

Determinants and Influences on Students' Carrer Choice

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Abstract

The objective of this study is to explore the influences and determinant those effect on the decision of career selection. Students may choose career according to their interests, demand of time, educational background, socio-economic background, opportunity, personality/gender, motivation and environment. In this study Target population is Students of Gujrat city where as sampled population is students enrolled in first year of intermediate. Taking the 5% margin of error a sample of 380 is suggested, for collecting the desired information according to the nature of population we use stratified random sampling. In reliability analysis the "Cranach's Alpha" guide us that the variables included in the study are reliable and the confirmatory factor analysis, confirm our all factors. Neural network analysis is also performed on the data which shows that education background and educational background playing most important role in determination of career selection. The characteristics of different groups of students who chose their career "by choice" or "by force" are explored by using cluster analysis.

Key words: Neural Net Work Analysis, Cluster Analysis

1. INTRODUCTION

Since the beginning of life on earth man's struggle is towards betterment. Everyone in this world wants to be stable. In this regard one must choose a professional career which should be continued throughout life. Career should be chosen according to one's interests and the demand of time. Usually one wants to adopt such a career which would help him to get himself stable and also his nation and country in long run. In this regard family also shows its concern. They urge the person to adopt such a career which would prove fruitful both financially and morally.

In student's life a stage comes, where they have to select a subject/field that is the pre-requisites of their career that they want to join in future. This decision has very important role because it affects their remaining professional life.

As students attempt to decide career while in high schools/ colleges, they face problem of matching their career with their abilities and school performance. Career choice made by student is determined by his preceding created in past by the student's personality, opportunity and his socio-economic and educational background, Environment of area where he lives.

According to Basvage (1996), a research question was asked in her study: "What is it that impacts student's preference"? It showed that there are some factors that urged students to prefer one thing over another while choosing a career. The wide-ranging options that were present for lifelong profession. These professions are set forth in a structure of policies moving toward individual objectives. Fields of professional, educational, and sociological attempts are discovered for the determination of fulfilling individual, social, financial, and academic aims. Career

choice in this study is taken as choice of students about degree and our concern is that what type of factors influencing upon their selection. Career choice is here taken into two scale:

- a) Career by choice b) career by force/limitations

Career by choice means that student choose the career by their own choice according to their interest. Career by force means restrictions on choice due to merit criteria or opposition by parents. There are number of factors that effects the career selection of students, so due to broad and varying factors, this study complements the most important factors. The most important factors had included in this study which discussed in literature are considered, given as follows: Educational Background, Socio-economic Background, Opportunity, Personality, Motivation and Environment.

According to the study of Super (1957), Edwards and Quinter (2011), educational background of a student impact on the selection of career because many times career selection was based on merit criteria which usually based on previous degree marks. Socio-economic background also plays an important role in determination of career choice for students because many students have to financially plan their education according to their family earnings. Michael Borchert (2002), in this study opportunities were taken as an influencing factor of career selection. Opportunities are varieties in one's life which are visible either in an indirect or clear manner. Schnabel, U., et al. (2002), there is a strong relationship between parent's education, socioeconomic background and the career choice of their offspring. These opportunities or paths give one's a selection between the varieties of profession. The profession chosen by individual may or may not outstrip one's current skills. In selection of a career, opportunity is a shaping factor for students to choose any field. Pilot Mudhovozi and Regis Chireshe (2012), stated in this study that the socio-demographic factor was most important factor for career selection. Date, J. Morra, et al. (2009), and Natalie (2006), stated in this study that Personality was also a shaping factor that had impact on the chosen career. According to Oyamo and Amoth (2008), Motivation like Media and Hero idealization, family and peer group pressure were significant factor of career selection. Duffy and Dick (2009), research on the role of spirituality and religion in career development. The factor of Environment had an enormous influence on the career that students decided.

Edwards and Quinter (2011), investigated that career choice was a multifaceted judgment for students since it regulated the kind of occupation that they expected to follow in life. The findings of this study indicated that availability of advancement opportunities and learning experiences were the most influential factors affecting career choices among students. Schnabel, et al. (2002), determined that regardless of the ancient style in all Western societies to raise educational contribution; nevertheless of students' social origin, there was a strong relationship between parents' education, socioeconomic background and the career choice of their offspring. Peter A. Spanger (2000), explored in this study that the behaviors and procedures have impact on high school students as they select their career. Loven T. et al. (2003), reported about the factors affecting the career choice attitudes of students who graduated from any municipal farming education program. The factors researched in this study were environment and motivation. Falojogun V. and Bamidele T. (2008), this study explored factors affecting career decisions among

secondary school youth education. Findings showed that gender and school type significantly influenced students' decisions on career choice. Hewitt (2010), this study showed that there were two types of factors that effected career selection which can be intrinsic or extrinsic or both and also stated that most people choose the career according to choice of their parents and other follow the choices opened by their educational background.

Adkintonide and Olunatosin (2011), Stated that the educator's abilities that effected students' choice of training as a career among college students in Osun state, Nigeria. The study concluded that with the prevalence of the observed problems, teaches should be refreshed regarding their lecturing abilities as students are motivated by their teachers. According to Cavanaugh (2002), Students could be counseled to take part in their career choice, planning was compulsory to require students to give in to an explanation of their ideas for some college education or training to school administrators; or at least explain their forthcoming career ranks in detail. Natalie (2006), life context, personal abilities, natural propensity and academic achievements were the factors those impact on selection about career of students. Motope, S. and Makotose, A.B. (2007), the objective of this study was to explore the factors which had impact upon the female engineering students' career choice in the start of the twenty-first century.

Thomas P. Dick and Sharon F. Rallis, (1991), women continued to unreasonably understated in fields of biological science and engineering. A model for career choice was proposed that included both the direct and indirect effects that socializers can play in defining career choices. Duffy and Dick (2009), research on the role of mysticism and belief in career selection although narrow in scope had recommended that such factors related positively to wanted career development resulted such as career selections. In the study by Weiler (1977), it had been shown that consultants could not 'do it all.' That were the counseling realities that counselors could not only solve the problem of career selection of students here in this study it was debated what analysts could or could not do. Lankard (1996), in this study revealed that the procedure of family interface and its effects on the student could have a long impact on the final selection of choice. This study showed that motivation and inspiration were significant factors for career choice.

