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## Impact of natural language processing on CRM and trust: An integrated framework

**Assion Lawson-Body**, *University of North Dakota, [assion.lawsonbody@und.edu](mailto:assion.lawsonbody@und.edu)*

**Laurence Lawson-Body**, *University of North Dakota, [laurence.lawsonbody@und.edu](mailto:laurence.lawsonbody@und.edu)*

**Abdou Illia**, *Eastern Illinois University, [aillia@eiu.edu](mailto:aillia@eiu.edu)*

**Lori Willoughby**, *Minot State University, [lori.willoughby@minotstateu.edu](mailto:lori.willoughby@minotstateu.edu)*

### Abstract

Natural language processing (NLP) is an interdisciplinary concept with anecdotal studies in many fields. A limited number of studies have empirically investigated NLP applications in several industries. This research is intended to fill this gap in the literature. Using traditional tools to interact with customers in their natural languages creates misinterpretations and increases cost in language processing. This study proposes NLP techniques to minimize human factor errors in natural language processing and build multilevel relationship trust. Therefore, a sentiment analysis-based literature review is conducted to examine customer relationship management (CRM) empowered by NLP that offers a new way of building trust with customers effectively. More specifically, sentiment polarity was used to separate the favorable and unfavorable views of NLP applications. We found an integrated framework showing pillars of artificial intelligence such as machine learning, deep learning, and NLP. We also found that Data warehouse and Hadoop feed the framework which relates CRM to Trust. Future research can be used to test the framework using statistical inferences. Theoretical contributions and practical contributions are offered.

**Keywords:** natural language processing, CRM, trust, artificial intelligence

### Introduction

NLP plays an essential role in artificial intelligence and has recently received growing attention in many disciplines (Charoensukmongkol and Sasatanun, 2017; Iovine et al., 2020; Bhatia et al., 2021; Palivela, 2021; Alhogail and Alsabih, 2021). Most importantly, NLP has applications in many fields, including CRM. CRM derived from relationship marketing and uses NLP to improve customer trust. Relying on verbal and oral conversations, CRM is one of the areas that can heavily benefit from NLP. It is interesting to study the aspects of CRM affected by NLP, which has received limited and little attention in research. A primary task of NLP is to allow customers to extract verbal features from texts, messages, graphs, and visualizations they received from companies.

In terms of NLP applications, many digital assistant programs such as Amazon Alexa, Siri, or Google Assistant are now gaining popularity (Iovine et al., 2020). These NLP applications allow customers to execute a wide range of actions through messages in natural language. Customers can complete tasks like requesting help on the products, receiving after-sales services support, managing complaints, sending texts, making phone calls, or playing songs (Iovine et al., 2020). However, these NLP applications have not been sufficiently investigated in CRM. More specifically, they have not been empirically tested to determine their impact on the relationship between CRM and trust. In other words, these NLP applications can help companies implement CRM strategies by recommending and advising appropriate products and services to

customers. They can also tailor and personalize offers to the customers' needs. The fundamental new insight in this research is their contributions to customer trust. Is interacting with customers in their natural languages enough to build trust between them and the companies? For instance, in the science of language field, people's surroundings and the language expressed by their peers are reflected in their natural language (Bhatia et al., 2021). Also, the natural languages of those people are revealed in their text data, E-mails, and direct messages they produce in their daily lives (Bhatia et al., 2021). In the context of CRM, well-known individuals who are like each other are frequently mentioned together in relationship messages. Likewise, traits and characteristics most associated with these individuals are usually mentioned alongside these individuals (Bhatia et al., 2021), including traits used in the CRM initiatives. Thus, using these traits to build semantic representations for individuals (Bhatia et al., 2021) might predict how NLP is perceived in trust-building ability. Therefore, in this study, we examine CRM empowered by NLP that offers a new way of building trust with customers effectively.

The remainder of this paper is organized as follows. Section 2 describes the literature review of works related to this research. Section 3 outlines the research methodology. Section 4 illustrates the integrated framework. Finally, Section 5 presents some conclusions, discussions, and perspectives for future avenues of research.

