Journal of the Nigerian Association of Mathematical Physics
Volume34,(March, 2016), pp157 – 166

Factor Analysis of Career Preference Survey Among University Students

F.B. Adebola

Department of Statistics,Federal University of Technology, Akure, Nigeria.

Abstract

This paper examined some of the factors that determine the choice of present course of study among Nigerian students, using Federal university of technology, Akure (FUTA) as a case study.

Data for the study were collected from primary sources using both structured and close ended questionnaire. The questionnaire has sixteen (16) pre-determined factors in Likert scale, and also a part for personal profile. Stratified random sampling scheme was employed, and proportional allocation was used in allocating sample size 'n_h' in each School. The sample data was tested for adequacy and appropriateness using Bartlett's test of Sphericity and Kaiser-Meyer-Olkin Measure of Sampling Adequacy (MSA). Significant p value for Bartlett's test and a MSA value of 0.8 were obtained, indicating that the data is appropriate for factor analysis. From the sixteen predetermined factors in the questionnaire, five factors were extracted using principal component analysis and they accounted for approximately 60% of the total variance.

Key words: Sample Survey, Career Choice, Stratified Random Sampling, Factor Analysis, Proportional allocation

1.0 Introduction

Career choice has become a complex issue with the advent of science and technology, industrial revolution and job competition, which was not in existence in the olden days, when sons were trained to take up their father's occupation likewise the daughters takes up their mother's upon their demise. For example the son of a hunter is expected to be a hunter, and the son of a king is already a prince who will assume the throne when the father dies. Nowadays industrialization and civilization has made it possible for a common person to be rich as long as he or she has due skills and knowledge and one has not only to make due career planning but also careful career research before making a career choice so as to adjust with the evolving socio-economic conditions [1].

It has been seen that many factors influence present course of study of students in tertiary institutions, and identifying these underlying factors would give parents, education chancellors, and the industry an idea as to what students consider important in choosing their career. It will also help the upcoming students to examine their selection process.

2.0 Theoretical Frame Work

Generally, research works has been carried out on factors that influence career choice among different levels of students. Some were carried out on senior secondary school students, colleges, and students studying a particular course. Some of the research works are summarized below.

A descriptive survey was carried out on form four secondary school students in Kisumu city, who were preparing for their final examination. Out of the 2,464 form four students, stratified random sampling technique was used to select 332 who took part in the survey. Data for the survey was collected using questionnaire and interview schedules which were presented to students. Quantitative data was analysed using One Way Analysis of Variance (ANOVA). All the factors reported more than 50% of the respondents agreeing that their career choices were influenced by seven (7) factors [2].

Aresearch work to determine the factors influencing choice of a career in paediatrics by medical students in Kenya was conducted through questionnaire approach [3]. A cross-sectional survey of 450 medical students from the University of Nairobi, Kenya, was conducted and the preferences of the students was assessed as regard future specialization and timing factors influencing this choice. The data collected had a response rate of 385/450 = (85.6%) and the data was analyzed using the Statistical Package for Social Sciences (SPSS). It was discovered that Surgery was the most preferred choice closely

Corresponding author: F.B. Adebola, E-mail:femi_adebola@ yahoo.com, Tel.: +2348038380448

followed by Paediatrics. Thirteen percent of the students chose Paediatrics. It was also discovered that female students were five times more likely than males to select paediatrics indicating that gender had a significant effect on their choices. The study indicates that paediatrics is popular among female students and that several factors influence choice of this specialty. Understanding these factors may help medical school administrators and faculty plan future recruitment strategies.

A hypothesis was formulated to guide a study using simple random sampling(srs) method to draw a sample size of six hundred and sixteen (616) senior secondary school two students in Nigeria [4]. The two instruments used for the study were Students' Personality Questionnaire (SPQ) and Students' Career Choice Questionnaire (SCCQ). The first questionnaire had a coefficient of 0.89 while the second had a coefficient of 0.81. Both have content validity and language appropriateness. Chi-square statistical analysis was carried out on the data; results showed that there was a significant relationship between the artistic, social, enterprising and investigative personality types on one hand and career choice on the other. However, no significant relationship was found between the realistic and conventional personality types and career choice.

