Quantitative Management

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Submitted by:
Group 2

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Problem Statement

The pandemic has impacted the lives of more than 555 million workers, as per the government data. In India, the unemployment rate reached 27.1 percent in early May, as nearly 122 million Indians lost their jobs between March and April, according to Centre for Monitoring the Indian Economy. Further, 37.5 million students have been out of campus. Many B-school are worried about student's placement. One action area is to find the foremost student criteria which corporates look for. ABC B-school wanted a report based on insights drawn from past recruitment trends of the college. It wanted to formulate a data and insight driven robust program that would help improve the situation.

We have sample secondary data for analysis of placement and to come up with actionable recommendations. This data set includes secondary and higher secondary school percentages and specializations of unique students from the past. It also includes their UG specialization, work experience and status of placement.

Statistical Techniques Used

Descriptive statistics- It are used to describe the basic features of the data. They provide simple summaries about the sample and the measures. In our case, we have used boxplot to know how variables are affecting student's placement

Regression Analysis- Regression analysis is a powerful statistical method that allows us to examine the relationship between two or more variables of interest. While there are many types of regression analysis, at their core they all examine the influence of one or more independent variables on a dependent variable.
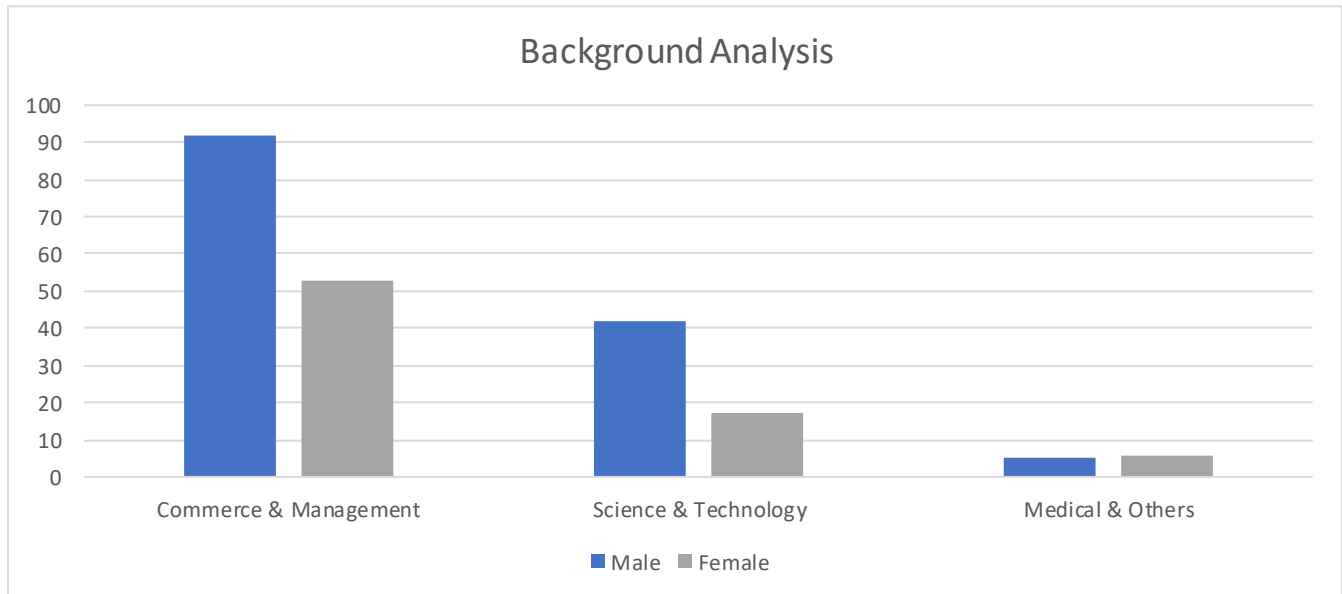
Correlation- It is a statistical measure that indicates the extent to which two or more variables fluctuate together. A positive correlation indicates the extent to which those variables increase or decrease in parallel; a negative correlation indicates the extent to which one variable increases as the other decreases.

Hypothesis testing- It used to test an assumption regarding a population parameter. It two-sample t-test, an inferential statistical. In our case, we used to find the mean MBA% of population from the sample secondary data which is available.

