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Customer Service in Social Media: An Empirical Study of the Airline Industry

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Abstract: Until recently, customer service was exclusively provided over traditional channels. Customers could write an email or call a service center if they had questions or problems with a product or service. In recent times, this has changed dramatically as companies explore new channels to offer customer service. With the increasing popularity of social media, more companies thrive to provide customer service also over Facebook and Twitter. Companies aim to provide a better customer experience by offering more convenient channels to contact a company. In addition, this unburdens traditional channels which are costly to maintain. This paper empirically evaluates the performance of customer service in social media by analysing a multitude of companies in the airline industry. We have collected several million customer service requests from Twitter and Facebook and automatically analyzed how efficient the service strategies of the respective companies are in terms of response rate and time.

Keywords: Customer Service, Social Media, Twitter, Facebook, Airline Industry, CRM, Analytics

1 Introduction

Contacting a company to receive help with a service or to make a complaint is often a tedious task. Calling a service centre can lead to long waiting times and waiting for a response to an email can take days or even weeks. Due to these drawbacks of traditional channels, many customers turn to social media and post questions or make complaints on the social media presence of a company. Ignoring these customer inquiries can lead to negative feedback and even bad press for the company. For this reason, many companies offer customer service over social media. This paper reports on an empirical study of social media-based customer service in the airline industry.

Analyzing social media is a challenge due to the volume and structure of the data as well as its velocity. Thousands of tweets and posts arrive as a permanent stream of data that needs to be processed accordingly. Analysing such volumes by hand is impossible and the unstructured nature of the data is demanding for the underlying architecture. This paper evaluates millions of customer inquiries from Twitter and Facebook and analyzes how companies respond to them. The results give a market overview of the current state of customer service in social media and serves as a benchmark for the airline industry. To the

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best of our knowledge, this work is the first benchmark of customer service in social media of its size and presents interesting findings for the strategies in different market segments.

This paper is organized as follows: Section 2 introduces related work and reviews the current state of customer service. Section 3 describes the technical approach, identifies different airline segments and defines relevant Key Performance Indicators (KPIs) to evaluate customer service performance. Section 4 presents the results and highlights companies that perform well or poorly. Finally, Section 5 concludes with a summary of results and an outlook on future research.

2 Background

In the traditional customer service business, the service level is typically measured using the *Average Handling Time (AHT)* or *Average Queue Time (AQT)*. The AHT describes the average time that an agent requires to handle a customer inquiry. The lower it is, the faster the request or question could be served, leading to lower cost for the service provider. Similarly, the AQT describes the average time that a customer has to wait in a queue until a service agent becomes available and able to respond to the inquiry. In other words, the AQT describes the time that passes until the first response from the company. A lower AQT delivers a much better service experience for the customer and leads to higher satisfaction.

In social media, such KPIs are much harder to define as there is no line of waiting customers. Additionally, the handling time can be difficult to determine due to the unstructured nature of conversations in social media. In the following section we derive suitable performance measures for service in social media and present ways to automatically monitor such KPIs for industries and companies. Our analysis results are demonstrated using the airline industry. In the past, the analysis of customer service in social media for the airline industry has attracted considerable attention from research and practice.

As an example, Talkwalker [Ta16] published a number of descriptive statistics of the last month for 18 large airlines. Their focus lies on number of mentions, sentiment of the posts as well as language and country of origin. Their key findings report, for example, that airlines such as KLM, Qatar, jetBlue, and Flying Emirates attract mostly positive sentiment in social media. In contrast, Air France, American Airlines or Iberia attract mostly criticism and negative feedback. Furthermore, large US airlines appear to receive the most mentions in social media, followed by large European airlines.

Similarly, customer service provider Conversocial [Co16] has recently published a report evaluating service performance in social media. The authors have analyzed up to $2,000$ @-mentions from Twitter in July 2016 for 20 different airlines and have computed the number of tweets and response times. Their results show that Southwest Airlines, Alaska Airlines, KLM and Lufthansa provided the best performance with respect to response time and response rate. In contrast, spirit Airlines, Turkish Airlines and easyJet provide the worst. However, the analysis conducted in this paper has a much wider scope and is thus much more comprehensive.

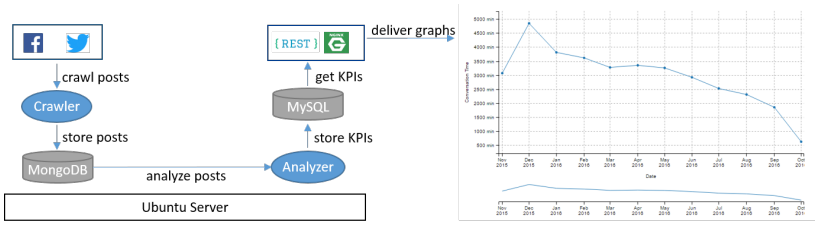

Fig. 1: Visualization of the architecture.