Badura et al. (2001), stated that each individual undertaking the procedure was affected by many factors including the framework in which they live in, their individual propensities, social links and scholastic achievements. According to Oyamo and Amoth (2008), studies in Kenya showed the results that there was impact of area and motivation on selection of any career by students. This study indicated that rural students tend to seek help from parents more than urban students and urban students got motivation more by their teachers rather than parents. Study by Greenberger (2000), was about the selection of career according to gender which showed that there were some typical criteria for males and females to do any job. The study showed that gender is the factor, playing most significant role in selection of student's career choice.

1.1- Objectives of study

- To determine the factors those influence on career selection.
- Confirm the factors by confirmative factor analysis those affect the decision-making process of College students about their future career choice.
- Estimate and predict the career choice of a student by using Neural Network model.

- Estimate and predict the career choice of a student on the basis of academic achievements for developing separate models for both categories, career by choice and career by force by using Neural Network model.
- Investigate that which factor plays a significant role in what level of decision making about the career by using Cluster Analysis.

2. MATERIAL ANDMETHODS

The population of study consisted of all the students who had enrolled in first semester of B.S and M.Sc., Semester Fall 2012 and were studying at University of Gujrat Hafiz Hayat Campus and students who were enrolled in first year of Intermediate, Graduation and Post-Graduation those were studying at Fatima Jinnah College, Marghzar College, and Zamindar College. Stratified random sampling had been applied; it was used as data was heterogeneous, homogeneity was required and to ensure the adequate representation of each discipline in the sample. To determine the sample size of the study a formula given by Yamane (1967) $n = N / (1 + Ne^2)$ was used.

Since the total population size was 7528 and the data was categorical so the sample size 'n' was taken 380 with 0.05 margin of error. By using the proportional allocation method a sample of 380 students was selected. Firstly, strata's were made with respect to the institute and then each designed stratum was further stratified on the basis of degree (class) in which students were enrolled. As total population was 7528, population of students in M.Sc., population of Marghzar college was 892 from which 874 students were enrolled in Intermediate and 18 students were enrolled in Post-graduation, population of Fatimah Jinnah college was 1056 from which 1008 students were in main campus of UOG was 3630 from which 2500 students enrolled in B.S and 1130 students were enrolled in Intermediate and 48 students are enrolled in Post-graduation, and the population of Zamindar college was 1950 from which 1000 students were enrolled in Intermediate, 600 students were enrolled in Graduation and 350 students were enrolled in Post-graduation. So, according to sample 182 students were selected from UOG from which 125 were enrolled in B.S and 57 were enrolled in M.Sc. 47 students were selected from Marghzar College from which 45 were from intermediate and 2 students were from master degree, similarly 52 students were selected from F.J College of which 50 students were enrolled in Intermediate and 2 were from Master degree and 99 students were selected from Zamindar College from which 50 students were of Intermediate , 31 of graduation and 18 of Post-graduation total sample was of 380.

Well-structured questionnaire,a main instrument was employed, it consisted of two parts. First part was about demographic information and second part constituted the factors selected through literature review and measured through total number of 57 questions and the 5-point Likert Scale.

Descriptive statistics were carried out for all items involved in the study. Confirmatory factor analysis was used to confirm the factors. Neural Network Analysis was used to fulfill the main objectives of the study. An Artificial Neural Network (ANN) was an information processing paradigm that was inspired by the way biological nervous systems, such as the brain, process information. The key element of this paradigm is the novel structure of the information processing system. It is composed of a large number of highly interconnected processing elements (neurons) working in union to solve the specific problems. There are numerous ways to sort cases into groups,

Hierarchical cluster analysis, k-means cluster, and two-step cluster are the major types of clustering; in this study two-step cluster analysis is used. It provides a simple profile of individuals and also suggests how groups of units are determined such that units within groups are similar in some respect and unlike those from other groups.

3. RESULTS AND DISCUSSION

In order to observe the career selection of students, the results of descriptive statistics are calculated for all variables but results of some of the important variables are discussed here. These results provide simple summaries about the sample and the measures.

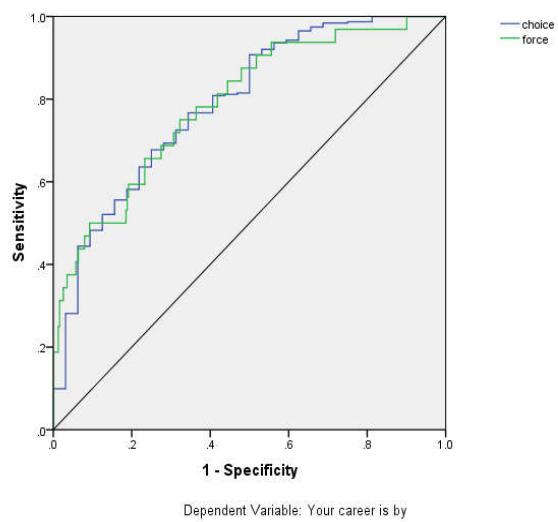
3.1- Descriptive Analysis

In order to observe the career selection of students, descriptive statistics are calculated for all the variables. These results provide easy summaries about the sample. The mean and S.D of quantitative variables is shown here. It shows the minimum family income of respondent is 8000 and maximum income is 270000. The mean income is 52020.52 with S.D 37092.796. According to the variable gender, females are 62.9% and male respondent's are 37.1% which indicates that proportion of students with respect to gender is much different. 46.1% of the respondents belong to rural areas and 53.9% are from urban areas. Schooling background of 56.1% of respondents is Urdu medium and 43.9% of the respondents had throughout studied in an English medium school. As four institutes are selected to collect the data so, 12.4% of respondents are taken from Marghzar College, 13.7% of the respondents from Fatima Jinnah College, 25.8 % from Zamindar College and 48.2% of the students from University of Gujrat. 38.2% of the students are from intermediate, 41.1% are from Graduation and 20.8% are from Post-Graduation. The percentage of respondents from different disciplines have maximum percentage 26.1% of the respondents, selected from Chemical and biological sciences, 13.7% from Commerce & Business, 13.2% from Computer science & information technology, 12.6% from Mathematical sciences, 11.6% from Engineering, 8.6% from product design, 6.8% from Social Sciences, 4.5% from Languages and 2.9% from Humanities. In case of previously studied subjects 47.4% of respondents had studied Biological sciences, 16.8% of students from mathematical sciences, 15.3% from Computer science, 14.5% from Arts and humanities and 6.1% from Commerce. Parent's profession is also categorized as nominal variable where according to our study, 24.75 of fathers of respondents belong to business which is maximum among all professions, 15.5% are from misc., 10% are from Education Department, 9.2% are retired, 8.25 from Defense Department, 7.1% are from agriculture, 6.6% are self-employed, 6.35 are Foreign Job holders, 5.8% have Private job, 3.45 are from health Department and 3.2% are laborer. In case of mothers, 86.6% of mothers are House wives, 10.8% from Education Department, 2.1% are from Health Department and 0.5% have Private job. According to the results of our study, 90 % of respondents had chosen career by choice and 10% by force.

