CHAPTER 4

ANALYSIS AND INTERPRETATIONOF DATA

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4.1 Introduction

Chapter four analyses and interprets data based on the research design adopted in chapter third, research design and methodology. The present study aimed to determine student engagement and satisfaction among the students who have done at least one course in MOOCs. To study student satisfaction, a self-made questionnaire was developed for data collection. On the other hand, the researcher has adopted a standardized tool for data collection. For a better understanding of the challenges faced by the students, the qualitative method was also adopted.

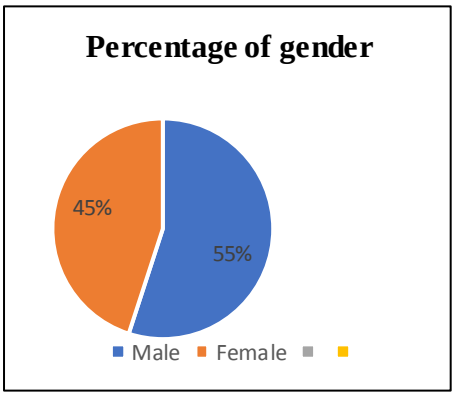
The researcher used mean, standard deviation, percentage analysis, student 't-test, ANOVA, Pearson's coefficient of correlation, principal, component analysis (PCA) in this chapter. The researcher has presented the collected data and its interpretation by using statistical calculations with the help of SPSS-22 statistical software and Microsoft Excel 2007. The collected data was classified, organized, and analysed for testing the hypothesis formulated in the present study.

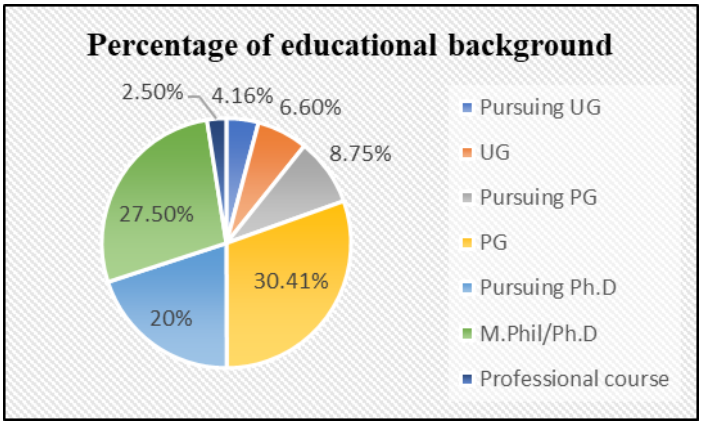
4.2 Representation of Data

Data of the present study is collected from those students who are in the field of higher education and completed at least one course in MOOCs. The data obtained from the sample through the administration of the developed tool have been subjected to descriptive and inferential analysis in tune with the stated objectives. The analysis of

data is presented in the form of tables, graphs, and charts below and further discussed after the tables and graphs:

Graph 4.1 The graph shows demographic sample distribution





The above table presents the division of the sample in terms of attending at least one course in MOOCs. As seen from the above table, 132 (55%) males and 108 (45%) females have taken for the study. The researcher has also taken the students from different backgrounds based on their educational programme such as 10 (4.16%) participants are from pursuing UG programme, 16 (6.6%) participants from UG programme, 21 (8.75%) participants from pursuing PG programme, 73 (30.41%) participants from PG programme, 48 (20%) participants from pursuing Ph.D.

programme, 66 (27.5%) research scholar and 6 (2.5%) participants from professional courses constitutes the sample.

4.3 Statistical Analysis and Interpretation

Objective 1 To create a model of student satisfaction in MOOCs.

Table 4.1 KMO and Bartlett's Test of student satisfaction

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.	**.796**	
Bartlett's Test of Sphericity	**Approx. Chi-Square**	2297.017
	df	210
	Sig.	.000

The above table represents that the score of the KMO measure of sampling adequacy value of the 21 factors is 0.796, which is greater than 0.65 concerning student satisfaction in MOOCs. According to Field (2005), this value is acceptable and considered perfect. The KMO score is .796 to above and the interpretation of the score is good, indicating that principal component analysis can be carried out if the KMO measure of sampling adequacy is more than 0.65. Bartlett's test of sphericity is 0.000, which also shows a significant value of the factors and $p<.05$; thus, representative of the sample is suitable for principal component analysis (Malhotra & Dash, 2012). Here, the Chi-square is 2297.017 and the p-value of .000 implies a high probability of obtaining this result.

