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1. Introduction

The COVID-19 pandemic has deeply rocked the manufacturing sector. As has been the case after other big upheavals, such as the financial crash of 2008-2009, it is possible that a return to pre-crisis levels would take several years, if not more. Back in 2008, it took three years for the automotive sector to rebound to pre-crisis stages. The path of the recession would be at least as serious this time as it was during the financial crisis, if not worse yet. The new crisis varies from the previous ones in character, both for the best and for the worst. For the better: before COVID-19, production levels had already slowed down and businesses were not as focused on high growth as before the financial crisis.

Furthermore, corporations have more capital and equity available, and the experience of the recession is stronger. For the worse: The simultaneous shock of supply and demand with shutdowns has contributed to exceedingly severe slumps and is more likely to rebound "up and down" than a smooth curve. Furthermore, as a development engine, China is struggling, and market disruptions already occurring are now escalating. Depending on the sub-sector, the consequences of the crisis can vary significantly. For example, because of anticipated government infrastructure stimulus and a rise in e-commerce, building machinery and intralogistics equipment are likely to feel somewhat less serious consequences than they did during the financial crisis.

On the other hand, the impact would be felt even more intensely by firms in the machine tools, plastic machines, and steel construction equipment industries. The causes for this are the overcapacity that already existed before Coronavirus (steel) and the pace of disruption (e-mobility, sustainability) contributing to restrictive investment behaviour, for example in the automobile industry, which is important for machine tools. There are so many business executives hanging on to what might be false expectations. The issue of reduced demand in the long run can not be addressed by existing tools, such as short-time jobs. Companies in vital industries must now review their prior expectations regarding the course of the recession, plan out a range of scenarios and continue to look objectively at their systems in order to prevent a massive decrease in earnings.

In order to back in track of economy growth especially in manufacturing sector, a statistical overview regarding the condition and position of key leading manufacturing sector must be analysed. Therefore, a **comprehensive data analysis dashboard** must be producing in assisting the policy maker to shape the landscape of manufacturing sector in economic growth.

2. Objective

1. To identify the trend of performance in manufacturing sector from 2019 to third quartile 2020 (October 2020).
2. To provide the interactive visualization towards top management.
3. To analyze the trend of performance specifically in sales value, employment trend, and salaries and wages.
4. To investigate the relationship of sales value, employment trend in every field.
5. To forecast the performance of the manufacturing sector relative with the factor contribution

3. Scope

In this study using business intelligence tool and machine learning to focus on identifying the trend and analyzing the performance of manufacturing sector. From that, forecasting the performance with the factor contributor. In the dataset is consist of monthly statistics on sales value, number of employees and salaries & wages based on the Monthly Manufacturing Survey. It is covered data from 2019 to October 2020. In this study also, the dataset able to be analyze which include four main sector which is food and beverages, electric and electronics, petroleum and textile. The limitation of this study is the forecasting may not suitable for all the manufacturing sector, because each and every sector having different of key of influence. The stakeholder involved are the designer & data gatekeeper, audience which are top management in manufacturing sector, and Azlan as the point person in business who have the business view.

4. Goal

Develop the Intelligence Dashboard Decision Support Digital in manufacturing sector to analyse current condition and potential performance in future the study also aims at encouraging and recognizing engagement between industry and postgraduate student as well as contributing to the industrial need with application of Business intelligence technologies. It in directly grounded the skill with the reality condition of manufacturing sector.
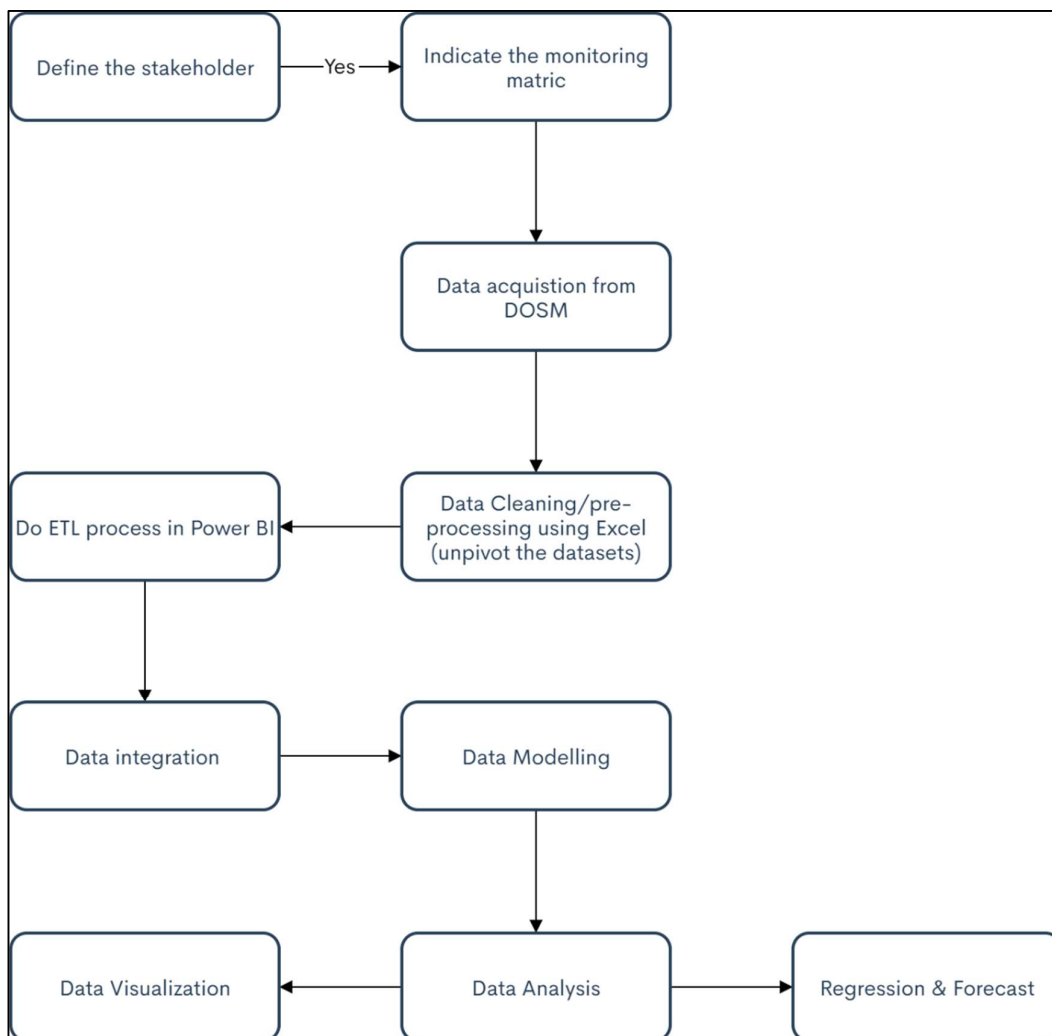
4.1 Proposed Flow

Figure 4.1: Propose Flow on Intellligence Dashboard Decision Support

In starting of the study, defining stake holder involve in this project. Usually there are four main stake holder the designer, the audience, the point person and the data gatekeeper. When defining the key responsibility of these stakeholder, it will be being a factor of contributor in successfully implement the project. Indicating metric monitoring will be the guideline what the standard need to achieve. Therefore, the product of digital dashboard will be constructed based on what have been stated in the metric. The following steps is the technical stat on how the implement the analysis.

