

Chapter 1

Introduction

The goal of sentiment analysis is to ascertain if a statement's representation of feelings or attitudes regarding the text is positive, negative, or neutral. It is utilized for brand reputation, consumer comprehension, and social media sentiment analysis. Sentiment analysis is a sort of text research or text mining that uses natural language processing (NLP), machine learning, and statistics to extract information from a text. People experience a wide spectrum of emotions, including sadness, happiness, interest and disinterest, positivity and negativity, yes or maybe no, and others. A machine can mechanically learn to recognize emotion with the right dataset (in text). A corporation can use sentiment analysis to assess the aspect-based sentiment, the orientation specificity of such a company's product or service, and to identify and examine emotion and intent. Customers use sentiment analysis to monitor brand recognition and make decisions, and businesses use it to evaluate customer satisfaction and assess comments on social media and other information. For a person, sentiment analysis aids in decision-making. For instance, a person looking to purchase a motorbike at great velocity can use an algorithm to determine whether a text discussing fast velocity is good, bad, or neutral. Additionally, when marketers comprehend their clients, they may answer in the greatest approach feasible. When a corporation is aware of the attitudes of clients about a product, it may guarantee better service and deliver the special equipment. This research will leverage a dataset compiled from Glassdoor and apply several machine learning algorithms to the dataset comprising employee evaluations of their jobs. Each word in a sentence will be transformed into phrases or other words using tokenization techniques. To ascertain the sentiments of the audience, the technique examines the order and context of the situation of each phrase. After conducting studies on several sentiment analysis on different platforms. For example- Nasa Zata Dina and Nyoman Juniarta conducted a study on Aspect based Sentiment Analysis of Employee Review Experience carried out in April 2020 had accuracy reaching more than 90. This paper is based on supervised machine learning to assist us with a better sentiment analysis technique or result. The collection of our dataset will be discussed first. After that, different pre-processing techniques will be used, such as data cleaning, tokenization, lemmatization, removing punctuation, and stop words. After data preprocessing, different machine learning techniques like Naive Bayes Classifier, K-Neighbors Classifier(KNN), Random Forest, Support Vector Machine (SVM), Logistic Regression and deep learning techniques like Long Short Term Memory(LSTM), Gated Recurrent Unit(GRU), Convolutional Neural Network(CNN) will be used. For evaluation,

different evaluation methods will be used, such as Precision, Recall and F1-Score.

1.1 Research Problem

Finding a job has become more difficult as a result of COVID-19 since there is more competition now than there used to be. Many workers lost their jobs during the epidemic, some of them changed careers, and many more. 21% of people in Japan are dissatisfied with their current job [13]. Many people believe that their employment is a means of support. Company culture is an important factor in influencing employee satisfaction, according to 74% of American workers [13]. The nature of the task, the level of the work, the connection with the supervisor, and a variety of other factors affect an employee's satisfaction. If a worker is happy, an organization will be in business for a very long period. Increasing employee satisfaction may boost morale and contentment with the company, which increases overall organizational effectiveness. Job satisfaction is essential for an employee's professional advancement, physical and emotional well-being, and a host of other factors. Job happiness is crucial for both the employee and the employer. Employee reviews need to be evaluated, and extensive studies are needed to determine work satisfaction and the elements associated with it.

Glassdoor is America's top destination when it comes to looking for a job. According to Internet Glassdoor, there are 114 million employer reviews, CEO approval ratings, salary reports, and other employment-related data in their database. Current or former employees don't have to worry about violating company rules when they post anonymously on Glassdoor. Here, workers are asked to assess the benefits and drawbacks of a specific organization. Since it is anonymous, they are unlikely to find their honest point of view. A human individual, however, is unable to go through all of these reviews to determine whether or not they are favorable. It is necessary to examine all of this data systematically as a result. As a result, it is possible to obtain relevant information by analyzing Glassdoor data. The employee's voice may be heard in online evaluations and the qualities that the employee values most should be examined to determine the level of satisfaction brings. Satisfaction internet statistics do have certain limitations. The quality of this review, for instance, cannot be guaranteed as everyone is free to share their opinion online.