Table 4.2 Total Variance Explained of student satisfaction

Component	Initial Eigenvalues	Extraction Sums of Squared Loadings				
	Total	% Of Variance	Cumulative %	Total	% Of Variance	Cumulative %
SS 1	6.068	28.894	28.894	6.068	28.894	28.894
SS 2	2.541	12.101	40.996	2.541	12.101	40.996
SS 3	1.732	8.247	49.243	1.732	8.247	49.243
SS 4	1.466	6.983	56.226	1.466	6.983	56.226
SS 5	1.139	5.424	61.650	1.139	5.424	61.650
SS 6	1.104	5.258	66.908	1.104	5.258	66.908
SS 7	.965	4.594	71.502			
SS 8	.884	4.207	75.709			
SS 9	.801	3.817	79.526			
SS 10	.665	3.168	82.694			
SS 11	.570	2.715	85.408			
SS 12	.493	2.347	87.755			
SS 13	.458	2.179	89.934			
SS 14	.386	1.836	91.770			
SS 15	.350	1.669	93.439			
SS 16	.313	1.492	94.930			
SS 17	.290	1.383	96.313			
SS 18	.242	1.150	97.463			
SS 19	.211	1.003	98.467			
SS 20	.197	.937	99.404			
SS 21	.125	.596	100.000			

Extraction Method: Principal Component Analysis.

Table 4.3 Component Matrix of student satisfaction

Statement	Components			
	1	2	3	4
SS1				.532
SS2				.728
SS3				.667
SS4		-.548		
SS5	.527			
SS6			.604	
SS7	.685			
SS8	.609			
SS9	.605			
SS10	.508			
SS11			.578	
SS12	.596			
SS13	.668			
SS14	.492			
SS15	.658			
SS16		.746		
SS17			-.637	
SS18	.757			
SS19	.553			
SS20	.685			
SS21	.582			

Extraction Method: Principal Component Analysis

6 components extracted.

The above tables represent the grouping of variables under four components: variables 5,7,8,9,10,12,13,14,15,17,18,19,20 and 21 under the component 1, variables 4 and 16 are grouped under component 2, variable 6 and 11 are grouped under component 3 and variables 1 and 3 are grouped under component 4. The primary objective of the principal component analysis is to investigate the effective dimension of student engagement in MOOCs. The data were analyzed through SPSS-22 to summarize the 21 variables of the questionnaire demonstrating student satisfaction in MOOCs. The data were subjected to PCA, under exploratory component analysis. According to the cumulative percentage, 56.22% is good for measuring the validity of a tool and it shows that the validity of the question refers to accuracy of the method to measure what it intends to measure. The maximum variance is created by the first factor i.e. 28.89% variance of the total cumulative percentage.

The table demonstrates that component (factor)1 represents the customized course content based on student satisfaction where students are connected with different aspects, such as; self-assessment with the help of reflective level questions or quizzes, related to intended learning outcome, suitable for all learning styles, speed validation of the course, encourage communication and cooperation, feedback by the teams and peers, feedback by the instructor, build learner confidence by promoting their participation in the discussion forum, peer assessment, scope in creativity, problem-solving approach, difficulty level. Component (factor)2 represents student satisfaction based on feedback provided by course coordinator for wrong attempts made by learners and speed validation of e content. Component (factor)3 represents student satisfaction based on interaction with the organized content, a variety of objective questions

strategies used, and active participation as well. Component (factor)4 represents student satisfaction based on video content where students are connected to organized content which covers all learning outcomes, and can be completed within the presribed ime. The researcher has taken a self-prepared tool for measuring student satisfaction, the scale named student satisfaction in MOOCs. After checking the validity of the questionnaire, it shows good results and the tool is applicable for the population where the tool has been used and therefore, the results are used to create a model of student satisfaction with MOOCs

