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Gluščević Luka
University of Novi Sad, Faculty of Economics in Subotica
Subotica, Serbia
luka.gluscevic@ef.uns.ac.rs

Grljević Olivera
University of Novi Sad, Faculty of Economics in Subotica
Subotica, Serbia
olivera.grljevic@ef.uns.ac.rs

Marić Mirjana
University of Novi Sad, Faculty of Economics in Subotica
Subotica, Serbia
mirjana.maric@ef.uns.ac.rs

EXPLORING USER SATISFACTION: A TOPIC MODELING APPROACH

Abstract:
In today's highly competitive market for mobile business applications, user demands and expectations are continuously rising and evolving rapidly. As a result, companies increasingly focus on enhancing user satisfaction and fostering customer loyalty, as these are essential for a stable and reliable source of revenue, as well as for spreading positive word-of-mouth and acquiring new users. Conducting evaluations of user experience for mobile business applications is crucial for their ongoing improvement, as user experience directly impacts user satisfaction and customer loyalty. In this paper, the authors provide a step-by-step methodology for exploring user satisfaction using topic modeling, demonstrated through a case study on SalesForce. SalesForce is one of the most popular cloud-based CRM solutions. By reviewing the literature, the authors didn't find a similar case study on Sales Force. The authors have organized the results of their empirical research into groups of factors influencing positive (e.g. intuitive interface and efficiency in solving tasks related to customer relationship management) and negative user satisfaction (e.g. performance issues, system crashes, and slow operation) with the SalesForce application.

Keywords: user satisfaction, user experience, topic modeling.

INTRODUCTION

The sustainability of the business relies on user satisfaction and positive user experience. The satisfied user remains loyal to the brand, promotes products or services in their community, and influences others' purchase decisions. Monitoring user satisfaction helps companies identify customer needs and areas of improvement to enhance products or services. Maintaining high levels of user satisfaction becomes even more relevant during crisis times. Prioritizing user needs and addressing them helps companies build a loyal customer base and their resilience and adaptability in times of crises, which contributes to the long-term sustainability of a company.

Modern digital technologies have led to a dramatic growth in today's development of mobile business applications, which can be found in the Google Play and Apple stores. Evaluating the user experience of mobile business applications is an important aspect of their sustainability in a rapidly growing and highly competitive market, as it directly impacts user satisfaction and customer loyalty. This research aimed to investigate, based on online reviews of SalesForce collected from Google Playstore, what kind of user satisfaction there is with the SalesForce mobile application, for the reason that it is the first step for the improvement of any product.

In the context of this research topic, the authors aimed to answer the following research question through the results of empirical research:

RQ1. Which factors of user experience affect mobile users positively, and which affect them negatively?

In this paper, the authors offer methodological steps for exploring user satisfaction using topic modeling, illustrated in a SalesForce case study. SalesForce is one of the most widely used cloud-based CRM solutions. Topic modeling is a technique that reveals hidden thematic structures, referred to as topics, from a collection of texts based on keywords,

which reflect the most salient information in text documents (Maier, et al., 2018). In addition to discovering topics, topic modeling can reveal the relationships between topics and help track their development over time. It tracks trends, emotions, rumors, and factors influencing service or product consumption.

The research methodology comprises five tasks 1) Data collection and cleansing, 2) Data pre-processing, 3) Selection of a suitable topic modeling approach, 4) Identification of the optimal number of topics, and 5) Interpretation of the resulting topic model. The dataset comprises 9.308 user-generated online reviews of SalesForce collected from Google Playstore. The authors created three data subsets based on the ratings associated with collected reviews. Reviews rated with one or two stars are referred to as negative reviews and comprise the first data subset. Reviews rated with three stars, mixed sentiment reviews, comprise the second data subset, while the third is the collection of the reviews rated four and five stars. Topic models are built for each review subset. The main findings refer to the following. Negative SalesForce user experiences are caused by performance issues, system crashes, or slow operation, especially manifested on the Android platform. Software anomalies, such as blank screens and login difficulties also cause frustration among users. A positive experience is built thanks to the intuitive interface of the SalesForce mobile application and efficiency in solving tasks related to customer relationship management. People having the mixed reviews, write positively about the application performance but express concerns about the need for excessive adjustments. The findings gained from topic modeling analysis represent valuable insights for the company, which can serve as a direction for product improvements.