It wasproposed that three areas of a student's life affect the career choices they make: environment, opportunity, and personality. Anonymous survey was used to collect data for the research work. 325 students in the senior class of the Germantown Senior High School were chosen for the survey. It was concluded that students do not feel environmental factors are important in their career choices. The students chose 'personality' as the most important factor in their choice of career[5].

Most of the past research work made use of descriptive statistics, such as bar chat, frequency tables, and chi-square in analysing their data. Factor analysis, a data reduction tool was mainly used in analysing the data collected from this survey.

2.1 Mathematical Models

In the 'classical factor analysis' mathematical model p denotes the number of variables ($X_1, X_{2,\dots,} X_P$)and the number of underlyingfactors ($F_{1,}$ $F_{2,\dots,}$ F_m) denoted by m. $X_j$is the variable represented in the latent factors. Hence, this model assumes that there are m underlying factors whereby each observed variables is a linear function of these factors in combination with a residual variate.This model target is to reproduce the maximum correlations.

$$X_j = a_{ji}F_1 + a_{j2}F_2 + \dots + a_{jm}F_m + e_j \qquad \text{………………..} \qquad (1)$$

Where j = 1, 2,…, p

The factor loadings are $a_{ji}, a_{j2}, \dots, a_{jm}$ which denotes that a_{j1} is the factor loading of j^{th} variable on the 1^{st} factor. The unique factor is denoted by e_j . The factor loadings give us an idea about how much the variable has contributed to the factor; the larger the factor loading the more the variable has contributed to the factor [6].

3.0 Research Methodology

This study investigates the factors affecting the choice of career of undergraduates in Nigerian universities using Federal University of Technology, Akure (FUTA) as a case study. Stratified random sampling (srs) technique is used in drawing samples used for the survey. The question then is what are the factors that come to the mind of prospective students when applying for a course into universities? What influences these factors? What informed these preferences? Data used for this study was collected by the use of questionnaire approach, based on past researches and other sources .Sixteen (16) factors were gathered and used as pre-determined factors posed to students in Likert scale so that the students could indicate how much each of the factors influenced the choice of their present course of study.

3.1 Stratified Random Sampling

In stratified random sampling a population of size *N* is divided into homogenous non over-lapping subpopulations of N_1, N_2, $N_{3,\dots,} N_L$ units respectively with known values. The subpopulations are referred to as strata. When the strata have been determined, a sample is drawn from each, the drawings being made independently in different strata. The sample sizes within the strata are denoted by n_1, n_2..., n_l, respectively. It should be noted when dividing population into strata that the strata must be mutually exclusive; i.e. every element in the population must be assigned to only one strata and no element in the population should be excluded from a strata i.e. all the strata should be collectively exhaustive.

According to [7] and [8], the principal reasons of using stratification are as follows:

i. If data of know precision are wanted for certain subdivisions of the population, it is advisable to treat each subdivision as a 'population' in its own right.
ii. Administrative convenience may dictate the use of stratification.
iii. Sampling problems may differ markedly in different parts of the population.
iv. Stratification may produce in the estimates of characteristics of the whole population.

