Automatic Classification of Complaints and/or Suggestions Using A Mobile Based Suggestion Box System

Chucknorris Garikayi Madamombe

Department of Computer Science
Namibia University of Science and Technology, Windhoek, Namibia
chuckygari@gmail.com

Abstract - **In every organisation, information is regarded as a very essential resource. Without proper information, most organisations will not function at their optimum capacity. To date, most companies and institutions are still using traditional physical suggestion box to collect information from stakeholders. Nonetheless, information which is gathered through physical suggestion box is in the form of physical papers and it takes too long to process. In addition, physical suggestion boxes involves a lot of paperwork and few people are now using them. As an alternative to physical suggestion boxes, mobile centered suggestion boxes can be adopted. However, automatic classification and processing of information gathered through mobile phones becomes necessary due to the large volumes of information collected. In general, stakeholders are easily frustrated when their suggestions are not attended to in time as expected. Thus the main purpose of this study was to propose and design a classification system that automatically process data based on common keywords. The classification system is designed using Natural Language Processing (NLP) methods. In this study, data was collected using three methods which are; online survey, physical suggestion cards and Short Message Service (SMS). The sample used in the study was made up of students from various colleges in Namibia. Based on common keywords in the data captured, a prototype of the classification system was developed. The findings from the study indicated that mobile suggestion boxes are essential and should be used in every organisation in order to gather as much information as possible. The challenges and benefits of mobile box suggestion systems was also examined.**

Keywords - automatic text classification; Natural Language Processing; e-governance; mobile phone; suggestion box system; stakeholders; online survey; Short Messge Service.

I. INTRODUCTION

Worldwide, the number of students who are enrolled at institutions of higher learning are increasing rapidly [1]. On the same note, the number of students who are enrolled at universities in Namibia has been increasing rapidly [2]. At present, one of the largest university in Namibia is still using the traditional way of physical suggestion boxes to collect information from students and all stakeholders. The information that is collected through these physical suggestion boxes is complaints, suggestions as well as general feedback. Considering that this university has various campuses that are located in different towns, the use of physical suggestion boxes is no longer effective and it has to be replaced with modern suggestion boxes such as mobile phone suggestion boxes. According to [3], physical suggestion boxes are time consuming and they involve a lot of paper works. Thus, they are less effective as compared to mobile suggestion boxes [3]. Generally, students as well as various stakeholders are no longer making use of physical suggestion boxes since they do not spend most of their time at the campus.

Worldwide, the use of ICT technologies is becoming inevitable due to the exponential growth of information experienced by many organisations [3]. There is need for improved efficiency for any organisation to prosper. It is crucial for organisations to take into consideration feedback from stakeholders so that they can improve the organisational performance [4]. Due to the fact that the students enrollment is increasing every year and that the university campuses are scattered all over the country, an online mobile based suggestion box system would be more convenient. Good governance encompasses taking into consideration the feedback that come from various stakeholders [5]. This study has proposed the implementation of an online mobile suggestion box system in an effort to capture the complaints as well as the suggestions from the students and stakeholders.

According to [6], an organisation or company that does not take into consideration the views and feedback from its stakeholders will likely to encounter problems in future. Feedback is important because it helps to grow the organisation through corrective measures where they would be going wrong. In addition, a harmonious working environment is achieved if the organisations are listening to the complaints as well as the suggestions of its stakeholders. At universities, students' protests would be minimised if the complaints are attended to in the shortest possible time. The same applies to companies and organisations, strikes by workers would also be reduced significantly if the complaints are attended to in time.

These days mobile phones are affordable and hence they are becoming popular even to students at the universities. Unlike in the past when the mobile phones were only owned by the working class. These days having a mobile phone has become a basic need and not a luxury need. This is because mobile phones are being used for faster communication in schools, home as well as at work [7].

According to [8], the fast growing in the usage of mobile phones in the whole world have a vast potential in transforming the educational systems in all the countries. Due to the fact that mobile phones are becoming more popular and affordable, using mobile suggestion box systems will be gradually replacing the traditional physical suggestion box systems. It will be easy for people to launch their complaints as well as the suggestions at the comfort of their houses using mobile phones. In order to ensure professional and improved customer care, mobile based suggestion box system will have to be adopted by companies or organisations.