5. **Data Sets Sources**

The dataset is sourced from DOSM (Department of Statistical Malaysia) presents monthly statistics on sales value, number of employees and salaries & wages based on the Monthly Manufacturing Survey. The main objective of this publication is to provide statistics on the latest trends of the manufacturing sector to assist users in the planning and formulation of policies and decision making.
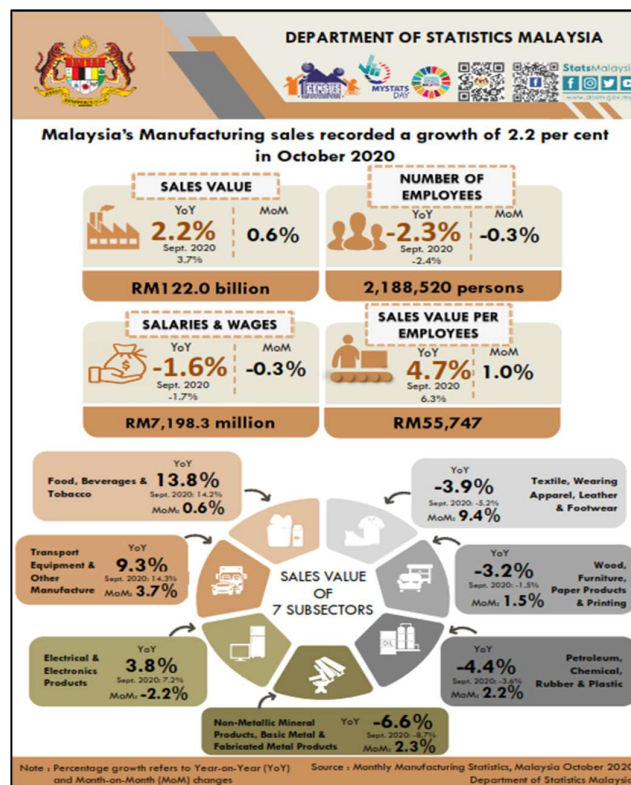
Figure 5.1: The summary of Malaysia Manufacturing Sales from DOSM

Figure 5.2: Datasets from DOSM before undergoes cleaning process

"Data is trusted, understood, accurate, and is provided and used in a meaningful, secure, and consistent manner."

6. Data Cleaning, Integration and Modelling

Figure 6.1: ETL process for the datasets.

Cleaning process were done manually in Microsoft Excel. The importance and usable data have been selected and the cleaning process start. After remove unnecessary data, the data set have ben construct according to the desired arrangement. This process called extract, transform and load (ETL) process. All the data have been integrated from difference sources and table. If refer to the Figure 4, 10 table include one is the main table. The overall sales value as the main sources to be analyse, and it integrated to each sector of detailed aspect. The integrated data transform the unstructured data into a meaningful and valuable information.
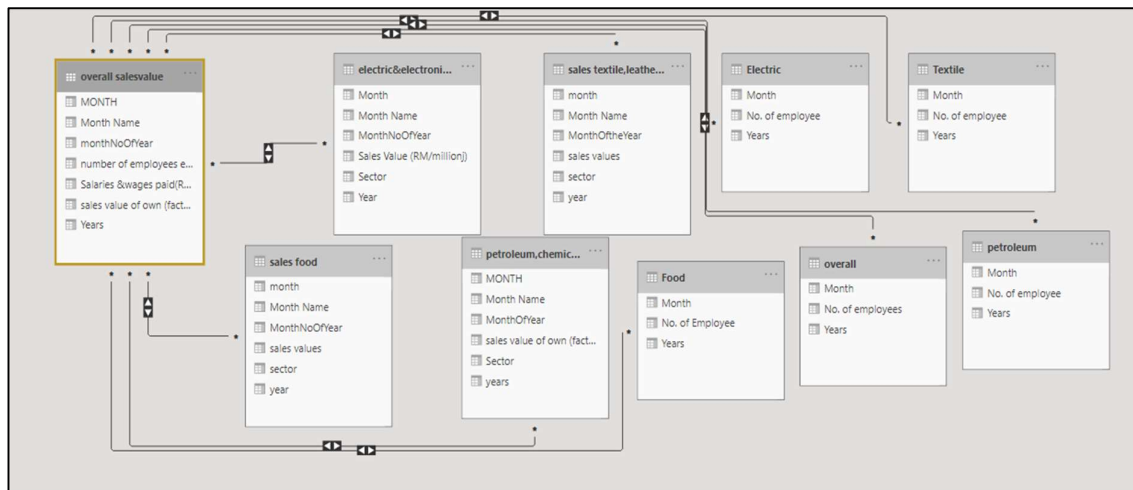

Figure 6.2: Data integration and Modelling

7. Operational Method

Table 7.1: Operational Method for the study

Objective	Expected outcome	Tools
To identify the trend of performance in manufacturing sector from 2019 to third quartile 2020 (October 2020).	1. Visualize overall performance. 2. overall, no of employees in manufacturing 2019 vs 2020	Power BI
To provide the interactive visualization towards top management. **To analyze the trend of performance specifically in sales value, employment trend, and salaries and wages.**	1. Specified into every sector of sales performance. 2. Detailed to every sector sales, employees, salaries and wages	Power BI
To investigate the relationship of sales value, employment trend in every field.	1. Regression for every sector in terms of sales value. 2. Visualize the employment trend in each sector	Power BI Orange
To forecast the performance of the manufacturing sector relative with the factor contribution.	1. Linear projection between the performance and contributor factor	Orange

8. Result of Analyticals

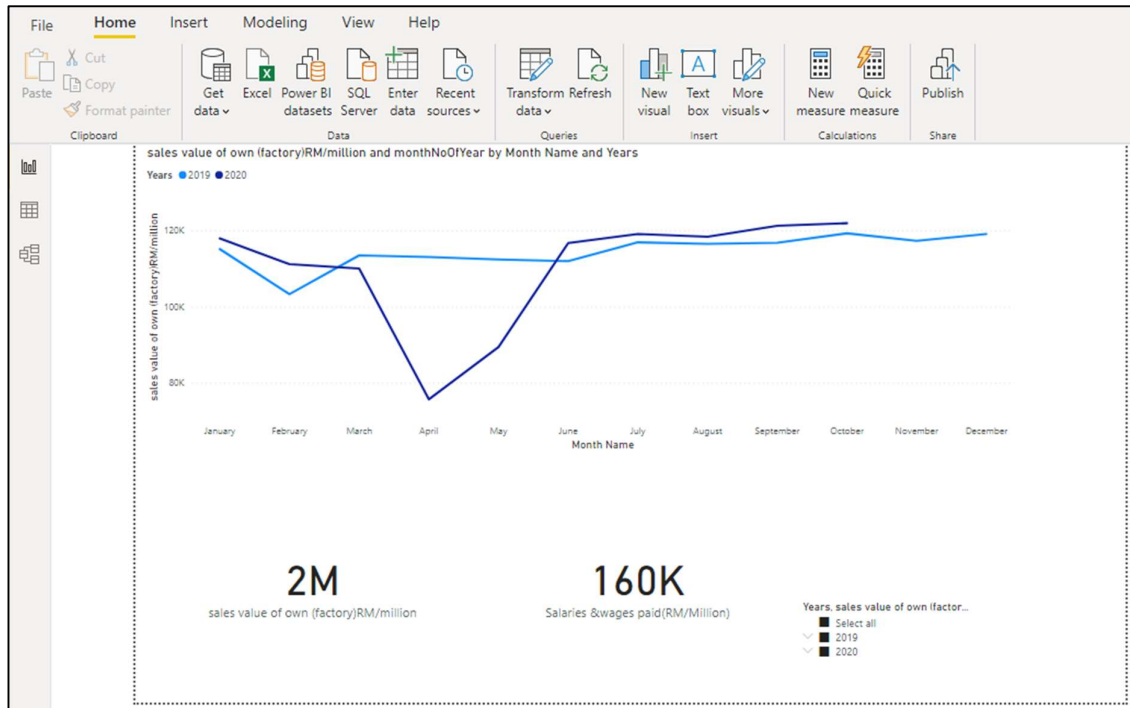### 8.1 Using Microsoft Power BI Application:

Figure 8.1: Main dashboard for the digital dashboard.