3.2 Proportional Allocation

In proportional allocation the stratum sample is selected such that the size of the sample is proportional to the total number of units in each stratum. If the stratum size to be allocated is 'n', then stratum sample size is given as

$$n_h = \frac{n}{N} N_h = nW_h \qquad \text{................} \qquad (2)$$

Thus in proportional allocation

$$\frac{n_h}{n} = W_h = \frac{n_h}{N_h} = \frac{n}{N} = f \qquad \text{......................} \qquad (3)$$

Where $n_h$is the sample size in each stratum and n is the total sample size i.e.,

$$n_1 + n_2 + \ ... + n_l = n \qquad \text{................} \qquad (4)$$

$N_h$is the stratum size and N is the total size i.e., population size, where

$$N_1 + N_2 + \cdots + N_l = N \qquad \text{................} \qquad (5)$$

In carrying out this survey, Stratified random sampling was employed. The study population (Federal University of Technology, Akure) comprises of six schools, with each school serving as a stratum, proportional allocation was use to allocate sample size $n_h$to the strata

3.3 Characteristics of Study Population

The study population for this research work is the entire 14175 students of the Federal University of Technology, Akure (FUTA) in Ondo State. Nigeria. Samples of 374 students were selected based on [7] formula. The university 'FUTA' is a top ranking university of technology in Nigeria, established in 1981. It's academic discipline and research is stretch across six different schools and over thirty departments. The six different schools are: School of Agriculture and Agricultural Technology (SAAT), School of Engineering and Engineering Technology (SEET), School of Environmental Technology (SET), School of Earth and Minerals Sciences (SEMS), School of Sciences (SOS), and School of Management Technology (SMAT).

3.4 Questionnaire Design

The type of questionnaire used was self-administered. It was designed in such a way to encourage the responses and minimize incomplete submission. The questionnaire was also kept as short as possible. The questionnaire was divided into two (2) sections. The first part (section I) contains sixteen (16) pre-determined factors in Likert scale so that the students could indicate how important each of the factors influenced the choice of their present course of study. The second part (section II) contains the respondents' personal profile. Data for the study was collected from primary sources using both structured and close ended questionnaire and also personal interview with the students. The respondents were observed and their entry records were verified to check the responses of the respondents.

3.5 Data Collection

This study used the stratified random sampling technique, targeting the students of Federal University of Technology, Akure, located in Ondo state, Nigeria. The University has a population of fourteen thousand one hundred and five (14175) students, with six schools, and the schools are further divided into various departments based on thedistribution of undergraduate students 2012/2013 academic session gotten from Academic planning unit FUTA.

From the study population of 14175, a sample size of three hundred and seventy four (374) students was drawn using stratified random sampling technique based on [7]. Proportional allocation was used in allocating sample size to each school to ensure equitable representation and reduce bias. The six schools in the study population were used for stratification. In order to ensure that the study sample cuts across the every department in the school, proportional allocation was further used in allocating sample sizes to various departments in each school.

Table 1: Table showing the distribution of students in FUTA according to schools.

SCHOOLS	**Number of students**	**No of Student sampled**
School of Agric. & Agric. Tech	2391	63
School of Eng.&Eng. Tech	3152	83
School of Environmental Tech	2601	69
School of Earth & Min. Sciences	1398	37
School of Sciences	3838	101
School of Management Tech.	795	21
Total	**14175**	**374**

4.0 Data Presentation and Analysis

The results obtained are based on the data obtained from 314 (83.96%) respondents out of the sample of 374 questionnaires, because of non-responselimitations. Exploratory analysis was carried out on the data and the data was analysed using factor analysis thereby reducing the sixteen (16) predetermined factors to a lesser number of underlying factors.

The results presented on Table 2 indicates that a high number of students 58.2% strongly agreed that future ambitions is the most important factor that influence their career choice, 21.5% considered future ambition important, 13.8% were neutral, 3.2% felt it was unimportant and 3.2% most unimportant. Only 3.2% see inability to sponsor preferred course as most important factor in the choice of their career while 42.4% said it's most unimportant. Interest in the course had a percentage of 52.4% for most important and just 3.2% as most unimportant.Admission opportunity was also considered as a factor that influence choice of career with 38.6% considering it as most important, 26.4% considered it important, 12.9% were neutral and 9.6% most unimportant.4.5% of the respondents considered peer group as most important in their career choice, 17.7% considered it important, 26% were neutral 27.3% agreedthat it's an unimportant factor while 24.4% considered it most unimportant in their choice of career.