The paper is organized as follows. The first section provides the literature review reflecting the importance of user satisfaction monitoring, and the sustainability of the business. The following section gives an overview of the research methodology. Section *Research Results* presents resulting models and provides insights into SalesForce mobile application user experience and satisfaction. Concluding remarks are presented in the section *Conclusion*.

1. BUSINESS ASPECTS OF USER EXPERIENCE

The fourth industrial revolution and modern digital technologies have influenced the strengthening of the customer's role and their significant differentiation in the global market. Customers today have the ability to switch companies they buy products and services from with just one click. For this reason, companies, in addition to understanding, predicting, and meeting specific customer needs and desires, have focused on building their loyalty. Loyalty can be defined as the intention of customers to continuously choose a specific brand or company to purchase products or receive services from. A larger base of loyal customers contributes to higher company revenues, positive word-of-mouth marketing (WoM), and gaining a competitive advantage in the market (Arslan, 2020; Rane et. al., 2023).

Building loyalty directly contributes to user satisfaction and user experience. User satisfaction represents the level of satisfaction of customers after using a company's product/service. Satisfied customers tend to make repeat purchases and thus show loyalty to the company. Loyal customers are crucial for a stable and reliable source of company revenue because they buy more frequently and in larger quantities than new customers. Furthermore, satisfied customers contribute to positive word of mouth (WoM), as they often recommend the product/service to their friends and family, which contributes to acquiring new customers, expanding the market, and increasing brand recognition. A satisfied customer is more likely to become a loyal customer, who perceives the company as a partner, providing valuable feedback on products/services, based on which they can be improved to enhance user experience (Arslan, 2020; Rane et. al., 2023).

User experience encompasses all interactions that customers experience during the process of purchasing and using products/services. User experience is a holistic concept that includes interactions between customers, companies, and the company's offerings. It involves sensory, social, emotional, cognitive, affective, spiritual, and physical responses of users to all interactions with the company. Positive user experience will develop a positive emotional value for customers, which will impact the increase in customer satisfaction (Kumar & Mokha, 2021).

In this paper, the authors focused on exploring user experience in the domain of business mobile applications, as this market is rapidly growing. The increasing number of business apps on Google shows how important it is for these apps to be easy to use. The most successful companies, such as Google, iPhone, SAP, and SalesForce, see user experience as a key success factor and a source of innovation. Consumers buy and use business mobile applications based on their design, usability, and attractiveness. Regardless of whether a company strategically addresses user experience or not, consumers will still have it. Poor user experience of mobile business applications will lead to decreased revenue, customer dissatisfaction, negative ratings and comments, negative WoM, and a negative impact on the brand (Sabukunze & Arakaza, 2021; Hussain et al., 2017; Liang et al., 2015).

Companies aiming to strategically approach designing good user experience must iteratively conduct the following three phases of this process. The first phase involves researching user needs, characteristics, behaviors, and usage context of the product/service. The second phase involves using the results obtained from the previous phase, in which business and user needs are explored, to design a solution that follows human factors principles and design best practices. The third phase of the good user experience design process is evaluating the solution made together with users, by conducting usability testing. Based on the results obtained, changes need to be made to the initially designed solution. The described process is iterative and standardized by the International Standards Organization (ISO) with ISO 9241-210: "Human-centered design for interactive systems." Investments by companies in positive user experience

provide a significant return on investment ranging from a return of $2 to $100 for every $1 invested in user experience design (Ross, 2014). In the empirical research reported in this paper, the authors presented how topic modeling can be used in the first two phases of the described process.

