Assessment of the Healthcare Administration of Senior Citizens from Survey Data using Sentiment Analysis

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Abstract—**Healthcare is most frequently used by older people and understanding how they feel about the way healthcare administration gives them the attention and support they need, is crucial to building a healthcare system that is effective in meeting their needs. This study determined the seniors' opinions on the healthcare administration by employing SurveyMonkey, a robust online survey tool as an opinion miner. The study used the Orange application, which made data processing simple, to gauge the seniors' opinions toward healthcare administration by analyzing text sentiment using the VADER Sentiment Analysis, which may distinguish between the polarity of positive, negative, or neutral emotions as well as their intensity. Results showed that the majority of seniors (51.1%) had a negative response to healthcare administration, whereas 47.9% had a neutral response and 1.0% had a positive response. Based on the study, the government should enhance its senior citizens' healthcare services to better satisfy their demands and ensure their happiness. This is clear from the respondents' feedback regarding the services they would like to utilize and how they believe they may be improved. Additionally, the findings provided sufficient information for future consideration to enhance seniors' satisfaction with developmental activities and programs and improve healthcare administration.**

Keywords—*Sentiment analysis; opinion mining; senior citizen; healthcare services*

I. INTRODUCTION

The world's population is aging swiftly, and senior citizens have the fastest rate of population growth. The World Health Organization claims that this trend is anticipated to continue [1]. Health and well-being are crucial for seniors, and the enhancement of their quality of life is a major concern for modern society due to their chronic health difficulties, including the available healthcare services. Due to the growing aging population and increasing life expectancy, seniors need care and access to sophisticated healthcare systems that might enhance their standard of living [2]. Understanding the care and support needs from their perspective and the larger context of their experiences with the services is crucial to successfully addressing those needs [3]. Indeed, we need to reconsider how healthcare administration is being served to senior citizens.

The Philippines is one of the nations with an aging population. As of 2015, 7.4% of the population was over 60 years old, and by 2045, 15.9% of people are expected to be over 60 years old [4]. Given the rapidly aging population, the complexity of senior citizens' needs, the significance of health information in service delivery, and the difficulties associated with health information in general, it is crucial to ascertain the state of senior citizens' healthcare system to coordinate the country's healthcare services and promote healthy aging [5]. Increasing access to high-quality healthcare is of the utmost importance in emerging countries like the Philippines, and the government needs to be committed to enhancing the healthcare system, especially for vulnerable populations like senior citizens [6].

As the population of seniors increases, particularly in the provinces, their use of health services is becoming more important. Catanduanes is one of the provinces in Region V - Bicol, located in the Southeast part of Luzon in the Philippines. In order to reach its health goals, the provincial government is working hard to achieve health-related goals through its scorecards for planned activities to analyze health issues, however, the prevalence of various diseases continues to rise, despite the provincial government's attempts. This suggests that based on the province's geographic situation and demography, ongoing assessments of health services and inhabitants' health problems should be responsive and appropriate [7], most importantly for senior citizens.

In order to strengthen programs that can help manage the healthcare services of senior citizens, this study collects information on how healthcare services are being administered to them and how they feel about the care they received. By successfully recommending programs that have been proven beneficial and efficient for those in the city and those in the provinces, this study solves information gaps on the need to improve healthcare services given to senior citizens for their health and well-being.

The study will make use of sentiment analysis, a text classification technique that groups texts according to the sentiment of the thoughts they contain. To determine whether a textual analysis is positive, negative, or neutral, it aims to extract the sentiment polarity from the text. Natural language processing (NLP) research in this area is among the most active, with both text and data mining projects being conducted [8][9]. Sentiment analysis has previously been the topic of extensive research and it gives us a method for accurately comprehending sentiments and extrapolating important information from them, it is also a type of text classification that integrates NLP, machine learning, data mining,

information retrieval, and other academic areas [10][11]. A database can be created that contains precise information about healthcare management, including the quality of their services and suggestions for improvements, by efficiently gathering and analyzing the thoughts and opinions of senior citizens.

