

Using Conjoint Analysis to Estimate High School Students' Preferences for Selecting a College

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Abstract

This paper addresses three questions: (1) what attributes do students prefer while selecting a college? (2) How do preferences for colleges develop in high school students? What are the critical success factors for educational institutions? This research aims to identify the attributes and their respective levels which have the potential to influence consumer preference and choice in selecting a college. Perspectives of coordinators of three high schools gathered during in-depth interviews and secondary data helped us find out the factors which impact students' preferences for colleges. The study was conducted across 3 high schools with 95 students. They expressed their preferences on a five- point likert scale for each set of different attributes related to an educational institution. Full- profile conjoint analysis generated complete profiles of educational institutions for all the attributes and their levels. The findings from conjoint analysis identified image, eResources, HEC Ranking, Dormitory, Playing Fields, Franchises and availability of a Personal Tutor to be the most important attributes.

Keywords: Attributes, Preferences, Conjoint Analysis

Introduction

There are 146 chartered colleges and universities in Pakistan, making the environment competitive. With more than a hundred choices, selecting a college has become a widely discussed topic in education. Students are at a critical stage in life when they are graduating from high school. The dilemma arises; of the choice of colleges and the career they want to pursue. This is the first major educational, financial, vocational and social decision for most students for which they have had a great deal of choice and responsibility (Mark, 1994). Parents and high school students always have to fight through the decision of which college to select for their children's' lucrative future. Traditionally, in Pakistan, parents have a huge part to play in the choice of college for their children and it is usually based on peer pressure, self-image and the popularity or fame of the institution (Sonmez, 2003).

Considering the rapid growth in education industry, institutions are also concerned about getting the best pool of students. Therefore, the dilemma lies with both the entities; student body i.e. the end consumers, and the educational institutions i.e. the suppliers of quality education. Colleges are now emphasizing more on branding and hence the need to explore consumers' preferences regarding the choice of educational institutions. In this paper, we propose to measure students' preferences in college choice and selection based on the joint influence of multiple independent factors, such as Higher Education Commission Ranking, variety of food available, on-campus entertainment facilities and the availability of student dormitories.

Literature Review

In the area of marketing of universities, one of the earliest works contributed is by Kramp and Heinlein (1981) who made an attempt to find out the needs of the prospective American student market; study the university's' image and develop techniques to identify potential students. An initial and interesting observation made by them was that a large number of universities studied by them had no idea of their image in the consumer's eye.

Dowling (2000) found housing security, high quality of dormitories and other facilities as factors deemed important by students. The choice process of students in universities in UK was examined by Hooley & Lynch (1981), who studied the attributes used in the decision making processes by using qualitative techniques and followed it with a card sort conjoint analysis to determine the tradeoff. The six influential attributes highlighted, out of the attributes identified, were university location, course suitability, academic reputation, type of university (modern/old), distance from home, and teacher's advice.

Similarly in a follow up study of Turner, Soutar & Turner (2002) examined a number of factors that students might take into consideration when making a university decision. The type of course that students want to study, the institution's academic reputation, the atmosphere of the campus, the quality of the faculty, the type of university were rated high. The existence of different approaches in marketing and creating differentiating images between old and new universities in Europe was identified by Ivy (2001). The study showed that the old universities were product-orientated and emphasized on a high degree of association to higher quality of teaching, research output; the courses offered and staff reputation. The new universities on the other hand placed strong emphasis on the marketing of their institutions on the basis of sports facilities, students' union facilities and use of the World Wide Web. An extension of this distinctive pattern can also be found in the study by Mazzarol (1998), who found different factors to be significant for attracting international students from different geographical regions. However, some factors that were found to be dominating in a majority of contexts were image and resources.

Technology was introduced into the classroom with the development of video film over 80 years ago (Mackay & Stockport, 2006). Instructors have, over the years, continued to bring in emerging technologies such as television, satellite feeds, DVDs, and computer systems to supplement the traditional classroom instruction. The traditional classroom setting has, however, remained the dominant means of delivering courses in higher education despite the advancement of technology.

Many studies have discovered positive connections between enhanced physical activity and natural playscapes (Dyment and Bell, 2007), creative play behaviors (Dyment and Bell, 2007; Herrington and Studtmann, 1998; Tranter and Malone, 2004), motor development (Fjørtoft, 2004), environmental learning (Tranter and Malone, 2004), and preference as far a college choice in concerned (Ozdemir and Yilmaz, 2008).

