Business Analysis

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Abstract- The current market scenario shows a rise in the number of data driven organizations that rely on data to make business process decisions. Although there have been a few studies that have employed machine learning and AI with promising results. This project distinguishes itself from all of them in a very fundamental way. The proposed system aims to perform a stringent financial ratio analysis using Data Science. This would enable any organization to pinpoint its puncture and fix it in time as well as strengthen its strengths. The key to success lies in the interpretation of the analyzed ratios for a particular organization or firm. We intend to propose a system that aims to provide a very relevant interpretation of the analyzed financial ratios. This would enable companies, market experts as well as financially illiterate individuals to ponder in the right direction in terms of business processes.

Keywords:- Data Science, Data Analysis, Business Process Model.

I. INTRODUCTION

The current market trends suggest that more and more business organization are relying on a data-driven model for business processes. The dawn of "Age of Data" have led to wide possibility for data processing. Data has became a powerful tool from the standpoint of economic world. Due to unstable economy public sector is pressurized to enhance the performance measures implemented for understanding and managing the data. Data is available in many form such as global, international & etc. There by thorough analysis is needed to serve as an input for the formulation and implementation of the strategy. Although previous research have shown businesses use data analytics only to measure the performance which is inadequate to assure uptrend in the business functioning. Business Intelligence is recognised as a sufficient technology that can predict performance outcomes. Business Intelligence handles data manipulation, management and analysis which provides to the decision making process. Even though business intelligence manage data and it's analysis, systematic data manipulation techniques are required by modern businesses [7]. Many attempts to automate the process of analyzing the business data lack simplicity. We intend to propose a system that will automate the analysis of data in a very particular narrative. The Proposed system will calculate and analyze a company's financial ratios creating a dataset that will then be an input to a Data Analysis algorithm that will produce some remarks based on the dataset. In terms of the business process, each ratio depicts a particular aspect of a company's performance. These ratios are used by a business analyst to pinpoint faults in a business process of different companies. Some of the ratios and their meanings that would illustrate the significance of ratio analysis are:-

➢ *Liquidity Ratios*

• *Current Ratio:*

Formula:
Current Assets / Current Liabilities

Meaning: It determines the ability to clear/pay current payables in a short span. A current ratio of more than 2 indicates a company is in a stable state to pay off its obligation.

Improve by: Increment current assets by incrementing profit, faster conversion of debtors into cash, borrowing additional long-term debt, selling additional capital stock, or unloading of unproductive fixed assets and retaining proceeds. Reduce current liabilities by paying off creditors

• *Working Capital to Sales:*

Formula:
Working Capital / Total Sales

Working Capital = Current assets - Current liabilities

Meaning: It determines the value that working capital should meet daily payables in relation to the business volume

Improved by: To increase current assets and current liabilities or minimize non-profit sales while not affecting working capital

• *Working Capital:*

Formula:
Current Assets - Current Liabilities

Meaning: It measures of liquidity level of a company; working capital suppose to be at least one half of operating budget

Improved by: Increase net income to improve cash flow, should increase current assets by increasing receivable, even decreasing current liabilities by reducing short-term obligations.

• *Return on Net Worth:*

Formula:
Profit before tax / Total Net Worth

Meaning: It measures the relation between profit and net worth. Also depicts the value of yield the investors are earning from their investment

Improve by: Increase gains or decrease the debt burden

- *Return on capital employed:*

Formula:
EBIT(1-TAX) * 100/Total capital employed

- *Return on Equity:*

Formula:
PAT * 100/Shareholder's fund

➢ *Operating Efficiency Ratios*

- *Operating Expenses to Sales:*

Formula: Operating Expenses / Total Sales

Meaning: It measures the contribution of operating expenses to the overall income earned

Improve by: improve sales while maintaining the operating expenses

- *Total Assets to Sales:*

Formula: Total Assets / Total Sales

Meaning: It measures the relationship between Total Assets and Total Sales

Improve by: Increase sales or decrease non-profitable assets

- *Labor to Net Sales Ratio:*

Formula: Payroll (salaries plus fringe benefits) / Net Sales

Meaning: It depicts the involvement of employees in generating income

Improve by: Decrease employees expense by decreasing salaries, decreasing hours, or decreasing employees. Improve margins and other income with no increase in employee costs.

- *Labor to Gross Income Ratio:*

Formula: Payroll (salaries plus fringe benefits) / Gross Income

Meaning: It depicts the involvement of employees to in generating income after cost of goods sold.