Using VADER Sentiment Analysis, which is also known as Valence Aware Dictionary for Sentiment Reasoning, this study's overall goal is to evaluate the healthcare administration for senior citizens and develop a methodology that enables them to contribute data that can be utilized to analyze their perceptions, experiences, expectations, and concerns about the healthcare services they received. A profiling and online survey were conducted on the sentiments/opinions of senior citizens towards healthcare administration using SurveyMonkey. Additionally, the Orange Data Mining application tool performed a sentiment analysis evaluation. The sentiment analysis of senior citizens' healthcare administration's online survey was done using the VADER method. Since it was considered to be a time and money-saving approach for minor evaluation efforts, researchers employed the SurveyMonkey software as an assessment tool to gather user comments and opinions [12].

The purpose of this study is to unearth the problem and hopeful insights of the senior citizens, as indicated by the sentiment analysis based on the completed survey. The importance of this study lies in the possibility that it may establish the foundation for the management of senior citizens' healthcare as it discovers opportunities for service enhancement. The researchers' goal in conducting this study is to provide guidance to government policymakers and healthcare administrators on how to prioritize meeting the needs of seniors in order to provide them with high-quality healthcare services. In addition, this may also help the provincial and rural health office to improve its services for older people in terms of health and wellness. By working to make it a reality, we are supporting the UN's third Sustainable Development Goal to promote health and well-being.

II. RELATED WORKS

A. Healthcare Services for Senior Citizens

Discussions about how seniors use healthcare services are becoming more and more crucial as the senior population increases. A study being conducted in South Korea aims to create an integrated healthcare service system that is centered on elderly citizens, meeting their needs in daily life and promoting well-being, wellness, and well-dying. A natural structure of regular care, professional care, and rehabilitation for senior members of society in line with the responsibilities of the patients, their families, and caregivers are required for the implementation of the integrated medical care system for elderly users presented in this study [13].

The study [14]'s goal was to determine what senior citizens need from "embedded retirement facilities (ERFs)," multipurpose, and community-based care facilities for the elderly in mainland China. This study is based on questionnaire data collected in northeast China. The findings show that senior citizens' healthcare services are deemed to be the most significant. Senior citizens use community-based facilities, but

decision-makers and facility administrators frequently fail to consider their needs. Seniors in China also tend to be inactive and largely silent in both formal and informal civic involvement because they typically believe that policymakers would take notice of and accommodate their needs.

The purpose of the [15] study is to evaluate older people's well-being to explore whether the data are consistent with previously announced changes in senior treatment in relation to the real resources provided to their patients. The respondents reported being generally satisfied with their lives. The results show that small-town residents felt substantially worse about their quality of life than seniors from large cities. This shows that the healthcare system continues to utterly fail to meet patients' actual demands, particularly in the elderly sector. Being open to a broader discussion about the diverse needs and resources that elderly people in rural and urban areas face is crucial for doing this.

The study of [6] attempts to assess the potential influences on elderly persons' use of healthcare in Davao City, in the Philippines. Various factors were discovered to be significant predictors of healthcare consumption through the use of multiple regression analysis. The findings demonstrated how socioeconomic demographic, personal characteristics and health insurance knowledge affect the way senior citizens use healthcare. By launching health insurance awareness campaigns and creating health-improving initiatives, policymakers and local government organizations may think about enhancing senior citizens' access to healthcare services.

B. Sentiment Analysis on Healthcare Services

However, in order for various stakeholders to profit from the knowledge gleaned through sentiment analysis, a study by [16] proposes the use of sentiment analysis of hybrid techniques through the development of a module that makes it possible to integrate sentiment analysis functionalities in Web applications related to healthcare at the comment and entity levels. The healthcare industry is one of the least researched industries, however, researchers were aware of a few instances where sentiment analysis was applied to help various industries. Thus, a review of the literature was conducted to examine sentiment analysis utilized in various healthcare settings. The data produced after using sentiment analysis to understand how people feel about various healthcare-related topics enables various stakeholders to take decisions that are advantageous to them. These studies shown allow for validation that the module can be incorporated into Web applications, provide sentiment analysis functionalities to them, and provide various benefits based on the information obtained after using its functionalities without requiring a great deal of effort, like making better decisions or obtaining the reputation and knowing the opinion on aspects related to the healthcare domain.