The overall performance of manufacturing sector specifically in sales value recorded 2Million cumulatively. It can see that for 2020 it is a huge downtrend from March to April due to Movement Control Order (MCO). However, a significant climb up trend from April until June and have slightly overtake sales value in 2019 and it maintained until October. From the observation, we can infer that in manufacturing sector the recovery phase after MCO is excellent and the performance maintained until October and it is not a sector effected badly by the pandemic but it is bounce back excellently compared to the 2019 sales value.

Unfortunately, this excellent performance is not applicable for the employment trend in the manufacturing sector. There is a drastic drop in no of employees engaged in the sector from March to April and it is continuing drop slightly over the month even though the sale is sky rocketing. What is the factor it is happened contradict?
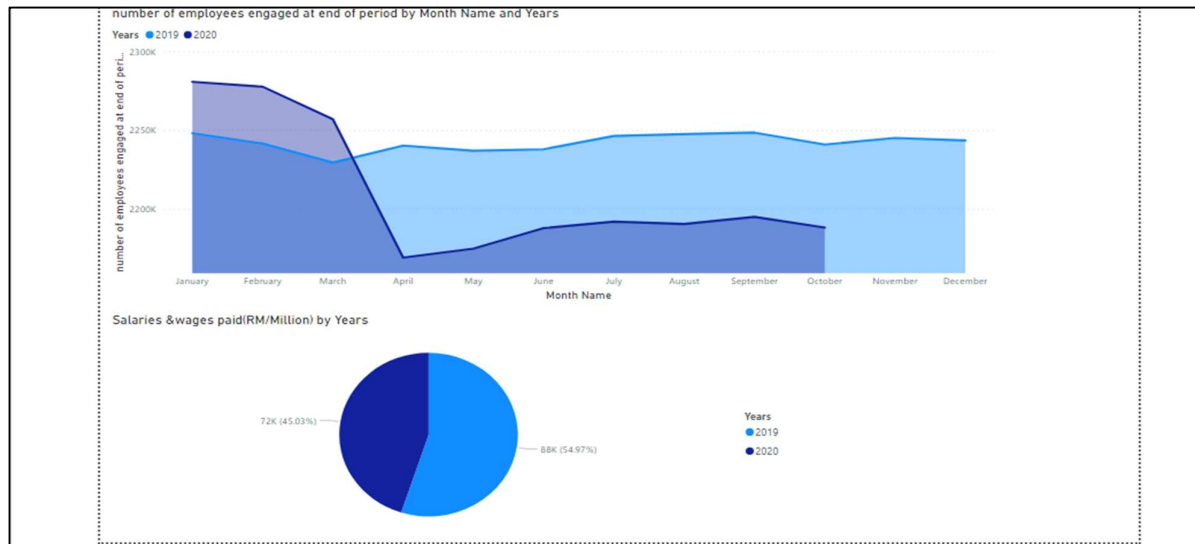
Figure 8.2: Summary of Number of employees and Salaries and Wages.

Figure 8.3: Example of Food and Beverages performance

8.2 Using Orange Application:

In Orange tool, we are doing the statistical analysis factor of performance in the manufacturing sector. This includes regression analysis and linear projection. In this section we can see regression for every sector in terms of sales value and linear projection between the performance and contributor factor.
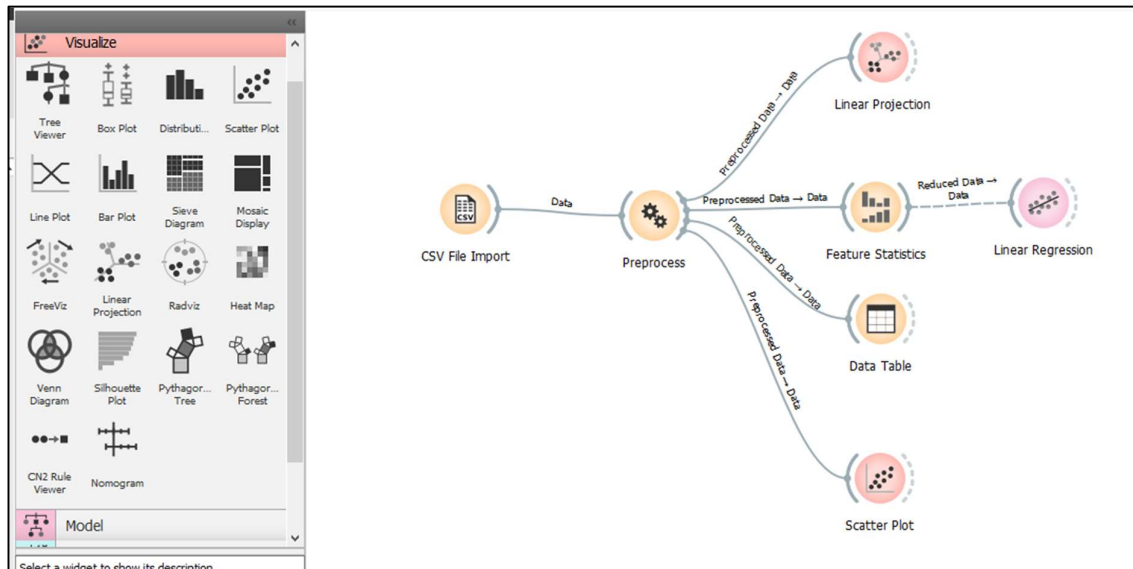

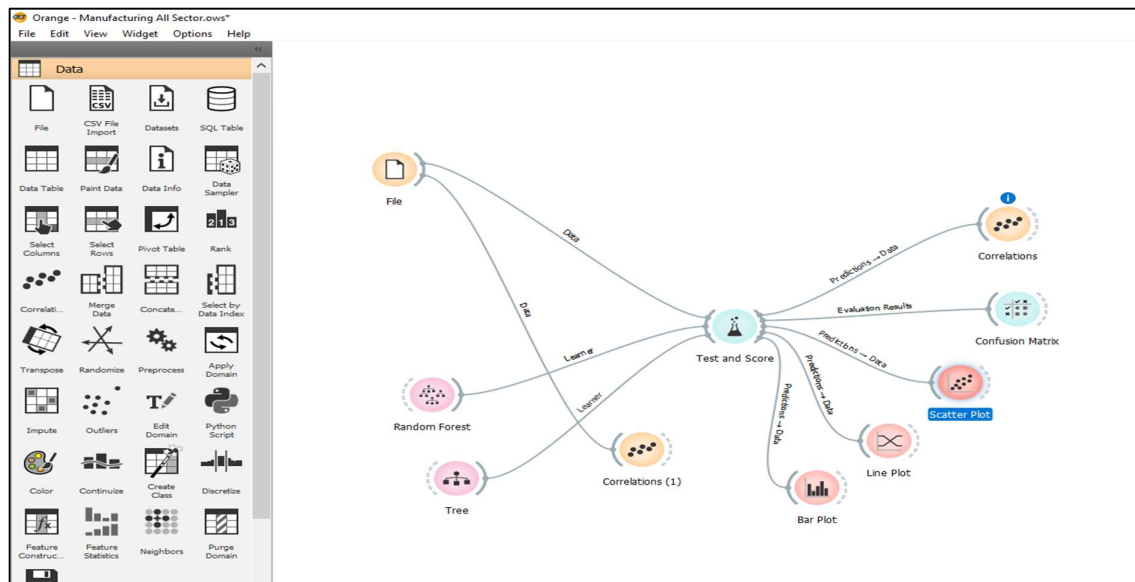**Figure 8.4: Orange Layout for Linear Projection**

