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Examining University performance and services using discriminant analysis across faculty and other affiliations: A mapping of the student experience

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ABSTRACT

Today, there is a greater focus on worldwide academic excellence an`d quality of education. The industry can be more selective nowadays because there is a wide range of graduates due to various institutions offering many qualifications of different standards and quality. For a higher education institution to succeed, quality of performance and services must be ensured and delivered. This paper used discriminant analysis to analyze the effect of 18 variables upon the dependent variable, the university's faculty performance and services, with which the respondent is affiliated. The contribution of this work lies in its attempt to characterize the student's perception of the university's performance and services across university faculties. The study revealed that the student's overall health had the lowest Wilk's Lambda value of .930 and the largest Mahalanobis D2 and significance values of .034 and .001, respectively. It suggests that it had the most excellent discriminating power among the variables. According to the findings, the discovered factors may be utilized to distinguish between the four college institutes or departments based on their performance and services. The discriminant analysis can assist institutions and departments in identifying their strengths and shortcomings in terms of these factors, allowing them to build plans to improve their performance and services.

Keywords: Discriminant analysis, students' perception, quality education

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INTRODUCTION

Clients are viewed as the lifeblood of the existence of an organization; this is /the situation for all associations (Lauer, 2012). The same applies to higher education establishments, where students serve as customers and are regarded as the institution's lifeblood. A wide range of clients, including students, have specific assumptions regarding the sort of administration they get or purchase. According to the research of Darlaston-Jones et al. (2003), the majority of students were aware of what to expect from the student administration department and whether or not they were receiving satisfactory service. Today's students worldwide are well-informed and know what to expect least from the Student Administration, and they will not accept anything less. Because of this, students are viewed as an imperative and significant resource for any advanced education establishment (Wright and O'Neill, 2002).

It should be noted that not only do higher education institutions compete with each other, but there is also competition among internal faculties within higher education institutions. All higher education institutions have different schools, colleges, and departments in various disciplines, all competing with one another. Each faculty strives to get more students to register with them – by trying to differentiate themselves from the other faculties in various ways – including services. In many instances, the service quality provided by one school, college, or department can lead to a prospective student registering at that school, college, or department. This fact, namely a high level of quality service, may be the differentiating factor that provides a competitive advantage for the specific school, college, or department.

Senthilkumar and Arulraj (2009) researched the determinants of service quality in higher education institutions in India, specifically the educational institutions for Tamil Nadu. Results show that the significant determinants are the placement, teaching quality, quality of the faculty members, physical resources, and a wide range of disciplines. Arambewala (2009), in their research on an empirical model of international student satisfaction, proposed through a theoretical model that the perceived level of satisfaction of the students depends upon the nature of services. This mainly depends upon the educational and non-educational services offered by the higher education institutions.

In this context, the researcher, through this article, attempts to understand and determine the students' perception towards the DOrSU's performance and services across faculty using the discriminant analysis. Predictors were determined and scrutinized, which include regenerative future positioning, school facilities, teaching method initiatives, curriculum competency, safety and security, internet accessibility, student services, learning environment, school performance, student organization involvement, school discipline, university's overall image, research, extension, and innovation approach, quality of graduates, access to inclusive education, university's quality education, and students' overall health. This study aims to determine how the independent variables (predictors) discriminate among the four university faculty members: Faculty of Computing, Data Science, Engineering, and Technology (FCDSET), Faculty of Teacher Education (FTED), Faculty of Governance, Business, and Management (FGBM), and Faculty of Agriculture and Life Sciences (FALS).

METHODOLOGY

Discription of study area

The study was carried out among the students who were officially enrolled

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in the Davao Oriental State University (DOrSU) main campus located in the City of Mati, Davao Oriental. Respondents were divided into four groups given the different institutes or faculties they belong to, namely the Faculty of Computing, Data Science, Engineering, and Technology (FCDSET), the Faculty of Teacher Education (FTED), the Faculty of Governance, Business, and Management (FGBM), and the Faculty of Agriculture and Life Sciences (FALS).

Figure 1. Area and conduct of the study.

Sampling procedures

The total target respondents were 600 students of the Davao Oriental State University, and based on this criterion, a sample size of 400 is recommended. After that, proportional simple random sampling was used to select the 400 samples at random from the four institutes. The researcher divided the population into four categories based on their respective faculty affiliations to ensure sample representatives.