The first step is to get information from Glassdoor. Web scraping is used to gather data, which is then saved in a database. The entirety of the data is presented in human-readable language. All data is processed using Natural Language Processing (NLP) so that the computer can interpret it. Phases of Natural Language Processing include data processing and algorithm development. Data must be pre-processed after it has been collected. Pre-processing transforms raw data into a format that is both convenient and effective. To decide if the data is favorable, negative, or neutral, the emotional approach is employed. Furthermore, the sentimental analysis can be used to identify emotions like joy, rage, despair, or dissatisfaction. This helps to clarify employee satisfaction. Researchers and entrepreneurs have made several attempts to extract relevant information from product reviews. Much earlier research emphasized external client happiness or product reviews. In the meantime, only a few studies are interested in surveying internal customer (employee) satisfaction. Employee motivation, performance, and other factors are all closely tied to employee satisfaction. Employee happiness and company performance have previously been

studied, as well as the relationship between organizational culture and workplace satisfaction and other factors. However, there are relatively few studies that use internet reviews and draw conclusions about those variables to examine job satisfaction. Therefore, the goal of this project is to use machine learning techniques like Naive Bayes, Decision Tree, K- Nearest Neighbors and some deep learning methods like Long Short Term Memory(LSTM), Gated Recurrent Unit(GRU), Convolutional Neural Network(CNN) to train and categorize data.

1.2 Research Objectives

The sentiment is a feeling-driven attitude, idea, or judgment extracted for reviews. The method of sentiment analysis can evaluate sentiment polarity like whether a person reacts positively or negatively or neutrally on a topic using the text or dataset. Almost every brand, company, and organization uses sentiment analysis to get an idea of their brand value, product improvement, etc. The Internet is a useful resource for gathering sentiment data, as users may share their ideas on a variety of social networking sites. With the growth of information and communication technology (ICT), sentiment analysis has become a necessary technique as a result of user-created material on internet platforms to disentangle consumer sentiment information about a product or service. Researchers believe that exposing application programming interfaces (APIs) and encouraging data collection on social networking sites would help expand the scope of sentiment analysis. The objective here is to collect employee reviews about their job on the glassdoor.com website and then analyze those to determine whether their attitude towards their job was satisfactory or not using machine learning techniques. So, the objectives are:

- Understanding the application of algorithms like Naive Bayes, Decision tree, LSTM, GRU, word embedding technique, stemming, and overall natural language processing (NLP).
- Sentiment classification of targeted reviews from glassdoor
- Developing a model for evaluating the sentiment with the probable best accuracy
- Suggest improvements to the current model

Chapter 2

Background

2.1 Literature Review

According to evaluations on glassdoor, this document offers the results of a survey of employees' job satisfaction. Over 600,000 companies have ratings and reviews available online. Recently, many individuals have lost their employment, many are dissatisfied with their work conditions and perks, and there has been continued price inflation. Through this study, various businesses, groups, and polarity in the work satisfaction rate will be identified.

ELM (Emitted Light Modulation) is used in the study [12] for aspect-sentiment embeddings. The authors first gathered data from Glassdoor.com, then they afterward tokenized the reviews into sentences using the NLTK Tokenize Package. The raw text is then transformed into review-level summary embeddings. They finally used the ELM algorithm. In their dataset, the workers' incomes, locations, work-life balance, etc. were utilized. The accuracy rate for the study was 95%.

The authors of the research [29] looked outside the office setting and employed browsing and text analytics to establish the indoor work environment. Additionally, it advocated enhancing the working circumstances of those who are most negatively impacted by poor indoor environmental quality. Its findings also identify the most important IEQ factors across a range of industrial sectors and job roles, a finding that can be of great use to businesses, particularly in those areas where IEQ accusations are found to be most widespread. However, automatic information extraction using an iterative cleaning method is not always able to retrieve all the relevant data. Additionally, the repeated cleaning method used for automated information extraction might not always yield accurate results. Future research on the significance of both the soundscape within workspaces, as well as acoustic measurements and investigations, are all actively encouraged. With a 99.99% accuracy rate, it worked utilizing 1,158,706 English employer review outcomes.

The purpose of the study [5] is to offer a fresh perspective on how to examine employees' job satisfaction and how it relates to organizational performance. This study pulls anonymous employee reviews from glassdoor.com for textual analysis. It looked at the connection between worker happiness and business performance using user text mining. The major focus was on the connection between customer satisfaction and company financial success, and it was discovered that there is a positive correlation between employee contentment and share prices. It inspires other scholars to think about the expansive setting that a text processing technique enables.