## Related Work

### CRM dimensions

Since its inception, many authors have applied CRM in different contexts and named it differently, such as relationship marketing, eCRM, social CRM (Jalal et al., 2021), etc. One aspect distinguishing CRM from relationship marketing is that CRM involves utilizing information technologies (IT), whereas relationship marketing does not use IT to facilitate the relationship process (Charoensukmongkol and Sasatanun 2017). Jalal et al. (2021) have linked CRM to social media networks, blogs, podcasts, wikis, forums, media sharing, and social bookmarking. In addition, these authors have used social CRM to describe electronic exchanges through social networking and microblogging websites. Moreover, Baashar et al. (2020) used the term e-CRM as a modern approach that integrates Web 2.0 with conventional CRM systems to build assertive communication and relationships between customers and firms.

In terms of the definition of CRM, there is no unanimity among authors who have investigated and examined the concept in the literature. CRM is an innovative technology that seeks to improve customer satisfaction, loyalty, and profitability by acquiring, developing, and maintaining effective customer relationships and interactions with stakeholders (Baashar et al., 2020). CRM technology enables firms to capture, store, access, share, and analyze large amounts of customer data (Suoniemi et al., 2021). CRM can refer to utilizing customer-related information or knowledge to deliver relevant products or services to consumers to improve customer retention through the effective management of customer relationships (Charoensukmongkol and Sasatanun (2017).

The customer-centered approach is a critical success factor for many organizations in the global business landscape. CRM has the potential to help firms effectively organize their operations around customer-centric processes (Suoniemi et al., 2021). Valmohammadi (2017; cited in Vicente et al., 2021) distinguished five dimensions for measuring the level of use that any company may have for CRM: information sharing, customer involvement, long-term partnership, joint problem-solving, and technology-based tools. Some of these elements have a solid connection to the customer-centric approach of CRM, and some do not. Information sharing and customer involvement are more relevant to relationship initiation, relationship maintenance, and relationship improvement. In addition, both are the ones that come closest to the CRM empowered by NLP. CRM dimensions are categorized into four processes such as identification,

differentiation, interaction, and customization (Charoensukmongkol and Sasatanun, 2017). Identification consists of gathering data about customer demographic profiles and purchasing habits. Differentiation is about grouping customers into clusters based on similar needs and values. Interaction is how companies establish communication to initiate and develop relationships with customers. Finally, customization involves personalizing the offers to the customer's requirements.

CRM old initiatives based on databases and data warehouses often do not meet firm expectations, and most fail. The new CRM initiatives have changed with the advent of big data. Traditional CRM has begun to shift from structured data to CRM focused on unstructured data. Charoensukmongkol and Sasatanun (2017) found that the entrepreneurs who used social media intensively for CRM reported higher satisfaction with their business performance. This study covers the rapid development of novel technologies related to CRM, such as artificial intelligence and big data. Therefore, we posit that companies who use NLP in-depth for CRM should achieve higher customer trust.

Collectively, this study proposes a CRM model to support customer empowerment through NPL. This investigation does not differentiate between the traditional CRM supported by database and data warehouse systems and the modern CRM supported by social media. Charoensukmongkol and Sasatanun (2017) indicated that while large corporations commonly adopt the traditional CRM, there is evidence that small firms implement social media CRM. Furthermore, this work accepts both CRMs. Although social CRM and traditional CRM have already been examined several times in the literature, the application of NLP for CRM to increase customer trust has not been adequately investigated.

### **Trust and CRM**

Trust can be defined from two perspectives (Valero et al., 2022). Traditionally, trust is based on models that establish reliable relationships among different partners and individuals involved in the communication. From the modern perspective, trust can be defined as the assessable confidence built from previous experiences and will have ramifications on future interactions. Additionally, trust means an intention to be vulnerable to others if the relationship is linked to positive expectations (Fregidou-Malama and Hyder, 2021). Trust means an intention to be vulnerable to others if the relationship is linked to positive expectations (Fregidou-Malama and Hyder, 2021). Moreover, trust is also defined as the trustor's willingness to place him or herself in a susceptible position based on the premise that the trustee will act according to their expectations (Chaudhary et al., 2021). Furthermore, trust is conceptualized as a reciprocal relationship between the trustor (the company) and the trustee (the customer).

In the context of this research, the relationship is monitored by NLP. The presence of NLP in the relationship between trust and CRM should reduce relationship conflicts and generate knowledge. Increased trust enhances the likelihood of knowledge transfer (Chaudhary et al., 2021) using NLP. Trust manifests in increased access to valuable information and stronger relationships in the face of risk and uncertainty. This is because NLP provides easy and adaptable access to personalized information to the customers. Trust needs to progress toward new approaches that have not been considered previously (Valero et al., 2022). In the case of transforming CRM using NLP, customer trust should increase toward the company that empowers relationship management through machine learning and artificial intelligence algorithms.