Improve by: Reduce employees expense by reducing salaries, reducing hours, or reducing employees. Improve margins and other income with no hike in employee costs.

Analyzing such ratio with an automated system that uses Logistic regression techniques will provide more prominent outcomes. The algorithm will generate remarks based on these ratios that would be meaningful even to a financially illiterate being.

II. LITERATURE REVIEW

The following research articles are selected for review, keeping in mind the traditional and conventional approaches of Business Analysis:

Event log data generated during process execution serves as a valuable source for designing predictive analytics approaches for various purposes such as estimation of technical production parameters for more robust production plan optimization, detecting process specific anomalies in real-time, analyzing the behavioral patterns of customers, risk management by predicting compliance violations, resource allocation and etc [1]. Although event log is a promising system proposal, using Data Science approach with logistic regression for Ratio Analysis could better depict a department level analysis for an organization. Logistic Regression is a powerful tool for computing classification problems. According to the existing literature, the identification of business model core components can be regarded as a highly cited research objective. In contrast, there is a lack of knowledge about the actual generation of the business model. The scientific work in this sub-domain, however, involves efforts to develop methods, frameworks, standards, or languages that facilitate the development or design of new business models or the innovation of existing ones [9]. Therefore approaches toward automating the business process are essential and necessary for the constant growth of the economy. A particular study suggests Goal-Oriented Requirement Analysis (GORA). In GORA, customers' needs are modeled as goals to be achieved finally by software systems that will be developed, and the goals are decomposed and refined into a set of more concrete sub-goals. Thus, we can hold the processes of requirements elicitation and refinement as resulting artifacts of GORA. After finishing GORA, the analyst obtains an acyclic (cycle-free) directed graph called goal model or goal graph. Its nodes express goals to be achieved by the system that will be developed, and its edges represent logical dependency relationships between the connected goals. More concretely, a goal can be decomposed into sub-goals, and the achievement of the sub-goals contributes to its achievement. We have two types of goal decomposition; one is AND decomposition, and the other is OR. In AND decomposition, if all of the sub-goals are achieved, their parent goal can be achieved or satisfied. On the other hand, in OR decomposition, the achievement of at least one sub-goal leads to the achievement of its parent goal [4].

III. PROPOSED SYSTEM

Nowadays, two trends may be easily observed: the increasing importance of an IT artifact for the enterprise competitiveness, and an increasing complexity and turbulence of an enterprise and its environment. As a result of the latter one, enterprises, in order to survive, have to become agile. Although numerous understandings of enterprise agility may be found, they all agree that change sensing and responding are the key prerequisites for achieving and sustaining enterprise agility[5]. The number of Business organizations that are data driven are increasing and the trend is not expected to fade anytime soon. The key role of a business analyst is to conduct cost/benefit analysis. An analyst does this by analysing the financial statements and over the course of his/her career the analyst develops strategies for gathering, reviewing and analyzing data requirements and create conceptual prototypes and mock ups. Even after years of experience analysts cannot determine the absolute best next decision for maximum welfare and profitability. There have been attempts to automate the process of analysing businesses employing artificial

intelligence and machine learning but there is no documented successful attempt of analysing businesses by automating analysis of financial ratios. In this proposed system we are employing an algorithm to analyse the financial statements of an organization based on data science and thereby provide accurate results than a professional analysts can provide. One of the most important task in analysing any business is eliminating the unimportant data and then organising the rest. We aim to achieve this by employing our developed algorithm too. We aim to employ the three step process of logistic regression to derive the final output, that is, the next best action decision. The final output of the system would consist of a remark describing the current status of the organization and a suggestion for the next best decision to be performed. To implement the proposed algorithm, a sample data is collected from a company. Altogether 5 years data has been collected. It includes ratios such as Activity Ratios, Liquidity Ratios, Solvency Ratios and Profitability Ratio. The collected data from the organization is given to the analyst who then analyzes the data by the using graphical representations provided in the system and based on his market knowledge, the analyst sets benchmarks for every ratios. Based on how far from the benchmark is a given particular ratio in that year, the ratio is classified as HIGH or LOW/GOOD or BAD. This classified data along with the yearly ratios will be an input to a logistic regression model.
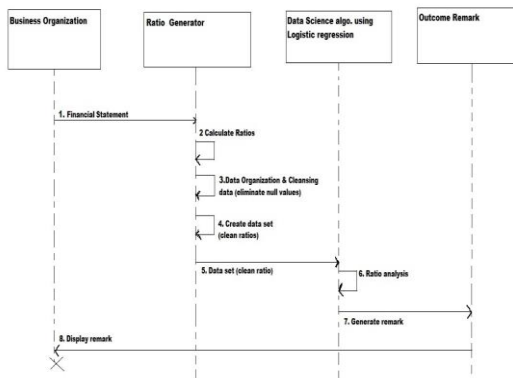