Due to the vast amount of online information available on healthcare, [17] employed sentiment analysis in this field. They came to the conclusion that sentiment analysis has many advantages, one of which is its ability to use medical data to achieve the greatest results and improve the standard of healthcare. They offer approaches and methods for sentiment analysis employed in the medical field and look for additional

information to help users make the best decision regarding the subject under study.

C. VADER Sentiment Analysis

VADER is also known as Valence Aware Lexicon and Sentiment Reasoner. The VADER vocabulary was created using conventional sentiment lexicons. Also, this work offers machine learning techniques for sentiment analysis as well as sentiment intensity and orientation lexicons. In order to better understand how the public feels about different entities, this sentiment analysis methods try to identify the feelings of written reviews. Emotions are linked to many characteristics of a product or service as part of the analysis of consumer feedback data. Moreover, VADER sentiment outperformed seven sentiment analysis lexicons, either better or equally well. [18][19][20].

According to a study by [21], VADER maintains and even improves on the advantages of conventional sentiment lexicons like LIWC or Linguistic Inquiry and Word Count: it is larger, yet just as easily examined, understood, and swiftly deployed without requiring substantial learning/training), and it is easily extended. VADER differs from LIWC in that it is both more perceptive of sentiment expressions in social media and more tolerant of generalization to other domains. This can be downloaded and used without charge from the website.

Other research confirms the ease of use of VADER's rule-based sentiment analysis. A compilation of lexical features and their corresponding emotion metrics make up this document. Several guidelines are developed based on the language's grammatical and syntactical usage, and these rules are utilized to assess the text's mood. VADER employs a rule-based method and assigns values to each word in the text in order to consider both the sentiment category and the intensity or strength of the text in addition to the sentiment category. It also performs far faster than machine learning algorithms [22][23].

VADER excels across a range of domain types. Compared to machine learning techniques, VADER has a number of advantages. It is firstly quick and computationally effective. The second advantage is that the terminology and regulations of the VADER are clear and not hidden. Because of this, VADER is easy to understand, build upon, and alter. By setting the threshold at 0.05, VADER is a preferable option if processing the sentiment quickly and if it was the only thing that had been planned. VADER also adheres to grammatical and syntactical rules for expressing and highlighting sentiment intensity. VADER outperforms Text blob and NLTK sentiment analysis technologies in terms of performance. [24].

According to empirical findings, the technique utilized is the best technique for ranking many choices. Additionally, users of the healthcare sector's decision-making processes and healthcare providers' goals for quality improvement can both benefit from ranking information.

III. METHODOLOGY

This study is divided into four main phases, the first of which is the actual data gathering from senior citizens whose opinions will be utilized to determine the study's analysis of the government healthcare system. As can be seen, the data will be cleaned using a preprocessing procedure in the phase after which it will be tagged with the necessary sentiment labels using the VADER method. The orange data mining application will be utilized in this step. Preprocessing entails tidying up the text, making it all lowercase to make it easier to read, and removing any affixes from words to get them down to their root forms.

To understand more about the primary healthcare administration for seniors, particularly in the province, the researcher conducted a survey on senior citizens in Virac, Catanduanes. The study was carried out in the barangay San Isidro Village since it has the highest number of senior residents in the municipality. A total of 694 responses were gathered using the SurveyMonkey software which is an online survey tool. This online survey software makes designing and managing reliable online surveys easy. It is also a highly effective and well-known online platform.