Clustering- It is used to segregate groups with similar traits and assign them into clusters. We have K-means clustering to create clusters and no. of clusters were decided with help of elbow curve. Each cluster had a distinct characteristic.

Background Analysis

First, we did background analysis based on gender and we found that most of the candidates belong to Commerce and Management background irrespective of gender. We can see from graph too, most of candidates belong to Commerce and Management background followed by Science and Technology and Medical and Others.
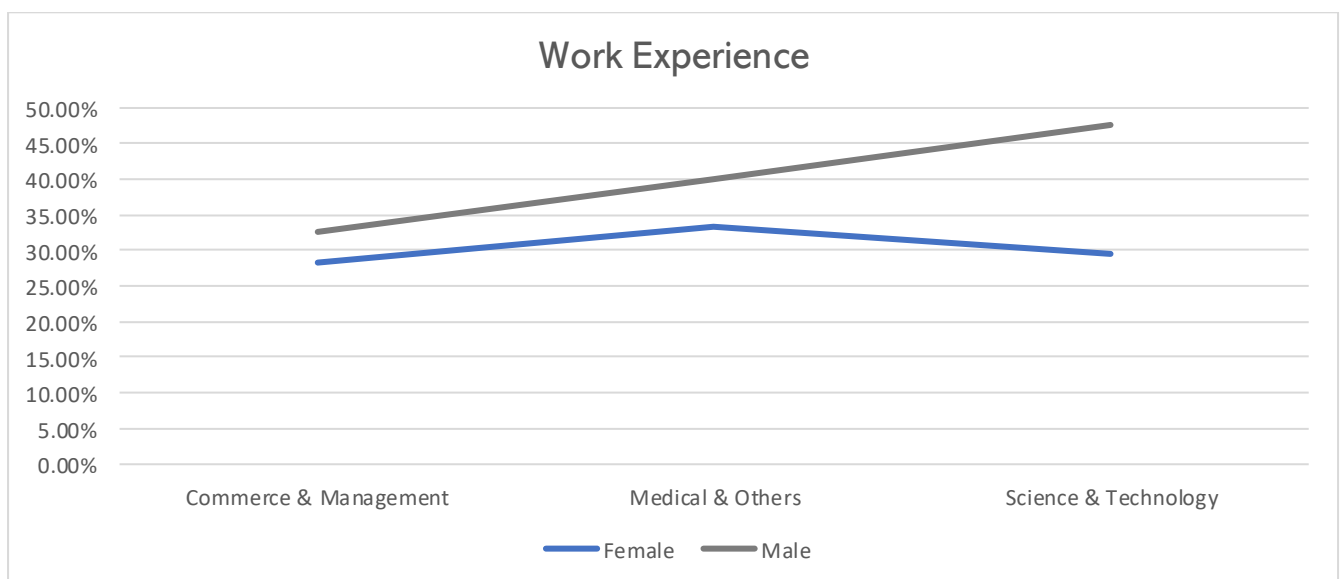
Background Analysis

Chart: Background Analysis — bar chart showing Male (blue) and Female (grey) counts by background.
- Commerce & Management: Male ≈ 91, Female ≈ 53
- Science & Technology: Male ≈ 42, Female ≈ 17
- Medical & Others: Male ≈ 5, Female ≈ 6

Legend: ■ Male ■ Female

Work Experience Analysis

There are two categories of candidate in Institute:
1. Freshers
2. Candidates with work experience

We analyzed data based on work ex. and found this stat ,32.61% male from commerce and management background has work ex, whereas only 28.3% female from same background has work ex. and so on.

Work Experience

Chart: Work Experience — line chart showing Female (blue) and Male (grey) percentages by background.
- Commerce & Management: Female ≈ 28%, Male ≈ 32.5%
- Medical & Others: Female ≈ 33.5%, Male ≈ 40%
- Science & Technology: Female ≈ 29.5%, Male ≈ 47.5%

Legend: — Female — Male

| Domain	Male	Female
Commerce and Management	32.61%	28.3%
Medical and Others	40%	33.33%
Science and Technology	47.62%	29.41%

We can see from the given table that the widest difference of work ex between male and female is in science & technology and least in commerce & management. Whereas in media & other this difference is only 6.66%.