Researchers have studied trust from various dimensions and perspectives. Kumar and Sharma (2021) defined four types of trust: behavior trust, reputation, honesty, and accuracy. Chaudhary et al. (2021) found that reputation is crucial for developing relationships with stakeholders and achieving financial and managerial goals in family businesses. Three characteristics drive perceptions of trust: ability, integrity, and benevolence (Chaudhary et al., 2021). First, the ability feature implies that the trustee possesses the

skills, knowledge, and experience to understand the outcomes and constraints of the relationships. The second characteristic of benevolence is the extent to which the trustee desire to act in the trustor's best interest even if the trustee receives no compensation in any form from doing so. The third characteristic of integrity is that the trustee accepts the principles imposed by the trustor.

Several trust variables are discussed in the literature review of this paper. However, all trust variables are not directly associated with the goal of this paper. To better situate the reader, we posit that multilevel trust is appropriate to the goal of this research. Multilevel trust is crucial to understanding how trust is built to facilitate the development of long-term relationships (Fregidou-Malama and Hyder, 2021). Three different levels of trust have been distinguished: person, group, and firm. Trust at the international level has been added to the multilevel trust hierarchy (Fregidou-Malama and Hyder, 2021). Moreover, research linked trust to cultural context and indicated that it is easier for individuals from the same culture, values, norms, and experiences to develop trust and relationships (Fregidou-Malama and Hyder, 2021). However, some companies operate in cultural ecosystems characterized by unfamiliar languages (Fregidou-Malama and Hyder, 2021). Therefore, firms that communicate with customers using NLP to translate messages into their natural languages should create an appropriate context for trust development.

The multilevel trust bears on the initiation, maintenance, and development of long-term relationships between the companies and their customers. In addition, the multilevel trust encompasses trust at an international level and trust between people of different cultures. Therefore, individuals who speak the same languages are more inclined to develop multilevel trust in comparison to individuals who speak different languages. The use of NLP should favor and increase trust between companies and their customers with different cultures and speaking different languages.

### **Natural Language Processing Frameworks**

NLP is how machines or computers completely replace humans for tasks like article writing, fixing grammar errors, creating summarizations/narratives quickly, real-time question-answering, report generations, and streamlining operations (Palivela, 2021). Voice transfer has proved to be an effective technique in NLP. The voice-to-voice transfer algorithm aims to convert every language problem into another language or foreign language format (Palivela, 2021). In voice transfer learning, an algorithm is first trained on a voice and data-rich task, and then the trained model is finetuned on another downstream task (Palivela, 2021). Machine translation is a sequence-to-sequence task based on an encoder-decoder structure (Shuang et al., 2020). The encoder transforms the source sentence, and the decoder predicts the following words based on previous information (Shuang et al., 2020).

The cognitive fit theory is used to explain NLP because machine translation from one language to another is one of the promising areas of NLP. The machine imitates the cognitive ability of human beings and proposes algorithms to replace human beings' translation capability (Palivela, 2021). In terms of general domain language, many outstanding results were obtained in giving the machine the ability to understand the semantic meaning of documents (Perboli et al., 2021). Using traditional tools to interact with customers in their natural languages creates misinterpretations and increases costs in language processing. This study proposes NLP techniques to minimize human factor errors in natural language processing and build multilevel relationship trust.

Integrating NLP into CRM would drastically decrease the time spent by the customer to understand the products. Extracting valuable information from a full-text essay is a critical step supported by an autonomous system that processes natural language (Perboli et al., 2021). NLP has shown outstanding capabilities in harvesting the abundance of unstructured data. Therefore, NLP can integrate its

computational algorithms into CRM to learn, understand, and produce human language content. NLP should be an ideal dimension of CRM for measuring customer trust. Many NLP frameworks and approaches have been designed before this study. For instance, Gosal et al. (2019) developed NLP Latent Semantic Analysis (LSA) approach. This novel approach is used to collect and interpret more than 20000 photos from the Camargue region in Southern France to improve recreational attractions and annual festival participation. They found six distinct user groups interested in nature, ornithology, religious pilgrimage, general tourists, and aviation enthusiasts. Also, Van der Aa et al. (2018) introduced the approach of a behavioral space to deal with behavioral ambiguity in textual process descriptions. A behavioral space is adequate because it reduces and minimizes incorrect interpretations of NLP messages.