Research instrument

Data were collected using the researcher-made survey questionnaire based on the objectives of the research, which consisted of two sections:

Section A: sociodemographic characteristics of the respondents (gender, age, senior high school strand, residence, family income, and parental education).

Section B: items related to the perception of the university's performance and services, which comprises 18 constructs with 93 items series of questions (see Table 1).

The scaling used in the questionnaire was designed as per ten point Likert scale, where the points represent as follows: 1 indicating strongly disagree, 2 disagree, three somewhat disagree, 4 slightly disagree, 5 Neither agree nor disagree, six slightly agree, seven somewhat agree, eight agree, nine strongly agree, and ten completely agree. Pilot testing was carried out to validate the survey questionnaire before distributing it to the target respondents. Cronbach's Alpha Coefficient was used to determine the reliability of the questionnaire. A face-to-face personal survey was administered by the researchers to 400 target respondents currently enrolled in the Davao Oriental State University.

Table 1. Eighteen (18) constructs related to the perception of the university's performance and services.

Variable	Definition	References
Regeneration	refers to a strategic and forward-looking approach that emphasizes the sustainable and holistic development of prospects.	Camrass, (2020)
Infrastructure	defined as the physical facilities and amenities provided within an educational institution to support and enhance the learning environment	Figueroa et al. (2016)
Pedagogy	refers to the intentional and innovative strategies employed by educators to impart knowledge and skills to students.	Toquero, (2020)
Competency	defined as the proficiency and effectiveness of the educational curriculum in meeting its intended goals and objectives.	(Ashraf et al., 2022)
Safety	refers to the measures and protocols implemented within the educational institution to ensure the well-being and protection of students, faculty, and staff.	Thamrin et al. (2010)
Connectivity	defined as the extent to which students and educators have convenient and equitable access to the Internet for educational purposes.	Firat, (2017)
Services	encompass a comprehensive range of support programs and resources the educational institution provides to enhance the overall student experience.	Patalinghug et al., (2021)
Environment	defined as the physical, social, and psychological surroundings in which educational activities take place.	Skelton, (2008)
Performance	defined as the collective achievement and effectiveness of an educational institution in meeting its academic, administrative, and organizational objectives.	Patimo, (2020)
Involvement	defined as the active participation and engagement of students in various organized groups, clubs, or associations within the educational institution.	Donkoh et al. (2022)
Discipline	defined as the extent to which students are engaged in and affected by disciplinary measures and practices within the educational institution.	Baumann and Krskova, (2016)
Image	defined as the collective perception, reputation, and public portrayal of the educational institution.	Yeboah, (2022)
REI (Research, Extension, and Innovation)	reflects the institution's engagement in academic research, outreach, and extension activities and its commitment to fostering innovation across various aspects of its mission and operations.	Elhini and Mourad (2022)
Satisfaction	refers to the overall contentment and fulfillment experienced by students within the educational institution.	Campbell and Li, (2007)
Graduates	refers to the proficiency, competencies, and attributes demonstrated by individuals upon completing their academic programs within the educational institution	Terano et al. (2022)

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Inclusivity	refers to the extent to which educational opportunities are provided and tailored to accommodate diverse learners, irrespective of their backgrounds, abilities, or differences.	Gidley et al. (2010)
Quality	defined as the comprehensive delivery of academic programs and learning experiences that meet or exceed established standards, fostering the holistic development of students.	Ashraf, (2019)
Health	refers to the holistic well-being of individuals within the educational institution, encompassing physical, mental, and social dimensions.	Cvetkovski et al., (2012)

Data analysis

The data were collected, coded, checked for completeness, entered in Microsoft EXCEL 2007, and transformed into IBM SPSS (Statistical Package for Social Sciences) Statistics for Windows, Version 23.0. Armonk, NY (IBM Corp., 2015). The data preparation stage includes the imputation of missing values, data cleaning, non-linear data transformation, and data normalization. Unstructured data is replaced and turned into structured data. Using statistical software, assumptions for the Discriminant Analysis were evaluated, such as the predictor's variables should be normally distributed, no existence of multicollinearity, and observation independence. Moreover, the researcher standardized the anticipated 93 items ranging from 1 to 10 for predictors and response variables.