Yang Z., et al. (2013) found out that the student preferences rely immensely on spatial attributes, specifically furniture and ambiance, air quality and temperature, which are greatly impacted by the design, maintenance and management of classrooms. The research also studied the non-classroom factors, including gender, cumulative GPA, college year, seating location and expected course grade and their impact on student perceptions of learning environments.

This paper, however, aims at combining factors identified in prior research and attributes deemed necessary by high school coordinators to find out the most important of all. Conjoint analysis will help us prioritize based on relative importance, the attributes that are most important in creating preferences.

Data Collection

This paper has employed qualitative research and secondary research to indicate the attributes that determine students' preferences for colleges.

Sample I

The first part of this research was to conduct in-depth interviews with high school coordinators to find out the factors that students look for while they are going through a life changing decision i.e. which college to opt for. We interviewed coordinators of three schools, namely: Beaconhouse School System (Defence Campus), Lahore Grammar School (Gulberg Campus) and Aitchison College. The schools were selected based on convenience sampling and were all based in Lahore, Pakistan. Open-ended questions were asked from the coordinators about the attributes they look for their students while they are involved in helping them with their career choices and factors that students hold important while making a college choice. Qualitative research helped us capture both the perspectives: the school's point of view and the students' preferences. The literature we gathered was insightful, however, the attributes identified were mostly from United Kingdom, India and United States of America. Therefore, conducting qualitative research helped us to identify the attributes of colleges from Pakistan's perspective.

Sample II

To estimate the students' preferences and identifying attributes that students consider while short listing the choice of colleges, we will be using conjoint analysis; full profile procedure. Our sample consists of 95 high school students in three different schools namely, Beaconhouse School System (Defence Campus), Lahore Grammar School (Gulberg Campus) and Aitchison College.

Second year high school students were selected because they represent the target market for colleges. Table 1.0 shows the representation of students from each school.

Table 1.0 Sample for Conjoint Analysis

Schools	Number of Students
Beaconhouse School System (Defence Campus)	36
Lahore Grammar School (Gulberg Campus)	38
Aitchison College	21

24 profiles Fractional Factorial Design with orthogonal arrays for the above problem were generated out of which 4 is the holdout set, Card number 18 - 22 (See Appendix I). Respondents were asked to provide, for each profile, preference ratings in estimation set and holdout set. The ratings will be on 5-point likert scale (1 = strongly preferred and 5 = strongly not preferred).

Methodology

Undertaking qualitative research and analyzing prior literature identified attributes. To estimate the students' preferences and identifying attributes and their levels they consider while short listing the choice of notebooks and how they make preferences of choice of college, we will be using conjoint analysis; full profile procedure. In multiple factor evaluations complete profiles of brands are constructed for all the attributes and their levels. Information obtained from a conjoint analysis will help us answer the following market research questions:

Research Question 1: What attributes do students prefer while selecting a college?

Research Question 2: What are the critical success factors for educational institutions?

This study intends to have a different index card for each profile, which is a mix of a set of attributes. There are going to be three sets of data; one will be holdout set (4 profiles) solely for the purpose of validity and reliability, second will be estimation set for analysis purpose, 18 profiles and the third will be for user-choice simulation, 2 profiles (See Appendix I).

Attributes

Identifying the relevant attributes and their corresponding performance levels is the first step in designing a conjoint study (Orme, 2005). Secondary data in this area helped us identify college attributes such as image, availability of dormitory, advice from teachers, Higher Education Commission ranking, marketing, extracurricular activities, new and alternative means of teaching and play fields. On the contrary, qualitative research pointed out friendly and cooperative management, events and extracurricular activities, image of the college and food choices available in cafeteria (See Appendix II).

It has been observed that a typical conjoint analysis study involves seven or eight attributes. We have proposed seven attributes and their levels in Table 2.0.

