Step 2: Replace all urls with the URL of the platform you use. Repeat this step for each URL for each page

Data Import
```
PAGE 1 Import Comments (REPLACE URL)
airport_1_comments_html <- read_html(" ") #url page 1
airport_1_comments_nodes <- airport_1_comments_html %>% html_nodes(".review-content p")
#CSS selector for comments
airport_1_comments_text <- html_text(airport_1_comments_nodes)
```

```
airport_1_comments_text
Import Names (REPLACE URL)
airport_1_names_html <- read_html(" ") #url page 1
airport_1_names_nodes <- airport_1_names_html %>% html_nodes(".user-name") #CSS
selector for usernames for matching
airport_1_names_text <- html_text(airport_1_names_nodes)
airport_1_names_text
airport_1_names_text <- str_split(airport_1_names_text, "                   ")
airport_1_names_text
Import Date (REPLACE URL)
airport_1_date_html <- read_html(" ") #url
airport_1_date_nodes <- airport_1_date_html %>% html_nodes("#super-container .rating-
qualifier") #CSS selector for date
airport_1_date_text <- html_text(airport_1_date_nodes)
airport_1_date_text <-str_split(airport_1_date_text, "       ")
airport_1_date_text <- airport_1_date_text[1:20]
airport_1_date_text
PAGE 2 Import Comments (REPLACE URL)
airport_2_comments_html <- read_html(" ") #url page 2
airport_2_comments_nodes <- airport_2_comments_html %>% html_nodes(".review-content p")
#CSS selector for comments
airport_2_comments_text <- html_text(airport_2_comments_nodes)
airport_2_comments_text
Import Names (REPLACE URL)
airport_2_names_html <- read_html(" ") #url page 2
airport_2_names_nodes <- airport_2_names_html %>% html_nodes(".user-name") #CSS
selector for usernames for matching
airport_2_names_text <- html_text(airport_2_names_nodes)
airport_2_names_text
airport_2_names_text <- str_split(airport_2_names_text, "                ")
airport_2_names_text
Import Date (REPLACE URL)
airport_2_date_html <- read_html(" ") #url page 2
airport_2_date_nodes <- airport_2_date_html %>% html_nodes("#super-container .rating-
qualifier") #CSS selector for date
airport_2_date_text <- html_text(airport_2_date_nodes)
airport_2_date_text <-str_split(airport_2_date_text, "       ")
airport_2_date_text <- airport_2_date_text[1:20]
airport_2_date_text
Page 3 Import Comments (REPLACE URL)
airport_3_comments_html <- read_html(" ") #url page 3
airport_3_comments_nodes <- airport_3_comments_html %>% html_nodes(".review-content p")
#CSS selector for comments
airport_3_comments_text <- html_text(airport_3_comments_nodes)
airport_3_comments_text
Import Names (REPLACE URL)
airport_3_names_html <- read_html(" ") #url page 3
airport_3_names_nodes <- airport_3_names_html %>% html_nodes(".user-name") #CSS
selector for names for matching purposes
airport_3_names_text <- html_text(airport_3_names_nodes)
airport_3_names_text
airport_3_names_text <- str_split(airport_3_names_text, "                ")
```

airport_3_names_text
Import Date (REPLACE URL)
airport_3_date_html <- read_html(" ") #url
airport_3_date_nodes <- airport_3_date_html %>% html_nodes("#super-container .rating-qualifier") #CSS selector for date
airport_3_date_text <- html_text(airport_3_date_nodes)
airport_3_date_text <-str_split(airport_3_date_text, "   ")
airport_3_date_text <- airport_3_date_text[1:20]
airport_3_date_text
The above pattern should be repeated for each page of the platform you are using

Combine Pages (Reduce or expand to match number of pages you have)
airport_comments_text <- c(airport_1_comments_text, airport_2_comments_text, airport_3_comments_text)
airport_comments_text
airport_date_text <- c(airport_1_date_text, airport_2_date_text, airport_3_date_text)
airport_date_text
airport_names_text <- c(airport_1_names_text, airport_2_names_text, airport_3_names_text)
airport_names_text
airport_friends_text <- c(airport_1_friends_text, airport_2_friends_text, airport_3_friends_text)
airport_friends_text
airport_reviews_text <- c(airport_1_reviews_text, airport_2_reviews_text, airport_3_reviews_text)
airport_reviews_text
airport_locations_text <- c(airport_1_locations_text, airport_2_locations_text, airport_3_locations_text)
airport_locations_text