Figure 4.2 Current Model of Student Satisfaction

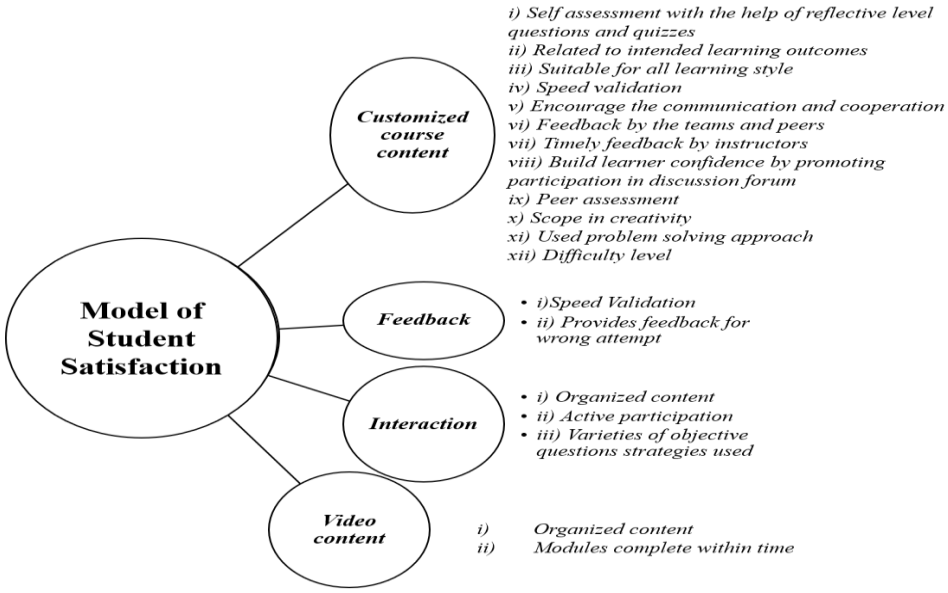


Table 4.4 Reliability Statistics of student satisfaction

Cronbach's Alpha	N of Items
.868	14

The above table is used for checking the reliability of the result of the item for the respective tool. In the case of reliability, we use Cronbach's alpha and the result showed 0.868, which is more than 0.75. It is showed the positive result of reliability. The developed tool will show the same result on the different samples of the same population.

Objective 2 To create a model of student engagement in MOOCs.

Table 4.5 KMO and Bartlett's Test of student engagement

Kaiser-Meyer-Olkin Measure of Sampling Adequacy	**.887**	
Bartlett's Test of Sphericity	**Approx. Chi-Square**	1696.102
	df	66
	Sig.	.000

The above table represents that the score of the KMO measure of sampling adequacy value of the 12 factors is 0.887, which is greater than 0.65 for student engagement in MOOCs. According to Field (2005), this value is acceptable and considered perfect. The KMO score is 0.88 to above and the interpretation of the score is good, indicating that principal component analysis can be carried out if the KMO measure of sampling adequacy is more than 0.65. Bartlett's test of sphericity is 0.000, which also shows a significant value of the factors and $p<.05$; thus, representative of the sample is suitable for principal component analysis (Malhotra & Dash, 2012). Here, the Chi-square is 1696.102 and the p-value of .000 implies a high probability of obtaining this result.

Table 4.6 Total Variance Explained of student engagement

Component	Initial Eigenvalues	Extraction Sums of Squared Loadings				
	Total	% Of Variance	Cumulative %	Total	% Of Variance	Cumulative %
SE1	6.326	52.715	52.715	6.326	52.715	52.715
SE2	1.049	8.741	61.455	1.049	8.741	61.455
SE3	.994	8.281	69.737			
SE4	.781	6.508	76.245			
SE5	.580	4.833	81.078			
SE6	.475	3.962	85.040			
SE7	.443	3.694	88.734			
SE8	.380	3.167	91.901			
SE9	.358	2.979	94.880			
SE10	.275	2.290	97.170			
SE11	.185	1.545	98.715			
SE12	.154	1.285	100.000			

Extraction Method: Principal Component Analysis.

Table 4.7 Component Matrix of student engagement

Statement	Components	
	Factor 1	**Factor 2**
SE1	.643	
SE2	.788	
SE3	.768	
SE4	.805	
SE5	.786	
SE6	.825	
SE7	.836	
SE8		-.598
SE9	.834	
SE10	.788	
SE11	.704	
SE12		.800

Extraction Method: Principal Component Analysis.

The above tables of Principal component analysis reveals that variables 1,2, 3,4,5,6,7,9,10, and 11 are grouped under component 1, and variables 8 and 12 are grouped under component 2. The primary objective of the principal component analysis is to investigate the effective dimension of student engagement in MOOCs. The data were analyzed through SPSS-22 to summarize the 12 variables of the questionnaire demonstrating the student engagement in MOOCs. The data were subjected to PCA, under exploratory component analysis. According to the cumulative percentage, 61.45% is good for measuring the validity of a tool and it shows that the validity of the

question refers to how accurately a method measures what is intended to measure. The majority of the variance creates in the first factor 52.71% variance of the total cumulative percentage which is 61.45%.