This research demonstrates how to retrieve the required data from its source using the Orange Data Mining application and how to use tools to carry out text mining operations. The procedures, particularly when applying the classification technique using the VADER method of Sentiment Analysis of Orange Application, are shown in Fig. 1.
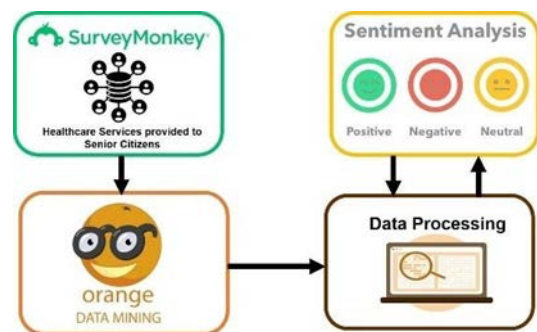

Fig. 1. Using orange data mining application for the sentiment analysis

A. Data Collection and Gathering

To understand more about the primary healthcare administration for seniors, particularly in the province, the researcher conducted a survey on senior citizens in Virac, Catanduanes. The study was carried out in the barangay San Isidro Village since it has the highest number of senior residents in the municipality. A total of 694 responses were gathered using the SurveyMonkey software which is an online survey tool. This online survey software makes designing and managing reliable online surveys easy. It is also a highly effective and well-known online platform.

The survey provided was composed of three questions, the first was the name of the respondent, which was also optional, their age, and the third question asked about senior citizens' opinions of the healthcare services provided.

Fig. 2 shows the 694 data collected from the senior citizens' responses using the SurveyMonkey software. The responses were gathered and downloaded in a comma-separated (CSV) file that would be utilized in the following step.
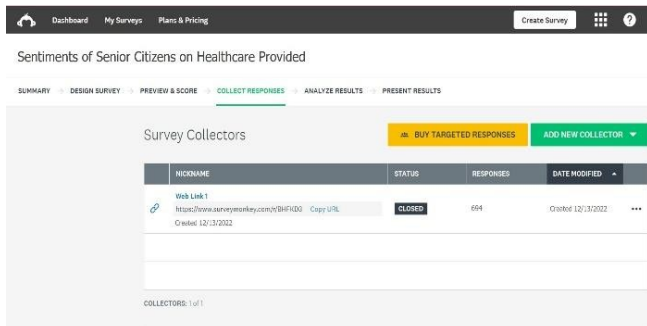

Fig. 2. Collected data using SurveyMonkey tool

B. Data Processing

Using the Orange Data Mining Application, the survey text corpus from the SurveyMonkey responses was imported and processed. The corpus goes through pre-processing to ensure that it was converted to lowercase and removed unwanted words. To verify the outcomes, a word cloud was additionally attached to the pre-process text widget.

Fig. 3 depicts the loading of SurveyMonkey survey text into the corpus, and Fig. 4 depicts the pre-processing of corpus texts acquired on senior citizens' opinions of the healthcare services offered to them by the governments.
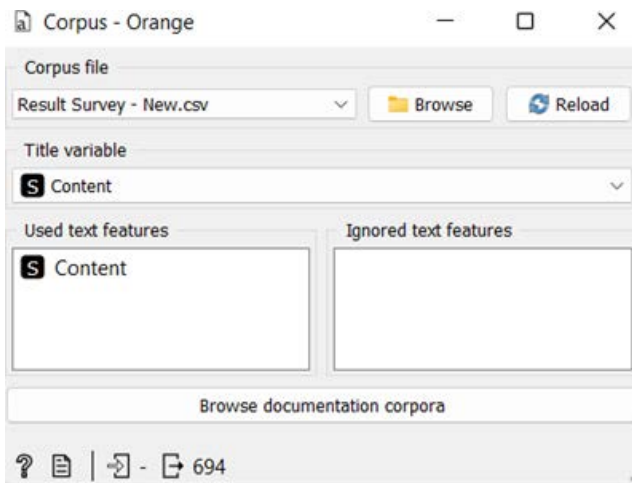