Table 2.0: Attributes and Attribute Levels

Attributes	Level No.	Description
Image	1	Yes
	2	No
Dormitory	1	Yes
	2	No
Playing Fields	1	Yes
	2	No
	3	Neutral
Cafeteria	1	Franchises
	2	Regular Food
	3	Snacks
Extra Assistance	1	Personal Tutor
	2	Guidance Counselor
	3	Carrier Counselor
HEC Ranking	1	Yes
	2	No
Academic Facilities	1	Libraries
	2	Discussion Rooms
	3	eResources

In-depth interviews and secondary data indicated the attributes that are important in creating students’ preferences for colleges. Factors subcommand helped us explain the model illustrating the expected relationship between factors and consumers’ preferences. Conjoint analysis assumes a discrete relationship; however, we specify the following two:

Discrete: Qualitative and secondary research shows that HEC Ranking and Academic Facilities specifically discussion rooms and libraries have no relationship with students’ preferences. Therefore, we conduct our analysis on the assumption that academic facilities have no influence on consumers’ preferences. Interviews have revealed that HEC ranking has no specified relationship with students’ preferences.

Linear: We would be specifying the expected direction of the linear relationship with words such as MORE or LESS. Qualitative research and prior research shows that consumers have negative preference for Dormitory (Yes or No) and Image (Yes or No) (LINEAR LESS). However, consumers’ level of preference increases with variety of food choices available, Playing Fields (Yes, No or Neutral) and Extra Assistance (Personal Tutor and Guidance Counselor or Carrier Counselor) hence we identify these factors having a LINEAR MORE relationship with the dependent variable i.e. preference. Figure 1.0 shows the assumed relationship between the attributes that are deemed necessary in a college and the dependent variable (preferences for colleges).

Figure 1.0: Expected Relationship between the Seven Attributes and College Preferences

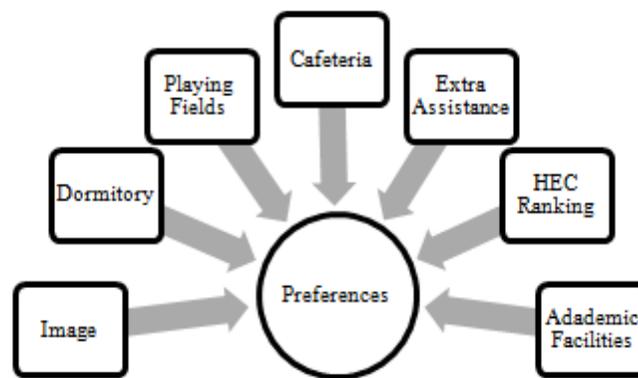


Table 3.0 shows a tabular representation of model description from SPSS output. Attributes with three attribute levels are Fields, Assistance, Cafeteria and Academic. Assistance and Cafeteria have a Linear More relationship with preference and Image and Dormitory have a Linear Less relationship. On the contrary, Image, Dormitory and Ranking have two attribute levels. Ranking and Academic Facilities have a Discreet relationship with preferences.

Table 3.0: Model Description

Attributes	No. of Levels	Relation to Ranks or Scores
Image	2	Linear (less)
Dormitory	2	Linear (less)
Fields	3	Linear (more)
Cafeteria	3	Linear (more)
Assistance	3	Linear (more)
Ranking	2	Discrete
Academic	3	Discrete

All factors are orthogonal.

Results and Discussion

This section includes the overall conjoint analysis results which will display preference scores for the different attribute levels, along with the overall attribute importance scores. After generating an orthogonal design, we collected preference data from the 95 subjects (See Appendix I). A unique subject ID identified each response. Table 4.0 shows the utility scores and their standard levels for each attribute level.

Table 4.0: Utility Scores

Attributes	Levels	Utility Estimate
Ranking	Yes	.085
	No	-.085
Academic	Libraries	.012
	Discussion Rooms	-.023
	eResources	.011
Image	Yes	-.101
	No	-.202
Dormitory	Yes	-.059
	No	-.117
Fields	Yes	-.096
	No	-.191
	Neutral	-.287
Cafeteria	Franchises	-.039
	Regular Food	-.078
	Snacks	-.117
Assistance	Personal Tutor	-.028
	Guidance Counselor	-.057
	Carrier Counselor	-.085
(Constant)		.582

Higher utility values in table 4.0 indicate greater preference for a particular attribute level. Looking at the utility scores, we can conclude that Ranking is an important factor in forming preferences for the choice of college, 0.085. Among the academic facilities, the factor that will give most utility to students is the facility of library (0.012) followed by availability of eResources (0.011) and the availability of discussion rooms (-0.023). For the overall image of the college, we can safely say that larger negative value for utility means lower utility (-0.202), therefore, we can say that image is critical to the decision making process for college choice. The availability of dormitory does impact undergraduate students' preference for college choice as indicated by the lower negative value of utility (-0.059). Having playing fields shows greater preference (-0.191) over having no playing fields (-0.287). Respondents have shown clear preference for franchises (-0.039) over regular food and snacks. Extra assistance in the form of personal tutor (-0.028) shows high utility over guidance counselor and carrier counselor. Table 5.0 presents the overall importance scores for a volunteering experience.

