THE SUPPLY CHAIN VISIBILITY ANALYSIS TOOL

AFFILATION
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ABSTRACT:

Supply chain visibility is that the ability to trace raw materials and components from original suppliers and makers through the organization's manufacturing facilities to customers. The goal of SCV is to enhance and strengthen the availability chain by making data readily available to all or any stakeholders, including the customer. Supply chain visibility ensures you're intimate every aspect of your inventory and allows you to raised help customers by improving performance and reducing errors. The SUPPLY CHAIN VISIBILITY ANALYSIS is the aim taken here. The algorithm that is used for analysing the data is Linear Regression and K-Means. This analysis helps the organization to improve the delay in time for each process and modify them.

Keywords: Supply Chain Visibility Analysis, Linear Regression, K-Means, delay time, track.

I. INTRODUCTION

Supply Chain Visibility is that the ability to trace raw materials and components from original suppliers and makers through the organization's manufacturing facilities to customers. The process starts when the supplier gives the order and till the finished product reaches the customer. The overall production and shipment process is tracked with respect to the time duration of each process taking place to find where time delays and in which process. Using the machine learning algorithm to find the reason where the production or shipping process lags in time. Machine learning may be a sort of AI (AI) that gives computers with the power to find out without being explicitly programmed. It is used to analyse the various stages of the company and help to alternate the process to reach the product earlier to the customer. Python is used for analysing and visualizing the data. The algorithm that is used for analysing the data is Linear Regression. Linear regression quantifies the connection between one or more predictor variable(s) and one outcome variable. Linear regression is commonly used for predictive analysis and modelling. Linear regression is additionally referred to as multiple correlation, multivariate regression, ordinary method of least squares (OLS), and regression. This analysis helps the organization to improve the delay in time for each process and modify them.

II. RELATED WORK

A supply chain is the network of organizations that are involved, through upstream and downstream linkages, in the different processes and activities that produce value in the form of products and services delivered to the ultimate consumer [5].Supply chain management has become one of the primary key success factors to deal with the increasing complexity of the current business environment. Although supply chain management is a mature discipline, the complexity of actual supply chains has greatly evolved over the last two decades due to the dynamic interaction of a wide range of processes, decisions, and structures, whose understanding becomes essential for gaining a competitive advantage in the marketplace [10].

A commerce visibility network allows for the collection and distribution of real-time location and status information regarding the movement of goods and assets through a supply chain [11].Although visibility has become a popular buzzword in the supply chain literature it remains an ill-defined and poorly understood concept. It is assumed that if companies across supply chains have visibility of demand, inventory levels, processes, etc., that organizational performance improves [6].However, few companies effectively manage their supply chains, and the greatest difficulty is in achieving supply chain visibility. Many companies still suffer from a lack of visibility, and in spite of extensive research and the availability of modern technologies, the concepts and quantification methods to increase supply chain visibility are still ambiguous [12].

Increasing uncertainty has made the task of satisfying customers more challenging. Efficiency along the supply chain is important to maintain acceptable product prices, but flexibility to deal with time-varying or dynamic demand could be even more important nowadays. With the high probability that customers will suddenly increase, reduce, cancel, or move forward or backward their orders, supply chain players need to be more flexible in many respects [8]. All firms participate in a supply chain, from the raw materials to the ultimate consumer. How much of this supply chain needs to be managed depend on several factors including the complexity of the product, the number of available suppliers, and the availability of raw materials [3].

Logistics and supply chain management are ever changing and demanding disciplines, but provide attractive and rewarding opportunities to people who wish to work in these areas [4]. Logistics is an integral part of our life. Today, more than ever, it influences a large number of human and economic activities. Logistics deals with the planning and control of material flows and related information in organisation, both

in public and private sectors [9]. Increasingly, supply chain management is being recognized as the management of key business processes across the network of organizations that comprise the supply chain [2].

III. METHODOLGY

A. DATAMINING

Data mining is the process of categorizing the data into useful information. It is a transformation that transforms raw data into clear useful data for the companies. It helps companies to gain more knowledge on each dimension and helps them to take vise strategic decisions on their own. It is also known as artificial intelligence, predictive modeling (or) machine learning. It is basically done when the volume of dataset is huge.Itishugeprocesswhichmakesclustersofinformationtogethersothatthecompaniescanuseit easier. This is the method which helps companies to do future forecasting. The main component in Business Analytics field is predictive analytics and datamining.