The mobile based electronic suggestion box system that is proposed in this study is a type of an e-governance system that is aimed at improving the way in which complains and suggestions are handled on a daily basis. The main purpose of the proposed mobile based suggestion is to classify various complains as well as suggestions by the students in all campuses. Since it is a computerised suggestion box, it will process as many data as possible compared to the data that could be processed by using a physical suggestion box system.

A. Objectives of the study

In order to achieve the desired results, the study objectives as outlined below were examined. The objectives of the study were used to guide and direct the research.

- To examine the influence and problems related with the use of traditional physical suggestion box systems;
- To classify the most common keywords that are used by students and stakeholders when sending complaints and suggestions through the mobile box suggestion systems;
- To design and implement a prototype of a mobile based suggestion box that classifies common key words.

The whole paper has been outlined as follows; Section II has outlined the technical approach used in designing the proposed prototype. The review of related works have been outlined in Section III. Section IV has outlined in detail the methodology that have been used in order to achieve the study objectives. The results of the study were presented in Section V. Section VI has outlined the design and the implementation process of the proposed model. The conclusion of the paper has been outlined in Section VII.

II. TECHNICAL APPROACH

The parse tree structure as well as the WordNet database have been used in the study. Reference [8] noted that a parse tree is a well-arranged deep-rooted tree that denotes the syntactic structure of a sentence according to some context-free grammar or language. In the proposed mobile suggestion box system, complaints as well as suggestions would be received as sentences or phrases from the students and stakeholders. Then, the parse tree method would show the actual syntax in which complaints and suggestions are send by the students and various stakeholders. Furthermore, using the parse tree approach, complaints and suggestions can be categorised effortlessly. Generally, the sentences are first constructed with meaningful words. This means that the parse tree structure has to consider first the meaning of the words as they are used in the sentences. According to [10], electronic suggestion box systems can process natural languages in a similar way just like human beings. The mobile based suggestion system must just be supplied with the words and their meanings for it to process and classify common words just like human beings. Human beings use traditional dictionaries to understand some words. However, these traditional dictionaries cannot be understood by machines and computers. Hence, the machines and computers use WordNet to understand the meanings of words. According to [10], WordNet is an online lexical database that is intended to be used under the program control for English language. Thus, nouns, verbs, adjectives and adverbs are organised into a set of synonyms called synsets with each word representing lexicalised concept [11]. Generally, the WordNet is used by the computers to find the meanings of the keywords that would have been used by students and stakeholders when launching their complaints and suggestions. This technique is important because it improves the classification of complaints and suggestions. Furthermore, the use of WordNet can also significantly reduces vagueness of words [12].
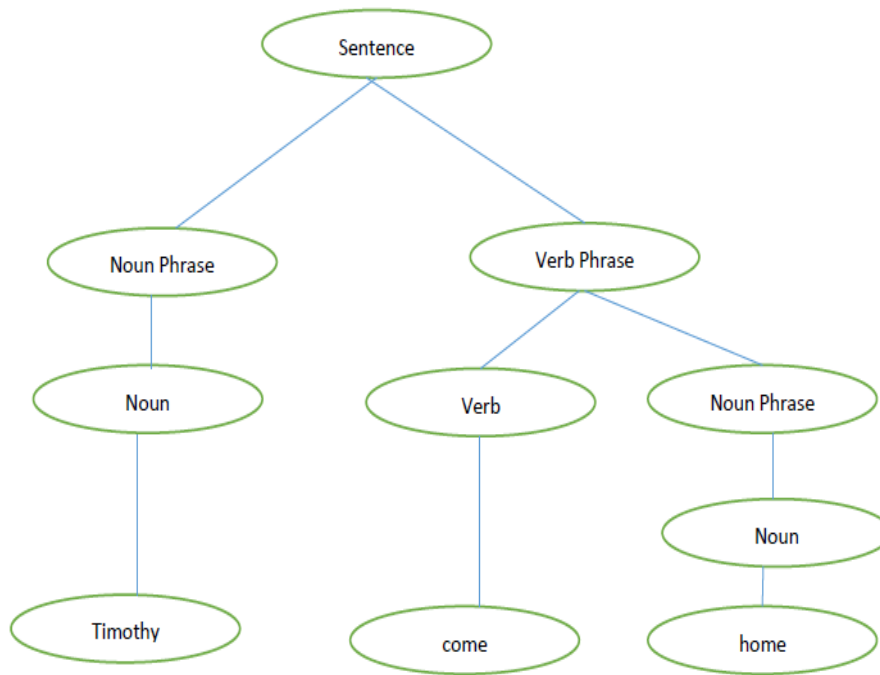
Figure 1 - The Parse tree structure