Table 5.0: Importance Scores

Importance Values	
Ranking	13.143
Academic	17.692
Image	14.362
Dormitory	11.349
Fields	15.650
Cafeteria	11.590
Assistance	11.960
Averaged Importance Score	

Please note the following for an accurate interpretation of the importance scores,: 1) the higher the score, the more importance the attribute holds and 2) the importance scores display relative importance with all of the importance scores adding up to 100 points. Examining Table 5.0 below, it can be concluded about attribute importance when students are choosing a volunteering experience. Clearly, academic facilities are the most important (17.692) attribute in the college choice decision. Availability of playing fields is the second most important attribute (15.650).

The overall image of the college is also important for students (14.362), this is in line with the findings of Mazzarol (1998) and HEC Ranking (13.143) is really close in importance and act as the fourth most important attribute. Then comes academic assistance (11.960) followed by variety available in cafeteria (11.590). The availability of student dormitories in a college is of the least importance (11.349) amongst the attributes in decision-making, but it is still considered important in the decision of college choice.

Table 6.0 shows two statistics, Pearson's R and Kendall's tau, which provide measures of the correlation between the observed and estimated preferences. The table also displays the value of correlation for holdout profiles (Kendall's tau for Holdouts), in our research, we had four holdout profiles.

Table 6.0: Correlations
Correlations^a

	Value	Sig.
Pearson's R	.854	.000
Kendall's tau	.576	.000
Kendall's tau for Holdouts	.667	.087

a. Correlations between observed and estimated preferences

The purpose of having a correlation value for holdout profiles is validation, and not analysis. The cut-off point for significance is 0.05 and we observe that both the significance values; Pearson's R and Kendall's Tau are significant i.e. they are less than 0.05 hence justifying the model fit. Kendall's Tau for Holdouts is 0.500. The acceptable range is between 0 and 1.

Table 7.0 shows number of reversals. When specifying linear models, we assumed that Fields, Cafeteria and Assistance have Linear More relationship with preference; whereas, we suggested that Image and Dormitory will have an inverse relationship (Linear Less) with consumers' preferences.

Table 7.0: Reversals

Number of Reversals		
	Fields	56
	Cafeteria	46
Factor	Assistance	42
	Dormitory	27
	Image	27

Table 7.0 shows the number of people whose preferences were opposite to what we initially gauged for our model. In total, 56 cases for Playing Fields, 46 cases for Cafeteria and 42 cases for Academic Assistance, 27 cases for Dormitory and 27 cases for Image are reverse. We initially proposed negative relation between Dormitory and Image with preference. It is surprising to see that 48% of the respondents prefer having choice in the food that is available in college premises. 28% of the respondents do consider image of the college as important in their decision-making. Our research depicted a positive relationship between fields and preference for selecting a college, however, 60% of the respondents preferred the opposite. This clearly indicates that having playing fields, variety in food and availability of extra assistance in a college serves as important attributes in forming preferences of high school students.

User-Choice Simulation

Conjoint analysis is critical when it is about its capability to predict preference for product profiles that weren't rated by the subjects, Simulations. Simulation profiles are part of the orthogonal plan, along with the profiles from estimation profiles and holdout profiles. So far we have determined the factors that are important in creating students' preferences, however, we are now interested in finding out the optimum level of attributes which will be responsible for the highest total worth.

We generated two simulation profiles in which each individual's ranking of the factors is used to predict which would be preferred out of the two alternative patterns. Both the simulation profiles had poles opposite levels of attributes, however, the results, in their ideal sense won't be conclusive, since there can be more combinations for the 18 levels of attributes. Table 8.0 shows the predicted probabilities of selecting each of the simulation cases as the most preferred one, under three different probability-of-choice models.