3 Set up

3.1 Architecture

To analyze the posts we set up a dedicated server which provides the necessary databases and also hosts the front end in form of a website. All social media posts are collected via the Facebook Graph API [Fa16] and the Twitter REST API [Tw16]. The data is crawled by using Python scripts that periodically query the APIs and store new posts in a database. The advantage of using Python scripts in our implementation is driven by the intention to create a modular solution without dependencies on other frameworks. The APIs provide each post as a collection of key-values in form of a JSON file. This data is inherently unstructured and may differ between Facebook and Twitter as well as different API versions. For this reason, we utilize a document-based database to store the social media posts. The document-based database allows to store arbitrary key-value data as single objects. Due to its popularity, size of community and maturity status, MongoDB [Mo16] is our choice of database.

Besides the document database, we employ a MySQL database [Or16] that is used to store our defined KPIs for each post together with its time stamp. In contrast to the unstructed JSON objects, the KPIs have a well-defined structure and are best stored in a relational database. Similar to the crawler, the KPIs are periodically calculated by Python scripts that analyze each post and store the KPIs in the MySQL database. Note that we are not dependent on MySQL and could use another relational database, e.g., supporting more OLAP functionality. Finally, the KPIs are delivered to a web service using a REST API hosted by an nginx web server and are visualized using JavaScript. Note that since most calculations are performed asynchronously, we expect our architecture to be able to hold even longer time series without performance issues. The overall structure of the architecture is shown in Figure 1.

3.2 Data Sources

We have identified the airlines with the largest passenger volume, fleet size and revenue targeting various market segments. Our search has resulted in 48 different airlines, ranging from low-cost airlines such as RyanAir to full-service airlines such as Lufthansa. For all

Tab. 1: Number of social media posts per airline from January 2016 – November 2016 and number of passengers as reported on the companies' homepage.

Airline	Number of posts	Passengers per year
KLM	404,964	27,740,000
Iberia	229,677	14,000,000
Etihad Airways	175,609	17,400,000
Air France	166,225	79,016,000
WestJet	139,560	18,500,000
Lufthansa	155,643	107,000,000
easyjet	117,301	70,000,000
Air Berlin	83,696	27,274,777
Thomas Cook Airlines	75,288	6,700,000
Air Canada	73,731	41,000,000

companies, we collected the Facebook and Twitter accounts targeted at the English and German speaking market. This has lead to a total of 66 Twitter and 58 Facebook accounts. We focus our analysis on Facebook and Twitter since they are the most widely used platforms to offer customer service.

For all Twitter accounts, we have collected the *@-mentions* directed at the airlines by querying their Twitter REST API [Tw16]. In other words, we have searched the stream of tweets for all tweets in which one of the companies is addressed. To collect the responses from the airlines, we query the timeline of the airline's Twitter account. This approach allows us to build a conversation structure where posts and their responses are linked.

For all Facebook accounts, we utilize the Facebook Graph API [Fa16] to collect all posts from the airline's Facebook page. This includes so-called *visitor posts*, i.e., posts that users can leave on the page, as well as comments on posts from the company.

Unfortunately, API access is often limited. As an example, the Twitter API restricts search access to approximately the past 9 days. To lift these restrictions we continuously monitored the different accounts over time to gather a total of 6.187.835 posts directed at one of the airlines and 1.777.234 responses from the respective airlines. This allowed us to construct a total of 1.388.922 conversations, i.e., chains of posts and responses which can be used to automatically analyze the service performance. In our analysis we restrict the samples to the current year, i.e., January 2016 – November 2016. For brevity we are not able to present the results for all 48 airlines. Instead, we focus on the ten airlines with the largest volume on social media as shown in Table 1. To put this into perspective, we also listed the number of passengers per year.