All the descriptive statistics provide the overview about the characteristics of the sample. Total scores are computed by combining the variables in each factor into a single score that replaced the original with new composite variables, to be used for further analysis.

Table 3.1: Measures of Goodness of Fit for all the factors that can affect learning

| Recommended criteria's | | | | | | | |
|---------------------------|----------|-----|------------|----------------|--------|--------|--------|
| Factors | χ^2 | d.f | P-value | $\chi^2 / d.f$ | GFI | AGFI | RMSA |
| | | | < α | < 3, 2-5 | > 0.90 | > 0.90 | < 0.80 |
| Educational background | 21.494 | 9 | 0.0000 | 2.388 | 0.981 | 0.955 | 0.035 |
| Socio-economic background | 67 | 14 | 0.0000 | 4.7857 | 0.956 | 0.911 | 0.95 |
| Opportunity | 18.760 | 9 | 0.027 | 2.084 | 0.984 | 0.984 | 0.054 |
| personality | 0.3978 | 2 | 0.082 | 0.1989 | 0.999 | 0.997 | 0.000 |
| Motivation | 46.66 | 14 | 0.0000 | 3.3328 | 0.967 | 0.935 | 0.076 |
| Environment | 41.61 | 9 | 0.0000 | 4.6233 | 0.964 | 0.916 | 0.099 |

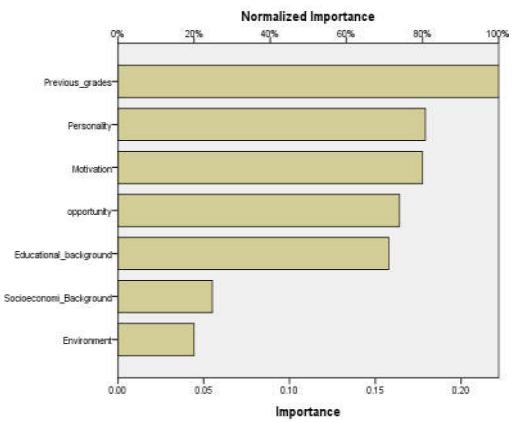
**Figure 3.1: Roc curve**

3.2- Prediction of Career Selection by using Neural Network

It was desired to predict career selection by using Multilayer perceptron. Here career selection was taken as dependent variable with two categories, “career by choice” and “career by force”. For analysis purposes 90.8% cases were used by training samples and 9.2% cases were used by holdout part. Valid sample size was 380 no missing observation and total sample size was 380. It included 6 independent variables and 1 dependent variable career selection which had the two categories “force” and “choice”.

3.2.1- ROC curve

ROC curve gave us clear and powerful result as compared to other table used in analysis. ROC curve was used to look visual displayed sensitivity and specificity for all possible cut-offs, in one plot. This graph told us about the sensitivity and specificity where sensitivity was the number of positive cases correctly classified and specificity was number of the negative cases incorrectly classified as positive. There were two lines in this graph one was blue which showed the category “by choice” and second was green which showed the category “by force” in the dependent variable, both lines were on the top left corner near to 1 which was the indication of the best fit of the model.



3.2.2- Contribution of predictors

The importance of independent variables in predicting the category of dependent variable was also checked by the graphical importance of the independent variables. This graph showed that all independent variables were important to predict the model on the bases of the dependent variable, because the differences between the independent variables were not wider. Its important was also computed in tabular form. The table showed important and normalized importance, which indicated that “Previous degree grades” was 100% most important variable to predict the model on the bases of dependent variable. Similarly next was “Educational background” 71.1% and so on.

3.2.3- Predicted pseudo probabilities

Graphical look of the classification box indicated the predicted pseudo-probability of the correctly classified cases of categories “choice” and “force”. The box of the blue color showed choice category and green box showed the force category. Most of the portion of the left blue box plot was above cut point 0.5 on the Y-axis; it meant that most of the cases were correctly classified and right green box plot indicated the pseudo-probability of correctly classified cases of the Category force of the dependent variable. Incorrect classified cases of both categories were shown below the cut point 0.5.

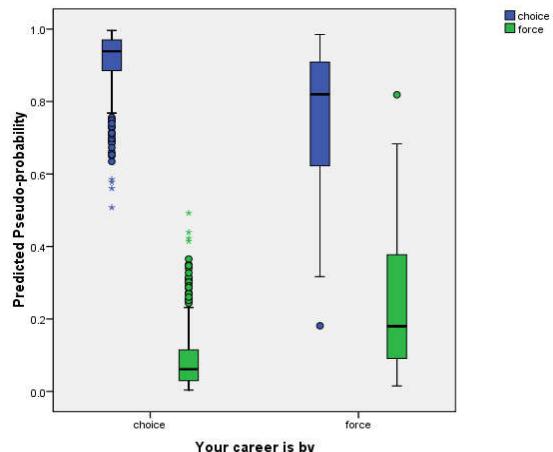


Figure 3.3: Predicted Pseudo-Probability

3.2.4- Relation among Input, Output and Hidden Layers

Relation among Input, Output and Hidden Layers for Career selection model was given in above Figure. Here in chart gray lines showed positive relationship and blue lines showed negative relationship. Hidden layer activation function Hyperbolic Tangent and Output layer activation function was Softmax. Input layer contained independent factors and variable previous grades used as factor, and output layer contained variable “Career selection” having two categories “By Force” and “By Choice”.