The Figure 1 above is a representation of the parse tree approach which is used the detection of the structures. As noted earlier on, complaints or suggestions are received from stakeholders as a full sentence. The full sentence could be for example, "Timothy come home". This sentence is they broken down into two parts. The noun phrase and the verb phrase are then formulated. The word "Timothy" falls under the noun phrase. The verb phrase is subdivided into a verb and a noun phrase. The word "come" falls under the verb and the word "home" falls under the noun. As indicated on the parse tree structure above, the whole sentence have been divided and classified.

III.   RELATED WORKS

The initial suggestion programmes were first launched in the 17th century by the British Navy [14]. They realised that it is important to gather information from people. They further noted that it is better for people to speak what they feel without being afraid. By doing so, people could actually mention some information which could help organisation to grow. According to [10], suggestion boxes were not so popular during the 18th and 19th century. They further noted that suggestion boxes became more popular first in the manufacturing sector during and after the Second World War. During this time, the suggestion boxes became part of the total quality movement in many organisations. The suggestion boxes became so important in many organisations because they could collect vital information from various stakeholders and such information was important in helping the organisation improve in its performance. Even up to date, suggestion boxes are still the pillar of many corporate suggestion programs. Suggestion boxes are useful because the anonymity of the individuals is retained and people can air their views without fear. Feedback, whether positive or negative, is useful for the growth of the organisations.

However, it is important to note that to date, there are various forms of suggestion boxes that exist [7]. This includes paper feedbacks that can be sent to customers via the postal box [7]. The customers would be requested to complete a certain form evaluating the service delivery that they have experienced at a certain company on a specific day. Some companies would place feedback cards or forms at receptions so that customers can complete those forms providing comments on any suggestions or complaints [8]. In some cases, call centres of organisation can actually make phone calls to customers in order to evaluate what they think about an organisation. Some organisations would ask the customers to go through a feedback survey after using a specific service. In some cases, some companies would put a physical suggestion box outside the building so that all the people can put in their suggestions and complaints. The people would just drop in their small papers with either a complaint or a suggestion. There are so many ways in which organisations would solicit customer feedback about their products and services as well as customer satisfaction [4]. Due to the fact that these suggestion boxes are providing crucial information to the organisations, there is need for advanced suggestion boxes so that more information could be collected and processed from the customers. There are web based suggestion boxes that have been developed and are used by companies but the major challenge is processing all the data collected in time [10].

Empirical studies that relates to the study have been examined and they have shown a serious gap of what have been done and what still need to be done. There is still a very limited literature in the field of suggestion boxes and yet they are very important in improving the customer service as well as the overall governance of many organisations.

Reference [10] conducted a study where by people were launching their grievances through the mobile phone. This type of suggestion box was used by a municipal organisation. In this application, people were registering the complaints with the municipal authorities and the people could be able to track their complaints or suggestion. This project was very helpful because it provided a direct communication link between the ordinary people and the municipal authorities. Furthermore, people were able to register freely for their complaints and they were also able to follow them up as they wish. In return, there was improved service delivery at the municipality because there was direct communication between the ordinary citizens and the municipal officials.

