

Towards Efficient and Informative Omni-Channel Customer Relationship Management

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Abstract. Nowadays customers expect a seamless interaction with companies throughout all available communication channels. However, many companies rely on different software solutions to handle each channel, which leads to heterogeneous IT infrastructures and isolated data sources. Omni-Channel CRM is a holistic approach towards a unified view on the customer across all channels. This paper introduces three case studies which demonstrate challenges of omni-channel CRM and the value it can provide. The first case study shows how to integrate and visualise data from different sources which can support operational and strategic decision. In the second case study, a social media analysis approach is discussed which provides benefits by offering reports of service performance across channels. The third case study applies customer segmentation to an online fashion retailer in order to identify customer profiles.

Keywords: Omni-channel CRM · Big data analytics · Customer segmentation · Data architecture

1 Introduction

Creating a positive customer experience is of major importance in Customer Relationship Management (CRM) [1]. Building on the concept of customer-oriented [10] and service-centered [13] marketing, seamless interaction with companies throughout all communication channels builds a strong relationship between the brand and the customer. In order to consider customer needs and promote a positive customer experience, services need to be aligned appropriately. These developments are subsumed under the term omni-channel CRM, which does not only require multiple ways of contact (multi-channel CRM), but is characterized by an orchestration among the channels instead of an isolated management per channel [14]. Customers typically outpace companies in the adoption of new channels due to the strong momentum of private consumer electronics in form of smartphones or tablet technology. For this reason, companies

struggle to extend their information systems and data management to maintain all channels consistently. Often, fast channel adoption from customers generates pressure and results in additional and poorly integrated systems. This paper aims to demonstrate the challenges and value that omni-channel integration can provide to customers and companies.

In a complex environment a holistic view on the customer is needed to improve the customer experience [9]. The concept of a *customer journey* models the relationship of a customer to a brand chronologically through a series of touch points. Each of these represents a part of the experience and can be a physical or digital contact with the brand that leaves a sentiment, i.e., a positive, negative or neutral experience for the customer. The experience can be based on rational or emotional impressions that may occur on purpose or by happenstance [3]. As every customer experience is different, personas are used to exemplify a typical customer journey [11].

While traditional channels such as voice are still dominant, a multitude of channels (e.g., social networks like Facebook, direct messengers like WhatsApp, or email) are demanded by customers. With this plethora of channels, customers tend to hop from one channel to another, while expecting no loss of information or service quality. The challenge is to identify the customer at each touch point. Figure 1 visualizes an example of a customer journey from the airline industry. Here, the customer checks the airline’s website for booking information and addresses open questions in a Facebook messenger conversation. The subsequent online booking process is carried out on the website and additional luggage is added via email afterwards. At the airport, a delay of the airplane is communicated via WhatsApp. Lastly, the customer posts on the airline’s Facebook wall about his experience. This exemplary journey highlights how customers can hop through channels while demanding equal service and no information loss regardless of channel. To demonstrate how a harmonious integration of channels can look like, we conduct and present three case studies in the omni-channel context.

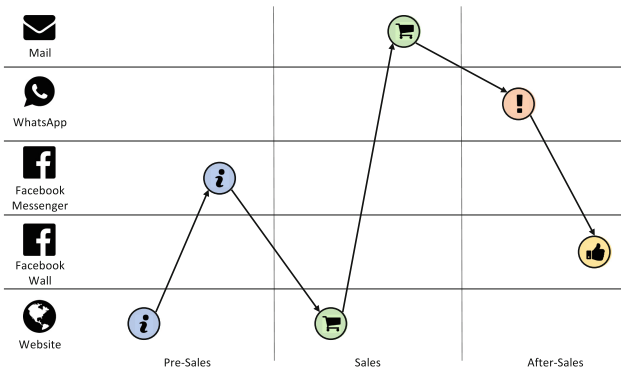


Fig. 1. Exemplary customer journey throughout a ticket purchase.