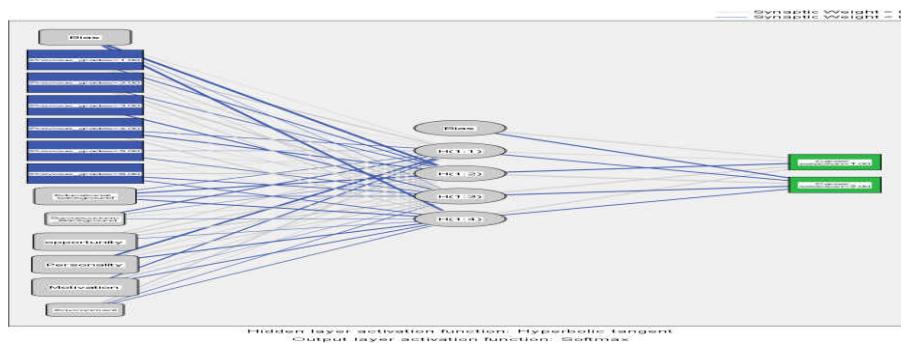


Figure 3.4: Relation between input, output and hidden layers

3.3- Prediction of Career Choice on the basis of Academic Achievement by using Neural Network

It was desired to predict career selection on the basis of Academic achievement, where Academic achievement is categorized as A^+ and above or below A^+ with two categories of career selection “by choice” and “by force”.

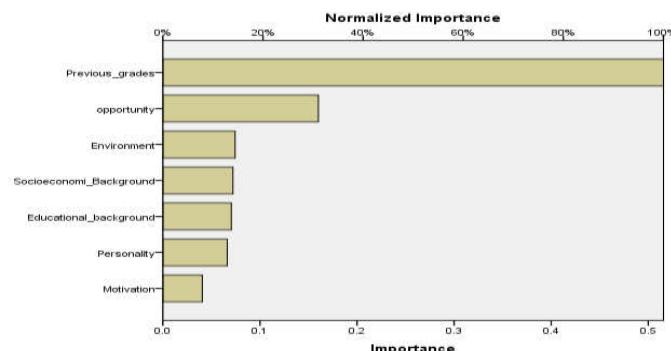
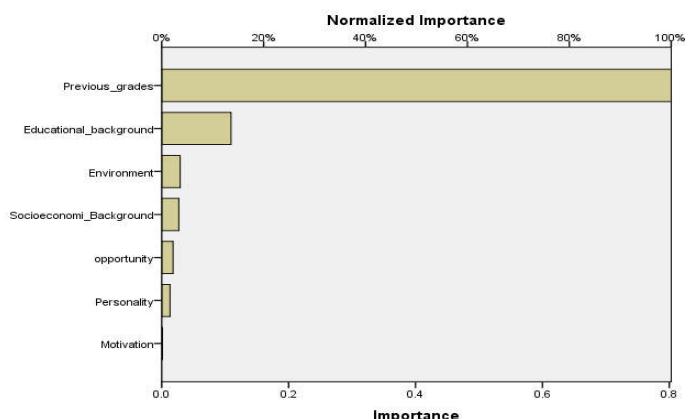
For analysis purposes 92.1% cases were used by training samples and 7.9% cases were used by holdout part. Valid sample size was 100 no missing observation and total sample size was 100. It included 6 independent variables and 1 dependent variable Academic achievement which had two categories “below 80% marks” and “above 80% marks” associated with career selection of students. These results were depicted in the Table B-1.

269 out of 269 cases of the category “ By Choice” of the dependent variable in the training samples were correctly classified, making a 100.0 % correctly classification under the category Below 80% of Academic achievement. And 41 out of 41 cases of the category “above 80%” of the dependent variable in the training samples were correctly classified, making 100.0% correct classification. Overall 100.0% of the cases in training samples were correctly classified. In holdout samples 30 out of 30cases of the category “Below 80 %” of the dependent variable under the category Force of career selection was correctly classified, making a 100.0% correct classification. And 8 out of 8 cases of the category “Above 80%” of the dependent variable in the holdout samples were correctly classified, making 100.0% correct classification. Overall 100.0% of the cases in holdout samples were correctly classified. The results of this classification showed that all the variables entered in the model had the ability to distinguish the career selection of students in form of “Career by choice” or “Career by force” with respect to the Academic achievement. Results of classification matrix were given in Table B-2.

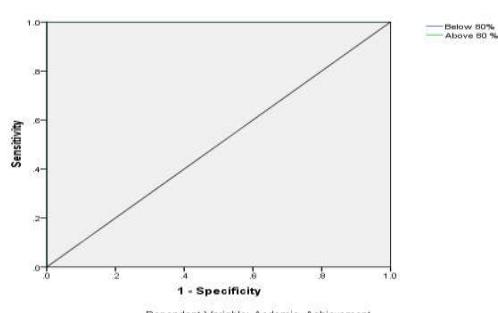
ROC curve gave us clear and powerful result as compared to other table used in analysis. It was used to look visual displayed sensitivity told us about the sensitivity and specificity where sensitivity was the number of positive cases correctly classified and specificity was number of the negative cases incorrectly classified as positive. There were two lines in this graph one was blue which showed the category below 80% and second was green which showed the category above 80 % in the dependent variable, in case of choice both lines on the top left corner near to 1 which was the indication of the best fit of the model. Roc curve for Choice category was shown in Figure.

There were two lines in this graph one was blue which showed the category choice and second was green which showed the category force in the dependent variable, in case of force both lines on the top left corner near to 1 which was the indication of the best fit of the model. ROC curve for Force category was showed in Figure.

The importance of independent variables in predicting the category of dependent variable was given table B-3. There were four columns of this table first showed the career selection type next was for variables under study and one was the importance and another was for normalized importance which showed that "Previous degree grades" was 100% most important variable to prediction of the model on the bases of dependent variable for both choice and force. Result for importance of variables was shown in Table B-3 for both categories of career selection "by Choice" and "by Force". The importance of independent variables in predicting the category of dependent variable was also checked by the graphical importance of the independent variables. Graph showed that previous grade was most important variable for model by choice. Chart for important variables for choice category was given in Figure.