Specialization Analysis

There are only two types of specialization offered by Institute and each specialization includes one major and one minor
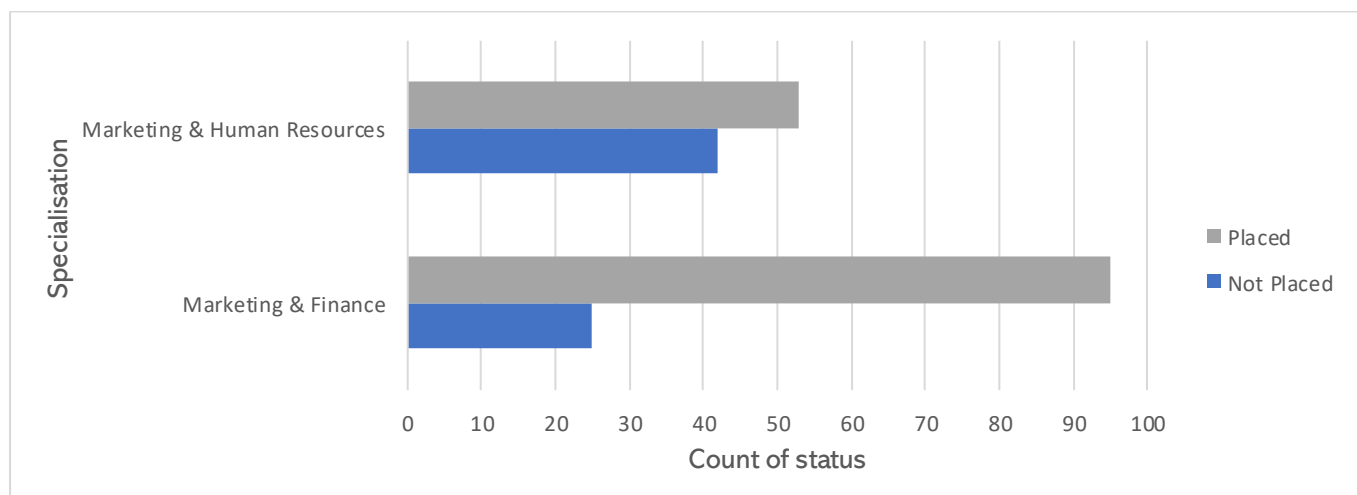
1. Marketing and Finance
2. Marketing and Human resources

We can see from below graph, that Males prefer Marketing & Finance more as compared to Marketing & HR, Whereas Females are equally inclined toward both the specialization.
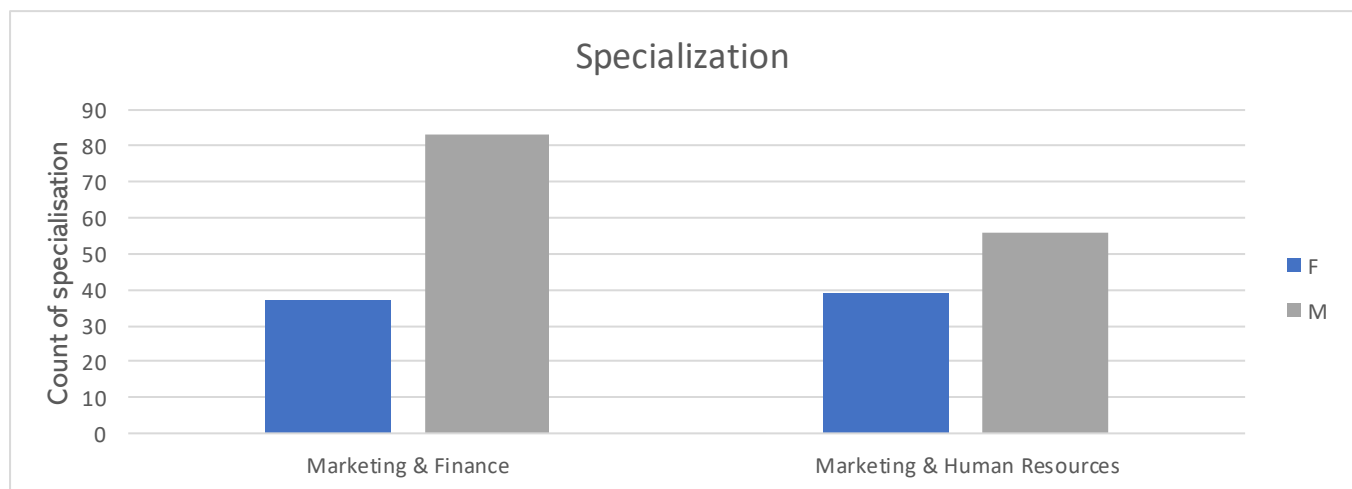
Placement Analysis based on Specialization
We analyzed the number of placed candidates to figure out which specialization has a greater number of placed candidates.