Build Full Dataframe
airport_data <- data.frame("Comment" = airport_comments_text)
airport_data$Date <- (airport_date_text)
airport_data$Name <- (airport_names_text)
airport_data$Location <- (airport_locations_text)
airport_data$Friends <- (airport_friends_text)
airport_data$Reviews <- (airport_reviews_text)
Comments Only File
write.table(airport_comments_text, file = "airport_comments", sep = "\t")
Use this to copy and paste comments into IBM Watson. Record the sentiment scores from IBM Watson and ratings from the webpage with these comments in a csv file named airport_analysis.csv

Import Reviews and Sentiments into the R dataframe
airport_analysis <- read.csv("airport_analysis.csv", header = TRUE)
use file.choose to get the "file.csv" name in the quotes
Combine the R dataframe and csv file with the scores
airport_data <- cbind(airport_data, airport_analysis)

Delete extra rows
airport_data <- airport_data[-c(),] #in the parenthesis list the top row numbers range you want to delete ex:(1:10)
airport_data <- airport_data[-c(),] #in the parenthesis list the bottom row numbers range you want to delete ex:(100:102)

Changes comments to lowercase for keywords
airport_data$Comment <- str_to_lower(airport_data$Comment, locale = "en")

Check the structure of the data and match these data types
str(airport_data)
as.character(airport_data$Comment)
as.character(airport_data$Date)
as.character(airport_data$Name)
as.character(airport_data$Location)
as.numeric(airport_data$Friends)
as.numeric(airport_data$Reviews)
as.character(airport_data$Comments)
as.numeric(airport_data$Rating)
as.numeric(airport_data$Sentiment)
airport_data <- as.data.frame(lapply(airport_data, unlist))

Identify Keywords
airport_data$EmployeeInteraction <- str_detect(airport_data$Comment, pattern = "answered questions|assist|assisted|assisting|assistance|call|called|customer experience|customer service|email|employee|employees|friendly|help|helped|helpful|helping|inform|knowledgeable|people|polite|rude|rushed|said|say|service|staff|timely|workers|professional|smile|solve problems|mean|face|disappointed|upset|positive experience|speak to|refused|disgruntled|treated|racist|worker|nothing open|option|options|communicate|communicating|communicated|explain|explained")
airport_data$Wayfinding <- str_detect(airport_data$Comment, pattern = "access|busy|concierge|confused|confusing|difficult|direct|direction|directions|disorganize|driving|easier|easy|figure out|find|finding|get around|get lost|get to|got to|guidance|guide|identify|layout|location|lost|map|navigate|navigation|organized|pointed|see|show|sight|sign|signage|signs|straightforward|transition|unclear|walk|walking|way|wherever")
airport_data$QueueingWaiting <- str_detect(airport_data$Comment, pattern = "busy|crowd|crowded|duration|efficient|expected wait|fast|hours|how long|line|lines|lining|long|organized|queue|queues|queuing|quick|quickly|seat|sit|sitting|slow|stand|standing|time|wait|waited|waiting|slowly|patient|patience|slowly|tsa|minutes|later|security|feet|meters|move|moving|get to|go through|screening|takes time|jam|packed|waiting areas|check point|a breeze|short lines|long lines|hold|interval|hold-up|delay")
airport_data$InfoSeeking <- str_detect(airport_data$Comment, pattern = "all you need|app|ask|asked|cell phone|clear|convenient|cooperative|desk kiosk|easy|navigation|easy to find|easy to find info|easy to find info|easy to navigate|easy to seek info|find|finding|frequent|friendly|gate change|gate staff|guide|hard to get|hear|heard|helpful|helpful|helpful staff|info|inform|information|kiosk|kiosk staff|message|monitor|monitors|navigate|obtain|organized|organizing|quick|quick to find|read|reading|see|seek|sign|signage| clear signage|frequent signage|signs|staff|unfriendly|useful info|website")
airport_data$SenseOfPlace <- str_detect(airport_data$Comment, pattern = "art|arts|artwork|beautiful|bright|building|clean|color|comfortable|decoration|design|emotion|environment|feel|feelings|modern|nice|place|plant|plants|sculpture|setting|wow|cozy |fresh|beautiful|singing|cool|shopping|clear cut|pleasant|favorite|experience|smoothness|fairly clean|convenient|smell|interesting|interesting things|see|fountains|renovated|new|lively|pleasant|favorite|inside space|layout|art installations|lovely|pretty|gem|thrilling|amusing|impressed|overwhelming|airy|bright|quaint|style|piano|rocking chairs|spacious|local|hospitality|nostalgia|laidback|sleek|cool sense|pleasantly|surprised|surprise|light|fountain")

```
airport_data$Crisis <- str_detect(airport_data$Comment, pattern =
"accident|accidents|alarm|ambulance|attack|blood|change|changed|chaos|crash|crisis|damage|
disruption|emergency|fight|fire|for
cover|harm|horrific|ill|illness|incident|injure|injured|landing|media|medical|medical|attentat|medic
al help|panic|people
running|police|rush|safe|safety|shelter|shooting|sick|sudden|terrorist|threat|traffic|tragedy|unexp
ected|unlawful|violence|violent")
airport_data$BasicNeeds <- str_detect(airport_data$Comment, pattern = "ac|air conditioned|air
conditioning|air|available|basic|bathroom|cellphone lot|charge|charging
locations|clean|cleaning|cleanliness|cold|comfort|comfortable|dirty|electricity|electronic
|electronic devices|facilities|filthy|floor|functioning|garbage|garbage can|heat|hot|long| lines for
the bathroom|long wait for the
bathroom|outlet|power|pray|restroom|restrooms|safe|seat|seating|secure|temperature|toilet|unco
mfortable|warm|water|wifi|wi fi|wi-fi|working")
airport_data$SpecificNeeds <- str_detect(airport_data$Comment, pattern =
"accessible|amenities|assist|assistance|assistive
device|autism|autistic|blind|braille|breastfeeding|cane|caregiver|cat|cats|changing
table|chaperone|child|children|convenient|diaper|directing|disability|disabled|dog|dogs|easy to
get around|easy to use|elevator|emotional support|family|family bathroom|flickering lights|good
layout|handicap accessible|handicapped|help|helped|helpful staff|helps you|illness|kid|kids|leg
braces|loud noises|medication|medicine|mom|monorail|nursing|paralyzed|pet|physical|propel
pushed the wheelchair|ramp|seizure|seniors|sensitive|sensitivity|service dog|shuttle
service|special|special needs|support|train|tram|walker|wheelchair|you can count on")
airport_data$Leisure <- str_detect(airport_data$Comment, pattern =
"activities|activity|art|art|bar|beer|bench|brew|burger
king|chair|clothes|coffee|comfortable|cool|dine|dining|dinning|drinks|dunkin
donuts|eat|eateries|eating|entertain|entertainment|fast food|food|food court|food options|food
selection|fun|gift|gift shop|gift shops|good
food|internet|lounge|mcdonalds|menu|movie|music|perform|performance|piano|play|play
area|plenty|price|pricing|quality|relax|relaxing|restaurant|restaurants|sandwich|selection|shop|sh
opping|shops|singing|snack|souvenir|souvenirs|spa|starbucks|variety|wendys|wifi|wi-fi|wine")
```