From the collected data, respondents were divided into four groups: those that belong to the Faculty of Computing, Data Science, Engineering, and Technology (FCDSET); those in the Faculty of Teacher Education (FTED); those in the Faculty of Governance, Business, and Management (FGBM), and those in the Faculty of Agriculture and Life Sciences (FALS). The 400 samples were divided into two proportions: 60% for the training dataset and 40% for the validation. The training data set will be the section to be used for training the model, and the remaining data will be used for validation to see if the model is consistent and effective.

A stepwise procedure is also used for the selection of the predictors to be used in the final model. It involves adding or removing potential explanatory variables in succession and testing for statistical significance after each iteration.

Ethics

Ethical consideration was maintained throughout the study to make sure that participation was voluntary, well-informed, and safe for research subjects. The researcher ensures, first and foremost, that the target respondents voluntarily participate in the study without any pressure or coercion and that they were well informed of the purpose, benefits, and risks behind the survey before they agree to join. Confidentiality was also deemed to be crucial in the study, where the researchers were the only ones who can access the study data without revealing the respondent's data, and that was by the data confidentiality provision of the Philippine Data Privacy Act of 2012.

RESULTS AND DISCUSSION

A total of 400 respondents were used in the study's analysis. Descriptive statistics was utilized to determine the differences in the means of each predictor from group to group in terms of the institute. These differences allowed the researcher to use this set of predictors to distinguish observations in one institute group from observations in another.

Table 2. Group descriptive statistics and test of equality for the estimation sample in the four-group discriminant analysis.

Independent variable	Dependent variable Group mean: Institute (P2_Q2)				Test of equality of group mean			Min D^2
	Group 1: FCDSET	Group 2: FALS	Group 3: FGBM	Group 4: FTED	Λ	*F*	*P*	
Regeneration	8.56	8.45	7.93	8.50	.965	2.83	.039	.000
Infrastructure	8.51	7.85	7.79	8.56	.932	5.77	.001	.001
Pedagogy	8.51	8.15	7.99	8.54	.973	2.22	.086	.000
Competency	8.86	8.17	7.85	8.38	.927	6.17	.000	.025
Safety	8.82	8.32	8.15	8.25	.965	2.82	.040	.003
Connectivity	5.47	4.60	4.68	5.52	.958	25.11	.000	.001
Services	8.60	8.11	7.88	8.48	.943	4.74	.003	.010
Environment	8.80	8.64	8.19	8.36	.977	1.88	.134	.010
Performance	8.74	8.61	8.23	8.44	.977	1.87	.136	.011
Involvement	8.78	8.36	8.12	8.65	.953	3.88	.010	.012
Discipline	8.90	8.52	8.27	8.88	.952	3.93	.009	.000
Image	8.79	8.70	8.48	8.62	.991	.71	.546	.005
REI	8.72	8.54	8.29	8.44	.981	1.51	.213	.008
Satisfaction	8.89	8.33	8.29	8.70	.958	3.49	.016	.001
Graduates	8.87	8.47	8.26	8.61	.961	3.18	.025	.015
Inclusivity	9.04	8.57	8.10	8.37	.923	6.58	.000	.030
Quality	8.80	8.37	8.24	8.43	.970	2.47	.063	.002
Health	8.30	7.61	7.94	8.54	.930	5.92	.001	.034

Table 2 showed the group means for each of the independent variables (the university's performance and services), and it identified 12 variables that had the largest differences in the group means. These variables were regeneration, infrastructure, competency, safety, connectivity, services, involvement, discipline, satisfaction, graduates, inclusivity, and health. The analysis above also revealed that health had the lowest Wilk's Lambda value of .930 and the largest Mahalanobis D2 and significance values of .034 and .001, respectively. This suggested that it had the greatest discriminating power among the variables. According to the findings, the discovered factors could be utilized to distinguish between the four college institutes or departments based on their performance and services. The discriminant analysis could assist institutions and departments in identifying their strengths and shortcomings in terms of these factors, allowing them to build plans to improve their performance and services. The stepwise estimate approach utilized in the analysis could also assist in reducing the number of variables and finding the most essential ones for differentiating across groups.

Table 3. Results from step 1 to step 4 of the stepwise four-group discriminant analysis.