Reference [12] proposed a simple and effective system for registering of complains by customers. Their study proposed a comprehensive customer complaint management system (CCMS) which was derived from the concepts of total quality management (TQM) as well as the quality function deployment (QFD). The study results indicated that exceptional service delivery in organisations can only be achieved when employs and all the stakeholders are involved in the operational activities. All the stakeholders should provide deep information that could help grow the organisations. The study also concluded that it is important for every organisation to implement a complaint/feedback management system so that they can be able to gather the views from different stakeholders. These systems must be implemented in any organisation regardless of its products and services as well as its size.

Reference [8] noted that complaint management systems can actually be linked to improved company performance and increased profits by organisations if implemented correctly. He not that most organisation do not value the importance of complaints by customers. Generally, most people do not need negative feedback. However, negative feedback is important because it helps the organisation to fix the problems where they are going wrong. The study concluded that proper implementation of complaint management system will not only improve customer satisfaction, but also improves company performance and profits.

Aforementioned related studies have indicated that there is little work that has been done so far pertaining suggestion box systems. Of the little studies that have been done, there is no research that has been done to examine the implementation of a mobile based suggestion system that utilizes Natural Language Processing (NLP) Techniques to automatically process and classify keywords. Therefore, this study would provide more information on the implementation of a mobile based suggestion box system.

IV. METHODOLOGY

Quantitative and exploratory research approaches were adopted in this research study. The sample size of a study is a subset of the total population. In this study, a sample that comprises of 245 students was used to represent the total population of about 15000 students from both private and public colleges in Windhoek.

In this study, surveys, SMSs from cellphones as well as physical suggestion cards were used to collect complaints and suggestions from all the stakeholders. After collecting the data from the stakeholders, common key words were collected and classified. Based on the data collected, a prototype was designed that could classify key common words that was used when stakeholders were launching the complaints and suggestions. The automatic text classification was done using NLP techniques. The use of different data collection techniques was helpful in identifying the most common keywords used by stakeholders. In addition, the various responses were also cross compared.

A. Online survey

Large-scale data collection can be achieved through the use of online surveys. Generally, the online surveys were used to collect information regarding the current operations of the suggestion boxes at different colleges. Furthermore, the online surveys were used to collect information on the challenges that are faced when using physical suggestion boxes. The participants were also asked to provide their views on implementing a physical suggestion box in colleges and universities.

B. SMS

In order to collect complaints and suggestions from stakeholders, a cellphone number was made available. Participants were ordered to send all their complaints or suggestions through that cellphone number. Each participant was allowed to send as many suggestions and complaints as possible. This was done to ensure that common key words could be collected and used in designing the prototype.

C.   Physical suggestion cards

Students at selected colleges were also asked to write their suggestions or complaints on the physical suggestions cards. These physical suggestion cards were distributed to the students during a class session. They were asked to write their complaints and suggestions and written the cards immediately before they go out of the classroom. This was done to ensure that the cards will not get lost. The students were not asked to write their names for anonymity. The dictionary topics were created using the common keywords collected through SMSs, online surveys and physical suggestion cards. In addition, these common keywords were used as the testing data for the prototype which was developed.

V.   RESULTS ANALYSIS

Survey Monkey was used to extract the data from surveys and computing the descriptive statistics. Moreover, SPSS and Excel software were used to analyse quantitative data. All the data collected through online surveys, SMSs and physical suggestion cards was analysed in detail. The stakeholders listed all the challenges, complaints and suggestions in the form of written sentences. Common keywords were then extracted from these sentences to form data dictionary. The Jaccard Similarity Index was used to obtain the reliability of the keyword analysis. The sections below outlines the results from the data collected.