Additionally, Iovine et al. (2020) designed and implemented a framework entitled Converse (Conversational Recommender System framework). This framework aims to build chatbots that can recommend items from different domains and interact with the user through natural language. Moreover, Bhatia et al. (2021) designed an algorithm for knowledge representation in NLP. This algorithm is dedicated to uncovering the traits, concepts, and attributes that people most strongly associate with influential leaders. Furthermore, Alhogail and Alsabih (2021) proposed a phishing email detection model. That approach uses deep learning algorithms to improve phishing detection accuracy by using a convolutional graph network (GCN) and natural language processing over an email body text. Finally, Palivela (2021) proposed a lightweight unified model with two dimensions. First, the model can classify whether a given pair of sentences are paraphrases of each other. Second, the model can generate multiple renditions given an input sentence. Following these authors, this research used sentiment analysis to develop a framework to integrate NLP, CRM, and trust.

### **CRM, Trust, and NLP**

The use of CRM provides a key component to achieving customer loyalty and attaining their trust (Vicente et al., 2021). Trust and CRM models have been contemplated and designed in several areas and fields (Vicente et al., 2021). CRM takes place in an online environment, and the interaction between companies and their customers is affected by information asymmetries (Vicente et al., 2021). This means that the generation of trust also involves a process of information processing on the part of platforms (Vicente et al., 2021). The perceived quality of language translation and verbal argumentations has facilitated trust-building (Ferreira et al., 2021). In a different vein, prior trust models were mainly focused on utilitarian cognitive aspects. Also, practical, and utilitarian cognitive aspects play their role in generating trust in relationships (Ferreira et al., 2021). NLP allows the customer to engage in direct conversation with the companies using electronic devices. Even the customer with lower cognitive capacity can hear in his native language and better understand the message transmitted by the companies. Affection can be built between the customers who use their mother tongue to communicate with the merchants.

Some of the most important applications of NLP are voice bots and chatbots in artificial intelligence (Palivela, 2021). NLP systems aim to generate or produce unambiguous and clear natural language, just as the way people communicate with each other (Palivela, 2021). Machines equipped today with NLP capabilities translate the language of the companies into the native language of each customer to build relationships with the customer. In general, people trust other people who speak the same languages and share the same culture as them (Fregidou-Malama and Hyder, 2021). Therefore, customers should trust companies that use NLP to talk to them in their local language.

The deep learning algorithms and NLP techniques continue to improve CRM systems. Deep learning outperformed NLP tasks to achieve state-of-the-art results in tasks such as text classification and machine

translation (Alhogail and Alsabih, 2021). Also, a convolutional neural network (CNN) that operates directly on graphs using structured data through semi-supervised learning to classify nodes should be used to illustrate the effect of NLP on CRM. CNN should allow organizations to translate a large set of graphs into voices in the natural language the customers can interpret and initiate relationships with those customers. Moreover, the recurrent convolutional neural network (RNN) that uses a recurrent structure to capture the contextual information of the text should perform voice translation by considering the contextual semantics of the customers (Alhogail and Alsabih, 2021).

Artificial Intelligence and, more specifically, NLP were applied to detect fake news on social networks and digital media (Saquete et al., 2020). The various procedures to catch fake news, automated fact-checking, and credibility scores draw more attention (Saquete et al., 2020). Automatic fact-checking automatically checks the veracity of disseminated information against all the available data (Saquete et al., 2020). There are different ways to accomplish automated fact-checking. But the credibility of the source of information is one of the appropriate methods used to resolve the issues of fake news, minimize the risks of jeopardizing CRM initiatives, and deter loss of trust. Credibility is a characteristic of trust and refers to trustworthiness in terms of the media, the information source, and the message (Saquete et al., 2020). Is building relationships with customers in their natural languages enough to build trust between them and the companies? In addition, are NLP techniques sufficient to minimize human factor errors in natural language processing and build multilevel relationship trust?