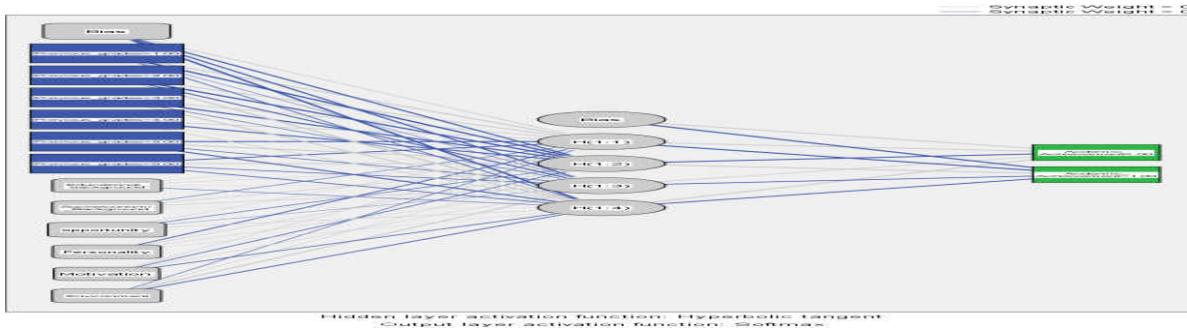


The importance of independent variables in predicting the category of dependent variable was also checked by the graphical importance of the independent variables. Graph showed that previous grade was most important variable for model by force. In both models for choice category as well as Force category variable "previous Grades" was most important variable. Result of that graphical presentation of importance chart was given in Figure.

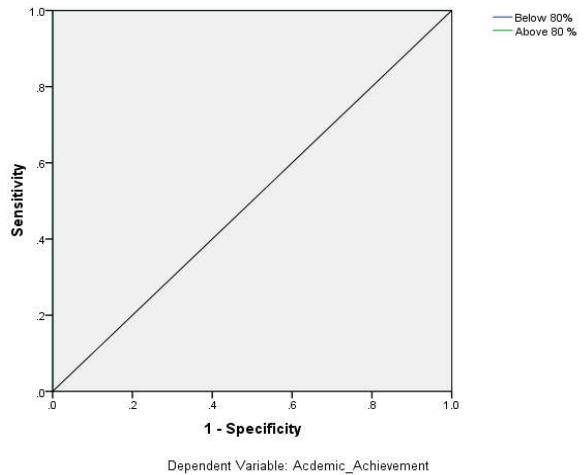


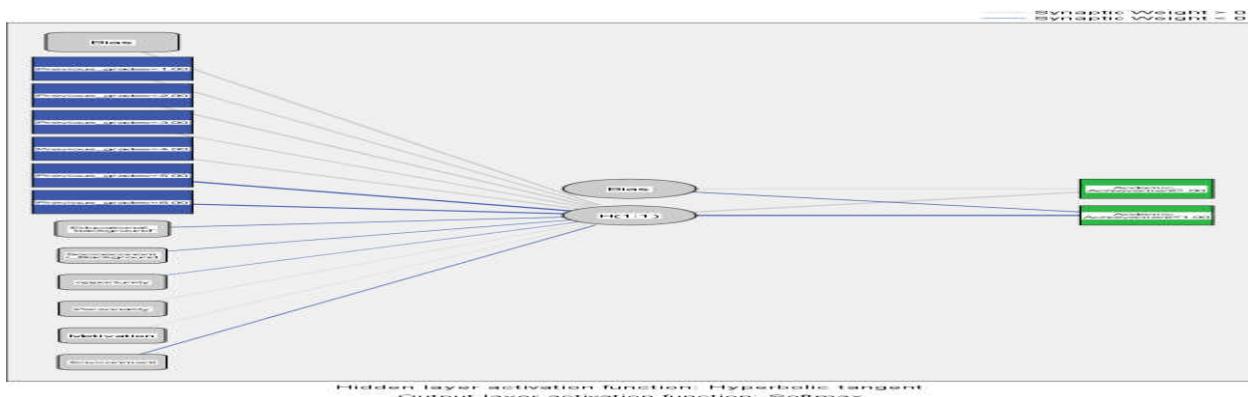
There were one factor and six covariates as independent variables and one dependent variable having two categories i.e. "career by choice" and "career by Force". Number of input layers was eight which included only one factor and rest of these were covariates. Output layer used softmax activation function. Hidden layer was used to assign the weight to the input layers to predict the output layer which was dependent variable having 2 categories "Above 80%" and "Below 80%" for category by Choice of career selection. H (1:1) H (1:2) H (1:3) H (1:4) were the 4 Hidden layer used to predict the output layer. Table B-4 depicted the results of parameter estimates. Result of parameter estimate for force category was given in Table B-5.

Relation among Input, Output and Hidden Layers for Career by Choice was given in Figure. Here in chart gray lines showed positive relationship and blue lines showed negative relationship. Hidden layer activation function Hyperbolic Tangent and Output layer activation function was Softmax where there were four hidden layers in model for career selection by choice.



Relation among Input, Output and Hidden Layers for Career by Force was given in Figure. Input layer contained factors and variable previous grades used as factor, and output layer contain variable "Academic achievement" having two categories "80% above" and "80% below".





3.4- Two-Step Cluster Analysis

Two step cluster analysis was used for identifying groups of individuals, whose characteristics were similar to each other and career was chosen by choice but different from individuals in other groups who did not choose career by choice (choose by force).

The process, in which number of clusters was chosen, was summarized in Auto-clustering Table C-1. The clustering criterion (Bayesian information Criterion) was computed for each potential number of clusters. Smaller values of the BIC indicated better models. The table showed that the smallest BIC is 1478.524 for which the number of clusters was four. The second clustering criterion was BIC change which was computed for each potential number of clusters. When the sign of “BIC change” changed from negative to positive the number of clusters was taken in front of that change. Table B-1 indicated four clusters according to that criterion. On the other hand, when the sign of “Ratio of BIC changes” changed from positive to negative the number of clusters was selected at that point. The frequency of each cluster was shown in cluster distribution Table C-2. It indicated that out of 380 cases, 128 cases were assigned to the first cluster, 119 to the second cluster, 38 to third cluster, and 95 to the fourth cluster. Number of individual assigned to the first cluster had the highest percentage of 33.7%.