The table demonstrates that component (factor)1 represents the academic engagement based on student engagement where students are connected with different aspects, such as; time management for the massive open online courses, taking notes during classes, revisiting notes during the preparation of assessment, searching further information, inspired to expand knowledge, participate in the discussion forum. Component (factor)2 represents socio-emotional engagement based on student engagement where students are connected to share learning materials with others and the course is interesting. The researcher has taken a standardized tool for measuring student engagement, the scale named MOOC engagement scale (MES) developed by Deng et. al., (2020). It includes four dimensions of student engagement as discussed above. After checking the validity of the questionnaire, it shows that the tool needs to be restructured for use in the present context of the study. Therefore, according to the statistical results the factors merged and two factors appear to be useful predictors of student engagement.

Figure 4.3 Current Model of Student Engagement

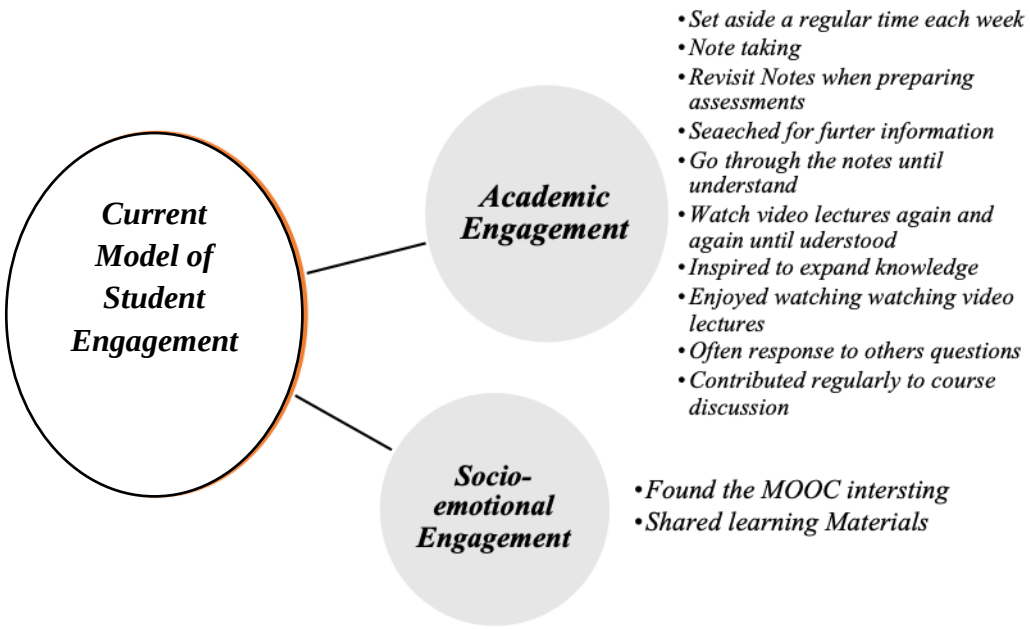


Table 4.8 Reliability of Student Engagement

Cronbach's Alpha	N of Items
.928	**10**

The above table is used for checking the reliability of the result of the item for the respective tool. In the case of reliability, we use Cronbach's alpha and the result showed 0.928, which is more than 0.75. It is showed the positive result of reliability. The developed tool will show the same result on the different samples of the same population.

Objective 3 To study the student satisfaction and student engagement in MOOCs with respect to their demographic details.

Ho3.1 There is no significant difference between male and female students with respect to their satisfaction in MOOCs.

Table 4.9 't' Table for student satisfaction on the basis of male and female

Gender	**N**	**Mean**	**SD**	**df**	**'t' Value**	**'p' Value**	**Remarks at 0.05 level**
Male	132	62.82	9.731	238	.645	.519	**Not Significant**
Female	103	61.98	10.433				

The above table shows that the computed 't' value is 0.645. Since, p=.519 which is basically showing p>0.05, that is greater than the significance level α= 0.05, then the Ho is failed to reject(Ghazal et al., 2018), and it can be believed that there is no significant difference between male and female students with respect to their satisfaction in MOOCs. The data shows that both the male and female teachers do not differ in their respective mean scores of student satisfaction. It means students are equally satisfied in MOOCs, whether male or female.