2. METHODOLOGY

The research presented in this paper aims to identify the sources of satisfaction and dissatisfaction of users of the SalesForce mobile application and to depict their user experience, providing guidelines for product improvement and marketing campaign design. The methodology, designed to guide researchers and practitioners in similar tasks, comprises five tasks: 1) Data collection, 2) Data cleansing and pre-processing, 3) Selection of a suitable topic modeling approach, 4) Identification of the optimal number of topics, and 5) Interpretation of the resulting topic model.

Data collection. For the case study presented in this paper, the authors use 9.308 online reviews, reflecting the opinions and attitudes of mobile application users, collected from the Google Play Store using custom-written Python code for scraping. The authors created three data subsets based on the star ratings associated with reviews. The negative review subset contains 2.501 reviews rated with 1 or 2 stars, the mixed sentiment subset comprises 705 reviews rated with 3 stars, while the positive subset contains 6.102 reviews rated with 4 or 5 stars.

Data cleansing and pre-processing have tasks of raising the corpus quality and transforming the data into a format suitable for selected machine learning algorithms. The goal is to eliminate noise from the data and create a cleaner dataset. The collected data was pre-processed in the following manner. All text was lowercase to minimize the dimensionality of the data, as machine learning algorithms treat different word forms, such as capitalized, uppercased, or lowercase, as different dimensions. Authors removed punctuation, numeric values, redundant characters, and newline characters from the texts, as they introduce noise in the data and do not add new knowledge or information about the text. Stopwords are removed from the text. These words have no semantical meaning but are commonly used in the written or spoken language, such as *and*, *or*, *but*. Text is tokenized, i.e., split into smaller units - words, for facilitating lemmatization as the next step of data pre-processing. Lemmatization is the text normalization process, which reduces words to their base form – the lemma – and decreases data dimensionality. For example, the verb *going* and its forms *gone* and *went* would be lemmatized to the base form *go*. Missing values, data instances without the full text of a review, are removed from the text.

Selection of topic modeling approach and identification of optimal number of topics. Authors Abdelrazek, Eid, Gawish, Medhat, & Hassan (2023) classify topic modeling approaches into four categories: algebraic, fuzzy, probabilistic, and neural. The subject of analysis in the case study presented in this paper is online reviews of the SalesForce mobile application. Online reviews are considered a short text and for conducting topic modeling over short text the probabilistic LDA approach is the most commonly used, as indicated by authors (Laureate, Buntine, & Linger, 2023). Authors Laureate, Buntine, & Linger (2023) emphasize that 79.79% of studies dealing with short text, encompassed in their systematic literature review, use LDA topic modeling. Following this finding, we have selected the same approach for topic modeling for our case study. LDA aims to extract groups of keywords - topics - that often appear together in documents (Grljević, 2023). The main assumptions of LDA modeling are: 1. words appearing together are associated with the same topic, 2. each document is represented as a distribution of topics, and 3. each topic is represented as a distribution of keywords (Grljević, 2023). The optimal number of the topic is unknown. During the experimentation and fine-tuning, the data analyst searches for the optimum by varying values for the number of topics and two crucial hyperparameters, alpha (α) and beta (β), which affect the granularity and diversity of identified topics (Egger, 2022). Alpha influences the number of topics representing each document. Beta influences the number of words describing topics. For each variation of their values, a model is built and its quality is assessed using topic coherence measure. Topic coherence measures the frequency of co-occurrence of leading words in a topic (Egger, 2022; Rosner, Hinneburg, Röder, Nettling, & Both, 2013). In the modeling process, multiple models with different parameter settings are constructed and the model with the highest coherence score is selected (Maier, et al., 2018).

The last step in topic modeling is ***discussing the resulting topic model,*** which should provide insights about leading topics influencing user experience. Section *Research Results* presents resulting models and provides insights into SalesForce mobile application user experience and satisfaction.