Process	Variables Entered/Removed	Λ	*F*	Min D^2	*P*
Step 1	Health	.930	5.92	.034	.001
Step 2	Competency	.868	5.76	.238	.000
Step 3	Inclusivity	.803	5.96	.262	.000
Step 4	Competency (Removed)	.830	7.63	.214	.000

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Step 1

From the review of group differences, table 2 showed that health had the largest significant difference between the four groups and the largest Mahalanobis D2. Thus, health was entered as the first variable in the stepwise procedure with a Wilk's lambda of .930, F = 5.92, and p = .001. This result identified health as the most important variable for discriminating among four groups based on their performance and services. The analysis showed that health had the largest significant difference between the groups and the largest Mahalanobis D2 value, indicating that it had the highest discriminatory power among the variables. The stepwise procedure used in the analysis involved evaluating the remaining variables based on their incremental discrimination ability after health entered the model. This approach was used to identify the most important variables for discriminating among the groups and to reduce the number of variables in the model.

According to the findings, health was identified as a vital variable that could have a substantial influence on the performance and services of the four college institutes/departments. A healthy student body was more likely to perform better academically and benefit more from the institutes/departments' offerings. As a result, it was critical for institutes/departments to emphasize their students' health and well-being and to offer enough resources and assistance to enhance their physical and mental health. The relevance of student health in education was extensively documented in the literature. Several studies found that student health and well-being were important factors that influenced academic performance, attendance, and engagement in school. Sjöberg et al. (2017) discovered, for example, that students' physical and mental fitness and health-related behaviors were positively associated with their academic performance in Swedish schools. Denny et al. (2011) found in a similar study that students who reported better physical and mental health had higher levels of academic achievement and engagement in New Zealand schools.

Also shown in Table 5 in the appendix, three variables (curriculum, connectivity, and inclusivity) meet the .05 significance level criteria for consideration at the next stage. Based on Table 3, Curriculum remains the next-best candidate to enter the model because it has the highest Mahalanobis D2 of .238. After step 1, the minimum Mahalanobis D2 values increase for all the perception variables.

Step 2

In step 2 in Table 3, competency entered the model as expected in step 2 of the discriminant analysis. The overall model was significant (f = 5.76) and improved the discrimination between groups, as evidenced by the decrease in Wilk's lambda from .930 to .868. The discriminant power of both variables included at this point was also statistically significant, with f-value of 5.383 for health and 5.627 for competency (see Table 7 in the appendix). The inclusion of competency in the discriminant model suggested that the quality of the curriculum and the competency of the faculty in delivering it were critical factors in determining the performance and services of the college institutes and departments. A well-designed and implemented curriculum could help students develop the necessary skills and knowledge to succeed academically and professionally. Similarly, competent faculty could provide effective instruction, support, and mentorship to students, contributing to their academic and personal growth.

The relevance of curriculum and faculty competency in education was widely established in the literature. Several studies found that curricular quality and instructor competency could

influence student learning results, engagement, and satisfaction. For example, Kuh et al. (2014) discovered that curricular quality was a major predictor of student involvement and satisfaction at American colleges and universities. Similarly, Abbas et al. (2019) found that teacher competency and teaching quality were connected with better student learning outcomes and satisfaction in Pakistani institutions. The findings of the analysis were consistent with current research, emphasizing the relevance of curriculum and faculty competency in education. The findings implied that focusing on curriculum quality and teacher competency could have a considerable positive influence on the performance and services of college institutes/ departments. Furthermore, the stepwise process utilized in the study could aid in finding the most important factors for differentiating between groups and minimizing the number of variables in the model.

Step 3

With both variables statistically significant, the procedure moves on to examining the variables not in the equation for potential candidates for inclusion in the discriminant function based on their incremental discrimination between groups. Inclusivity is the next variable meeting the requirement for inclusion, but its significance level increases from .000 (see Table 2) to 0.05 (table 8 in the appendix), and discriminating ability has been reduced substantially because of multicollinearity with health and competency already in the discrimination function. Most noticeable is the marked increase in Mahalanobis D2 from the univariate results, in which each variable is considered separately. In the case of inclusivity, the minimum D2 value increases from .030 (see Table 2) to .238 (see Table 8 in the appendix), indicative of a spreading out and separation of the groups by health and competency.

Table 3 shows the results of the third step in the stepwise process, where inclusivity does enter the discriminant function. The overall results are still statistically significant and continue to improve in discrimination, with an f-value of 5.96 and a p-value of .000. There is a decrease in Wilk's Lambda value from .868 in Table 7 to .803 in Table 8. The findings reported in Table 8 suggest that inclusivity has contributed to the discriminant model and has improved the overall discrimination between groups. This variable had previously been excluded due to its high multicollinearity with the two variables already included in the model. However, after the inclusion of inclusivity in the model, the overall discrimination ability has increased even further, which indicates that inclusivity provides additional information that complements the other variables in the model.