3.3 Airline Market Segments

In general, the airline industry can be divided into four main market segments: Low-cost carriers, regional carriers, leisure carriers, and full-service network carriers [Bö14]. Each segment is characterized by service level as well as number of flight routes. While low-

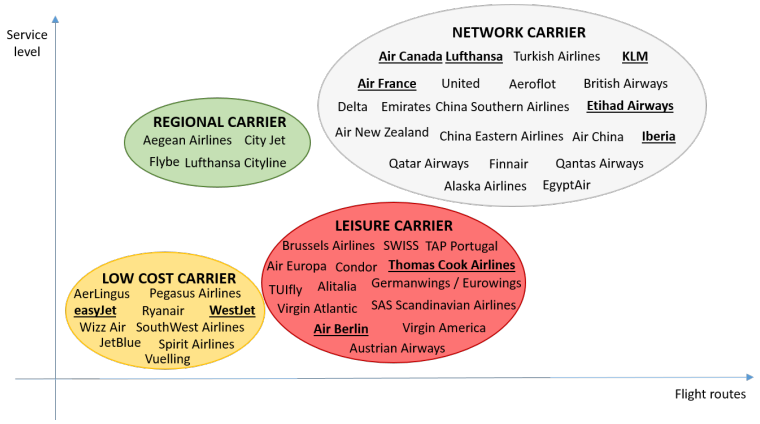

Fig. 2: Monitored airlines and their respective market segments.

cost carriers provide little service and few routes to achieve lower cost, full-service network carriers provide a dense network of flight routes with a high level of service. Leisure carriers focus mostly on popular holiday locations. Their service is often slightly better compared to low-cost carriers. Finally, regional carriers commonly operate in a geographically bounded area with few flights.

Following this classification, each of our monitored airlines can be assigned to one of the four segments. This classification allows us to compare the different strategies of each segment. An overview of all airlines and their respective segment is shown in Figure 2. The ten airlines that we focus on in this paper are marked. Six of them are full-service network carriers and two are low-cost carriers and leisure carriers, respectively.

3.4 Performance Measures

To automatically evaluate service quality, we define several measures based on the time stamps of posts. The goal is to define measures that provide a valuable overview of how fast a solution was found or offered.

As an intuitive measure, we first define **response time**. The response time in minutes can be seen as the equivalent to the AQT, which indicates how long a customer had to wait for the first response from a company. Therefore, it is defined as the delay between the publishing of a new inquiry and the response from the company:

$$\Delta(i) = t_r - t_i, \tag{1}$$

where t_i is the publishing date of the inquiry and t_r the publishing date of the first company response. The **average response time** defines the time the company needs to answer the inquires:

$$\mathrm{ar(C)} = \frac{\sum_{i \in I_C} \Delta(i)}{|I_C|} \tag{2}$$

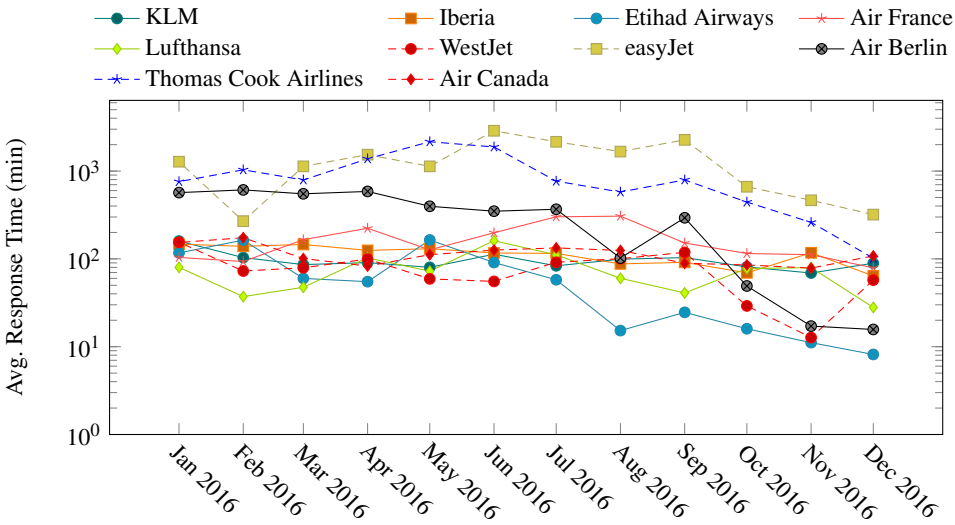

Fig. 3: Average response time of the monitored airlines.

where C is a company and I_C is the set of inquires posted to that company.

In contrast to more traditional channels, a problem with service in social media is that many inquiries are left unanswered. To evaluate this, we utilize the **response rate** as a second KPI. It indicates how many inquiries were left unanswered and is defined as the proportion of service inquiries that receive a response from the company, i.e.:

$$\text{rr(C)} = \frac{\sum_{i \in I_C} r(i)}{|I_C|} \text{ with } r(i) = \begin{cases} 1, \text{ if } \Delta(i) \text{ exists} \\ 0, \text{ else} \end{cases} \tag{3}$$

4 Customer Service Performance

We utilize the above performance indicators to calculate the response time and rate for all posts in our database in the time interval from January 2016 – November 2016. We aggregate the performance of each post to create a monthly report of the customer service performance.