Figure 8.5: Orange Layout for Regression Analysis

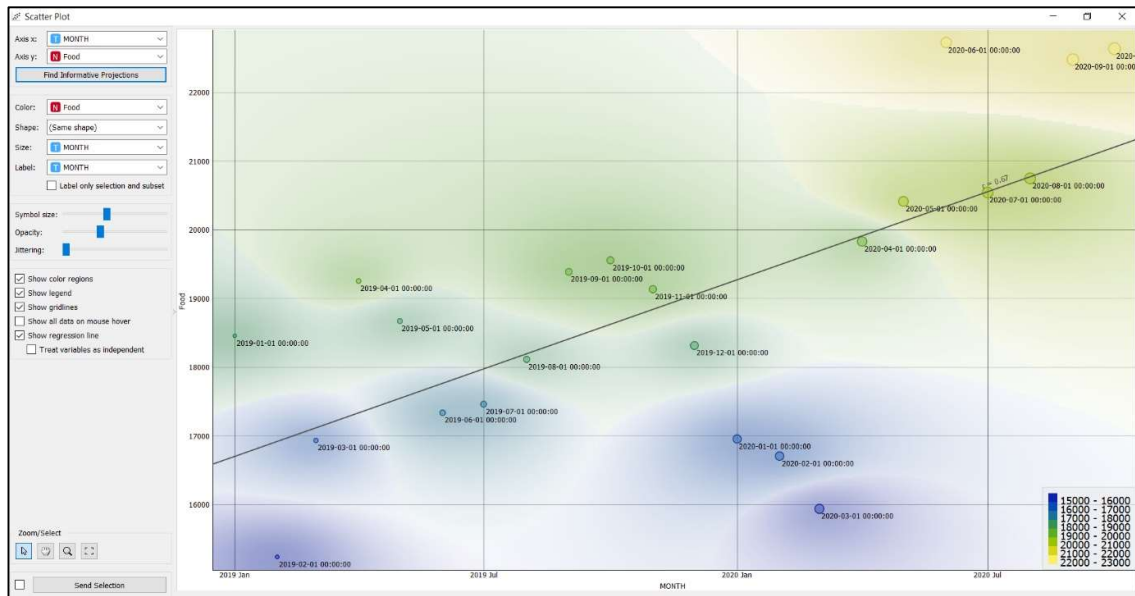**8.3 Result on Scatter Plot**

1) Food Industry

Figure 8.6: Month 2019-2020 vs Food Industry on Sales Value per millions

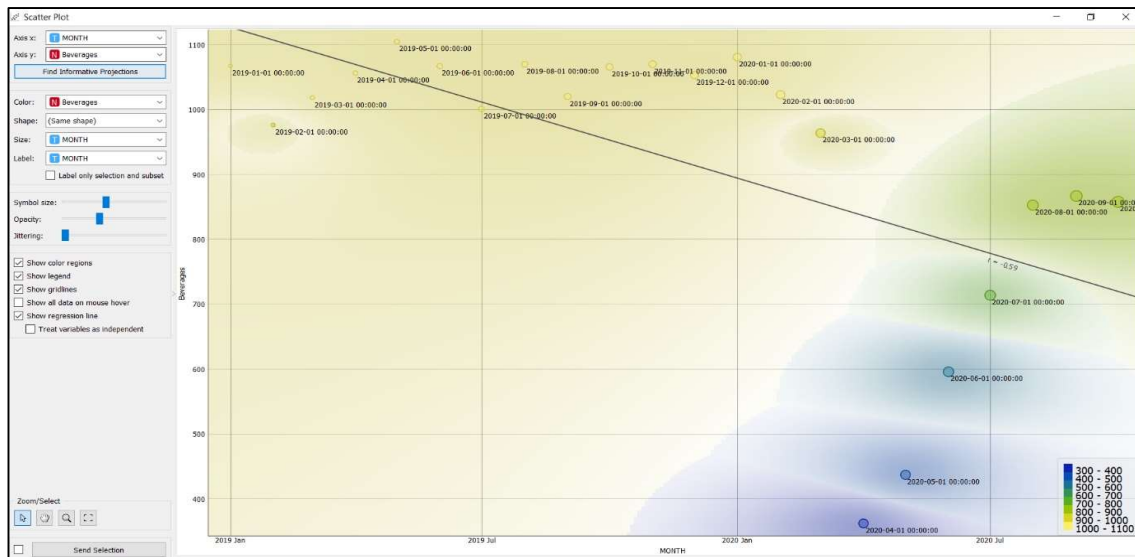Regression Line UPTREND, r = + 0.67

2) Beverages Industry

Figure 8.7 : Month 2019-2020 vs Beverages Industry on Sales Value per millions -

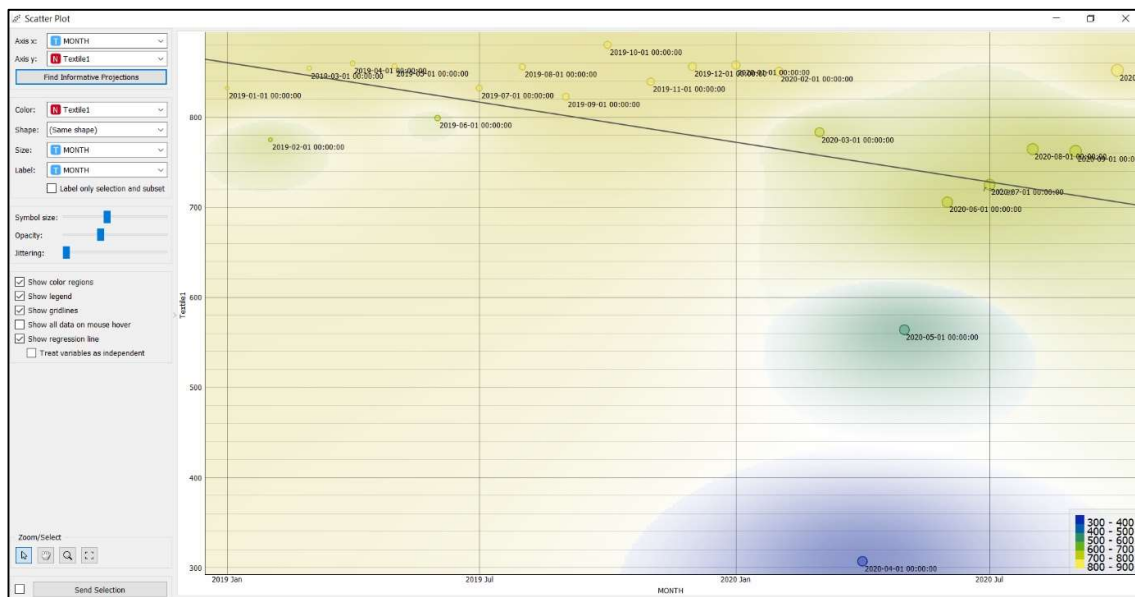Regression Line: DOWNTREND, r = -0.59

3) Textiles 1 Industry

Figure 8.8: Month 2019-2020 vs Textile1 Industry on Sales Value per millions –

Regression Line: <u>DOWNTREND</u>, r = -0.37