However, companies with fewer than 10 reviews are subsequently removed from the list. It gathered a total of 274,061 reviews between 2008 and 2014. Furthermore, the authors were unable to use more sophisticated regression analysis, control the industrial sector, and examine each industry separately. Additionally, it used nine categories and keywords for this study, but it is possible to use additional categories and keywords and construct more sophisticated extraction methods. For its study, three models were employed.

According to the study [34], regardless of the type of investment, businesses with significant operating cash flow growth have a high level of employee satisfaction with "accomplishment" and "promotion." This study used the KH (Koichi Higuchi) coder and sentiment classification to analyze the text of online reviews. It also divided each organization into groups depending on its corporate performance and ran a regression analysis to determine the relationship between employee happiness and corporate performance. Using the "growth rate of operating cash flow" and "ratio of making an investment cash flow to operating cash flow" indicators, this study classified the target companies into four dimensions using the NIKKEI VALUE SEARCH system, a powerful business intelligence tool that offers comprehensive corporate financials, economic data sets, and news and industry reports. The study did identify a link between employee happiness, company operating company's financial quality, and top management attitude toward investment, but it did not fully confirm the mechanism behind this connection. The accuracy percentage for this research article was 81.7%.

The job seeker may pick which firm best meets his needs and abilities with the aid of the study of the research review [17]. To remove any incomplete data, the raw data were processed during the data pre-processing step. Additionally, Stanford POS Tagger was used to remove any terms other than the noun keywords. This work employed user review data that was crawled from Glassdoor and saved in a database. The noun keywords were thereafter divided into each category. Finally, using the aspect-based sentiment analysis, the aspect score was determined. However, it was unable to tell if the evaluation was objective or only intended to harm some businesses. The accuracy percentage for this research article was 92.3%. This paper worked on EB that intelligence [20] can play an essential role in understanding the brand image and sentiments of current and old employees. It means that the company may utilize a variety of methods to learn about how employees feel about the many EVPs (Executive Vice Presidents) they offer and how they feel about the company's brand. The current research offers HR managers information on how to keep up with emerging employer branding tools and tactics, but it does not offer specific development plans for certain EVPs. Additionally, it offers suggestions on how an employer might raise the EB's social or interest value. On the other hand, the study can examine the tendencies in a particular sector where specialized expertise is required, like IT or knowledge management.

For this study's [18] rating and review data, which were accessible from 2012 to 2017 on the employment site Indeed, as well as financial information, which was gathered from the financial records of publicly traded organizations, were used. For 2,738 firms, there were 1.24 million reviews. The results showed a substantial positive association between job rating and financial success as determined by considering all three relevant factors. Although the data were conflicting when looking at relative within-firm impacts, it was discovered that reviews and financial results had a

positive association in the cross-section. This essay has an accuracy percentage of 88%.

A semi-open question appears to be effective for gauging work satisfaction in the paper, according to the study [26]. Furthermore, the study’s findings suggest that depending on the context, particular words would naturally have different sentiment ratings.

On the other hand, this study simply created a measure of work satisfaction from the textual replies, demonstrating the imperfect dependability of text measures derived by computer-aided sentiment analysis. The development of more dependable methods to create text measures and get closer to the measurement-error-free sentiment measure might be the focus of future studies.

To study online employee reviews of their employers and find work satisfaction characteristics concealed in the reviews for the research, methods employed the modeling approach, one of the common text mining techniques [13]. It was able to gather important information that helped it decide how to motivate workers to have more job satisfaction than before. Though the reliability test results for the topic modeling technique demonstrate acceptable levels of agreement, compared to humans, it still has relatively low levels of understanding. Because supervised learning algorithms require human supervision and may successfully identify work satisfaction components from the reviews, future studies may utilize them to extract job satisfaction factors from online employee reviews. More data may need to be gathered and used in future studies to provide more broadly applicable results. It achieved a 99.99% accuracy rate.

According to the paper [6], which used these datasets to examine the effects of relative earnings within an occupation and an employer, relative income within an occupation—rather than absolute income or relative income within a firm—indicates the key factor influencing job satisfaction resulting from changes in income. Although their findings are in line with prior research predictions, they differ in terms of how much salary affects work satisfaction. As the precise reasons influencing various components of a job remain unclear, this gave future studies on worker happiness a direction. The accuracy of this study is 99%.