Table 2: *Table showing the frequency distribution of responses for each predetermined factor*

	MOST IMPORTANT		IMPORTANT		NEUTRAL		UNIMPORTANT		MOST UNIMPORTANT	
Factors	N	%	N	%	N	%	N	%	N	%
Admission opportunity	120	38.6	82	26.4	40	12.9	39	12.5	30	9.6
Inability to sponsor my preferred course	10	3.2	13	4.2	46	14.8	110	35.4	132	42.4
Inability to secure Admission to preferred course	50	16.1	57	18.3	54	17.4	63	20.3	87	28
Interest in the course	163	52.4	88	28.3	37	11.9	13	4.2	10	3.2
Natural skills and abilities to perform well	121	38.9	109	35	53	17	20	6.4	8	2.6
Future Ambitions	181	58.2	67	21.5	43	13.8	10	3.2	10	3.2
Peer group	14	4.5	55	17.7	81	26	85	27.3	76	24.4
Family Influence	45	14.5	69	22.2	89	28.6	52	16.7	56	18
Job and Financial rewards	104	33.4	114	36.7	53	17	22	7.1	18	5.8
Self-Employment opportunity	123	39.5	94	30.2	62	19.9	22	7.1	10	3.2
Employment security	84	27	114	36.7	63	20.3	33	10.6	17	5.5
Mentor Influence	53	17	71	22.8	93	29.9	57	18.3	37	11.9
Role model in the specialty	49	15.8	75	24.1	90	28.9	63	20.3	34	10.9
Prestige attached to the course	85	27.3	109	35	69	22.2	31	10	17	5.5
Initial experience in the field	59	19	65	20.9	93	29.9	61	19.6	33	10.6
Ease of raising a family	65	20.9	75	24.1	80	25.7	46	14.8	45	14.5

4.1 Exploratory Analysis

Figure 1 shows the distribution of students sampled that were offered the course they applied for

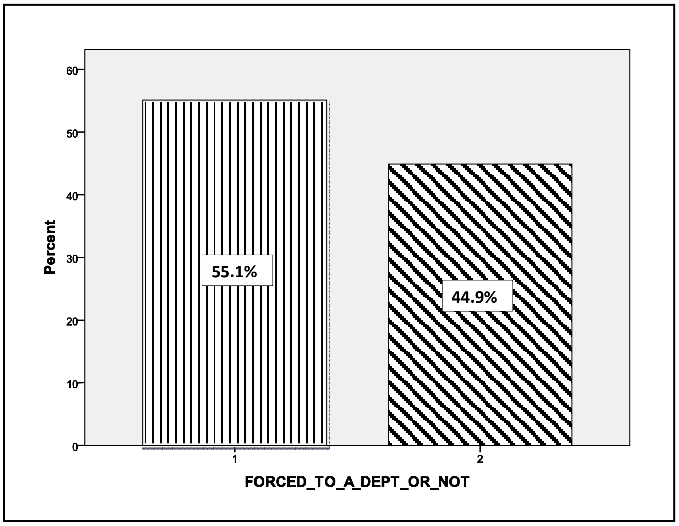

Figure 1: Bar chart showing the percentage distribution of respondent according to whether they were given their preferred course of study.