Table 8.0 Simulation Results

Card Number	Maximum Utility	Bradley-Terry-Luce	Logit
23	71%	58.30%	68.80%
24	29%	41.70%	31.20%

The BTL (Bradley-Terry-Luce) model determines the probability as the ratio of a profile's utility to that for all simulation profiles, averaged across all respondents. The logit model is similar to BTL but it uses the natural log of the utilities instead of the utilities. All the three models indicate that Card Number 23 is would be preferred. Students do consider the image of the college before they actually short list the number of options they have for colleges. Availability of student residences, playing fields is also critical to forming preferences. Moreover, we can conclude that HEC ranking and the availability of eResources in a college also act as critical success factors in determining the success of a college.

Managerial Implications

Implications are more for universities trying to be the best in the education industry. Aiming to be high in HEC Ranking and creating the best set of infrastructure to attract students. In the fight of being the best and communicating the message of excellence, colleges first need to be clear about what attributes of their colleges they need to highlight. Targeting the right consumer at the right time with the right set of attributes is critical to the success of any college that strives to be the best in the industry.

This research is most beneficial for managers in colleges struggling to find out the attributes that students prefer while they are selecting a college. Our research shows that high HEC ranking, availability of library facility, eResources, good reputation, and availability of student dormitories, playing fields, variety in food and extra assistance in the form of personal tutor are attributes that develop students' preferences for colleges.

Corporate strategies of universities must aim at devising long-term strategies to build enabling infrastructure that will make students feel at home. If students are given a living space in college coupled with variety of food on campus, it is more likely that students will have a comfortable life during college hours. The availability of libraries and assistance such as personal tutor might keep students engaged and satisfied. Having elaborate playing fields will enable them to strike a balance between studies and sports.

Limitations and Future Research

As a research limitation, the sample identified in this study might not be a representative of the population. This paper takes sample from three high schools from Lahore, therefore, we have a reason to believe that our findings might only be applicable to a certain segment of the market. To generalize more to the population of students, larger samples drawn from a larger cross section of high schools will be essential. Furthermore, this research is cross-sectional; it will be wise to conduct a longitudinal study to analyze results across a time line. Longitudinal study will not only highlight the changes in the attributes' preferences before getting into a college, it will also provide insights about the students' preferences while they are in the college.

Our research is limited to seven attributes, however, there can be many other factors pointed out in literature, which play a part in creating students' preferences. After high school coordinators have identified all the necessary attributes and after all factors have been listed from literature, researchers can perform exploratory factor analysis which will help group together levels of attributes. In this study, however, all the attribute levels have been identified and shortlisted based on researcher's own judgment.

A possible avenue for future research can be using structural equation modeling to find out the relationship between constructs and preference while image acts as a mediating variable. Future studies might study the entire range of services and include reference service as one multilevel factor. Such a study might involve a variety of students from different types of schools; public and private. The preferences shown by such studies could be used to help in decision making and answering questions such as: What range of services should the library offer? What types of eResources do students prefer?

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Appendix I

On a scale of 1 to 5, rate each set of college attributes based on your preference. With 1 being most preferred and 5 being least preferred.

1. Strongly Preferred 2. Preferred 3. Neutral 4. Not Preferred 5. Strongly Not Preferred

Card ID	Image	Dormitory	Fields	Cafeteria	Assistance	Ranking	Academic	1	2	3	4	5
1	Yes	Yes	Yes	Regular Food	Guidance Counselor	Yes	Discussion Rooms					
2	No	Yes	Yes	Snacks	Guidance Counselor	No	Libraries					
3	No	Yes	No	Snacks	Personal Tutor	Yes	Discussion Rooms					
4	Yes	Yes	Neutral	Snacks	Carrier Counselor	Yes	Discussion Rooms					