The authors of this study show actual findings on four text classification issues using various iterations of the multinomial naive Bayes classifier. They also discuss a method for enhancing the classifier using locally weighted learning. They demonstrated that some of the adjustments contained in TWCNB may not be required to get the best performance on particular datasets by contrasting traditional multinomial naive Bayes with the recently developed distorted weight-normalized complement naive Bayes classifier (TWCNB) [1]. Additionally, the researchers demonstrated the value of TFIDF conversion and document length normalization. Additionally, it demonstrates how multinomial naive Bayes may do better utilizing least squares learning and how support vector machines might occasionally beat both approaches by a large margin.

Unlabeled documents were implemented by the authors of the work [2], but their usage, in reality, is frequently constrained because of their difficulty to construct, inconsistent prediction results, or high computational cost when employing Multinomial Naive Bayes (MNB). In terms of AUC and accuracy, they attempted to enhance MNB with new data (labeled or unlabeled), which is not the case when combining MNB with Expectation Maximization (EM).

The Multivariate Bernoulli Nave Bayes Classification and the Multinomial Nave Bayes Classification are the two widely used Nave Bayes Text Categorization methods that the authors of [14] used to determine if the sentiment of the news story is positive or negative. The research also tries to determine which of the two methodologies presented works better for the dataset in question.

The goal of the study was to apply a machine learning method called Bernoulli's Naive Bayes Classifier to identify false news. This algorithm is an extended form of Multinomial Naive Bayes and uses predictors that are Boolean variables with values of 0 and 1. Gaussian Naive Bayes was used in earlier investigations [24]. Their suggested technique divides the input information into two categories, 00 for fake news and 10 for real news articles. Additionally, it is noted that the outcomes are improved in comparison to Gaussian Naive Bayes. According to the trials, Bernoulli's Naive Bayes Classifier produces better classification results than Gaussian Naive Bayes. Accuracy, precision, recall, as well as the F1 measure, are all compared. The precision is improved by 10%, precision by 15%, and F1 measure by 6%.

Three binary decision trees, each trained using a deep learning model with a convolution neural network focused on the PyTorch frame, were used by the authors of [27] in an effort to categorize data. The CXR pictures are categorized as normal or abnormal in the first decision tree. The third tree does the same function for COVID-19 whereas the second tree detects the aberrant pictures that contain symptoms of TB. The first and second choice trees' accuracy rates are 98 and 80%, consecutively, while the third decision tree's accuracy rate is 95% on average. Pre-screening patients for triage and quick decision-making may be done using the suggested deep learning-based decision-tree classifier.

When analyzing the effects of wrapper and filter selection methods on classification performance, the authors of [23] attempted to compare their findings. The Correlation Feature Selection (CFS), Information Gain (IG), and Chi-Square (CS) filter techniques have all been taken into consideration. The Best First Search (BFS), Linear Forward Selection (LFS), and Greedy Step Wise Search (GSS) wrapper approaches have all been taken into consideration. The WEKA tool has been used to create a Decision Tree algorithm as a classifier for this investigation.

By using split criteria at each node to separate the employee data among sections with exogenous variables belonging to the same class, decision trees are constructed iteratively. The procedure begins at the decision tree's root node and moves forward by applying split criteria through each non-leaf node to produce homogeneous subsets. However, according to the researchers [25], it is impossible to create pure homogeneous subsets. They suggested using metrics like the GINI index and gain ratio to gauge how good the split was. Additionally, they attempted to compare the GINI index versus knowledge gain empirically. Application of the Index value and Information acquired separately results in the construction of classification models that used a decision tree classifier technique. The models' classification accuracy was estimated utilizing different metrics such as Confusion matrix, Overall accuracy, Per-class accuracy, Recall, and Precision.

In order to evaluate the performance (as analyzed by correctness, precision, and recall) of both the KNN using a large number of parameters, assessed on a variety of real-world data sets, while and without adding different levels of noise. the authors of the paper [10] make an attempt to address this question. The experimental findings demonstrate that the KNN classifier's performance substantially depends

on the distance employed, with considerable performance gaps across different distances.