4) Textile 2 Industry

Figure 8.9: Month 2019-2020 vs Textile2 Industry on Sales Value per millions –

Regression Line: <u>DOWNTREND</u>, r = -0.28
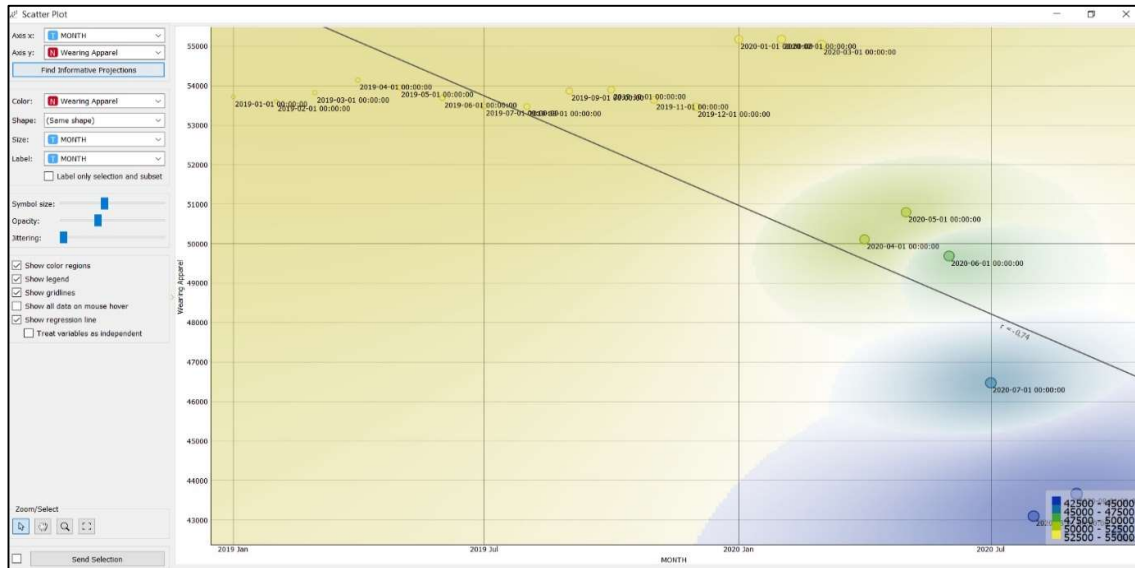
5) Wearing Apparel Industry

Figure 8.10: Month 2019-2020 vs Wearing Apparel Industry on Sales Value per millions

Regression Line: <u>DOWNTREND,</u> r = -0.74
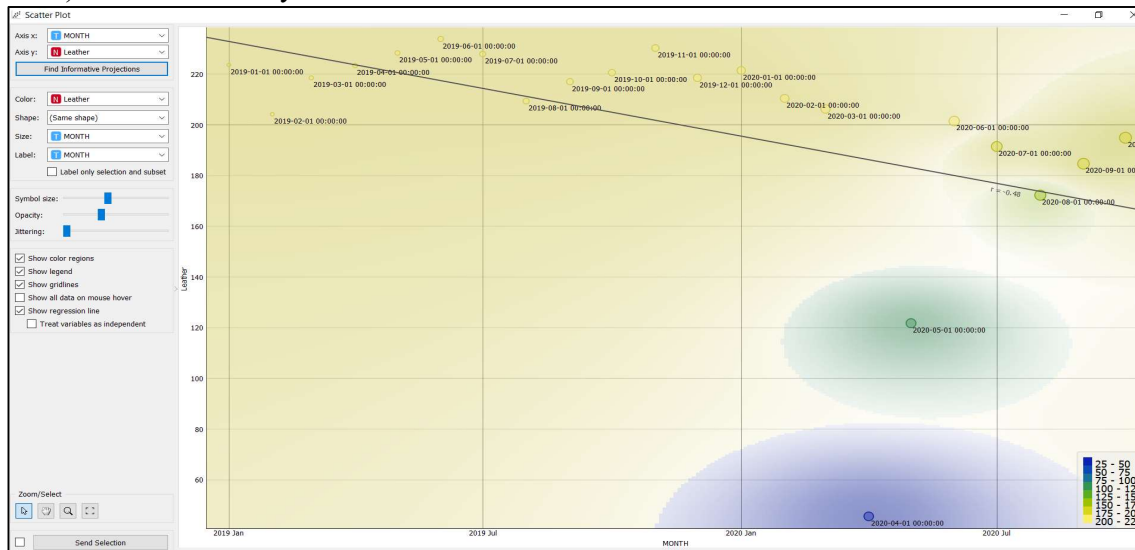
6) Leather Industry

Figure 8.11: Month 2019-2020 vs Leather Industry on Sales Value per millions –

Regression Line: <u>DOWNTREND,</u> r = -0.48
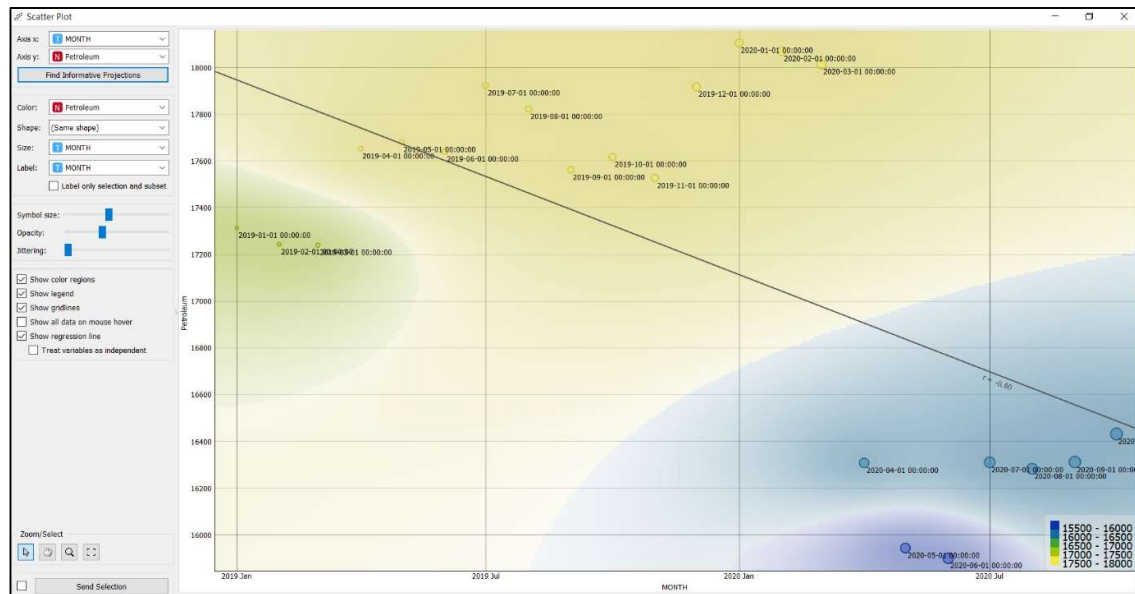
7) Petroleum Industry