B. LINEAR REGRESSION

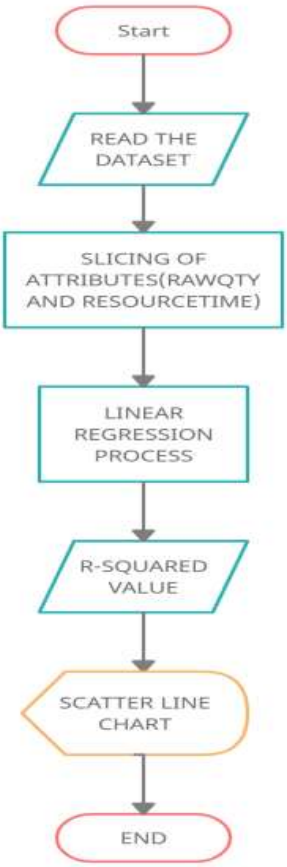
Linear regression may be defined as the statistical model that analyzes the linear relationship between a dependent variable with given set of independent variables. Linear relationship between variables means that when the value of one or more independent variables will change (increase or decrease), the value of dependent variable will also change accordingly (increase or decrease).[7]

There are five basic steps when you're implementing linear regression:

STEP -1	Import the packages and classes you need.
STEP -2	Provide data to work with and eventually do appropriate transformations.
STEP -3	Create a regression model and fit it with existing data.
STEP -4	Check the results of model fitting to know whether the model is satisfactory.
STEP -5	Apply the model for predictions. [7]

Machine learning involves a lot of statistics, one such is R^2 value. R^2 is the percentage of variation (i.e. varies from 0 to 1) explained by the relationship between two variables.[1]

FLOWCHART OF THE PROCESS



IV. RESULT

```
In [13]: model.fit(data,dataset.RESOURCETIME)

Out[13]: Pipeline(memory=None,
                  steps=[('polynomialfeatures',
                          PolynomialFeatures(degree=3, include_bias=True,
                                             interaction_only=False, order='C')),
                         ('linearregression',
                          LinearRegression(copy_X=True, fit_intercept=True, n_jobs=None,
                                           normalize=False))],
                  verbose=False)

In [14]: pred = model.predict(data)

In [15]: from sklearn.metrics import r2_score

In [16]: R=r2_score(pred,dataset.RESOURCETIME)

In [17]: R

Out[17]: 0.9965512646492133

In [172]: sns.countplot(y=dataset.RESOURCETIME,data=dataset, color="c")

Out[172]: <matplotlib.axes._subplots.AxesSubplot at 0x1fbfbd1dfc8>
```

Fig 4.1

In the Fig 1, R-Squared value is 0.99 that R^2 value implies that there is 99% less variation around the line than the mean. In other words, the relationship between RAWQTY and RESOURCETIME accounts for 99% of the variation. Said yet another way, RAWQTY is a good predictor of RESOURCETIME because when the RAWQTY go up so does the RESOURCETIME and vice versa.

```
In [173]: x=dataset.RAWQTY

In [174]: y=dataset.RESOURCETIME

In [175]: sns.barplot(x,y)

Out[175]: <matplotlib.axes._subplots.AxesSubplot at 0x1fbfbda6908>
```

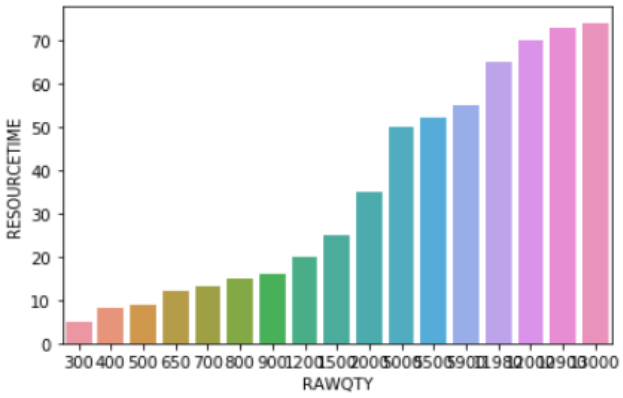


Fig 4.2

In the above Fig 2, it is evidently clear that RESOURCETIME goes up when RAWQTY is increasing and vice versa. This plot is to demonstrate the R^2 value.

```
In [181]: #plot for the TRAIN
          plt.scatter(dataset.RAWQTY,dataset.RESOURCETIME, color='red') # plotting the observation line
          plt.plot(dataset.RAWQTY, reg.predict(data), color='blue') # plotting the regression line

Out[181]: [<matplotlib.lines.Line2D at 0x1fbfbf97ac8>]
```

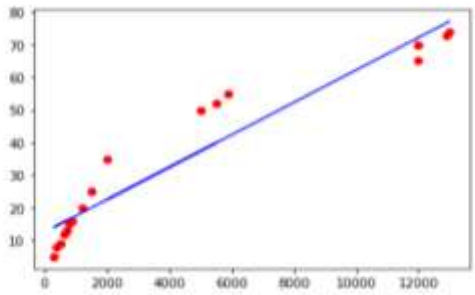


Fig 4.3

A scatter chart with a regression model is an excellent tool which can be used to depict the relationship between two variables in Fig 4.3. This shows the relationship between two variables visually.

V.CONCLUSION

In this paper, Jupyter Notebook is the tool to analyse the status of raw material using linear regression and the main objective is to improvise the performance of the functions that convert raw materials into finished products. To predict the performance, raw material quantity and resource time which is the time used to convert the raw material is the factor being used. In plotting the data of linear regression, it shows the relationship between the two variables. The R^2 value implies that there is 99% of dependence of the resource time to raw material quantity. This analysis helps to find the direct relationship between raw material and resource time.

VI. REFERENCE

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