A.   Benefits predicted if mobile based suggestion box are adopted in colleges and universities.
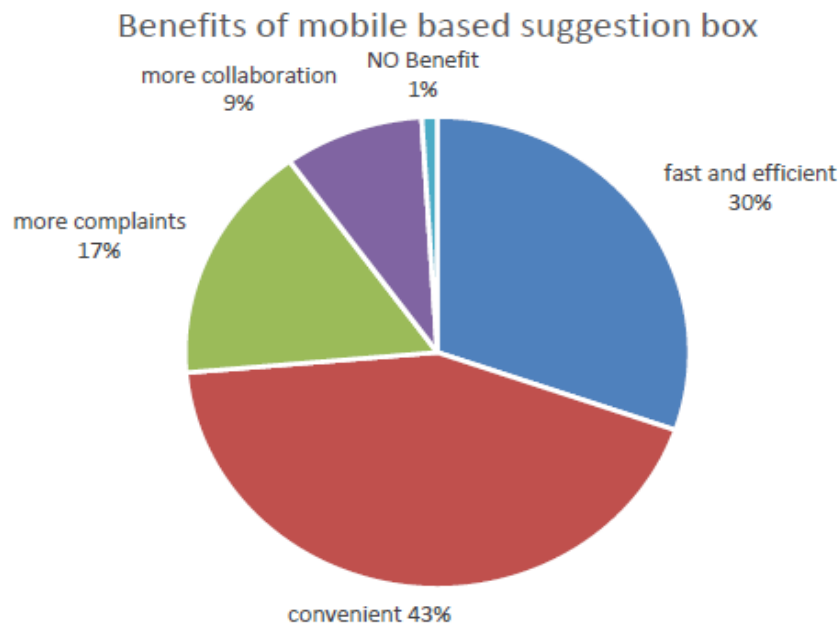

Figure 2. Advantages anticipated due to the use of mobile based suggestion box

As indicated by the figure 2 above, the results indicated that 30% of the respondents were of the opinion that mobile based suggestion box systems were fast and efficient. In addition, 43% of the participants acknowledged that mobile based suggestion box systems are more convenient compared to the physical suggestion box systems. Furthermore, 17% of the participants noted that more complaints and suggestions could be received and processed if mobile based suggestion system is adopted in colleges and universities. The results also indicated that 9% of the participants noted that mobile suggestion boxes would enable more interaction and connection between the stakeholders and the school administration. However, only 1% of the participants were of the opinion that the implementation of mobile based suggestion box systems at colleges and universities has no benefit at all. Nevertheless, this is a very small number as compared to the other participants who noted the positive impacts of adopting the mobile based suggestion box systems.

The results are in line with [12] who noted that electronic suggestion boxes are better than physical suggestion box systems. Reference [12] noted that the electronic suggestion box systems help the organisation to make more feedback from people and hence can help the organisations to make better decisions.

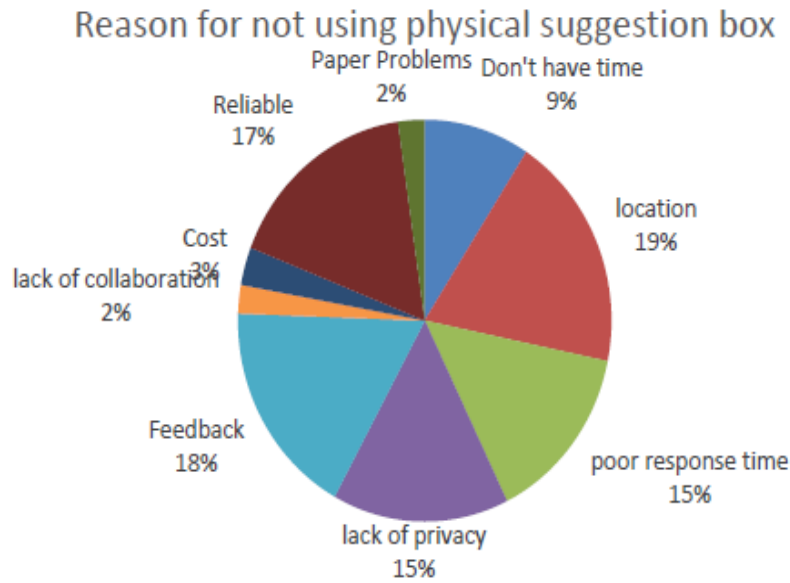*B. Details why physical suggestion boxes should not be used.*

Figure 3. Details why physical suggestion boxes should not be used.