3. RESEARCH RESULTS

For each data subset, positive, negative, and mixed sentiment, the authors developed a series of LDA-based topic models for different values for the number of topics $K = [2, 15]$ and hyperparameters $\alpha = [0.01, 0.31, 0.61, 0.91]$ and $\beta = [0.01, 0.31, 0.61, 0.91]$. Models with the highest coherence score are selected as optimal for each data subset. In the following sections, each topic model is presented with more details. Their analysis provides insights on user experiences with the SalesForce mobile application. The general conclusion is that users of the SalesForce application mostly experience issues regarding incompatibility of the application with different mobile devices, users consider the application unreliable, it loads slowly and requires frequent updates, users feel discomfort with the amount of

notifications. Satisfied users express positive opinions about application functionalities, customer support, user experience, and performance. Users with mixed sentiments have both of all, so they express positive and negative critics of SalesForce functionalities.

3.1 Topic modeling on negative sentiment reviews

For the negative subset of reviews the highest coherence score, 0.645, is achieved with $K = 11$, $\alpha = 0.61$, and $\beta = 0.61$. The discovered topics in the negative reviews point to the sources of dissatisfaction among SalesForce mobile users, and the aspects for potential product improvements that will enhance user satisfaction and experience.

Topic 1: **User interaction and challenges** with functionalities indicate that users have problems with basic functionalities considering them useless and redundant. The users experience difficulties in using them.

Topic 2: **Device interactivity and performance** indicate that users express frustrations with compatibility on different devices, and highlight threats about usability. Users also report that there are responsiveness problems on devices of different sizes such as tablets, laptops, PC and mobile. Users also report problems with payment methods, logout, and service support.

Topic 3: **Performance and reliability problems** indicate problems with data processing speed, as well as data management. Complaints include frustrations with slow performance and difficult file management and highlight stability problems.

Topic 4: **Functionality and usability feedback** indicate problems like slow page load time and often application updates. Also, highlight problems with production and compatibility with different devices. They also indicate the need to improve navigation, which doesn't fulfill users' expectations.

Topic 5: **The notification and performance system** is the most represented topic and contains 33.3% of the corpus. Users express their complaints about the services and restricted information. They also highlight user authentication and performance problems.

Topic 6: **Problems with the interface and dashboard** indicate system errors, a slow response time of the interface for adding and uploading data for user access, as well as displaying information on the dashboard. Highlighting is also on problems in interface design and customer experience.

Topic 7: **Service quality and support** indicates users' dissatisfaction with the platform's service quality and support. Users indicate problems such as slow response times, incorrect information, and irregular offline functionality.

Topic 8: **Interface and Functionality problems** indicate that user frustration with reliability and performance remains and that there are several recurring problems. The lack of user interest is also pointed out, due to problems with the interface and performance itself, and they emphasize that these problems should be fixed.

Topic 9: **Constant instability and user frustration** indicate that users have problems with frequent crashes and freezes, and express their negative experiences. Problems with errors and the need for frequent reconfiguration are common. The users emphasize the need for frequent reinstallations of application thinking it will solve the problems, which leads to their waste of time.

Topic 10: **Compatibility and installation errors** indicate that users are experiencing installation errors on Android devices, and are reporting errors of usability on older devices. Also, there are problems with updating, and some people uninstall application because of these problems, and they say that the installation process is very complicated, especially for Android devices.

Topic 11: **Login and authentication problems** indicate that there are problems accessing accounts, as well as problems entering login credentials, and often run into a blank screen. Some users report that they received error messages and not being able to move past the login screen.

3.2 Topic modeling on mixed sentiment reviews

For the mixed subset of reviews the highest coherence score, 0.677, is achieved with $K = 3$, α = asymmetric, and $\beta = 0.91$. These topics encapsulate both positive and negative sentiments. Their analysis allows the authors to reveal areas of satisfaction and areas requiring improvement, and to provide actionable insights for enhancing user satisfaction and overall experience.

Topic 1: **Functionality and user experience** comprise the most represented part of the corpus, 70.2%. Users express frustration regarding application performance. They are not satisfied with the speed and innovation of the application and seek for improvement of the user experience.

Topic 2: **Performance and user experience** indicate that long page loading time, displaying notifications, and availability raise nervousness among the users. The highlighting is on the significance of optimizing those features and improving the user experience problems.

Topic 3: **Language and word processing problems** indicate problems with grammar, syntax, and text quality. Mistakes in poor translation, language choice, and changes in language structures were highlighted. Users also point to problems with data storage and data quality.