From above graph, we can conclude that, the number of placed students has more in Marketing and Finance, whereas in Marketing and HR, the number of placed candidates is significantly low. Which is a matter of concern.

Based on this analysis, we can suggest the placement committee of the institute to give extra effort to bring more companies, which are interested in recruiting Marketing and HR candidates. In this way the institute can improve their placement in both the specialization which further will attract more candidates in both the specialization without any placement bias.

2. Descriptive Analysis:

It gives us idea of the distribution of the data, helps to detect outliers and enable to identify association among variables. We bifurcated students' result data into placed and unplaced category.

A box and whisker plot displays the five-number summary of a set of data. The five-number summary is the minimum, first quartile, median, third quartile, and maximum. We can observe that there is a difference in the median of SSC and HSC % in placed and unplaced students but in case of MBA% this difference is negligible. Hence, we can draw a conclusion that MBA % doesn't affect placement as much as the SSC and HSC does.
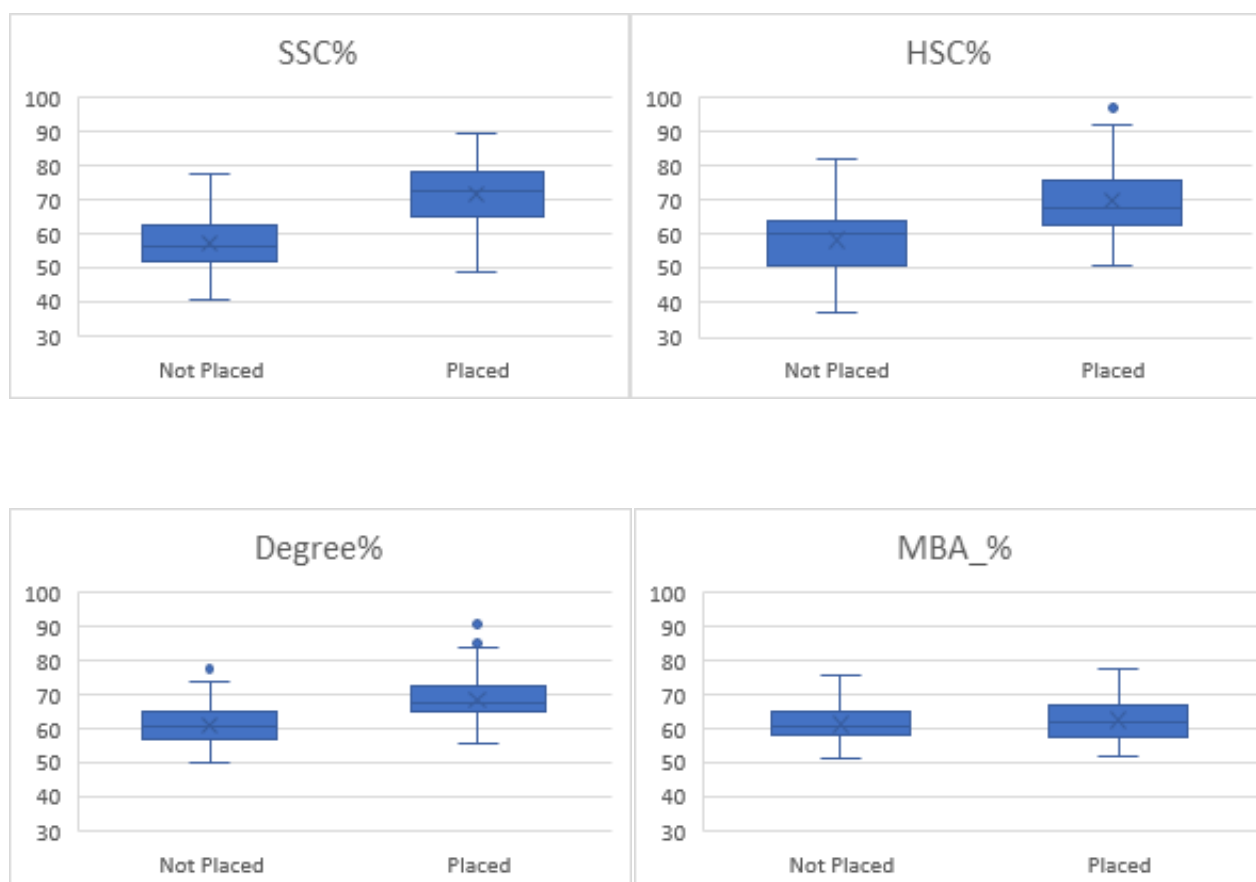
3. Regression Analysis:

To predict the MBA% based on the results of previous exams, we applied simple linear regression taking MBA% as the dependent variable and individually took SSC%, HSC% and Degree% as the independent variable. In this way we developed three regression models, where the equation shown in each graph can be used to predict the MBA%.

SSC%

$y = 0.2093x + 48.192$

HSC%

$y = 0.1899x + 49.679$

Degree%

$y = 0.319x + 41.109$
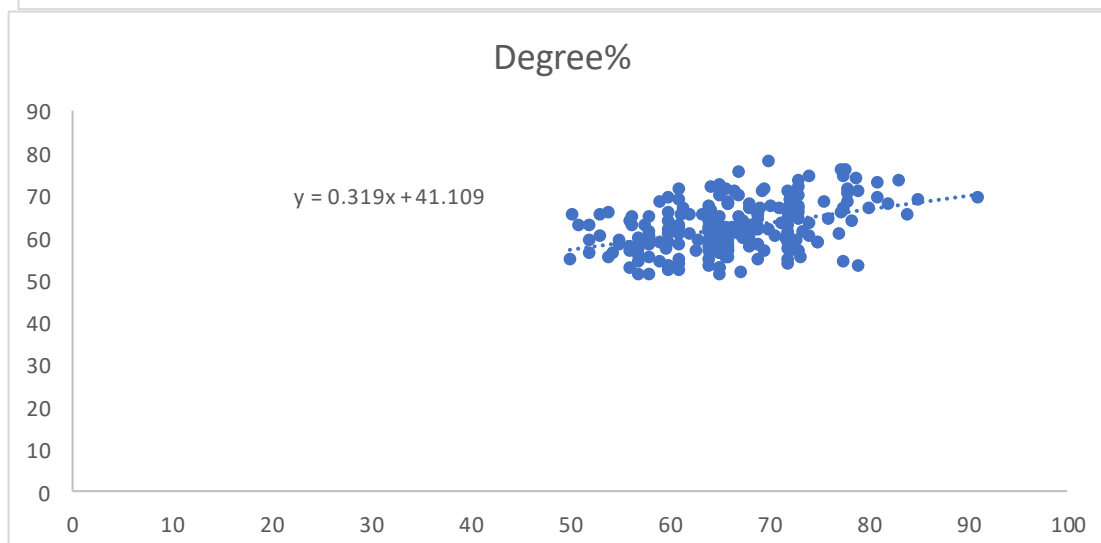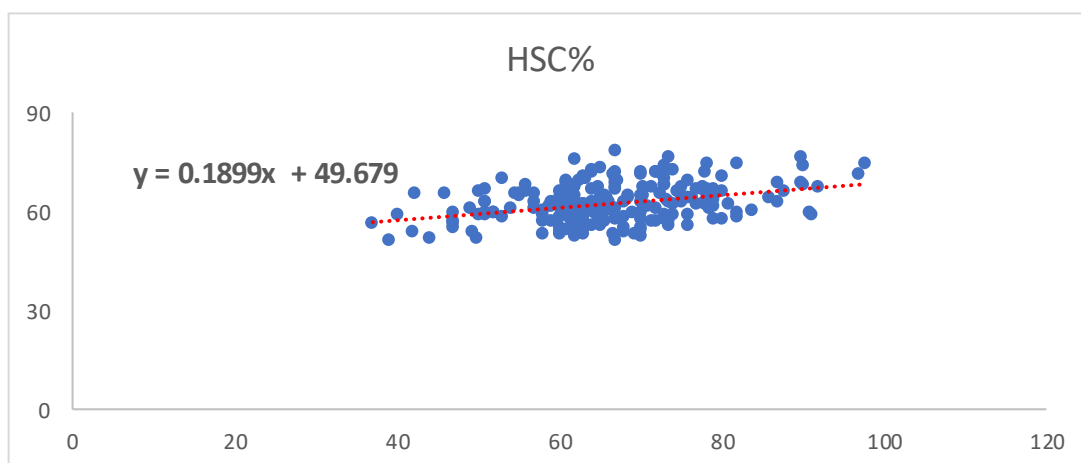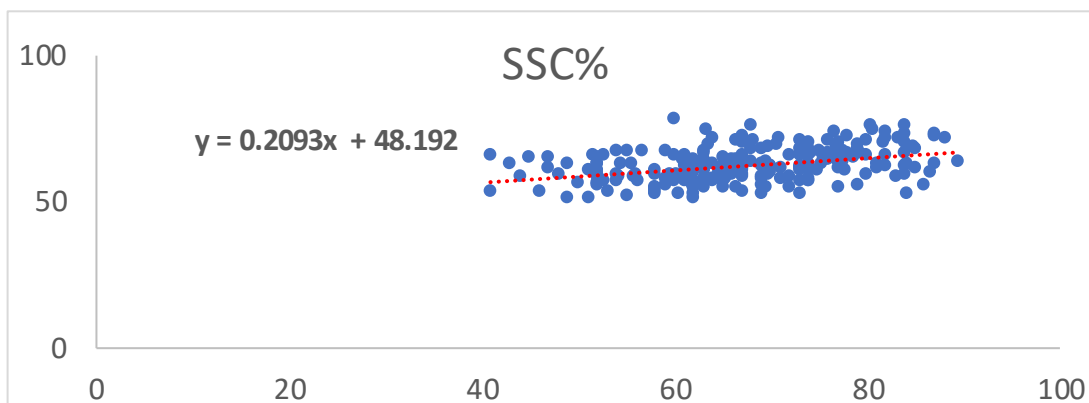
To test the significance of exam percentages in the status of placement we applied multiple regression taking placement status for both "Marketing & Finance" and "Marketing & HR" individually as dependent variable and SSC%, HSC%, Degree% and MBA% as the independent variables. The results indicated that the P-value of SSC% in "Marketing & Finance" is lowest, so it is most significant variable for that category. Also, for this category the P-value of Degree% and MBA% is greater than 0.05 and hence they are not significant variables for determining the placement status of "Marketing & Finance". In case of "Marketing & HR" most significant variable is MBA%.