### **Methodology: Sentiment Analysis based Literature Review**

Sentiment analysis identifies how sentiments are expressed in the text (Daudert, 2021). Historically, sentiment analysis is used to analyze customer feedback because it focuses on opinions contained in sentences and comments (Pratama and Tjahyanto, 2022). However, sentiment analysis can be conducted today using a machine learning approach. There are two machine learning methodologies: supervised data mining and unsupervised data mining. Because data used for sentiment analysis can be collected from literature reviews and social media networks like Twitter and Facebook (Pratama and Tjahyanto, 2022), unsupervised data mining is more appropriate for the sentiment analysis adopted in this paper. This is because unsupervised data mining uses a text mining approach and is a qualitative method.

To conduct sentiment analysis in this study, negative and positive messages about CRM empowered by NLP were identified in the literature and analyzed. The sentiment analysis-based literature review also covered sentences collected from the literature review on social media, NLP, CRM, and Trust. Unarguably, many companies do not provide data about their customers. Also, because NLP technology is new, many companies do not store the verbal semantics data of their customers. Therefore, text data collected from the literature review was used to feed the sentiment analysis method. Those text data were analyzed in this paper to identify how companies use speech recognition, verbal cues, and language translation to build relationships with their customers. In the same vein, those verbal and textual data were used to identify the trust of these companies' customers intuitively.

### **Results: An Integrated Framework**

The findings from the sentiment analysis-based literature review help to create the integrated framework. The sentiment analysis helps to find that customers process natural language better than the information displayed. Customers can also process images, photos, and self-environmental representations. NLP characteristics of language understanding, language generation, speech, and voice recognition are available for customers through machine learning derived from artificial intelligence. For instance, machine translators like Google Translator can facilitate CRM, influencing customer trust. CRM technologies can

pull customer structured data from a data warehouse system and unstructured customer data from the Hadoop framework. Companies can use NLP capacities to interact, initialize, develop, and maintain relationships with those customers. Customers will build an attachment to companies that use images and voicing technologies to understand their social media needs better. Many organizations use NLP for generating customer identification. CNN is based on the visual categorization of images. Therefore, they also use visual categorization to differentiate and interact with customers to organize pictures and videos. They provide customized products and services by analyzing customers' data from the data warehouse and Hadoop. Finally, companies use RNN and LSTM to analyze feedbacks they collect from customers. This feedback is used to design their products and services better. Customers will incline to trust companies that take their input in creating their products and services.