The remainder of this paper is structured as follows: Sect. 2 discusses a framework that structures omni-channel CRM from an analytical point of view. Based on this, three case studies are presented that demonstrate the challenges and value of omni-channel CRM. Section 3 presents a case study for data integration and Sect. 4 discusses how to visualise the integrated data. Then, Sect. 5 presents two case studies on analytical approaches for omni-channel scenarios to generate business value. Section 6 concludes with a summary of the results and an outlook.

2 Omni-Channel Framework

The utilization of customer data is crucial aspects of today’s businesses and the interweaving of channel data can become a lever for success. The potential value in the data can be exploited through analytical approaches that enable an improved customer profiling, realise up- or cross-selling potential as well as personalisation of marketing efforts. Figure 2 depicts an extension of a framework [12] that structures the analysis and interplay of data, channels and the resulting benefits.

The process is considerably data-driven and makes use of different data sources and structures. Each data source has its own structure due to different storage requirements or characteristics. The different sources can for example be SQL, NoSQL or file systems and data can be either internally generated or provided by an external partner and updated in intervals or as a continuous data stream. The varying structure makes it necessary to transform the data between extraction and loading in order to bring it into compatible formats. Based on this data management, analytical approaches bridge the gap between

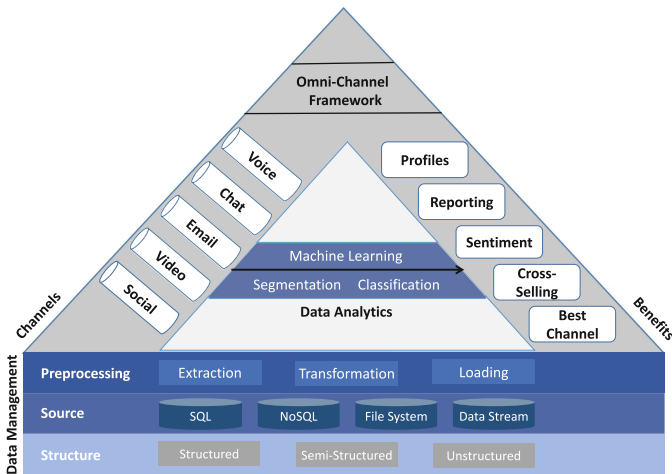


Fig. 2. Framework structuring the analysis of omni-channel data (cf. [12])

the channel or transactional data (left side) to enable benefits for the company or customer (right side). Concluding, the framework models all components in the analysis of omni-channel data and structures their relationships.

3 Data Management

In general data management comprises multiple areas such as data governance, data quality management, data architecture and design, database management and data warehousing [8]. In [12] we have introduced specific requirements to enable data management in omni-channel CRM. In particular, data persistency and unification of various data formats are relevant, as both play a key role for data integration. Data integration targets the issue most companies are confronted with nowadays: isolated data. This is based on the fact that a heterogeneous IT infrastructure across the various communication channels is common. For instance, a service centre might have chosen a particular software solution to handle voice and afterwards required an additional software to introduce the email channel. In the worst case, every channel is provided by a separate software solution. On top of that, software solutions can be provided as external services and therefore may require additional processing steps to integrate the data.

To demonstrate the challenges and benefits that this step poses, we have conducted a case study. In this academic project, we have emulated a real-life IT infrastructure which comprises three systems with different characteristics: Salesforce¹, Novomind² and OBI4wan³. We use this infrastructure as an exemplary case on how to integrate data from different sources. Salesforce provides a cloud-based CRM service and acts as a representative of a classical CRM system. Additionally, it manages the customers' data in a structured form within a relational database. Novomind offers products for service centres (i.e. call centres covering multiple contact channels), e-shops and product information management. It serves as a data source for customer emails as well as Facebook posts and messages, which represent semi-structured data. OBI4wan provides a cloud-based service to support brands in their customer interaction through online channels. In our implementation it represents an external data source to handle the customers' WhatsApp messages. Each tool was populated with artificial channel and CRM data and is summarised in Table 1.