Figure 8.12: Month 2019-2020 vs Petroleum Industry on Sales Value per millions –

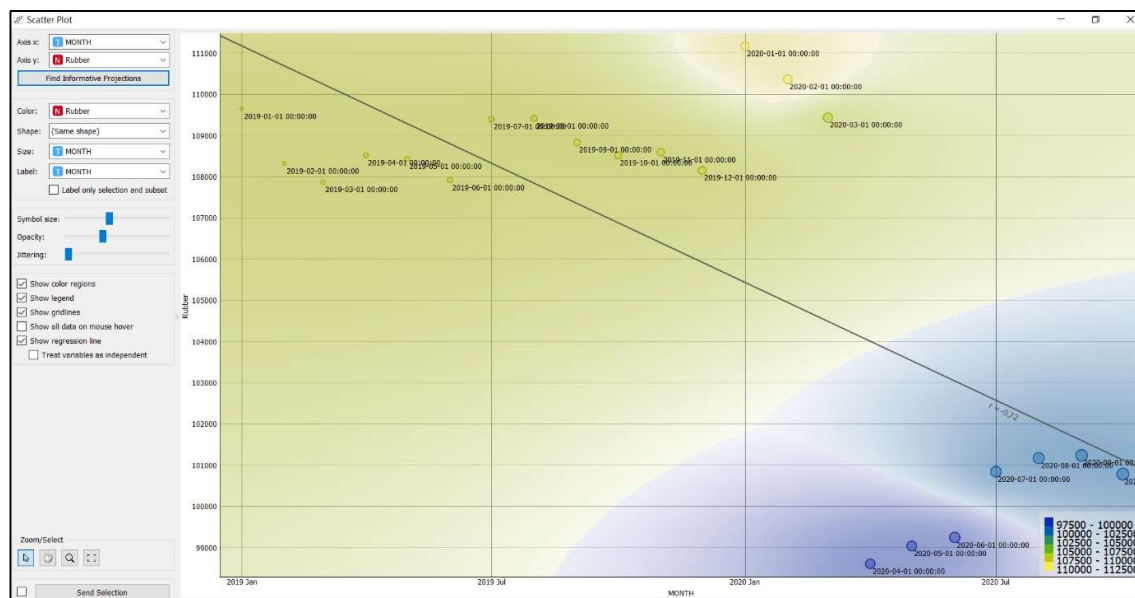Regression Line: <u>DOWNTREND, r</u> = -0.60

8) Rubber Industry

Figure 8.13: Month 2019-2020 vs Rubber Industry on Sales Value per millions –

Regression Line: <u>DOWNTREND</u>, r = -0.72

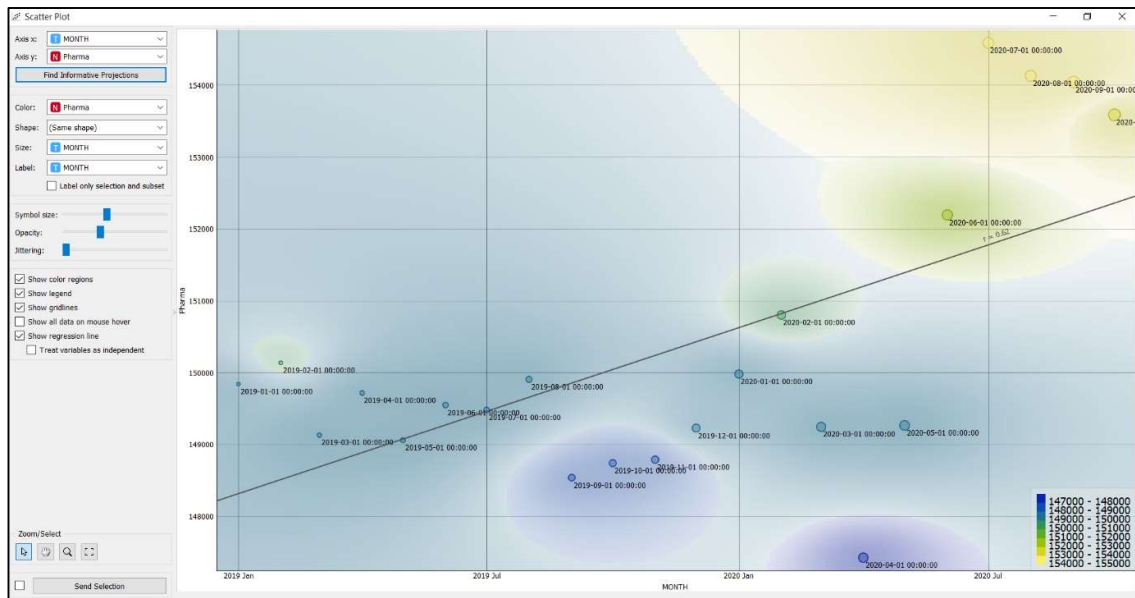9) Pharmaceutical Industry

Figure 8.14: Month 2019-2020 vs Pharmaceutical Industry on Sales Value per millions – Regression Line: <u>UPTREND</u>, r = +0.62

10) Plastic Industry

Figure 8.15: Month 2019-2020 vs Plastic Industry on Sales Value per millions – Regression Line: <u>UPTREND</u>, r = +0.89

11) Computer Industry

Figure 8.16: Month 2019-2020 vs Computer Industry on Sales Value per millions –

Regression Line: <u>DOWNTREND,</u> r = -0.65

12) Electrical Industry

Figure 8.17: Month 2019-2020 vs Electrical Industry on Sales Value per millions –

Regression Line: <u>UPTREND</u>, r = +0.20
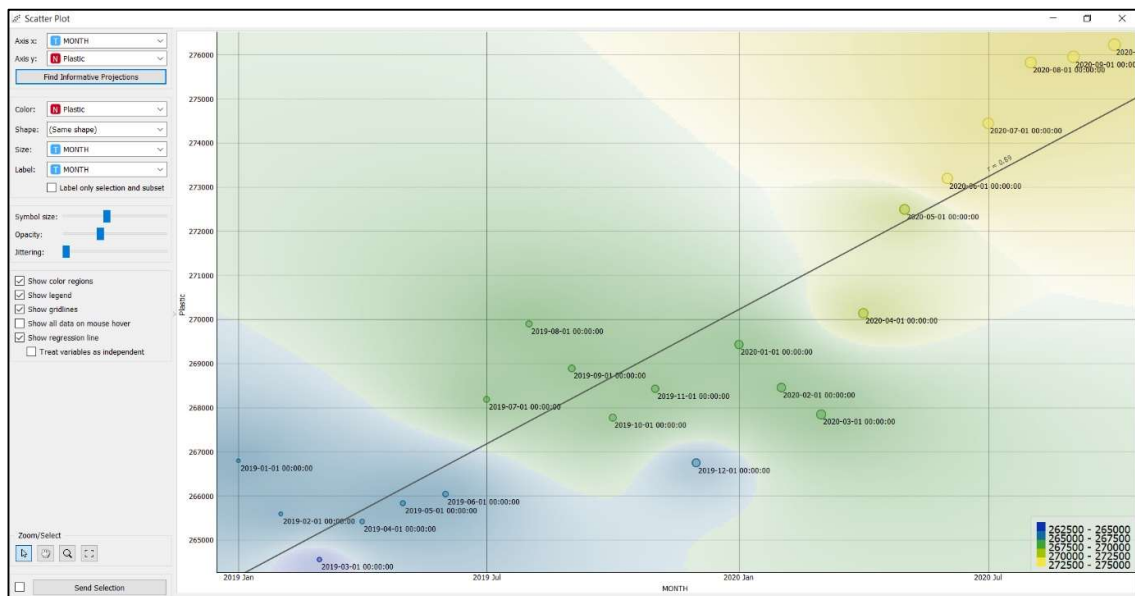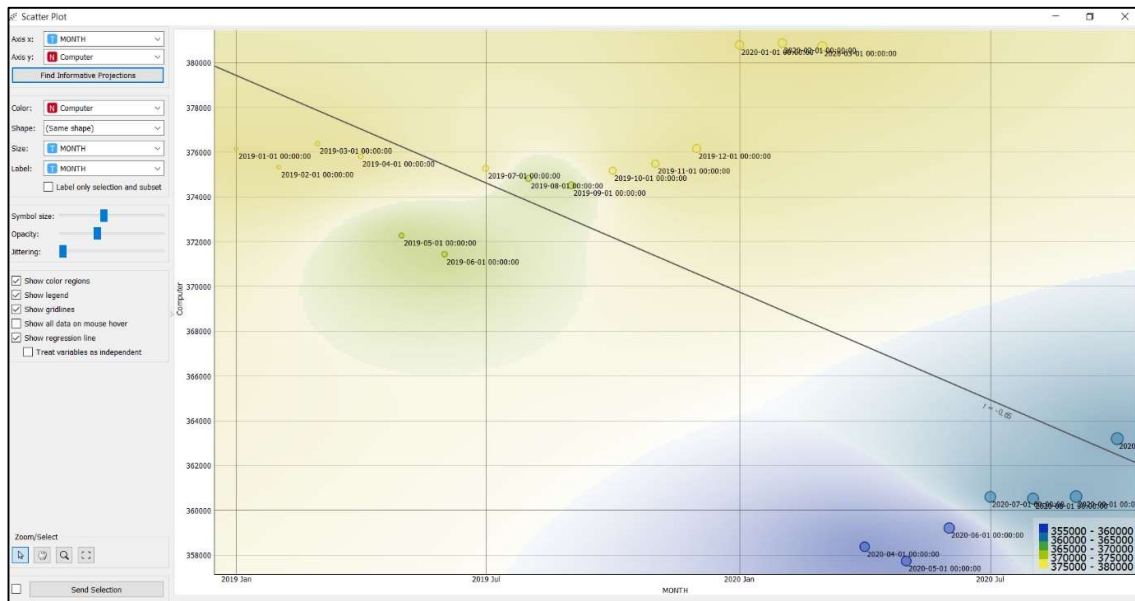
13) Machinery Industry