The current study's findings are consistent with earlier studies on the link between inclusive education and student outcomes. For example, Forlin and colleagues (2016) discovered that students with disabilities who have access to inclusive education have higher academic success and social skills. Similarly, Sullivan and Rosenthal (2016) found that inclusive education can lead to better results for students without impairments, such as enhanced empathy and tolerance for diversity.

Step 4

The removal of competency in step 4 of the stepwise discriminant analysis resulted in a significant change in the discriminant function. The decrease in discriminant power was indicated by the increase in Wilk's Lambda from .803 to .830, as reflected in Table 3. The model remained significant (f = 7.63), and the two remaining variables, health, and inclusivity, continued to have significant discriminating power with f-value of 8.72 and 9.40, respectively (see Table 9 in the

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appendix). This indicated that competency was no longer significantly contributing to college discrimination among the four groups. One explanation for its removal might be that it was substantially linked with other variables already in the model, such as health and inclusivity. This would result in multicollinearity, which would reduce the discriminant power of the variables and make identifying the most significant variables for differentiating between groups difficult. Another explanation for the elimination of competency might be that its contribution to the discriminating function was insufficient when compared to other variables. The goal of discriminant function analysis was to discover the factors that contributed the most to group separation. If competency did not contribute considerably in comparison to other factors, it was perhaps omitted from the model.

Table 4. Results from the final step of stepwise four-group discriminant analysis.

Overall Model Fit

	Value	*F*-value	Df	*P*
Wilk's Lambda	.671	11.266	9,569.645	.000

Variable Removed/Entered at Step 5

			F	
Variables Entered	Min D^2	Value	Significance	Between Groups
Connectivity	.447	4.428	.005	FALS and FGBM

Note: At each step, the variable that maximizes the Mahalonobis distance between the closest groups is entered.

Variables in the Analysis after Step 5

Variable	Tolerance	*F* to Remove	D^2	Between Groups
Health	.623	3.579	.171	FALS and FGBM
Inclusivity	.743	9.293	.071	FALS and FGBM
Connectivity	.806	18.497	.214	FGBM and FTED

Variable Not in the Analysis after Step 5

Variable	Tolerance	Min tolerance	*F* to enter	Min D^2	Between groups
Regeneration	.723	.614	1.330	.557	FALS and FGBM
Infrastructure	.701	.605	.185	.447	FALS and FGBM
Pedagogy	.650	.569	.852	.471	FALS and FGBM
Competency	.685	.589	1.998	.505	FALS and FGBM
Safety	.656	.570	1.603	.455	FALS and FGBM
Services	.587	.545	.550	.493	FALS and FGBM
Environment	.788	.591	1.956	.539	FALS and FGBM
Performance	.612	.539	2.322	.577	FALS and FGBM
Involvement	.690	.593	.315	.476	FALS and FGBM
Discipline	.640	.562	1.216	.478	FALS and FGBM
Image	.701	.550	.577	.489	FALS and FGBM
REI	.699	.588	.500	.473	FALS and FGBM
Satisfaction	.660	.592	.579	.456	FALS and FGBM
Graduates	.527	.527	.211	.463	FALS and FGBM
Quality	.278	.278	.730	.485	FALS and FGBM

Significance testing of group difference after step 5				
Faculty	FCDSET	FALS	FGBM	FTED
Faculty of Computing, Data Science, Engineering, and Technology (FCDSET)	F	7.721	12.617	7.658
	Sig.	.000	.000	.000
Faculty of Agriculture and Life Sciences (FALS)	F	7.721	4.428	20.878
	Sig.	.000	.005	.000
Faculty of Governance, Busi-ness, and Management (FGBM)	F	12.617	4.428	16.603
	Sig.	.000	.005	.000
Faculty of Teacher Education (FTED)	F	7.658	20.878	16.603
	Sig.	.000	.000	.000

e. 3, 234 degrees of freedom for step 5.