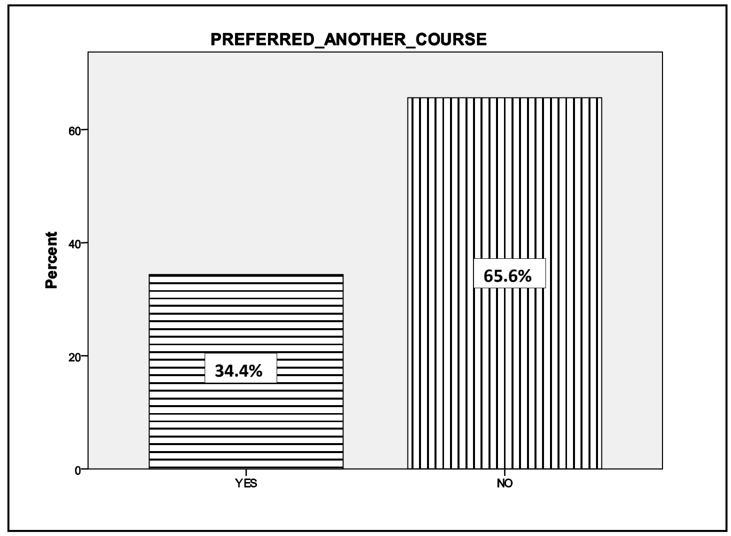

Figure 2: Bar chart showing the percentage distribution of respondent according to whether they will prefer to go for another course of study if given the opportunity

Figure1 shows that out of the 314 sample used, 173 (55.1%) were given the course they applied for while 141 (44.9%) were given another course. This implies that high number of students is thrown into department they do not put in for.

Figure 2 shows that out of the 314 sample used, 108 (34.4%) would prefer to go for another course if given to opportunity, while 206 (65.6%) said they preferred their present course of study.

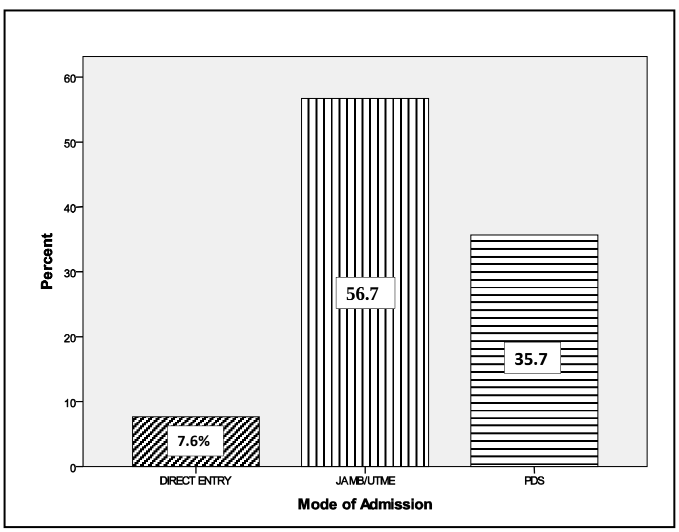

Figure 3: Bar chart showing the percentage distribution of respondent with respect to their mode of admission.

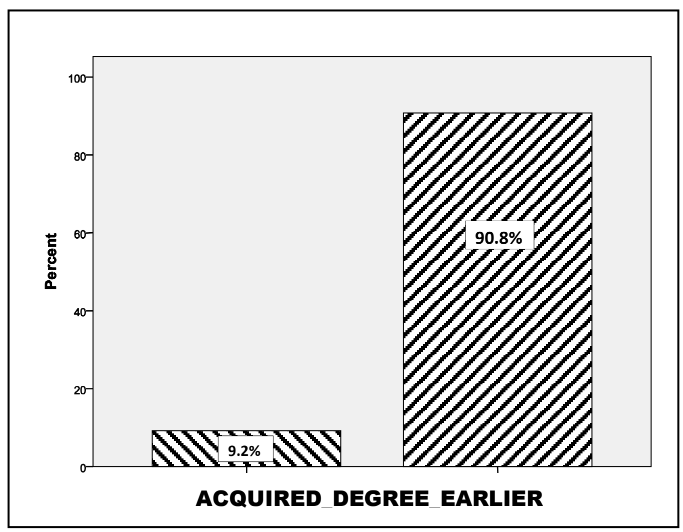

Figure 4: Bar chart showing the percentage distribution of respondent with respect to their degreeacquired earlier

Figure 3 shows that out of the 314 sample, 24 (7.6%) of the students were admitted into the school through direct entry, 178 (56.7%) were admitted through JAMB/UTME, and 112 (35.7%) were offered admission through Pre-Degree program.
Figure 4 shows that out of the 314 sample,29 (9.2%) of the students have earlier acquired one degree or the other before their admission into FUTA, while 285 (90.8%) have not acquired any degree before.