The centroids were shown in Table C-3; it indicated the clusters separated by the continuous variables. It showed the students who chose career by choice. They had educational background with mean 9.950. Their Socio-economic background was good with mean 12.6897. Opportunity for the students of first cluster had mean 12.7812 which was greater than the mean for Opportunity of cluster three. Personality had the mean 6.7812 which was lowest among all the four clusters. Students of first cluster had high Motivation with the mean 14.9799 which was better than second cluster. And the environment had the mean 10.0911 which was smallest among all four clusters. It also indicated the characteristics of students who under lie in second cluster. Students of second cluster also chose career by choice but they had better mean values for all the variables as compared to the first cluster. In the third cluster students were included who took their career by force. In this cluster no variable was playing larger value among all other variables. It also determined the characteristics of students who under lie in fourth cluster. Students of fourth cluster also chose career by choice all the variables had larger mean values for all variables as compared to the other clusters. All the variables had significant values for all variables. To clarify the properties of the clusters the cluster frequency by the career selection was shown in table C-4. It indicated that cluster 1 was comprised entirely of the

students who chose their career by choice with frequency 128. The second cluster contained the students who chose career by choice with frequency 119. The third cluster contained the students who chose their career by force with frequency 38. And in fourth cluster there were students who chose career by choice with frequency 95.

3.4.1-FactorwiseImportance

The “by variable” importance chart for first cluster was shown in figure 4.5. The variable on the Y axis was in the descending order of importance. Educational background was the most important variable for this cluster and all the other variables were playing significant role. For determining the significance of each variable the dashed

straight up lines marked the critical values. A variable to be significant, its t-statistic must exceed the dashed line in either positive or negative way. The importance measures for all the variables exceeded the critical value in this chart. It also indicated that for the first cluster, all the variables took larger than average value. These results confirmed the trends observed in the Centroids table. The “by variable” importance chart for second cluster was shown in Figure 4.6. It indicated that motivation was the most important variable for this cluster while opportunity was also very important variable in that cluster. In this variable the variable of Environment did not exceed the average value which indicated that environment was not playing the role in formation of second cluster. A variable to be significant, its t-statistic must exceed the dashed line in either positive or negative way. In this chart for second cluster motivation and personality exceeded critical value in negative way and three variables Opportunity, Socio-economic background and Educational background exceeded critical value in positive way.

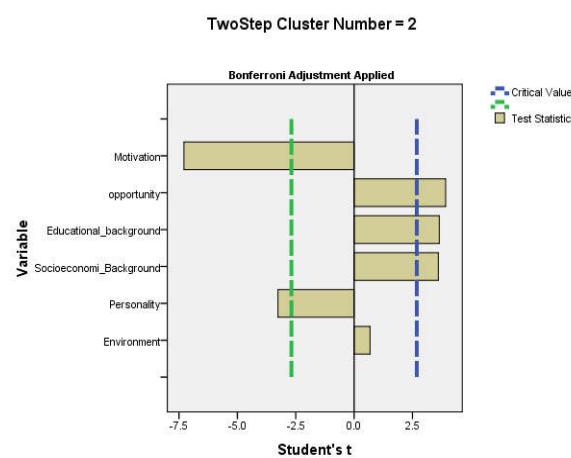
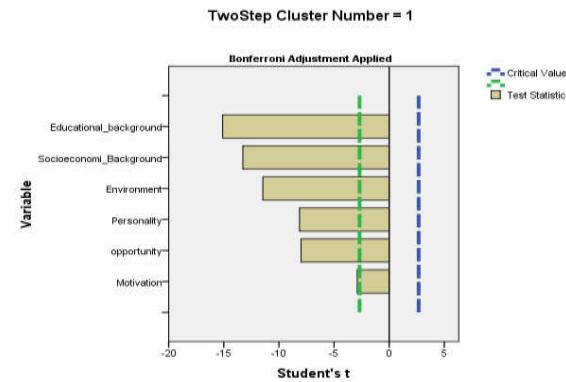


Fig.3.5: By-variable importance chart for cluster no. 2

The “by variable” importance chart for cluster number three was shown in Figure 4.7. The variables were not playing significant role in formation of third cluster as the cluster depended on the students whose career selection

was by force. In this case variables were not playing the significant role which supported the results and trends observed in Centroids table.

The “by variable” importance chart for cluster number four was shown in Figure 4.8. The variables on the Y axis were in the downward order of importance. Personality was most important variable for this cluster while Environment, Motivation and Educational background were also very important variables. So, it was concluded that all of the continuous variables contributed to the formation of fourth cluster. It also indicated that these results confirmed the trends observed in the Centroids table.

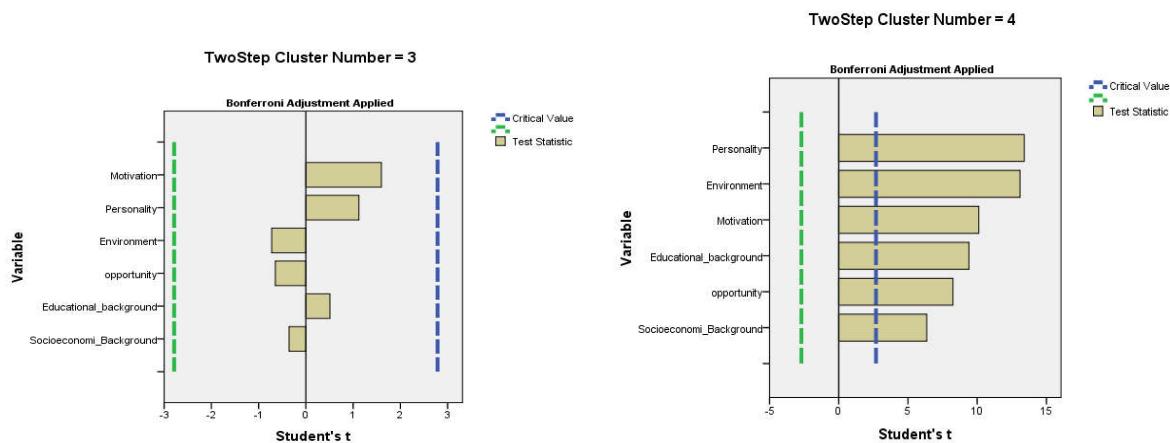


Fig.3.7: By-variable importance chart for cluster no. 3 Fig.3.8: By-variable importance chart for cluster no. 4

3.4- Conclusion

The study examined the effect on career selection of students. It also checked that which factor play an important role for measuring student's selection of career. The findings presented a picture which confirmed that the Educational Background, Socio-economic Background, Environment, Personality as well as Opportunity and motivation had influence upon career selection of student. Almost all of the students expressed their perception that motivation was most important in selection of career. Model for career selection was designed on the basis of factors influencing career choice. Separate models for both categories of career selection were designed. These models estimated the career selection on the basis of “Academic Achievement”. The results indicated that previous grades were most important for selection of career and all the other variables also play significant role, but in case of model computed for career by force only the previous degree grades was important.