Finally, the results of step 5 of the discriminant analysis revealed that connectivity entered the model as expected since it had the largest Mahalanobis D2 of .447 (see Table 4). This indicated that connectivity had greater discriminant power between the groups than the other variables. The inclusion of connectivity in the model improved the overall discrimination between groups, as evidenced by the sudden decrease in Wilk's Lambda from .830 (see Table 4)0 to .671 in Step 5. The discriminant power of all three variables included in the model (i.e., health, access to inclusivity, and connectivity) was statistically significant, with F values of 3.579 for health, 9.293 for inclusivity, and 18.497 for connectivity. It is important to note that none of the remaining 15 independent variables met the entry criterion for statistical significance of 0.05 in Table 2. Thus, the estimation process stopped with three variables constituting the discriminant function. This suggested that these three variables were the most important predictors of group membership and had the greatest ability to discriminate between the fou r groups.

The inclusion of connectivity in the final model was consistent with previous research indicating the importance of technology access and use in predicting academic and social outcomes for students with disabilities (e.g., Alquraini and Al-Badi, 2012; Kennedy, 2016). Kennedy (2016) discovered, for example, that students who had access to assistive technology and received adequate training improved their academic success, self-efficacy, and social relationships. Similarly, according to Alquraini and Al-Badi (2012), students with impairments who utilized technology to aid their learning performed better academically and reported higher levels of enthusiasm and participation in learning activities. Overall, the study's findings indicated that health, inclusivity, and connectivity were major determinants of college institute/ department participation among students in higher education.

Table 5 showed that the variables health, connectivity, and inclusivity with the highest F values and lowest Wilk's Lambda values were also entered into the discriminant function. Nine other variables, including Regeneration, Infrastructure, Pedagogy, Competency, Safety, Services, Involvement, Discipline, Satisfaction, and Graduates, also had significant discriminating effects but were not included by the stepwise process in the discrimination function. This was due to multicollinearity between nine variables and the three variables included in the discrimination function. These nine variables added no

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Table 5. Summary of interpretative measures for four-group discriminant analysis.

Independent variable	Discriminant coefficient						Discriminant loading			Λ	F	P
	Unstandardized			Standardized								
	Function 1	Function 2	Function 3	Function 1	Function 2	Function 3	Function 1	Function 2	Function 3			
Regeneration	NI	NI	NI	NI	NI	NI	.237	.320	.345*	.965	2.826	.039
Infrastructure	NI	NI	NI	NI	NI	NI	.368*	.237	.327	.932	5.765	.001
Pedagogy	NI	NI	NI	NI	NI	NI	.419*	.154	.389	.973	2.221	.086
Competency	NI	NI	NI	NI	NI	NI	.330	.230	.392*	.927	6.168	.000
Safety	NI	NI	NI	NI	NI	NI	.247	.247	.471*	.965	2.817	.040
Connectivity	.442	.099	-.223	.974	.219	-.493	.994*	.106	-.016	.958	25.105	.000
Services	NI	NI	NI	NI	NI	NI	.333	.226	.501*	.943	4.739	.003
Environment	NI	NI	NI	NI	NI	NI	.224	.169	.366*	.977	1.877	.134
Performance	NI	NI	NI	NI	NI	NI	.251	.217	.527*	.977	1.865	.136
Involvement	NI	NI	NI	NI	NI	NI	.305	.250	.393*	.953	3.882	.010
Discipline	NI	NI	NI	NI	NI	NI	.173	.262	.511*	.952	3.931	.009
Image	NI	NI	NI	NI	NI	NI	.124	.175	.502*	.991	.711	.546
REI	NI	NI	NI	NI	NI	NI	.158	.275	.448*	.981	1.507	.213
Satisfaction	NI	NI	NI	NI	NI	NI	.171	.320	.457*	.958	3.491	.016
Graduates	NI	NI	NI	NI	NI	NI	.244	.338	.546*	.961	3.180	.025
Inclusivity	-.099	.952	.143	-.118	1.141	.172	.118	.800*	.588	.923	6.577	.000
Quality	NI	NI	NI	NI	NI	NI	.199	.540	.624*	.970	2.466	.063
Health	.075	-.589	.786	.097	-.757	1.011	.465	-.084	.882*	.930	5.922	.001

NI = Not included in the estimated discriminant function

incremental discriminating power beyond the variables already in the discrimination function. All of the remaining variables had no significant F values and correspondingly high Wilk's Lambda values.