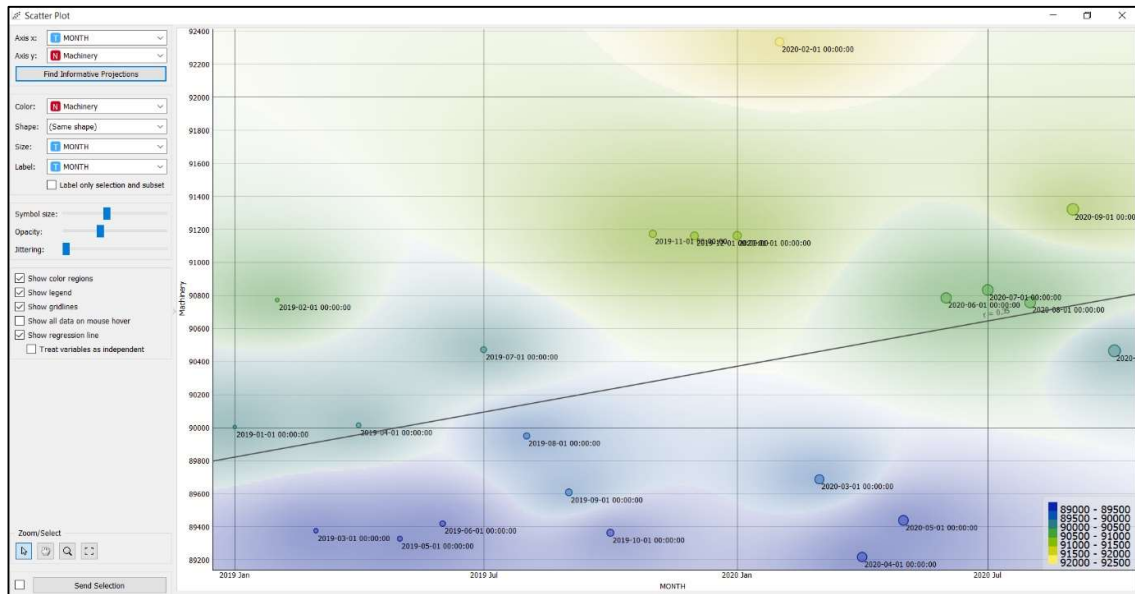
Figure 8.18: Month 2019-2020 vs Machinery Industry on Sales Value per millions – Regression Line: UPTREND, r = +0.35