Ho3.2 There is no significant difference among students of different educational backgrounds with respect to their satisfaction in MOOCs.

Table 4.10 ANOVA Table for student satisfaction on the basis of educational background

Educational Background	**N**	**Source of Variation**	**Sum of squares**	**df**	**Mean square**	**'F' value**	**'p' value**
Pursuing UG	10	**Between Groups**	106.173	45	2.413	.976	.521
UG	16						
Pursuing PG	21	**Within Groups**	479.735	194	2.473		**Not Significant**
PG	73						
Pursuing PhD	48	**Total**	585.908				
M.Phil/PhD	66						
Professional Courses	6						

The above table shows that the output of the one-way ANOVA analysis. We can see that the significant value is 0.521 (i.e., p=.521), greater than the significant level of 0.05. Since p>0.05, that is the level of α= 0.05, then the Ho is failed to reject, and it can be believed that there is no significant difference among the educational backgrounds of students for their satisfaction in MOOCs. However, the calculated value of F is not significant in all categories (F=1.267). It means students are equally satisfied with MOOCs on the basis of their educational background.

Ho3.3 There is no significant difference between male and female students with respect to their engagement in MOOCs.

Table 4.11 ‘t’ Table for student engagement on the basis of male and female

Gender	N	Mean	SD	df	‘t’ Value	‘p’ Value	Remarks at 0.05 level
Male	132	62.82	9.731	238	.645	.519	**Not Significant**
Female	103	61.98	10.433				

The above table shows that the computed ‘t’ value is 0.645. Since, p=.519 which is basically showing p>0.05, that is greater than the significance level α= 0.05, then the Ho is failed to reject (Ghazal et al., 2018), and it can be believed that there is no significant difference between male and female students with respect to their engagement in MOOCs. The data shows that both the male and female students do not differ in their respective mean scores of student engagement (Al-Rabia et al., 2021). It means students are equally engaged in MOOCs, whether male or female.

Ho3.4 There is no significant difference among students of different educational backgrounds with respect to their engagement in MOOCs.

Table 4.12 ANOVA Table for student engagement on the basis of educational background

Educational Background	**N**	**Source of Variation**	**Sum of squares**	**df**	**Mean square**	**'F' value**	**'p' value**
Pursuing UG	10	**Between Groups**	93.432	32	125.744	1.267	.169
UG	16						
Pursuing PG	21	**Within Groups**	492.475	207	72.668		
PG	73						
Pursuing PhD	48	**Total**	585.908				**Not Significant**
M.Phil/PhD	66						
Professional Courses	6						

The above table shows that the output of the one-way ANOVA analysis. We can see that the significant value is 0.169 (i.e., p=.169), greater than the significant level of 0.05. Since p>0.05, that is the level of α= 0.05, then the Ho is failed to reject, and it can be believed that there is no significant difference among the educational backgrounds of students with respect to their engagement in MOOCs. However, the calculated value of F is not significant in all categories (F=1.267). It means students are equally engaged in MOOCs based on their educational background.

Objective 4 To study the relationship between student satisfaction and engagement in MOOCs.

Ho4 There is no significant relationship between student satisfaction and student engagement in MOOCs.

Table 4.13 Coefficient of correlation value between student satisfaction and engagement

		SS1	SE 3
SS1	**Pearson Correlation**	**1**	**.959****
	Sig. (2-tailed)		**.000**
	N	**414**	**414**
SE 2	**Pearson Correlation**	**.959****	**1**
	Sig. (2-tailed)	**.000**	
	N	**414**	**414**

Correlation is significant at the 0.01 level (2-tailed).

There is a significant relationship between student satisfaction and student engagement in Massive Open Online Courses. The value of the coefficient of correlation is 0.959, which shows the high correlation between student engagement and their satisfaction in MOOCs at 0.01 level. Pearson Correlation is used for calculating this relationship. The table shows students engage in MOOCs where they are satisfied after completing the courses in MOOCs.

The data were analyzed in the present chapter using a suitable statistical technique. In continuation of the statistical treatment applied over the data, meaningful interpretation

was derived from them to gain newer insight into the problem. The summary and detailed conclusions derived based on analysis are presented in the next chapter.