Fig 1:- Sequence Diagram

In the above sequence diagram, the system flow is illustrated with an abstract overview of the transitions among the system components (Fig.1). To illustrate the system workflow here is proposed system architecture (Fig.2).
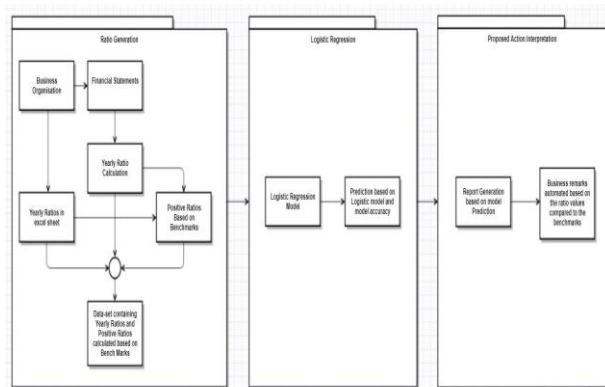

Fig 2:- Proposed System Architecture

In the figure each component interaction and the workflow is defined.

A. Ratio Generation

Every year each registered company releases their financial statements publicly. That information is used by a business analyst to determine the state of a company in terms of business and revenue. Moreover, companies themselves hire a business analyst that examines yearly statements to determine business strategies that would overcome certain punctures in a business. The proposed system works on that fundamental where business organization provides either Financial statements for the system to calculate Ratios or to directly provide yearly ratios. Every benchmark is computed based on the current market scenarios and also depending upon business sector a benchmark may vary. Furthermore, an analyst defines the benchmarks based on their intuition and market knowledge. These benchmarks are compared with the yearly ratios to conclude whether a ratio depicts positive trend or negative trend. The system creates a column where positive ratios as 1 and negative ratios as 0 . The yearly ratios along with the positive-negative ratio column are than treated as a dataset.

B. Logistic Regression

Here logistic regression model is implemented. The dataset generated by the system is passed as an input to the regression model. Positive-negative ratio column is passed as a target input and the yearly Ratios are passed as dependent input. The proposed model computes the dataset and produce prediction with the model accuracy score.

C. Proposed Action Interpretation

Based on the model predictions a report is generated. Each ratio that is calculated points toward a particular aspect of a business. For instance, if the liability ratio of a company is not as per the benchmark then it may mean that a company is not capable of paying short-term expenses or quick payments which could be a result of stock abundance, low cash in hand etc. Certain remarks can be automated by a system that would suggest improvement measures. Final report generated by the system would contain improvement remarks depending upon which ratio is showing a downwards trend (Fig.2).

IV. RESULTS AND DISCUSSION

This section of the paper explains the logistic regression model which is used for the proposed system and also the outcome of it based on a dataset acquired from an online website known as 'Money Control'. Every year each company release their Yearly financial statement in public. Using the information the proposed system can calculate Ratios based on certain formulas. Ratios are compared to benchmarks set by an analyst which determines prediction values as bad or good ratios that are represented as 0's and 1's for the predictive model.

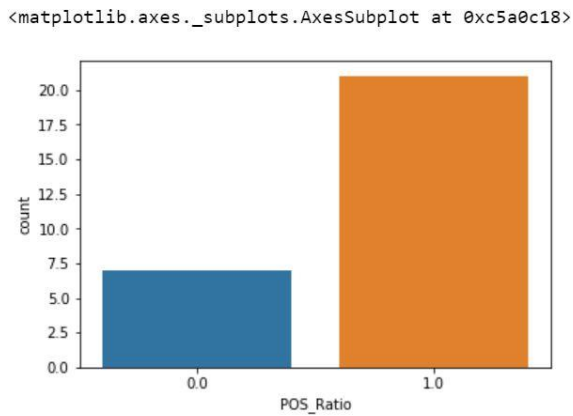`<matplotlib.axes._subplots.AxesSubplot at 0xc5a0c18>`

Fig 3:- Positive-negative ratio count of a sample data-set of 'TATA MOTORS'.