8.4 Result on Linear Projection
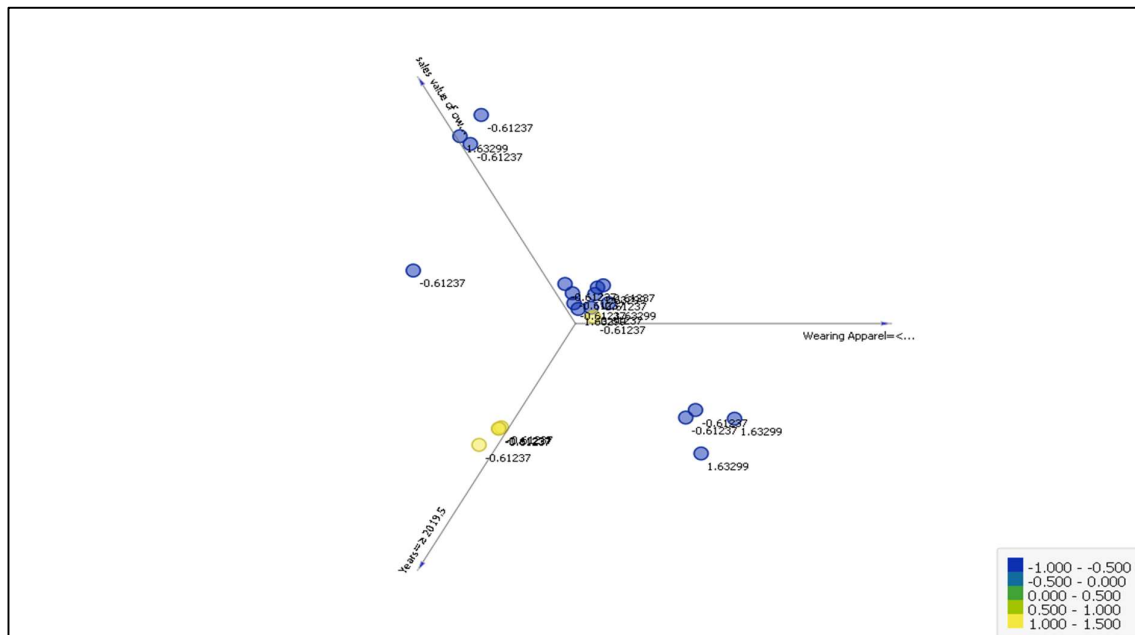

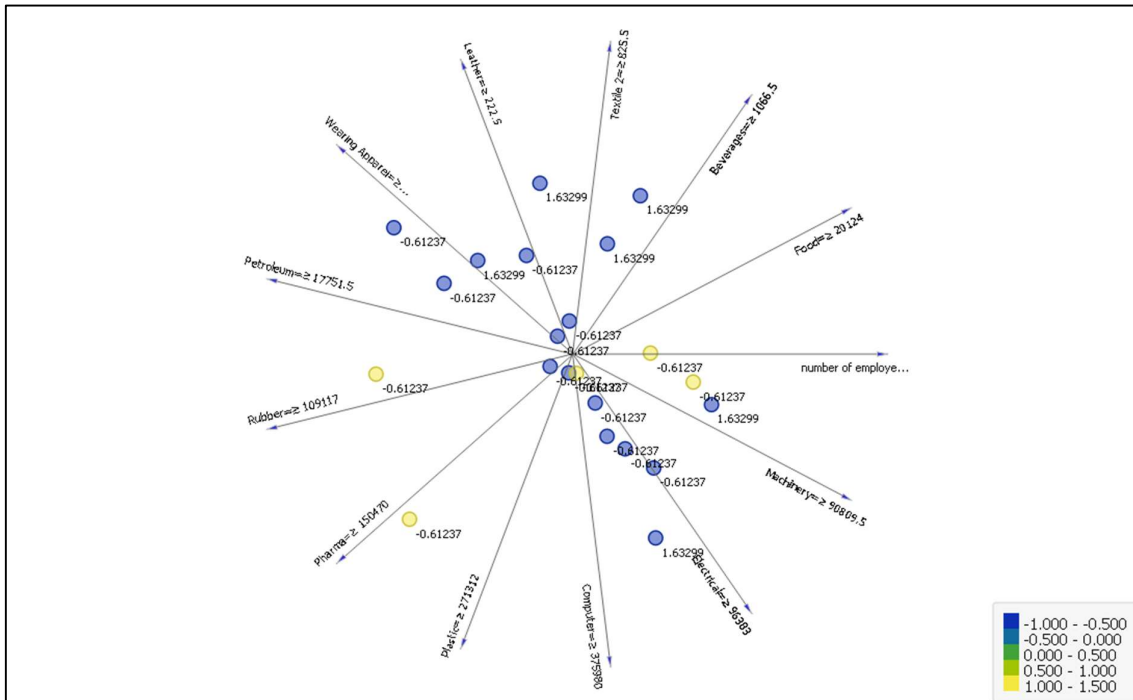**Figure 8.19: Linear Projection between Sales value and wearing appearel sector over the year**

Figure 8.20: Relationship Number of Employees in Every Sector
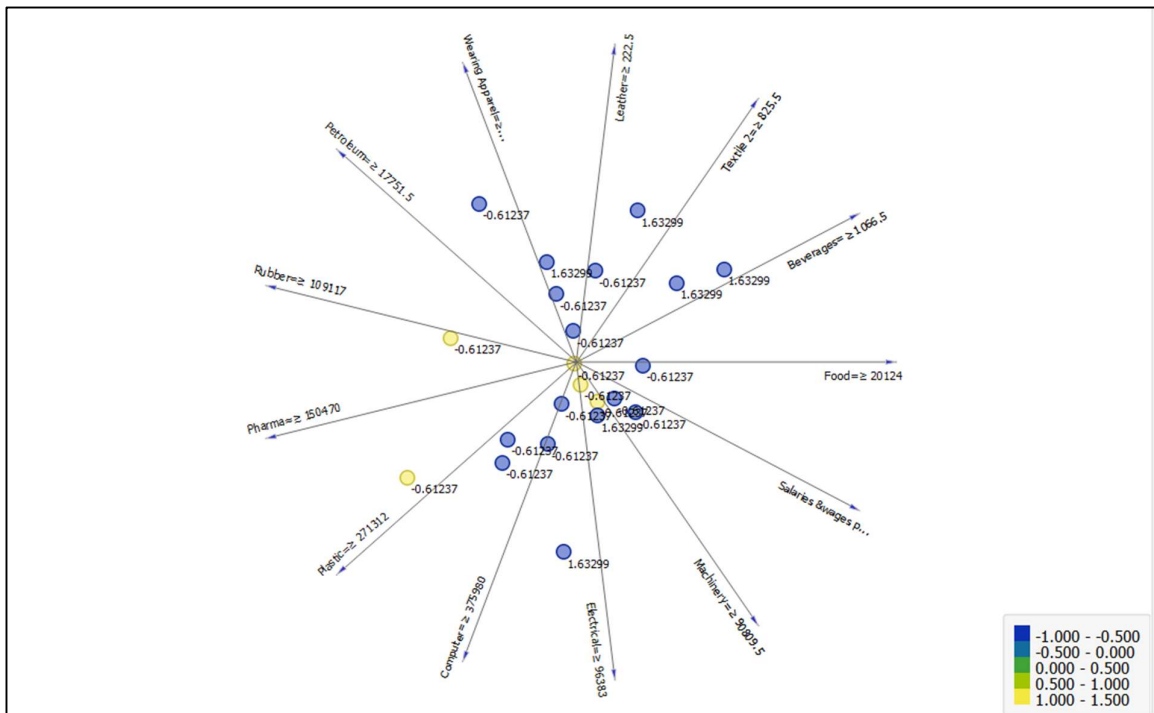

Figure 8.21: Relationship of Salaries and Wages for Every Sector

9. Discussion

From the scatter plot via Orange on every industry on Sales Value of own (factory) for 2019-2020 performance, table below shows on comparison between industry by ranking. 'r' referring to regression trend line: -

Positive Trend		Negative Trend	
1. Plastic Industry	r = +0.89	1. Wearing Apparel Industry	r = -0.74
2. Pharmaceutical Industry	r = +0.62	2. Rubber Industry	r = -0.72
3. Food Industry	r = +0.67	3. Computer Industry	r = -0.65
4. Machinery Industry	r = +0.35	4. Petroleum Industry	r = -0.60
5. Electrical Industry	r = +0.20	5. Beverages Industry	r = -0.59
		6. Leather Industry	r = -0.48
		7. Textile Industry 1	r = -0.37
		8. Textile Industry 2	r = -0.28

Table 9.1: Summary of R-value of Every Sector by ranking (top: r = +/-1)

In the scatter plot, from the Table 9.1, it shows the indicator by ranking on industry which making a positive r value or by means uptrend on regression line as indicator for positive

industry. Meanwhile, a negative r value or by means downtrend on regression line as indicator for negative industry. The table focusing on comparison between 2019 until October 2020 graph. The more r value close to the +1 or -1, the strong ranking on the industry. From the table, it concludes that plastic industry, pharmaceutical industry and food industry are the main industry that relevant on the era of Post Covid-19 on manufacturing areas. This also means that the prediction that the supply and chain from manufacturing sector will give a boost to trading sector on the same industry. Meanwhile wearing apparel industry, rubber industry and computer industry are the negative effects on the era of post covid-19. The prediction on the graph can be agreed from nowadays situation when there are no customer based goes to shopping mall and supermarket which have a huge sales on wearing apparel. Also, on the computer industry, when all manufacturer holding the stock and just have around 30% stock from standard stock in the market. Customer need to order first to get their computer. It changes 360 degrees from last year which the stock will always able in the open market.

In the linear projection, there are range of values for r. the close r value to the 0, it is showing the weak of relationship the independent variable with the dependent variable. For example, in figure 15 Linear Projection between Sales value and wearing apparel sector over the year. this is the relationship of sales value wearing apparel, the r value is most between -1 to 0, it is shown a weak relationship over the year, the changing of time from 2019 to 2020 is actually not affect the changing of sale of wearing apparel, it is the industry itself having down trend in sale.

10. Conclusion

      Manufacturing sector being an importance key player in economic growth as it be one of the largest contributor to the Malaysia's GDP. However, it is cannot be generalize to every area in manufacturing sector because electronics, wearing appearel amongst the area that recorded decrease in sales value. Contradictly, with the employment trend in manufacturing sector, eventhough sales value is increasing and overtake 2019 performance, the employment trend for 2020 is almost 40% drop and maintained in low number starting March 2020 until October. The analysis need to be continue to find the causes and reason of the contradicting result. After all that what the numbers said.