4.2 Scree Plot

To determine the optimal number of factors to be extract, a scree plot of the data was drawn using SPSS. Given below is the scree plot as reported by SPSS.

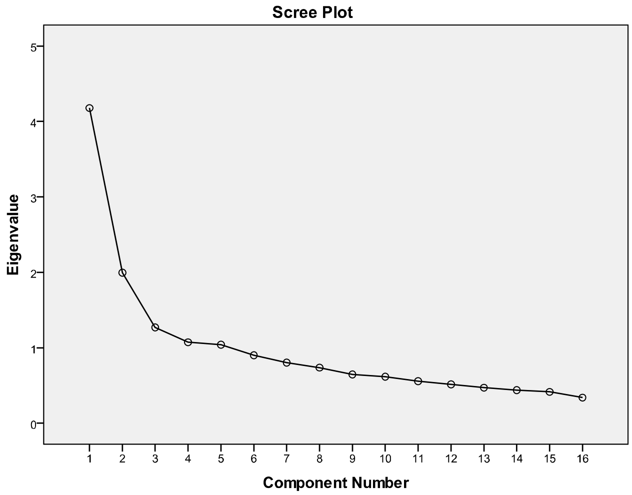

Figure 5: Scree plot of the data.

The scree plot in Figure 5 indicates that the best number of factors to extract is five. Hence the first five factors of the data were extracted because they all have eigenvalues greater than one. Also there is a point of inflection on factor 5 also supporting this claim.

4.3 Communalities

Communality is the proportion of variance accounted for by the common factors; it ranges from 0 to 1. A value of zero indicates that the common factors don't explain any variance while a value of one indicates that the common factors explain all the variance. Table 3 is the Table of communalities as reported by SPSS.

Table 3: Table of communalities of the common factors

Factors	Initial	Extraction
Admission opportunity	1	0 .571
Inability to sponsor my preferred course	1	0.594
Inability to secure Admission to preferred course	1	0.612
Interest in the course	1	0.767
Natural skills and abilities to perform well	1	0.615
Future Ambitions	1	0.612
Peer group	1	0.575
Family Influence	1	0.602
Job and Financial rewards	1	0.551
Self-employment opportunity	1	0.551
Employment security	1	0.623
Mentor Influence	1	0.657
Role model in the specialty	1	0.604
Prestige attached to the course	1	0.548
Initial experience in the field	1	0.602
Ease of raising a family	1	0.473

Table 3 shows that the factors account for high proportion of variance. The factor "interest in course" had the highest extraction value.

4.4 Total Variance Explained

The number of factors extracted, their Eigenvalues and the cumulative percentage of variance explained reported by SPSS is presented in the Table 4.

Table 4: *Table showing the number of factors extracted and total variance explained.*

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.177	26.108	26.108	4.177	26.108	26.108	2.223	13.895	13.895
2	1.996	12.472	38.580	1.996	12.472	38.580	2.018	12.611	26.506
3	1.270	7.935	46.515	1.270	7.935	46.515	1.917	11.982	38.488
4	1.073	6.709	53.224	1.073	6.709	53.224	1.716	10.725	49.213
5	1.040	6.502	59.726	1.040	6.502	59.726	1.682	10.512	59.726
6	.900	5.628	65.354						
7	.804	5.024	70.377						
8	.737	4.605	74.983						
9	.647	4.044	79.026						
10	.618	3.861	82.887						
11	.557	3.483	86.370						
12	.515	3.216	89.586						
13	.472	2.947	92.532						
14	.440	2.748	95.280						
15	.415	2.596	97.876						
16	.340	2.124	100.000						

Table 4 shows that five factors with Eigenvalues greater than 1 were extracted and the five factors accounted for 59.726% of the total variance.