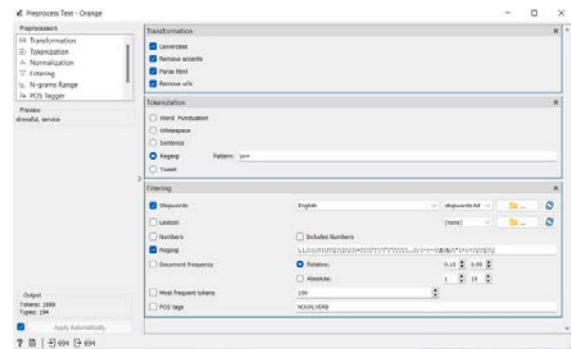Fig. 3. SurveyMonkey text responses gathered

Fig. 4. Corpus texts' pre-processing

C. Sentiment Extraction

The analysis of the survey data, also known as sentiment extraction, is another important stage. This analysis used topic modeling and VADER sentiment analysis. In this instance, the comma-separated (CSV) file, which was processed prior to sentiment extraction, is extracted to obtain the widget. The CSV file was turned into the corpus by selecting text characteristics from the dialog box, which was then processed.

The sentiments taken from the SurveyMonkey tool, which had previously applied VADER sentiment analysis, are shown in Fig. 5. Additionally, it displays the text's measured emotions, whether they are neutral, positive, or negative.

Fig. 5. Sentiments extracted from SurveyMonkey tool

D. Using Sentiment Analysis

Sentiment analysis was used in this study to determine whether the content of survey responses contained neutral, positive, or negative emotions. This kind of text analytics employs both machine learning and natural language processing (NLP). Fig. 6 shows the steps taken to achieve sentiment analysis for the survey of senior citizens. From the survey text corpus from responses from SurveyMonkey to the pre-processing of the text and word cloud, followed by the sentiment analysis using the VADER method, to repeating the pre-processing texts to ensure that there are no unwanted words included, and choosing the necessary columns to include in the result, to providing the corpus viewer to view the results of the sentiment analysis using the VADER method.
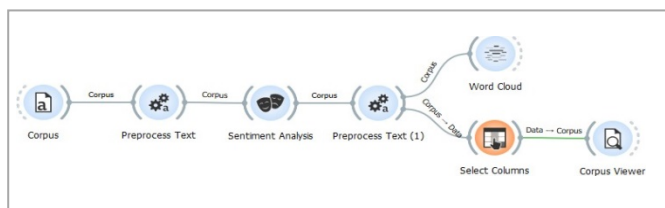
Fig. 6. Sentiments analysis activities using orange data mining application

IV. RESULTS AND DISCUSSION

The primary goal of this research is to evaluate how senior citizens' healthcare is administered using a survey conducted using the VADER sentiment analysis method. The data given by SurveyMonkey was important in helping us understand how senior citizens felt about receiving healthcare services provided by the government. Similar to this, different data collected from using the application gave some insight into the real sentiments of those people in response to their experiences, ranging from negative to neutral and there are also positive replies based on the VADER method.

A. Sentiment Analysis Result

Senior citizens who participated in the survey were asked for their opinions on the government's provision of healthcare services. This aims to comprehend how they feel toward and evaluate government-provided healthcare. They reviewed the services based on their prior experience with them.

The results show that 51.1% of the responses were negatively polarized after 47.9%, neutral feedback, and 1.0% positive feedback based on the VADER method of sentiment analysis. Fig. 7 illustrates a pie chart that displays how much polarity is expressed for each segment. This is anticipated since it is a natural reaction to feel negatively about senior citizens' healthcare services because it affects all of them. The sentiment results can also be explained by the increased anxiety as a result of their experiences with the issue. Additionally, some of the responses included their recommendations for how they would like the services to be delivered in view of their needs, which will aid in the improvement of the government-provided healthcare services.
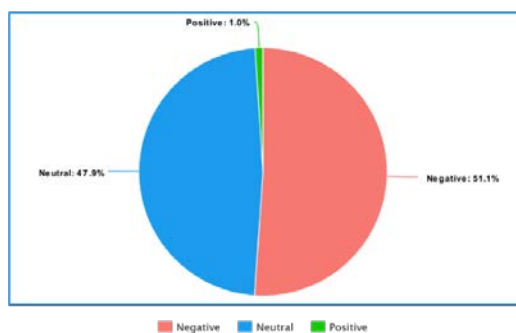