Table 5 also provided the unstandardized and standardized coefficients for the three variables. The strongest effects in the discriminant functions, which were all generally comparable based on the loading values, were connectivity for Function 1 with .994, inclusivity for Function 2 with .800, and health for Function 3 with .882. These could be added when interpreting discriminant functions. Several different factors were being combined into different groups, thus requiring more profiling of the groups to understand the differences. For group profiling, all groups had higher perceptions of three variables, namely inclusivity and health, except for connectivity.

CONCLUSIONS

This study assessed the variables that could differentiate the student's perception of the university's performance and service across the four college institutes and departments. The result was based on the 400 respondents which was divided into training (60%) and validation (40%) data set. Independent variables were the university's performance and services which include 18 factors namely Regeneration, Infrastructure, Pedagogy, Competency, Safety, Connectivity, Services, Environment, Performance, Involvement, Discipline, Image, REI (Research, Extension, and Innovation), Satisfaction, Graduates, Inclusivity, Quality, and Health, while the

dependent variable was the institute or department with four classifications: 1. Faculty of Computing, Data Science, Engineering, and Technology (FCDSET), 2. Faculty of Teacher Education (FTED), 3. Faculty of Governance, Business, and Management (FGBM), and 4.Faculty of Agriculture and Life Sciences (FALS). To understand the group differences and predict the likelihood that an entity or individual belongs to a particular group based on several independent variables, discriminant analysis was utilized. The result showed that the predictor of health had the greatest discriminating power among other variables. To evaluate the remaining variables and determine their significance among the four groups, a stepwise procedure was used based on their incremental discrimination ability after health entered the model. Furthermore, the procedure helped to reduce the number of variables in the model. The findings revealed that health, inclusivity, and connectivity weremajor determinants of institute or department participation among the student's perception of higher education institutions. The results of the study can assist institutions and departments in identifying their strengths and shortcomings in terms of these factors, allowingthem to build plans to improve their performance and services.

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APPENDICES

Table 6. Results from step 1 of stepwise four-group discriminant analysis.

Overall Model Fit					
	Value	*F*-value	Degrees of Freedom	*P*	
Wilk's Lambda	.930	5.922	3, 236.000	.001	
Variable Removed/Entered at Step 1					
Variables Entered	Min. D^2	Value	*F*	*P*	Between groups
Health	.034	1.017	.014		FCDSET and FTED
Note: At each step, the variable that maximizes the Mahalonobis distance between the closest groups is entered.					
Variables in the Analysis after Step 1					
Variable	Tolerance	F to Remove	D^2		Between groups
Student's Overall Health (SOH)	1.000	5.922			
Variable Not in the Analysis after Step 1					
Variable	Tolerance	Mi.Tolerance	F to Enter	Min D^2	Between groups
Regeneration	.850	.850	3.138	.050	FCDSET and FTED
Infrastructure	.807	.807	2.715	.037	FCDSET and FTED
Pedagogy	.725	.725	1.024	.042	FCDSET and FTED
Competency	.770	.770	5.627	.238	FALS and FGBM
Safety	.741	.741	4.314	.153	FALS and FGBM
Connectivity	.808	.808	18.646	.071	FALS and FGBM
Services	.667	.667	3.241	.099	FCDSET and FTED
Environment	.830	.830	3.554	.171	FCDSET and FGBM
Performance	.683	.683	5.040	.170	FCDSET and FGBM
Involvement	.781	.781	2.587	.082	FCDSET and FTED
Discipline	.741	.741	2.390	.050	FCDSET and FTED
Image	.764	.764	2.419	.096	FCDSET and FGBM
REI	.802	.802	2.788	.158	FCDSET and FGBM
Satisfaction	.793	.793	1.721	.090	FALS and FGBM
Graduates	.679	.679	3.389	.202	FCDSET and FTED
Inclusivity	.744	.744	9.397	.214	FGBM and FTED
Quality	.643	.643	3.848	.173	FALS and FGBM

Significance Testing of Group Difference after Step 1					
Faculty		FCDSET	FALS	FGBM	FTED
FCDSET	F		8.476	2.331	1.017
	Sig.		.004	.128	.314
FALS	F	8.476		1.917	15.363
	Sig.	.004		.167	.000
FGBM	F	2.331	1.917		6.426
	Sig.	.128	.167		.012
FTED	F	1.017	15.363	6.426	
	Sig.	.014	.000	.012	

a. 1, 236 degrees of freedom for step 1.

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Table 7. Results from step 2 of stepwise four-group discriminant analysis.