Figure 3 above has illustrated the reasons obtained from the study results as to why participants are not using physical suggestion boxes. The study results indicated that the reasons for not using physical suggestion box systems are associated with paper problems (2%), lack of time (9%), location of the suggestion box (19%), poor response time (15%), lack of privacy (15%), feedback (18%), lack of collaboration (2%) and reliability (17%). All these problems cited could be removed if the physical suggestion box systems are replaced with mobile suggestion box systems.

C. Challenges associated with physical suggestion boxes
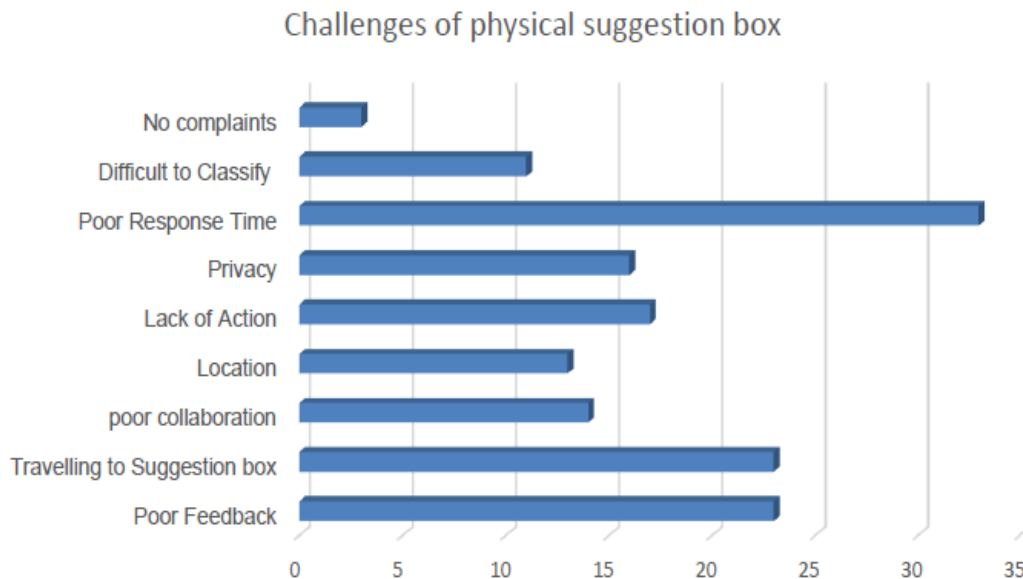

Figure 4. Challenges associated with physical suggestion boxes

Figure 4 above has outlined the challenges that are associated with physical suggestion boxes. The study results indicated that the following are the major challenges of using the physical suggestion box systems. Most of the participants noted that poor response time, poor feedback and the time taken to travel to a suggestion box is the major challenges that are faced when using physical box suggestion box systems. Very few participants noted that there is no problem associated with using the physical suggestion box systems. All the challenges that are outlined in Figure 4 can be minimised if the mobile based suggestion box system is implemented in all the colleges and universities.