The authors of [22] determined the location of the nearest neighbor by applying the Euclidean distance formula, as opposed to earlier ways that maximized the euclidean distance by evaluating it with other related formulae to reach perfect results. Their work investigated the calculation of something like the distance measure formula in KNN in comparison both with normalized distance measure, manhattan, plus normalized manhattan in order to acquire the best results or best value when calculating the distance to the nearest neighbor.

After processing the data, [33] the authors are then identified and use a supervised KNN classification technique. The algorithm divides the information into neutral, bad, and positive categories. These seminars speak to the broad public whose Tweets are taken in for examination. They performed sentiment analysis using the LDA machine learning method on this data. It is discovered that the discussion of COVID-19 includes a large amount of dread.

The best categorization technique is the decision tree. The outputs of the decision tree, according to [32] experts, might reveal mistakes brought on by overfitting or noisy data. As a result, the tree could grow overly large and have extra nodes and branches. Pruning is performed within the decision tree to deal with the mistake rate.

Long Short-Term Networks (LSTM) were tested by the researchers [11] for the automatic fake-news detection job. 36 model configurations are tested on two real-world datasets for the binary, end-to-end classification goal of automatically identifying false news. According to the experimental findings, bidirectional LSTM models with generative model word embeddings and, whenever appropriate, an adjusted multiplier factor exhibit strong discriminative ability in automatically classifying fabricated news.

After being present, a hypernymy link between compound entities is detected using the authors' [8] attention-based Bi-GRU-CapsNet model. They have included numerous significant elements in their model. English words or Chinese characters from compounded entities are supplied into the bidirectional gated recurrent units in order to circumvent the out-of-vocabulary issue. To concentrate on the distinctions between two compound entities, an attention mechanism is used.

The authors of [9] suggested a bi-directional hierarchical multi-input and output model-oriented recurrent neural network that takes into account both the lexical and semantic content of emotional expression. Their approach generates sentence and portion of speech representation using two separate Bi-GRU layers. The result of the softmax activation on the section of the speech representation is then considered while paying attention to the lexical information.

The researchers [19] used statistics, individual biographical data, and combined sequential behavior data from a VLE to try and predict students' success in a certain

course as it is being taught. In order to do this, a brand-new RNN-gated GRU combined neural network is developed, in which the data completion method is also used to fill in the missing stream data. This network can fit both static and sequential data. Three different time-series deep neural network algorithms—simple RNN, GRU, and LSTM—are initially taken into account to consider the sequential relationship of learning data.

The authors of [3] concentrated on the assessment of each of the traditional gated architectures for language modeling with voice recognition with a big vocabulary. They assess the highway network, lateral network, LSTM, as well as GRU specifically. Additionally, LSTM and GRU can benefit from the same drive that underlies the highway network. It has recently been suggested to add an extra highway link between the memory cells of neighboring LSTM layers in an expansion that is exclusive to the LSTM.

The authors of the research [28] suggested using a more holistic approach to create a more adequate foundation from which to construct a comprehensive knowledge of DL. In particular, this analysis aims to give a more thorough overview of the most crucial DL components, taking into account any recent advancements. Specifically, their study describes the significance of DL and offers the various DL networks and methodologies. The most common DL network type, convolutional neural networks (CNNs), is next introduced. Their evolution and key characteristics are described, for example, starting with the AlexNet network and ending with the High-Resolution network (HR.Net).

The authors of [31] outlined CNN’s tenets and distilled the reasons why they were especially well suited for vegetative remote sensing. The primary section summarized current trends and advancements, taking into account factors like spectral resolution, spatial granularity, various sensor types, modalities of generating reference data, sources of already-existing reference data, and CNN techniques and architectures. The analysis of the documents revealed that CNN may be used to solve a variety of issues, such as the identification of specific plants or the pixel-by-pixel segmentation of vegetation types, and that it performs better than shallow machine learning techniques in multiple studies. According to several studies, the utility of data with the extremely high spatial resolution is notably facilitated by CNN’s capacity to exploit spatial patterns. The typical deep learning frameworks’ modularity provides for a significant degree of flexibility for the adaptation of architectures, whereby especially multi-modal or multi-temporal applications can benefit.

In order to operationalize OC as a word vector representation, the researchers employed a variety of job characteristics. They [16] utilize text from 650k distinct Glassdoor reviews to confirm this model. They then provide a way for applying their concept to Glassdoor evaluations in order to measure the OC of workers by industry. Additionally, they validate our OC measure using a dataset of 341 employees by offering empirical proof that it contributes to the explanation of job performance. They talked about how their research may be used to develop tools and guide actions aimed at enhancing worker performance.