Variable	Marketing & Finance	Marketing & HR
	P value	P value
SSC %	1.29E-08	0.000275
HSC %	0.047181	0.001104
degree %	0.29782	0.001819
MBA %	0.20602	3.29E-06

4. Correlation:

The correlation was carried out to find the relation how each variable which impact to placement are related to each other. The below table shows the correlation between SSC%, HSC%, Degree% and MBA%.
SSC% and degree% have moderately positively correlation. Therefore, a good score in SSC% indicates a good score in degree % as well. SSC% and HSC% are least correlated. Therefore, SSC% does not affect the MBA%.

	SSC%	HSC%	Degree%	MBA%
SSC%	1			
HSC%	0.51	1		
Degree%	0.54	0.43	1	
MBA%	0.38	0.35	0.40	1

5. Hypothesis Testing

The hypothesis testing was conducted to check if the mean of MBA degree percentage is 62% or not of population using sample data

| Null Hypothesis	Mean of MBA%= 62%
Alternate Hypothesis	Mean of MBA%! = 62%
Level of significance	5%
Mean of sample	62.28
Standard deviation of sample	5.83
T critical	+ - 2.0453
Z statistic	0.72

In hypothesis testing conducted, t value does not lie in the rejection. Therefore, due to the lack of enough evidence we fail to reject the null hypothesis stating that mean MBA% is 62%.