4.5 Component Matrix

The component matrix for the principal component analysis as reported by SPSS is presented in Table 5.

Table 5: *Table showing the component matrix*

	Component				
	1	2	3	4	5
Future Ambitions	.666				
Job and Financial rewards	.644				
Self-employment opportunity	.609			.324	
Employment security	.588			.463	
Role model in the specialty	.569		-.389		
Natural skills and abilities to perform well	.553		.475		
Ease of raising a family	.549				
Mentor Influence	.547		-.502		
Prestige attached to the course	.533			.315	.393
Initial experience in the field	.527				.522
Family Influence	.516	.320			-.358
Peer group	.491	.376			-.312
Inability to secure Admission to preferred course		.708	.308		
Admission opportunity		.643			
Interest in the course	.492	-.577	.371		
Inability to sponsor my preferred course		.475	.384	-.367	

The Component matrix shown in Table 5indicates how each factor in the analysis correlates with each of the five related factors. Negative and positive correlations carry the same weight. Correlations coefficients that are less than 0.3 have been suppressed for clarity.

4.6 Rotated Component Matrix

The “rotation method” for factor analysis gets factors that are different from each other as possible, and helps you interpret the factors by putting each variable primarily on one of the factors. The rotated component matrix helps us to show the factor loadings for each variable.

The Varimax rotation simple implies when the targeted solution is orthogonal. Orthogonal solution is assumed when factors are not highly correlated with each other. Varimax attempts to achieve loadings of ones and zeros in the columns of the component matrix.

In Table 6 as reported by SPSS. Varimax rotation was used to obtain the rotated component matrix.

Table 6: *Table showing the rotated component matrix*

	Component				
	1	2	3	4	5
Employment security	.771				
Self-employment opportunity	.682				
Job and Financial rewards	.631				.325
Ease of raising a family	.460		.316	.365	
Interest in the course		.800		-.317	
Natural skills and abilities to perform well		.748			
Future Ambitions	.400	.621			
Role model in the specialty			.704		
Mentor Influence			.699		.354
Initial experience in the field		.413	.623		
Prestige attached to the course	.421		.538		
Inability to secure Admission to preferred course				.748	
Admission opportunity				.742	
Peer group					.706
Family Influence					.701
Inability to sponsor my preferred course				.451	.527
Total Variance Explained	13.895	12.611	11.982	10.725	10.512

The pattern matrix for Varimax rotations reports the factor loadings for each variable on the components or factors after rotation. The rotated solution gives a clear indication how each item correlates with each factor. For clarity, correlation values that are less than 0.3 have been suppressed.

Table 6 shows that component 1 accounted for 13.895% ofthe 59.726% total variance accounted for by the five factors, component 2 accounted for 12.611%, component 3 accounted for 11.982%, component 4 accounted for 10.725% and component 5 accounted for 10.512 %.

In summary five major factors were identified as the main factors that influence choice of career among university students which are “Employment Opportunity and Benefits”, ‘Student’s personality”, “Fore Knowledge of the course”, “Admission Opportunity”, and “Social Influence”.

4.7 Test of Hypothesis: Bartlett’s Test of Sphericity

Bartlett’s test of sphericity tests the hypothesis that the correlation matrix is an identify matrix; all off diagonal elements are 0 and all diagonal elements are 0. This could be interpreted to mean that all the variables are uncorrelated. If the significance value for the test is less than alpha level, we reject the null hypothesis that the population matrix is an identity matrix. When we reject the null hypothesis, we conclude that there are correlations in the data set that are appropriate for factor analysis.