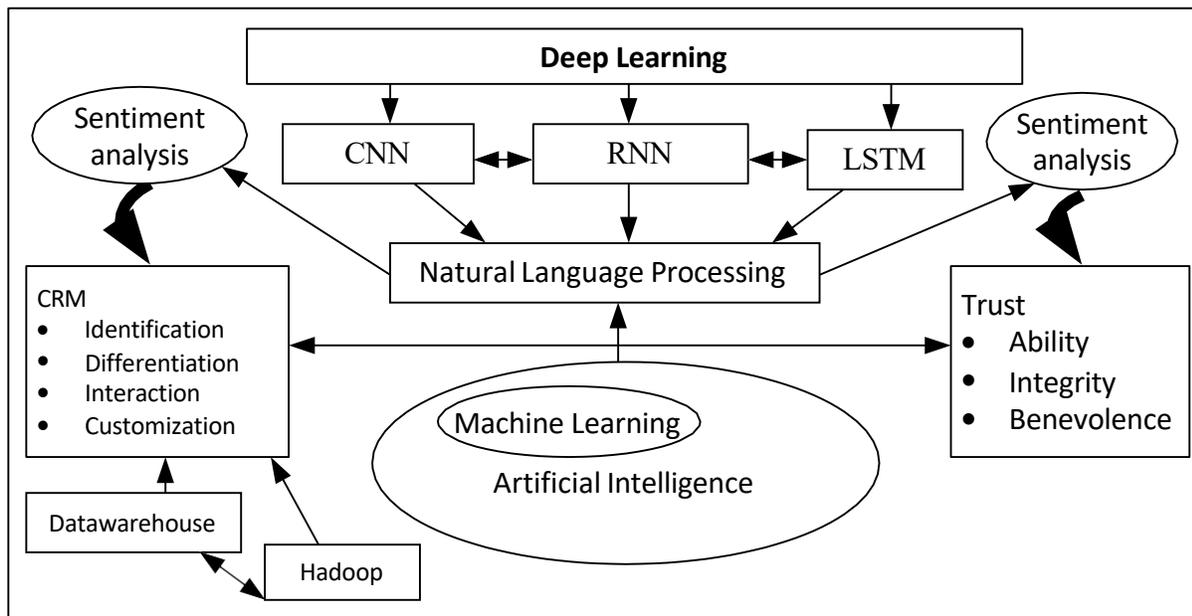


Figure 1: Integrated Framework

### Discussion and Conclusion

This paper examines CRM empowered by NLP that offers a new way of building trust with customers. To achieve this goal, a sentiment analysis-based literature review is conducted and led us to the following: the findings indicated that an integrated framework links the artificial intelligence component of NLP to CRM and trust. The framework outlines the dimensions of CRM, which pull data from data warehouses and Hadoop. NLP benefits from deep learning components of CNN, RNN, and LSTM to moderate or mediate the relationship between CRM and trust. With the advent of COVID-19 and even before that, many companies have been engaged in online business by finding customers on social media networks. Social media has become an enabler for NLP and CRM. Therefore, NLP creates a new opportunity to interact with social media customers to trigger their trust. Once the customers trust the companies, they should become loyal customers. Unarguably, customer loyalty has a beneficial impact on the return on investment of many organizations.

It is no longer a surprise that organizations that build customer relationships will need to cope with social media and artificial intelligence technologies. The new revolution of NLP has been conceptualized to have voice integrated into machine learning and deep learning. Companies should use NLP elements to empower their CRM activities because humans understand their native and mother tongue better than any other

language. Through this research, the authors used the integrated framework to provide a holistic view of using NLP to improve CRM and increase customer trust, which is crucial for many companies from different sectors. CRM investment does not necessarily guarantee a significant return on investment. Therefore, companies are trying to discover another way to limit the resources they invest in CRM by adopting artificial intelligence technologies.

## **Theoretical Implications**

This study shows the theoretical integration between CRM, trust, and NLP. Also, artificial intelligence, machine learning, deep learning, and NLP for deeper customer relationships analyses offer new theoretical combinations. Additionally, many theories from linguistics fields can serve as a theoretical background for NLP. Moreover, cognitive fir theory is the theoretical backbone of NLP. Furthermore, relationship marketing is the underpinning theory of CRM. This framework is conceptual; therefore, it provides a new theoretical model. Finally, sentiment analysis-based literature review is demonstrated as a powerful qualitative method to be used in NLP.

## **Practical Implications**

Many practitioners should use the framework developed in this study to select the best combination between NLP, CRM, and trust. Many organizations can use the framework as a model for NLP implementation. NLP can be used to transform business models by focusing on the components of this framework. The analysis undertaken in this study will benefit companies that continue to doubt the opportunity for NLP and the results that the use of CRM can bring to their executive management and decision-making process. The question-answers features of NLP can facilitate the interaction between companies and customers. Some of the aspect's companies struggle with when using CRM are the identification, differentiation, customer interaction, and customization of customers. This struggle constitutes the root of many CRM project failures. This study extends CRM and trust research by demonstrating that NLP can be used to reduce the high rate of CRM implementation failure in organizations. The root of failures is not recommended in this study. Instead the combination between NLP, CRM, and trust will allow organizations to combat the root of failures.

## **Limitations and Future Research**

This research will offer future researchers new strategic avenues. An empirical study must be performed to generate valuable findings from this framework. This is because the framework must be transformed into a research model allowing to distinguish independent, dependent, and mediating and moderating variables if necessary. Then survey should then be used to collect data and use statistic software to test hypotheses. Another scenario can be using case studies or interview data to complete the qualitative analysis.

Future research can use an unconventional data collection procedure to collect data from Facebook, Twitter, etc., to test hypotheses developed from the framework of this study. The framework can be used for comparison-based studies between private and public sector organizations. Multiple case studies from both sectors can be utilized to reveal new insights. Future research should be conducted to identify additional dimensions for NLP. Another avenue of research can be to analyze NLP in a cultural setting. For instance, how NLP is equipped with a customer's native language can impact purchasing behavior. The theory of planned behavior can explain the customer's intention to purchase more because the company interacts with the customer in his native language. The current framework has identification, differentiation, interaction, and customization as the dimension of CRM. Current research must be improved to add more variables to CRM, such as information sharing, customer involvement, relationship initiation, relationship maintenance,

and relationship termination. In the same line, new variables such as behavior, trust, reputation, honesty, and accuracy can be added to the trust.

In terms of limitations, we could not argue for the generalizability of this framework without further research and tests. Also, the sentiment analysis-based literature review should be supplemented by oral and text data collected from YouTube, Twitter, and Facebook.

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