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APPENDIX

Table A-1: Classification Matrix of Neural Network

| Sample | Observed | Predicted | | |
|----------|-----------------|-----------|-------|-----------------|
| | | Choice | Force | Percent Correct |
| Training | Choice | 313 | 0 | 100.0% |
| | Force | 26 | 6 | 18.8% |
| | Overall Percent | 98.3% | 1.7% | 92.5% |
| Holdout | Choice | 27 | 2 | 93.1% |
| | Force | 6 | 0 | 0% |
| | Overall Percent | 94.3% | 5.7% | 77.1% |

Table A-2: Contribution of Predictors

| Independent Variable Importance | | |
|---------------------------------|------------|-----------------------|
| | Importance | Normalized Importance |
| Previous degree grades | .222 | 100.0% |
| Educational background | .158 | 71.1% |
| Socio-economic background | .055 | 24.8% |
| Opportunity | .164 | 74.0% |
| Personality | .179 | 80.7% |
| Motivation | .177 | 80.0% |
| Environment | .044 | 20.0% |

Table A-3: Parameter Estimates

| Predictor | | Predicted | | | | | |
|----------------|---------------------------|----------------|--------|-----------|--------|-------------------------|-------------------------|
| | | Hidden Layer 1 | | | | Output Layer | |
| | | H(1:1) | H(1:2) | H(1:3) | H(1:4) | [Career selection=1.00] | [Career selection=0.00] |
| Input Layer | (Bias) | .041 | -.989 | -4.710E-5 | -.592 | | |
| | [Previous grades=1.00] | .732 | -.256 | .272 | .153 | | |
| | [Previous grades=2.00] | .059 | -.236 | .872 | .245 | | |
| | [Previous grades=3.00] | .064 | .000 | -.448 | .015 | | |
| | [Previous grades=4.00] | -.332 | -.667 | .159 | .473 | | |
| | [Previous grades=5.00] | -.036 | .186 | -.288 | .019 | | |
| | [Previous grades=6.00] | .104 | .990 | -.514 | -.439 | | |
| | Educational background | -.227 | -1.032 | -.347 | -.819 | | |
| | Socio-economic background | -.461 | -.092 | .210 | -.157 | | |
| | Opportunity | .394 | .603 | 1.032 | -.181 | | |
| | Personality | -.797 | .240 | .450 | -.653 | | |
| | Motivation | -.272 | .120 | -.010 | -.433 | | |
| | Environment | .447 | .061 | -.120 | -.205 | | |
| Hidden Layer 1 | (Bias) | | | | | .594 | -.653 |
| | H(1:1) | | | | | .281 | -.515 |
| | H(1:2) | | | | | -1.030 | 1.174 |
| | H(1:3) | | | | | .724 | -.956 |
| | H(1:4) | | | | | .592 | -.512 |

Table B-1: Case Processing Summary

| | | N | Percent |
|---------------|----------|-----|---------|
| Choice Sample | Training | 310 | 90.6% |
| | Holdout | 32 | 9.4% |
| Valid | | 342 | 100.0% |
| Excluded | | 0 | |
| Total | | 380 | |
| Force Sample | Training | 35 | 92.1% |
| | Hold out | 3 | 7.9% |
| Valid | | 38 | 100.0% |
| Excluded | | 0 | |

Table B-1: Case Processing Summary

| | | N | Percent |
|---------------|----------|-----|---------|
| Choice Sample | Training | 310 | 90.6% |
| | Holdout | 32 | 9.4% |
| Valid | | 342 | 100.0% |
| Excluded | | 0 | |
| | Total | 38 | |

Table B-2: Classification Matrix of Neural Network

| Your career is by | | | Predicted | | |
|----------------------|----------|-----------------|-----------|------------|-----------------|
| | | | Below 80% | Above 80 % | Percent Correct |
| choice | Training | Below 80% | 269 | 0 | 100.0% |
| | | Above 80 % | 0 | 41 | 100.0% |
| | | Overall Percent | 86.8% | 13.2% | 100.0% |
| | Holdout | Below 80% | 30 | 0 | 100.0% |
| | | Above 80 % | 0 | 2 | 100.0% |
| | | Overall Percent | 93.8% | 6.2% | 100.0% |
| force | Training | Below 80% | 27 | 0 | 100.0% |
| | | Above 80 % | 0 | 8 | 100.0% |
| | | Overall Percent | 77.1% | 22.9% | 100.0% |
| | Holdout | Below 80% | 2 | 0 | 100.0% |
| | | Above 80 % | 0 | 1 | 100.0% |
| | | Overall Percent | 66.7% | 33.3% | 100.0% |

Dependent Variable: Academic_Achievement

Table B-3: Contribution of Predictors

| Your career is by | | Importance | Normalized Importance |
|-------------------|---------------------------|------------|-----------------------|
| Choice | Previous degree grades | .516 | 100.0% |
| | Educational background | .070 | 13.7% |
| | Socio-economic background | .072 | 14.0% |
| | Opportunity | .160 | 31.1% |
| | Personality | .066 | 12.9% |
| | Motivation | .041 | 7.9% |
| | Environment | .074 | 14.4% |
| Force | Previous degree grades | .803 | 100.0% |
| | Educational background | .109 | 13.6% |
| | Socio-economic background | .027 | 3.4% |
| | Opportunity | .018 | 2.2% |
| | Personality | .013 | 1.6% |
| | Motivation | .001 | .1% |
| | Environment | .029 | 3.6% |