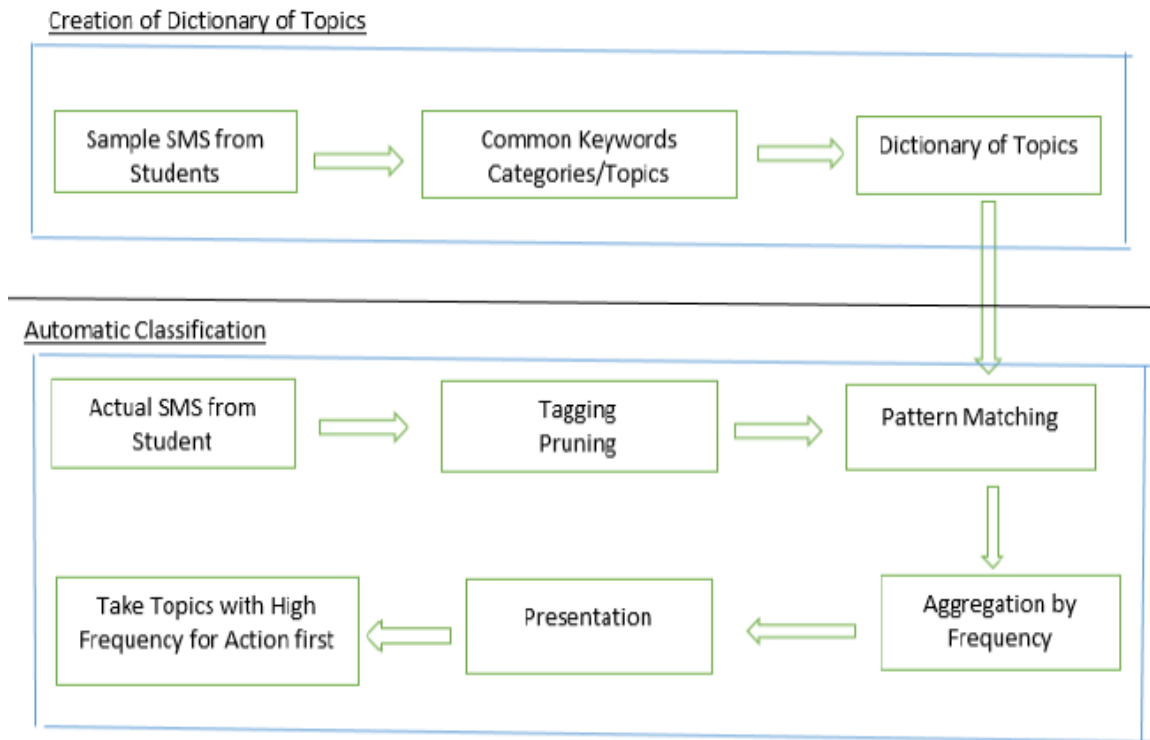## VI.   PROPOSED DESIGN OF A MOBILE BASED SUGGESTION BOX SYSTEM

Figure 5. Proposed design of a mobile based suggestion box system

Figure 5 above shows the proposed design of a mobile based suggestion box system. The first step is the creation of the dictionary topics followed by the automatic text classification.

A.   Creation of dictionary topics

An algorithm implemented in Python version 2.7.11 was developed to receive and classify all the complaints and suggestions using NLP techniques. A dictionary is then created using keywords that were used to construct the sentence in a complaint or suggestion. The keywords for example are as follows; 'lecturer', 'WI-FI', 'clean', 'admin'. The positive and negative words that are used in constructing the sentences can also be used for example 'high' or 'low'. After the dictionary topics are constructed, the automatic classification will then be done.

B.   Automatic Classification

In the proposed prototype, the SMSs from stakeholders were used. Tagging and pruning was also done when the sentences are received from the stakeholders in the form of complaints or suggestions. Tagging and pruning involves stemming and lemmatizing, synonym matching and removal of stop words.

C.   Finding Common Keywords

1) *Tagging* – Tagging involves grouping together the words into categories such as nouns, verbs, adverb, and adjectives and so on. Figure 6 below shows the key of tags and their meanings.

Tag	Meaning
ADJ/JJ	adjective
ADV/RB	Adverb
CNJ	conjunction
CC	coordinating conjunction
DET	determiner
EX	existential
FW	foreign word
MOD	modal verb
NN/N	noun
NP	proper noun
NUM	number
PRO	pronoun

Figure 6. Key of tags and their meaning

The data before tagging would read as "The fees are too high". The data after tagging would be as follows; ['The', 'DT', 'fees', 'NNS', 'are', 'VBP', 'too', 'RB', 'high', 'JJ'].

2) *Topic Pruning* – Just after the tagging process is completed, the topic pruning will start. This is the process of identifying the reliance of words used in the sentences.

3) *Stemming* – This is the procedure of decreasing modified words to their base form or word stem. In this context, a stem is a form to which affixes can be attached. Various stemming methods can be used for example the Porter stemming method. The main reason for stemming is to define and match all the words with the same stem. After stemming, the sentence will now read as follows; ['the', 'fees', 'are', 'too', 'high'].