Create Subsets

```
airport_EmployeeInteraction <- subset(airport_data, airport_data$EmployeeInteraction ==
TRUE)
airport_Wayfinding <- subset(airport_data, airport_data$Wayfinding == TRUE)
airport_QueueingWaiting <- subset(airport_data, airport_data$QueueingWaiting == TRUE)
airport_InfoSeeking <- subset(airport_data, airport_data$InfoSeeking == TRUE)
airport_SenseOfPleace <- subset(airport_data, airport_data$SenseOfPlace == TRUE)
airport_Crisis <- subset(airport_data, airport_data$Crisis == TRUE)
airport_BasicNeeds <- subset(airport_data, airport_data$BasicNeeds == TRUE)
airport_SpecficNeeds <- subset(airport_data, airport_data$SpecificNeeds == TRUE)
airport_Leisure <- subset(airport_data, airport_data$Leisure == TRUE)
```

Analyze Data
This finds the average star rating for the airport this summer
```
mean(airport_data$Rating)
```
These find the average star rating for each benchmark for the airport this summer
```
mean(airport_EmployeeInteraction$Rating)
mean(airport_Wayfinding$Rating)
mean(airport_QueueingWaiting$Rating)
mean(airport_InfoSeeking$Rating)
```

mean(airport_SenseOfPleace$Rating)
mean(airport_Crisis$Rating)
mean(airport_BasicNeeds$Rating)
mean(airport_SpecficNeeds$Rating)
mean(airport_Leisure$Rating)
This finds the average sentiment for the airport this summer
mean(airport_data$Sentiment)
These find the average sentiment for each benchmark for the airport this summer
mean(airport_EmployeeInteraction$Sentiment) mean(airport_Wayfinding$Sentiment)
mean(airport_QueueingWaiting$Sentiment) mean(airport_InfoSeeking$Sentiment)
mean(airport_SenseOfPleace$Sentiment) mean(airport_Crisis$Sentiment)
mean(airport_BasicNeeds$Sentiment) mean(airport_SpecficNeeds$Sentiment)
mean(airport_Leisure$Sentiment)