The first challenge that needs to be solved relates to the availability of the retrieved data. Since Novomind and OBI4wan offer limited search capabilities for historic data, we imported the data into a separate relational MySQL database which manages all customer messages. The import process is done in regular intervals using batch processes.

The second challenge relates to the matching of customer information in order to create an integrated view on the data source. We base this integration on the available CRM data. Assuming that the phone number of a customer is

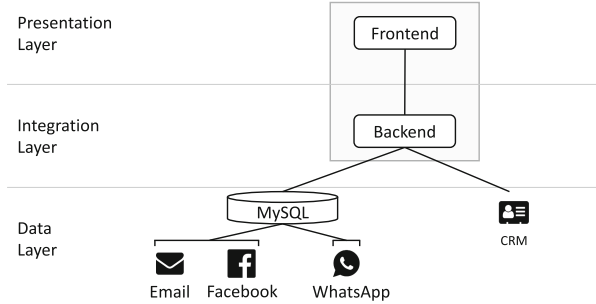
¹ www.salesforce.com.

² www.novomind.com.

³ www.obi4wan.com.

Table 1. Data sources in the case study.

	Channel	System	Structure	Origin
CRM	–	Salesforce	Structured	Internal
Email	Email	Novomind	Semi-structured	Internal
Facebook	Social	Novomind	Semi-structured	External
WhatsApp	Social	OBI4wan	Semi-structured	External

**Fig. 3.** Integration of different data sources in the case study.

available, we can easily use that to match the CRM data with WhatsApp chat messages. Similarly, if the email address is available, it can be used to match all emails, and the Facebook-ID can be used to match the social media account of a customer. In summary, we match all CRM attributes with the corresponding systems and combine them if available. An overview of our proposed architecture is provided in Fig. 3. Benefits of this approach are that each tool remains independent but its data is merged based on common attributes. In contrast to merging data sources permanently, this is a non-disruptive approach without the need to change working practices or the IT infrastructure. While this chapter has focused on the management of data, the following chapter targets its visualization.

4 Data Presentation

The integration of data across various platforms and channels can support strategic decisions made by management as well as the operational work. In a first step, the aggregated information can be visualised in order to provide a holistic view on the customer, its previous touch points as well as problems and purchase behaviour. At an operational level, this can improve customer service and help service agents by quickly providing them with important information about the customer. As a result, an agent can reply faster and thus reduce costs while providing a more tailored and relevant response.

To demonstrate the benefits of such an integrated view, we have developed a frontend which combines all the previously mentioned channels, while enriching

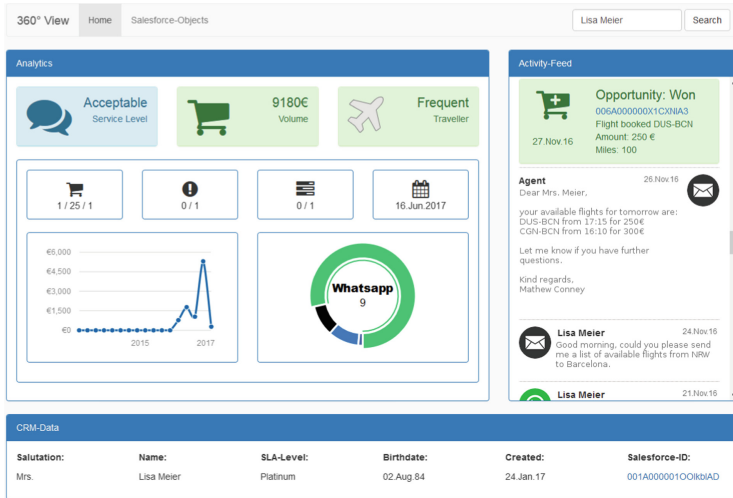


Fig. 4. Omni-channel view on the customer.

them with transactional and CRM data. The interface can support service agents in their daily work by showing them the relevant information about a customer at a glance. Figure 4 shows the of the proposed interface.