Figure 3 shows the average response time for the analyzed airlines on a logarithmic scale. It becomes obvious that Etihad Airways and WestJet provide the fastest customer service and often answer within the first 15 minutes. In addition, Air Berlin, Lufthansa and KLM answer reasonably fast within less than two hours. The performance of KLM is especially noteworthy, since they receive by far the most posts on social media (cf. Table 1). We observed the worst response time for easyJet and Thomas Cook Airlines who required almost twenty hours to respond. This is surprising, since they are among the companies that received the fewest requests in our study. In addition, Air Berlin and Etihad Airways

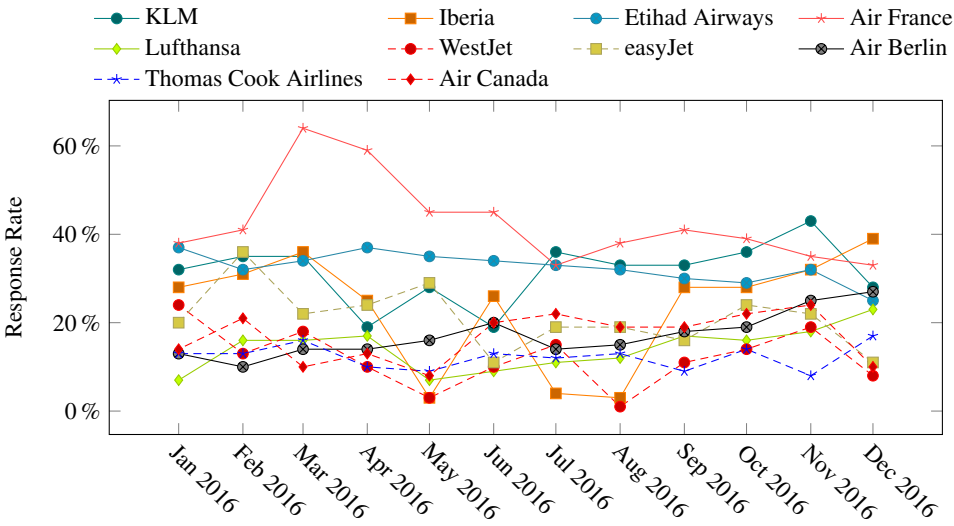

Fig. 4: Response rate of the monitored airlines.

have improved their service within our defined time interval, providing considerably faster response times in the recent months.

Similarly, the response rates of the companies are shown in Figure 4. The figure shows that Air France provides the most responses, replying to roughly 40% of all inquiries on average. In addition, Etihad Airways and KLM reply to more than 30% of inquiries. Both companies are also among the fastest to respond. The worst performance was surprisingly observed for WestJet and Lufthansa. Despite having a low response time, both companies replied to only few posts with a response rate of roughly 15%. Note that the response rate is generally lower than expected due to the fact that many posts on social media might not require a response from the company. As an example, we often observed airplane enthusiasts sharing pictures of an airplane with the company. While KLM often replied to such comments, many other airlines did not deem this necessary.

5 Conclusion

This paper has analyzed millions of customer service requests in social media and has defined several performance measures to automatically evaluate the provided customer service performance. The approach is demonstrated on the ten airlines that have received the most posts in social media since the beginning of the year. We have queried the public APIs of Twitter and Facebook to receive all interactions between the customer and the company. All posts were stored in a document-based database. The posts were then analyzed to derive key performance indicators such as the response time and response rate which were stored in a relational database and served to a web service.

Our results show that the customer service in social media is dominated by the full-service network carriers. Most notably, Etihad Airways and KLM provide fast response times and high response rates despite receiving a larger number of requests each year. This is most likely due to the fact that network carriers have the capacity and financial means to offer social media as yet another channel among many. In contrast, leisure and regional carriers were found to provide the least customer service in social media. For low-cost carriers the result is mixed. Even though WestJet provides fast responses, their overall performance is low. Similarly, easyJet is not able to provide the same service as its competitors.

Our study serves as a starting point for future analysis and can be used to compare the customer service of the airline industry. Furthermore, the same approach is equally applicable to other industries and companies. However, our results are only quantitative and do not consider the content of posts. In order to better evaluate service inquiries, text classification and topic modelling could be applied to get hold of the content of a message. This would allow a more accurate view of performance which also includes whether an issue was resolved or not. Another interesting question is to evaluate whether users with many followers, so called influencers, receive a faster response than others. Additionally, the impact of holidays, strikes, accidents or terrorism could be analyzed. Also, we consider the interplay of social media and classical channels an interesting field of research, as channel preference varies across customer segments and use cases along the customer lifecycle.

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