Fig. 7. Polarity of senior citizens' sentiment analysis feedback

B. Corpus View

The sentiment analysis corpus view provided some preliminary perspectives on the positive, negative, neutral, compound, name, and age based on the 694 replies with various tags filtered out. These views were further separated

and cleaned, and the results are displayed in Fig. 8. Policymakers, government agencies, and even Senior Citizens' associations would benefit most from the analysis of these profiles and sentiments because it would offer insightful feedback for the creation of practical programs and schemes to allay their concerns about healthcare services. This may also act as the basis for future program improvements for these services.
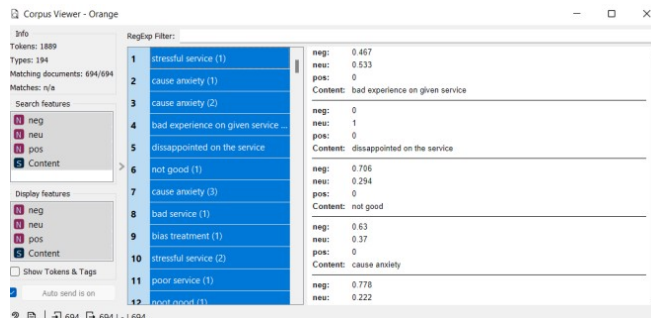

Fig. 8. Corpus view based on sentiments of senior citizens on healthcare administration

C. Word Cloud

Fig. 9 shows the terms from tag words or word clouds that were retrieved after a polarity analysis was performed to assess the positive, negative, and negative characteristics of opinions toward senior healthcare. These keywords reflect the responses to surveys on the respondents' healthcare services given to them. Based on their experiences, they have expressed their disappointment with inadequate procedures, health programs, assistance, and tools used to support them. Responses generated several keywords, including "stressful," "anxiety," "bad," "neglected," and "poor." These are some of the phrases they used to characterize the services they received. We can infer from these word tags that seniors have negative perceptions of the healthcare they received.

Fig. 9. Word clouds generated from sentiments expressed by senior citizens

V. CONCLUSION

The study's conclusions and the respondents' perceptions indicate that senior citizens' healthcare administration is ineffective. Seniors' opinions and sentiments in their responses are based on their engagement with the services offered to them. Sentiment analysis was utilized to evaluate the responses that reflected their opinions. This conclusion supports and clarifies the sentiment analysis finding that there is considerable sensitivity to the healthcare service offered.

Ineffective health monitoring and counseling, technology to assist with procedures, inadequate service, and mobility issues were some factors that sparked criticism. These factors all had an impact on how they perceived the services offered to them.

Significant relationships were also discovered between respondents' perceptions of the standard of healthcare. Based on the study, the government should enhance its senior citizens' healthcare services to better satisfy their demands and ensure their happiness. This is clear from the respondents' feedback regarding the services they would like to utilize and how they believe they may be improved. However, this study has important limitations that could encourage additional development and research. Seniors' views expressed on social media and the Internet in the provinces may one day be evaluated for several reasons. A better healthcare system may be created in response to unfavorable comments in order to effectively address and support seniors' concerns and improve the government's provision of healthcare services. This will assist the government in creating a plan to satisfy the demands of senior citizens while providing a suitable healthcare system. This will also show how important it is to have a reliable healthcare system across the country, not only in urban and rural areas. This will guarantee that senior folks are treated with the respect they deserve and that information concerning their health is immediately updated.

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