In its centre, a number of key characteristics of the customer are shown. Most importantly, its channel preferences are illustrated as an overview of past channel usage. This can be valuable information when reaching out to customers since it allows to choose channels that the customer prefers. Next to it, the value of previous purchases is shown which indicates the customer's importance for the company. In addition, a number of important statistics such as number of purchases, scheduled meetings, violations of the service level and travel frequency are shown.

On the right, an activity feed provides the most recent contact history with the customer. In other words, all Facebook wall posts, Facebook messages, WhatsApp messages and emails are shown. This component can provide a fast overview of previous touch points with the customer. It also facilitates the possibility to switch between channels without asking the customer the same questions over again. These features stress the value that only an integrated approach can provide. The interface is completed by CRM data at the bottom, i.e., by showing age, language or type of customer. It can be used stand-alone or embedded into existing systems.

5 Data Analytics

As shown above, the data from various channels can be used to provide a quick and complete overview of a customer. However, it also forms the basis of more

sophisticated analyses. In the following, we present two case studies that demonstrate how to analyse data from different channels and to create benefits for customer and company.

5.1 Social Media Benchmarking of Customer Service

First, the collected channel data can be used for more detailed and efficient reporting. As an example, a core interest of a service centre operator is to keep the response times low. This is necessary in order to keep customers satisfied but often also mandatory due to contractual obligations. Collecting data about past and current cases allows easy comparison of such response times. This analysis can either focus one channel or span across multiple channels. In the following, we demonstrate insights gained from this approach by using the example of different social media platforms. In recent times, an increasing amount of service inquiries are made over the various social media platforms, most importantly Facebook and Twitter. Many customers use social media due to the immediacy, convenience and informal nature of the channel. To analyse this data we collected over 40 million service inquiries from Twitter and Facebook directed at the social media account of one of 250 companies. The collected data enables us to benchmark the service performance for a single channel or compare it to other channels. In addition, social media data allows easy benchmarking within and across industries.

As an example, Fig. 5 shows the average response time of four large airline carriers over the past months. In general, we observe that response times in social media are considerably faster than for traditional channels where customers might have to wait for several hours or days. Most messages in social media receive a response within the first four hours. When comparing data across the two social media platforms, it becomes obvious that Twitter messages receive a response considerably faster than Facebook messages. Often, the response time

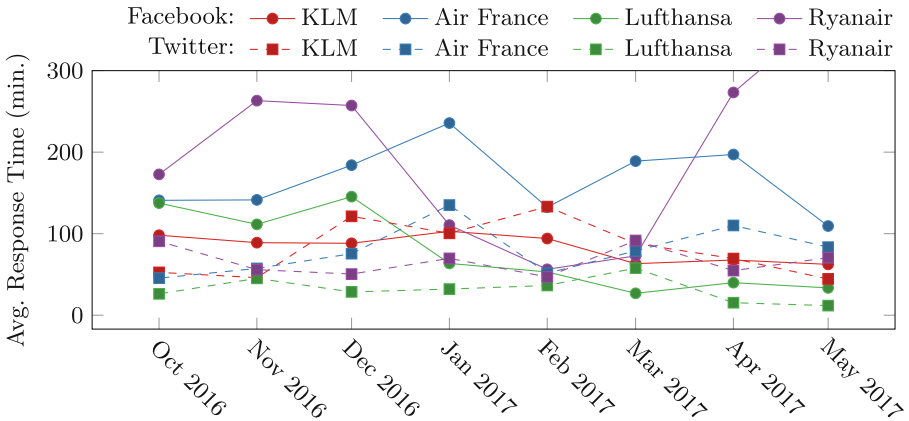


Fig. 5. Average response time of airlines in social media.

for Facebook posts is roughly 50% slower. Additionally, when comparing the four airlines, it becomes obvious that KLM and Lufthansa tend to respond much faster than Ryanair and Air France. This type of analysis can help to identify weaknesses in a company’s social media strategy, highlight mismatches between the different channel strategies and compare to the performance of competitors. A detailed analysis of the collected data and customer service performance in social media is available in [5] where response times, response rates as well as conversation lengths are evaluated.