Card ID	Image	Dormitory	Fields	Cafeteria	Assistance	Ranking	Academic	1	2	3	4	5
5	Yes	Yes	Yes	Franchises	Personal Tutor	Yes	Libraries					
Card ID	Image	Dormitory	Fields	Cafeteria	Assistance	Ranking	Academic	1	2	3	4	5
6	No	Yes	Neutral	Franchises	Personal Tutor	Yes	eResources					
Card ID	Image	Dormitory	Fields	Cafeteria	Assistance	Ranking	Academic	1	2	3	4	5
7	No	No	No	Regular Food	Guidance Counselor	Yes	eResources					
Card ID	Image	Dormitory	Fields	Cafeteria	Assistance	Ranking	Academic	1	2	3	4	5
8	Yes	Yes	Yes	Regular Food	Carrier Counselor	Yes	eResources					
Card ID	Image	Dormitory	Fields	Cafeteria	Assistance	Ranking	Academic	1	2	3	4	5
9	Yes	Yes	Neutral	Snacks	Guidance Counselor	No	eResources					
Card ID	Image	Dormitory	Fields	Cafeteria	Assistance	Ranking	Academic	1	2	3	4	5
10	Yes	Yes	No	Regular Food	Personal Tutor	No	Libraries					
Card ID	Image	Dormitory	Fields	Cafeteria	Assistance	Ranking	Academic	1	2	3	4	5
11	No	Yes	Neutral	Regular Food	Carrier Counselor	Yes	Libraries					
Card ID	Image	Dormitory	Fields	Cafeteria	Assistance	Ranking	Academic	1	2	3	4	5
12	Yes	No	Yes	Snacks	Personal Tutor	Yes	eResources					
Card ID	Image	Dormitory	Fields	Cafeteria	Assistance	Ranking	Academic	1	2	3	4	5
13	Yes	No	No	Snacks	Carrier Counselor	Yes	Libraries					
Card ID	Image	Dormitory	Fields	Cafeteria	Assistance	Ranking	Academic	1	2	3	4	5
14	Yes	No	Neutral	Regular Food	Personal Tutor	No	Discussion Rooms					
Card ID	Image	Dormitory	Fields	Cafeteria	Assistance	Ranking	Academic	1	2	3	4	5
15	Yes	Yes	No	Franchises	Guidance Counselor	Yes	Discussion Rooms					
Card ID	Image	Dormitory	Fields	Cafeteria	Assistance	Ranking	Academic	1	2	3	4	5
16	No	No	Yes	Franchises	Carrier Counselor	No	Discussion Rooms					
Card ID	Image	Dormitory	Fields	Cafeteria	Assistance	Ranking	Academic	1	2	3	4	5
17	Yes	No	Neutral	Franchises	Guidance	Yes	Libraries					

					Counselor									
Card ID	Image	Dormitory	Fields	Cafeteria	Assistance	Ranking	Academic	1	2	3	4	5		
18	Yes	Yes	No	Franchises	Carrier Counselor	No	eResources							
Card ID	Image	Dormitory	Fields	Cafeteria	Assistance	Ranking	Academic	1	2	3	4	5		
19	No	Yes	No	Regular Food	Carrier Counselor	Yes	Libraries							
Card ID	Image	Dormitory	Fields	Cafeteria	Assistance	Ranking	Academic	1	2	3	4	5		
20	No	No	No	Regular Food	Guidance Counselor	No	Discussion Rooms							
Card ID	Image	Dormitory	Fields	Cafeteria	Assistance	Ranking	Academic	1	2	3	4	5		
21	Yes	Yes	Yes	Regular Food	Guidance Counselor	No	Discussion Rooms							
Card ID	Image	Dormitory	Fields	Cafeteria	Assistance	Ranking	Academic	1	2	3	4	5		
22	Yes	No	No	Regular Food	Personal Tutor	Yes	Discussion Rooms							
Card ID	Image	Dormitory	Fields	Cafeteria	Assistance	Ranking	Academic	1	2	3	4	5		
23	Yes	Yes	Yes	Regular Food	Personal Tutor	Yes	eResources							
Card ID	Image	Dormitory	Fields	Cafeteria	Assistance	Ranking	Academic	1	2	3	4	5		
24	No	No	No	Franchises	Guidance Counselor	No	Discussion Rooms							

Appendix II

Attributes	Levels	Description
Image	Yes No	Good reputation
Dormitory	Yes No	Student residences
Playing Fields	Yes No Neutral	Football, Cricket, Hockey fields, basketball courts
Cafeteria	Franchises Regular Food Snacks	Subway, Gloria Jeans etc Regular Cuisine Crisps
Extra Assistance	Personal Tutor Guidance Counselor Carrier Counselor	Help through personal problems Understand academic performance Guidance about carrier choices
HEC Ranking	Yes No	Higher Education Commission
Academic Facilities	Libraries Discussion Rooms eResources	Library Facility Discussion Rooms for students Elaborate academic and market databases