Table B-4: Parameter estimates**Your career is by = choice**

| Predictor | Predicted | | | | | |
|---|----------------|--------|--------|--------|----------------------------|-----------------------------|
| | Hidden Layer 1 | | | | Output Layer | |
| | H(1:1) | H(1:2) | H(1:3) | H(1:4) | [Academic Achievement=.00] | [Academic Achievement=1.00] |
| Input Layer (Bias) [Previous grades=1.00] [Previous grades=2.00] [Previous grades=3.00] | .216 | -.355 | -.247 | -.483 | | |
| | .888 | -.972 | -.053 | -.124 | | |
| | 1.035 | -1.053 | -.338 | .781 | | |
| | .567 | -1.066 | -.161 | .553 | | |

| | | | | | | |
|-------------------|------------------------------|--------|--------|-------|--------|--------|
| | | | | | | |
| | [Previous grades=4.00] | .590 | -1.226 | .007 | .221 | |
| | [Previous grades=5.00] | -2.059 | 3.450 | -.235 | -.949 | |
| | [Previous grades=6.00] | -1.045 | 1.295 | -.416 | -.441 | |
| | Educational background | .070 | .170 | .076 | -.196 | |
| | Socio-economic background | -.165 | .271 | .445 | .034 | |
| | opportunity | .117 | -.186 | -.083 | .233 | |
| | Personality | -.234 | .178 | .123 | .110 | |
| | Motivation | .105 | -.174 | .123 | -.237 | |
| | Environment | -.088 | .091 | .487 | -.241 | |
| Hidden Layer 1 | (Bias) | | | | 1.535 | -1.947 |
| | H(1:1) | | | | 1.614 | -2.385 |
| | H(1:2) | | | | -2.198 | 3.002 |
| | H(1:3) | | | | .470 | -.712 |
| | H(1:4) | | | | 1.501 | -1.041 |

Table B-5: Parameter estimates**Your career is by = force**

| Predictor | Predicted | | |
|------------------------------|-------------------|-------------------------------|--------------------------------|
| | Hidden Layer 1 | Output Layer | |
| | | [Academic Achievement=.00] | [Academic Achievement=1.00] |
| Input Layer | | | |
| (Bias) | .678 | | |
| [Previous grades=1.00] | .569 | | |
| [Previous grades=2.00] | 1.126 | | |
| [Previous grades=3.00] | 1.001 | | |
| [Previous grades=4.00] | 1.462 | | |
| [Previous grades=5.00] | -2.479 | | |
| [Previous grades=6.00] | -2.151 | | |
| Educational background | -.338 | | |
| Socio-economic background | -.103 | | |
| opportunity | -.053 | | |
| Personality | .042 | | |
| Motivation | .003 | | |
| Environment | -.090 | | |
| Hidden Layer | | | |
| (Bias) | | .234 | -.445 |
| 1 | H(1:1) | 4.375 | -4.357 |

Table C-1: Auto clustering

| No. of Clusters | Schwarz's Bayesian Criterion (BIC) | BIC Change | Ratio of BIC Changes | Ratio of Distance Measures |
|-----------------|------------------------------------|------------|----------------------|----------------------------|
| 1 | 1901.659 | | | |
| 2 | 1661.485 | -240.174 | 1.000 | 1.466 |
| 3 | 1522.208 | -139.277 | .580 | 1.791 |
| 4 | 1478.524 | -43.684 | .182 | 1.598 |
| 5 | 1480.069 | 1.546 | -.006 | 1.291 |
| 6 | 1498.680 | 18.610 | -.077 | 1.408 |
| 7 | 1534.288 | 35.609 | -.148 | 1.115 |
| 8 | 1574.183 | 39.895 | -.166 | 1.117 |
| 9 | 1617.982 | 43.799 | -.182 | 1.307 |
| 10 | 1669.627 | 51.644 | -.215 | 1.042 |
| 11 | 1722.302 | 52.675 | -.219 | 1.070 |
| 12 | 1776.574 | 54.272 | -.226 | 1.006 |
| 13 | 1830.988 | 54.414 | -.227 | 1.086 |
| 14 | 1887.210 | 56.222 | -.234 | 1.100 |
| 15 | 1945.333 | 58.123 | -.242 | 1.073 |

Table C-2: Cluster Distribution

| | | N | % of Combined | % of Total |
|---------|----------|-----|---------------|------------|
| Cluster | 1 | 128 | 33.7% | 33.7% |
| | 2 | 119 | 31.3% | 31.3% |
| | 3 | 38 | 10.0% | 10.0% |
| | 4 | 95 | 25.0% | 25.0% |
| | Combined | 380 | 100.0% | 100.0% |
| Total | | 380 | | 100.0% |

Table C-3: Centroids

| | Clusters | | | | |
|---------------------------|-----------------|----------|----------|----------|-----------------|
| | 1 | 2 | 3 | 4 | Combined |
| Mean | | | | | |
| Educational Background | 9.950 | 14.8347 | 14.0526 | 17.1860 | 13.6991 |
| Socio-economic Background | 12.6897 | 17.4922 | 15.9586 | 19.3173 | 16.1774 |
| Opportunity | 12.7812 | 16.0490 | 14.7632 | 17.2053 | 15.1088 |
| Personality | 6.7812 | 7.7899 | 8.9013 | 11.1211 | 8.3941 |
| Motivation | 14.9799 | 14.0780 | 17.2932 | 19.4617 | 16.0492 |
| Environment | 10.0911 | 13.0911 | 12.5088 | 16.5737 | 12.8969 |
| Std. Deviation | | | | | |
| Educational Background | 2.80726 | 3.39793 | 4.27264 | 3.61585 | 4.41262 |
| Socio-economic Background | 2.97367 | 3.97466 | 3.79739 | 4.81711 | 4.70868 |
| Opportunity | 3.29597 | 2.61581 | 3.29702 | 2.47690 | 3.40211 |
| Personality | 2.24310 | 2.02081 | 2.78360 | 1.98293 | 2.75173 |
| Motivation | 4.17844 | 2.95046 | 4.8002 | 3.28971 | 4.26315 |
| Environment | 2.7692 | 3.3144 | 3.3064 | 2.7370 | 3.8718 |

Table C-4: Frequencies of career selection groups

| | Choice | | Force | |
|-----------------|------------------|----------------|------------------|----------------|
| | Frequency | Percent | Frequency | Percent |
| Clusters | | | | |
| 1 | 128 | 37.4% | .0 | .0% |
| 2 | 119 | 34.8% | .0 | .0% |
| 3 | 0 | 0% | 38 | 100% |
| 4 | 95 | 27.8% | .0 | .0% |
| Combined | 342 | 100% | 38 | 100.0% |