4) *Lemmatizing* - It is the method of alignment together the various words that are used to construct a sentence so they can be analysed as a single item. Therefore, the sentence after lemmatizing will read as follows; ['the', 'fee', 'are', 'too', 'high'].

5) *Removing stop words* – This involves removing some words in a sentence that has no much value to the meaning of the words. The words such as 'of', 'an', 'a', 'in', 'are', 'the' etc are removed during the removal of stop words stage. The sentence will now read as ['fee', 'high'] after removing the stop words.

6) *Synonym Matching* – PyDictionary could be used to merge synonyms for topic cleaning. Generally, Synonym matching comprises of the following processes;

   - Identify synonyms of a given word, e.g. 'high' and 'fee' and assign them to lists.
   - Synonyms of 'fee' are ['fees', 'subscription', 'charges', 'levies', 'costs', 'tuition', 'tolls' ,'account', 'bills'].
   - Synonyms of 'high' are ['high', 'great', 'extra ordinary', 'tremendous', 'huge']

7) *Pattern matching* – The process of pattern matching consist of identifying the most significant topics using keywords.

VII. CONCLUSION

The study has examined in detail the problems that are faced with the traditional physical suggestion box systems. In addition, the study has proposed implementing a mobile based suggestion box system to overcome the problems of the physical suggestion box systems. The prototype to identify and classify common keywords was designed using NLP techniques and Python programming language. Common keywords were extracted from the data gathered from SMSs, online surveys and physical suggestion cards. The implementation of a mobile based suggestion system has major advantages and should be adopted and replace the physical suggestion box systems.

REFERENCES

[1] Chiao-Chen and C. Yang-Chieh, "Comparing consumer complaint responses to online and offline environment," Internet Research, vol. 21, pp. 124-137, 2011.

[2] G.A. Miller, WordNet: Anon-line lexical database. International Journal of Lexicography3(4), 235-312, 1990.

[3] J. Daintith, "Dictionary of Computing", Oxford quick reference (5th. ed.), 2006.

[4] K. Coussement and D. Van den Poel, "Improving customer complaint management by automatic email classification using linguistic style features as predictors," Decision Support Systems, vol. 44, pp. 870-882, 2016.

[5] NUST, Regional Centres At Namibia University of Science and Technology. Retrieved from http://www.nust.na/?q=centres/coll/regional-centres, 2016.

[6] P.B., Muyinda, E., Mugisa, and K. Lynch, "M-learning: the educational use of mobile communication devices. Strengthening the Role of ICT in Development", 72.

[7] Park, H., Ribière, V., & Schulte, W, "Critical attributes of organizational culture that promote knowledge management technology implementation success". Journal of Knowledge Management, 8(3), 106-117, 2015.

[8] R. Johnston, "Linking complaint management to profit," International Journal of Service Industry Management, vol. 12, pp. 60-69, 2001.

[9] S. Black, "Introduction to public relations". London,Modino Press Ltd, 2013.

[10] T. Bomble, R. Raut, R. Kanekar, and S. A. Husen, "Android based complaint management system for municipal corporation," Journal of Engineering Research and Applications, Vol. 5, pp.64-66, April 2015.

[11] UNESCO, "Mobile learning for teachers in Africa and the Middle East: Exploring the potentials of mobile technologies to support teachers and improve". Retrieved from http://practices.unesdoc.unesco.org/images/0021/002163/216358e.pdf, 2012.

[12] V. Bosch and F. Enriquez, "TQM and QFD: exploiting a customer complaint management system," International Journal of Quality and Reliability Management, vol. 22, pp. 30-37, 2005.

[13] Pimpri Chinchwad Municipal Corporation, "SMS and Web-Based Complaint Monitoring System," Viewed Jul. 2012; http://www.asci.org.in/ICT/.

[14] Ahmad Shukri Mohd Noor, "Distributed Java Mobile Information System," Communications of the IBIMA, vol. 10, 2009.