3.3 Topic modeling on positive reviews

For the positive subset of reviews the highest coherence score, 0. 671, is achieved with K = 8, α = asymmetric, and β = 0.91. Through analysis of the resulting optimal topic model, the authors identified key topics that signify users' satisfaction.

Topic 1: **Positive user experience and satisfaction**, as the most common topic in positive sentiment reviews, accounts for 49.5% of the corpus. Users are satisfied, and highlight the ease of use of the application. They point out that the application is very effective, especially in sales and CRM, and highlight its benefits for conducting everyday tasks.

Topic 2: **Positive experience and system implementation** indicate that users are satisfied with the simplicity of use. The users emphasize how useful the application is in solving daily tasks and problems and highlight the help in increasing their productivity in everyday activities. These users also love the speed of page load.

Topic 3: **Positive performance and user experience** indicate that users agree with the functionality of the application and the services it provides, and they are also satisfied with the design of SalesForce. These users indicate cloud-based functionality and customer support as particularly favorable aspects of the application.

Topic 4: **Requests for improvements and updates** indicate that users suggest improvements in the area of frequent updates. They express interest in access from different devices.

Topic 5: **Reporting problems and suggestions** indicate that users are writing and evaluating mobile application notifications. They highlight that application provides redundant, often unnecessary information and indicate the need for application improvement in this area. They seek improved control over the notification system, requiring options that will allow them to control which notifications they will receive.

Topic 6: **Praise of the user experience** indicates the user's satisfaction with the user experience itself and satisfaction of its features and functionality, especially in providing support in case when problems arise. The design brings them improvements in solving everyday business obligations in relationships with customers.

Topic 7: **Usability and problem-solving** indicate that users have a positive opinion of the interface and functionalities, highlighting simple design and integration with other applications. Users want to have better training for application use, to have better usability.

Topic 8: **Feedback and suggestions** indicate that users have suggestions about how the application works. They often mention the word "developer" to indicate the problems they are experiencing or asking help for. This topic discusses the importance of getting feedback to improve performance and experience.

CONCLUSION

The goal of the research presented in the paper is to understand the perception and experience of SalesForce mobile application users. The authors used online reviews as the main data source of user opinion and using topic modeling they identified key topics that appear in the reviews, which describe the attitudes and experiences of users. Users express different levels of satisfaction, negative, mixed, or positive, directed toward application functionalities, bugs, or overall user experience, and often provide suggestions for improvements. Positive sentiment indicates that users are satisfied with the application and its aspects. They consider the application to be simple with high levels of protection and supportive of their business needs. Negative sentiment is directed towards mobile application failure and errors, functionalities, levels of protection, or user experience. Reviews with negative semantics indicate the need for further development and improvement of the application to increase user satisfaction. The results and insights obtained through

the topic modeling analysis are useful for building user loyalty, which is important for market survival, and improvements of the application.

Dependence on one data source, the Google Play store, which provided valid but limited information about user experiences with the SalesForce application can be considered as the main limitation of the presented study. The authors obtained valuable insights into users' sentiments and opinions, however, data may not be representative of all users. Not all users of mobile applications leave reviews about their user experience and they may not share the prevailing opinion. The research is limited in terms of the attributes included in the analysis. The research is based on topic modeling over online reviews and other more traditional factors influencing user experience, such as demographics, location, and consumer roles, which can provide additional insight into customer satisfaction, were not included in the analysis as the data source does not provide them.

The future research directions are various. One could refer to the expansion of data sources, such as online reviews from other reviewing sites, data from various social media sites, direct surveys, or even interviews. Application of different topic modeling approaches, such as Structural topic modeling or Non-negative matrix factorization, would allow comparison of the results and goodness of fit of other approaches to data. Comparison with competitors through parallel analysis of online reviews of other providers, such as SAP CRM. The comparative analysis could provide insight into the market position of SalesForce, compare products based on user opinion, experience, and satisfaction, and indicate strengths and weaknesses of the application compared to competitors.

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