6. Clustering

We carried out K-means clustering method to divide the students into "k" cluster such that each cluster defines students with certain characteristics. A cluster refers to a collection of data points aggregated together because of certain similarities. The K-means algorithm starts with a first group of randomly selected centroids, which are used as the beginning points for every cluster, and then performs iterative (repetitive) calculations to optimize the positions of the centroids. The **Elbow Method** was used to determine this optimal value of k. In our analysis, optimal value of k came to be 3. Following were the cluster characteristics:

Cluster 1	Cluster 2	Cluster 3
Good placed	Not placed	Highly Placed
Work-ex	No Work-ex	Work-ex
Science &Technology	Marketing & HR	Marketing &Finance
Science Stream	Medical & Others	Commerce &Management
Male Centric	Arts Stream	Commerce Stream
	Female Centric	Male Centric
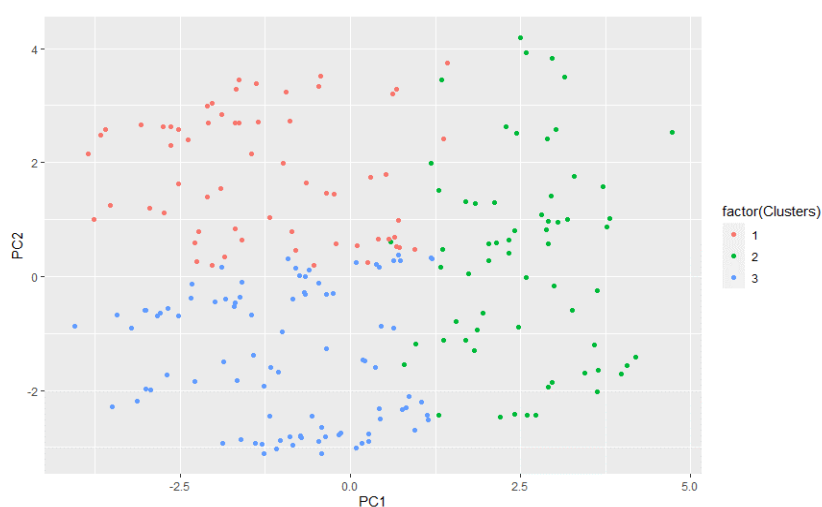
2D Cluster Representation

3D Cluster Representation
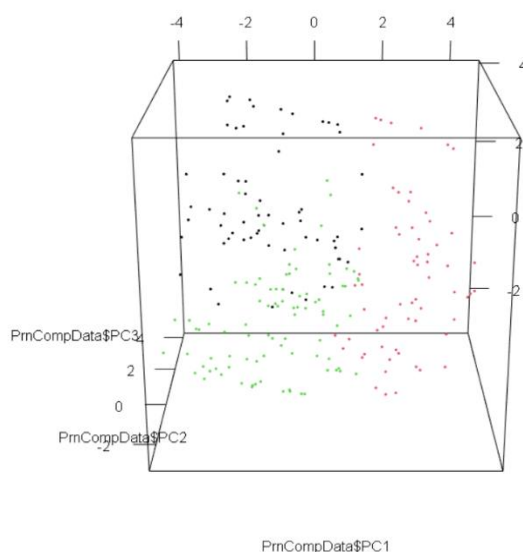
Recommendations:

Based on our analysis we have come up some recommendations for this B-school that can be implemented for better placements and betterment of the students as a whole:

1. The placement committee should approach more companies who want to hire for Marketing + HR roles because students who have opted for Marketing & HR as their specialization are less placed as compare to students who have opted for Marketing + Finance as their specialization. In Marketing & Finance the difference is not very large but in Marketing + HR numbers of students unplaced are almost 42% which is a very huge number.

2. Since we have concluded that chances of placement depend a lot on past academics of the students, therefore a pre placement test can be designed so that past academics are less focused while deciding the status of placement because taking past academics as a basis for final placement will provide undue advantages and disadvantages to some students.

3. As we found that males are more placed as compare to females as we found, so placement committee of the college should ensure that companies give equal opportunities to male and females.

4. Representation of students from all the specializations should be ensured in placement committee, this way committee will be more balanced and will also ensure equal opportunities to students from all the backgrounds.

5. Students should be provided training on latest technologies that are demanded and flourishing in the market so that their chances of placement increase because due to coronavirus there is already a job crunch in the market. Updating at this time will be very beneficial for the students.