Bartlett’s test of sphererıcty is used to test if k samples are from population with equal variances. Hence Barttlet’s test can be used to verify the homoscedasticity assumption of factor analysis and hence access the adequacy of the sampled data for Factor Analysis. The Bartlett’s test of sphericity compares the correlation matrix with a matrix of zero correlations (identity matrix). From this test we are looking for a small p value indicating that it is highly unlikely for us to have obtained the observation correlation matrix from a population with zero correlation matrixes.

4.8 Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO)

If two variables share a common factor with other variables, their partial correlation

$$a_{ij} = (r_{ij.1,2,3,\ldots,k}) \quad \ldots\ldots\ldots\ldots\ldots.. \quad (5)$$

$$\text{KMO} = \left(\sum_{ii=1}^{k}\sum_{j=1}^{k} r_{ij}^2\right) \Bigg/ \left(\left(\sum_{ii=1}^{k}\sum_{j=1}^{k} r_{ij}^2\right) + \left(\sum_{ii=1}^{k}\sum_{j=1}^{k} a_{ij}^2\right)\right) \qquad \ldots\ldots\ldots\ldots\ldots \qquad (6)$$

If $a_{ij} \approx 0.0$

The variables are measuring a common factor, and
KMO ≈ 1.0

If $a_{ij} \approx 1.0$

The variables are measuring a common factor, and
KMO ≈ 0.0

Presented in Table 7 is the test statistics for the test alongside its p-value as reported by SPSS:

Table 7: *Table showing the KMO, and test statistics of Bartletts's test of sphericity*

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.802
Bartlett's Test of Sphericity	Approx. Chi-Square	1183.489
	Df	120
	Sig.	.000
Determinant		0.021

Table 7 reports a p-value of 0.000 which is less than 0.05; hence we reject the null hypothesis of Bartlett's Test of Sphericity that the data came from population of unequal variances, and conclude that the data came from populations of equal variances thereby satisfying the homogeneity of variance assumption of factor analysis.

Also reported in Table 7 is the Kaiser-Meyer-Olkin {KMO} Measure of Sampling Adequacy (MSA). This is a measure of appropriateness of the data for factor analysis. We are aiming for values greater than 0.8, values below 0.5 are considered miserable. It is recommended that we consider removing variables with MSA values below 0.7. The reported MSA (Measure of Sampling Adequacy) value for this analysis is 0.802 indicating that the data is appropriate for factor analysis.

5.0 Summary and Conclusion

In this study, we were able to determine the major underlying factors that influence the preference of career among university students'. Factor analysis and Principal Component Analysis were carried out; the major factors were found to be:

i. Employment opportunity and benefits associated with course.
ii. Personality of the students
iii. Foreknowledge of the course.
iv. Admission opportunity.
v. Social influence.

6.0 References

[1] Judith Baines. (2009). A Dissertation on: What are the Factors that Shape the Career Decisions of LSE Students.

[2] Kochung Edwards and Migunde Quinter, Maseno University.(2011). Factors Influencing Students Career Choices among Secondary School students in Kisumu Municipality, Kenya.

[3] O. Issa, and K. I. N. Nwalo.(2004). Factors Affecting The Career Choice of Undergraduates in Nigerian Library and Information Science Schools.

[4] Dickson Onoyase and Anna Onoyase.(2009). The Relationship between Personality Types and career Choice of Secondary School Students in Federal Government Colleges in Nigeria.

[5] Michael Borchert (2002) Career Choice Factors of High School Students, a Research Paper Submitted to the Graduate College University of Wisconsin-Stou.

[6] Harman, H.H. (1976). Modern factor analysis (3rd ed. revised). Chicago, IL: University of Chicago Press.

[7] Cochran, W.G. (1977). Sampling Techniques,third edition. New York: John Wiley and Sons, Inc.

[8] Fabian C. Okafor(2002). Sample Survey Theory with Applications.