This particular figure shows the count of positive and negative ratios of a dataset which contain ratios of 'TATA MOTORS' from the year 2014 to 2018, calculated by an analyst through benchmarks using the proposed system (Fig.3). Looking at the plot itself one could derive an insight that the company is in a good state which is depicted by a large number of positive ratios. This intuition is validated by the regression model.
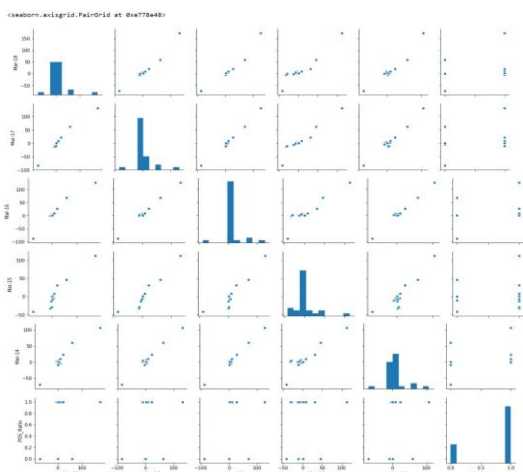

Fig 4:- Axis grid plot of a sample data-set of 'TATA MOTORS'.

The axis grid plot shows a linear relationship between the yearly ratios of the 'TATAMOTORS' dataset and a categorical nature of the POS_RATIO data entry(Fig.4). The model shows 77% accuracy score with 88% precision and recalls shown in the snapshot (Fig.5).

Fig 5:- Classification report and the accuracy score of the model

The model built on a dataset which is considered as development data will serve as a validation for the intuitions of analyst that the system we propose will generate based on the benchmarks. The intuition is nothing but a prediction that analyst makes for a company's performance based on the market knowledge by setting benchmarks for every given ratios. As per the benchmark, ratio is considered healthy if the value is closest.

V. CONCLUSION

The proposed system employs analysis of financial ratios of the organization to provide the next best decision to be made for maximum profitability. This novel solution focuses on those 20 percent of all the factors that contribute 80 percent of the profits to any organization. Analytics is cutting through the business world in many sector from improving processing and managing. Studies currently lack an application of Business Intelligence which is determining strategies that can statistically predict an outcome of an organization. Ratio analysis is a powerful tool that every analyst use to determine performance of a company. Typically Business is analyzed by a business analyst using some data driven techniques. Data-driven techniques involves analyzing a set of past data and to come up with some intuition. These intuitions are nothing but a human prediction for the future outcome of a company. Ratio Analysis is a Data-Driven techniques that is used for analyzing business processing. Analyzing a company's past ratio and coming up with an intuition that reflects the future outcome of a company is one of the many jobs for a business analyst. Now a days the Business industry is moving towards automation. Businesses are using technology to optimize their business functioning. Ratio analysis is a powerful tool that every business analyst use to predict an outcome of a company. Each Ratio depicts certain aspect of a company's functioning. Automating the process of Ratio Analysis using some Data Science algorithm will improve the business outcome significantly. Among all the business aspect there lies a need to automate the methods of business analysis for faster and accurate prediction of a business health in terms of growth. Every business relies on a business analyst for modeling their business processing. Majority of work done by a Business analyst is based on intuition and hunch. There is a lack of technological support to a Business Analysis which would facilitate a Business Analyst. Each ratio depicts a certain aspect of business which is considered by a business analyst while coming up with intuitions. Way a business analyst comes up with intuition is by analyzing the past ratios of a company and setting up benchmarks based on his market knowledge which will determine the ratio trend. A healthy ratio or an uptrend is when a ratio is fairly near to the considered benchmarks. Depending on which ratio is at fault business analyst suggest a course of action. We propose a solution that will automate this process. The analysis of financial ratios helps in narrowing down the area to focus on to solve financial crisis as well. Employing financial analysis is, hands down, the best method to analyse the current status of any organization at a department to department level within an organization unlike market shares with which we get to compare the company's performance with other organizations on the market. We provide the turnovers, ratios and margins of individual departments as well as of the entire organization and the entire data is processed by employing the data analysis algorithm which gives the remark about the current status of individual departments as well as of the organizations and suggests the next best decision to be performed.

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