5.2 Customer Segmentation

Finally, channel and CRM data can also be used to reveal hidden customer segments. While the entire customer base can be viewed as heterogeneous, it is often possible to identify segments of homogeneous individuals that share similar behaviour or interests. The acknowledgement of customer segments allows to target each segment with specific products or marketing strategies. Since the customer’s choice of channel is of particular interest in omni-channel CRM, this analysis can also incorporate channel usage in order to identify channel preferences and to refine the segments.

To demonstrate the benefits of this approach, we have performed customer segmentation for an online fashion retailer with more than 300,000 customers. We have combined demographic and CRM data with transactional data and have used attributes such as the average order value, return rate, voucher usage and recent purchase frequency as features. To identify the segments we applied the well-known k-means [7] algorithm as well as Gaussian mixture models [15]. The analysis revealed nine different segments, each comprising between 5% and 20% of the customers. The characteristics of each segment can yield valuable insights into what preferences customers have and help to target them appropriately.

As an example, one segment contains young people that make expensive purchases but also extensively use the free-return option. While this segment is highly profitable, it also shows that young people often demand free shipping. Charging for return costs could lose customers of this segment. Further, one segment consists of customers which mostly make purchases when incentivised by vouchers. Similarly, two other segments are mostly active when receiving newsletters. All three segments can be actively targeted by the marketing department, i.e., by sending vouchers or newsletters to the customers. Ideally, channel preferences of the customers should be incorporated in such an analysis, if available.

Customer segmentation allows to distinguish between valuable and less valuable customers and helps to devise marketing and communication strategies. More sophisticated customer segmentation can also be applied incrementally, where segments are adapted to a stream of new data. Stream clustering is specifically relevant when segmenting customers based on omni-channel data since it allows to evaluate new information without recomputing the entire model. This is computationally less expensive and also allows to monitor the development of segments over time. Commonly used stream clustering algorithms include D-Stream [6] or DenStream [2]. An empirical comparison of different approaches

is available in [4]. Stream clustering approaches usually incorporate an intermediate step, where the data stream is first summarised into a large number of preliminary clusters. This summary is then used with a traditional clustering algorithm to generate the final segments. A benefit of this approach is that relevant information is extracted from the stream without the need to retain every observation.

6 Conclusion and Outlook

In this paper we have introduced three case studies to highlight challenges and potential benefits of omni-channel CRM. All scenarios are structured using our comprehensive omni-channel framework. The first case study covers the data management layer of the framework to provide omni-channel insights. In particular, challenges for data integration are tackled by integrating data from different CRM system to create a unified view on the customer. This reduces heterogeneity of the IT landscape and can help to eliminate data silos. We have shown that this can support the service agent during his daily interaction with the customer and improve customer service. Once data silos are removed, new analytical approaches become applicable. To show this, we have introduced two case studies for analytical approaches in omni-channel CRM. The first case study demonstrates how public social media data can be utilized in order to compare the service performance and adjust the strategic alignment. On the one hand, it helps to identify weaknesses in the service performance across channels. On the other hand, it allows comparison among industries. The second case study demonstrates how to use CRM and transactional data for customer segmentation in order to identify groups of customers that share similar characteristics and behaviour. This allows to target each group individually by providing customised offerings while also increasing marketing efficiency for the company.

As our case study focuses on email and social media, potential future work could also integrate chat and voice data. Moreover, our data integration approach matches users based on available Facebook-ID, email and phone number. Here, more sophisticated approaches could be developed, e.g., automatically matching users by name or even picture. Finally, further analytical approaches could be employed such as automatically classifying user inquiries based on text analysis or customer segmentation based on streaming data.

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