The researchers [30] look at how businesses react to the greater workplace openness brought on by Glassdoor.com, which gathers and shares employee happiness evaluations. They were using a difference-in-differences design to take advantage of the staggered timing of the first reviews on Glassdoor and discover that after receiving reviews on the site, companies improve their workplace practices as indicated by corporate social responsibility results on human resources and diversity. They discover that this increase is concentrated in companies with poor initial assessments and high labor intensity, which is consistent with businesses upgrading their workplace procedures to maintain their competitiveness in the labor market. The rise is concentrated in businesses with significant institutional ownership, which is consistent with the idea that businesses are making more disclosures regarding workplace policies in order to satisfy regulators.

2.2 Algorithms

Sentiment analysis is identifying the emotional undertone of a text in order to discover whether it is favorable, negative, or neutral. As a starting point for sentiment analysis, the straightforward and understandable model of logistic regression is frequently utilized. The likelihood that a given text belongs to a specific sentiment class is modeled using a logistic function.

Support Vector Machines (SVMs): SVMs are known for their good performance on small and high-dimensional datasets. They use the idea of finding a hyperplane that maximally separates the different sentiment classes in feature space.

Naive Bayes: A notable probabilistic technique for sentiment analysis is naive bayes. It is based on the Bayes theorem and may be applied in a variety of ways, including Bernoulli, Multinomial, and Gaussian Naive Bayes.

Random Forests: As an ensemble approach, random forests mix different decision trees to create a more robust model. They are suitable for sentiment analysis and are especially helpful for handling unbalanced datasets.

KNN: The supervised learning method K-nearest neighbors (KNN) is used for the classification and regression applications. Finding the k-number of data points that are the closest to a particular data point allows the method to identify the object depends on the classifier or mean value of the nearby points. It's a straightforward approach that works well with both normal and quasi data. KNN's key benefit is that it is simple to comprehend and use, but when the data set is big, it may be prohibitively costly.

Bi-CuDNNLSTM: A recurrent neural network (RNN) architecture that makes use of the bidirectional processing technique and the CUDA-accelerated implementation of LSTM (CuDNN) is known as Bidirectional CuDNNLSTM (Bidirectional CuDNN Memory (lstm Memory).

Bi-GRU: The gated recurrent unit (GRU) architecture and the bidirectional processing method are combined in the bidirectional gated recurrent unit (Bi-GRU) kind of recurrent neural network (RNN) architecture. A Bi-GRU, like a standard GRU, employs gating methods to regulate the flow of data through the network, enabling it to choose whether data from earlier period steps to keep or reject.

Simple Gated Recurrent Unit (GRU): A Gated Recurrent Unit (GRU) is an example of a recurrent neural network (RNN) design that use gating methods to regulate the flow of input through the network. As a result, the network may process data sequences more effectively and efficiently by choosing what data from earlier time steps to keep or discard.

CNN: Deep learning neural network architectures known as convolutional neural networks (CNNs) are particularly effective in processing images and videos. CNNs are built to dynamically and efficaciously learn provides advanced of characteristics from input data and are prompted by the organization of the visual cortex.

1dCNN-BiCuDNNLSTM:1dCNN-BiCuDNNLSTM is a form of neural network architecture that combines the advantages of CNNs with bidirectional LSTMs. It consists of a 1D Convolutional Neural Network (1D CNN) and a bidirectional CuDNN LSTM (Bidirectional CuDNN Long Short-Term Memory). 1D CNNs are specialized CNN architectures that are designed to process one-dimensional data, such as time series, audio, or text. They use convolutional layers that are able to scan the input data in one dimension and learn different filters that can detect patterns such as trends, cycles, and anomalies. Transformer-based models (BERT): For sentiment analysis, transformer-based algorithms like BERT may be modified using a dataset of tagged text. These models are highly suited for comprehending the sentiment of the word since they have already been pre-trained on a sizable corpus of text and can capture the text’s overall context.

These are just a few examples of machine learning models and deep learning models that can be used for sentiment analysis, and there are many other models available, each with its own strengths and weaknesses. The model used will be determined by the nature of the issue and the characteristics of the data.