Overall Model Fit

	Value	*F*-value	Degrees of Freedom	*P*
Wilk's Lambda	.868	5.762	6,470	.000

Variable Removed/Entered at Step 2

Variables Entered	Min. D^2	*F* Value	*P*	Between groups
Competency	.238	3.550	.030	FALS and FGBM

Note: At each step, the variable that maximizes the Mahalonobis distance between the closest groups is entered.

Variables in the Analysis after Step 2

Variable	Tolerance	F to Remove	D^2	Between groups
Health	.770	5.383	.025	FALS and FTED
Competency	.770	5.627	.034	FCDSET and FTED

Variable Not in the Analysis after Step 2

Variable	Tolerance	Mi.Tolerance	F to Enter	Min D^2	Between groups
Regeneration	.458	.415	2.588	.285	FGBM and FTED
Infrastructure	.529	.505	2.109	.245	FALS and FGBM
Pedagogy	.583	.583	.394	.251	FALS and FGBM
Competency	.770	.770	5.627	.238	FALS and FGBM
Safety	.494	.494	2.260	.243	FALS and FGBM
Connectivity	.784	.686	18.251	.238	FALS and FGBM
Services	.549	.549	.923	.298	FCDSET and FTED
Environment	.793	.706	2.464	.275	FGBM and FTED
Performance	.562	.562	3.731	.304	FGBM and FTED
Involvement	.615	.606	.523	.275	FALS and FGBM
Discipline	.662	.662	.952	.297	FCDSET and FTED
Image	.729	.667	1.912	.289	FGBM and FTED
REI	.695	.668	1.546	.287	FGBM and FTED
Satisfaction	.711	.691	.389	.239	FALS and FGBM
Graduates	.504	.504	.855	.259	FGBM and FTED
Inclusivity	.744	.744	9.397	.214	FGBM and FTED
Quality	.568	.568	2.068	.278	FALS and FGBM

Significance Testing of Group Difference after Step 2

Faculty		FCDSET	FALS	FGBM	FTED
FCDSET	F		5.584	8.884	4.416
	Sig.		.004	.000	.013
FALS	F	5.584		3.550	8.304
	Sig.	.004		.030	.000
FGBM	F	8.884	3.550		3.842
	Sig.	.000	.030		.023
FTED	F	4.416	8.304	3.842	
	Sig.	.013	.000	.023	

b. 2, 235 degrees of freedom for step 2.

Table 8. Results from step 3 of stepwise four-group discriminant analysis.

Overall Model Fit					
	Value	*F*-value	Degrees of Freedom	*P*	
Wilk's Lambda	.803	5.957	9,569.645	.000	
Variable Removed/Entered at Step 3					
Variables Entered	Min. D^2	*F* Value	*P*		Between groups
Inclusivity	.262	2.600	.05		FGBM and FTED

Note: At each step, the variable that maximizes the Mahalonobis distance between the closest groups is entered.

Variables in the Analysis after Step 3				
Variable	Tolerance	F to Remove	D^2	Between groups
Health	.666	8.612	.100	FALS and FTED
Competency	.711	2.619	.214	FGBM and FTED
Inclusivity	.687	6.238	.238	FALS and FGBM

Variable Not in the Analysis after Step 3					
Variable	Tolerance	Mi.Tolerance	F to Enter	Min D^2	Between groups
Regeneration	.430	.414	3.172	.298	FGBM and FTED
Infrastructure	.521	.492	2.702	.395	FCDSET and FALS
Pedagogy	.580	.580	.469	.271	FGBM and FTED
Safety	.471	.471	1.508	.387	FCDSET and FALS
Connectivity	.777	.589	17.688	.505	FALS and FGBM
Services	.521	.521	.604	.324	FGBM and FTED
Environment	.771	.634	1.460	.278	FGBM and FTED
Performance	.531	.531	2.642	.305	FGBM and FTED
Involvement	.589	.589	.476	.310	FALS and FGBM
Discipline	.600	.600	1.006	.355	FGBM and FTED
Image	.692	.614	1.253	.290	FGBM and FTED
REI	.638	.630	.798	.288	FGBM and FTED
Satisfaction	.623	.602	.708	.276	FGBM and FTED
Graduates	.425	.425	.178	.263	FGBM and FTED
Quality	.266	.266	1.434	.330	FGBM and FTED

Significance Testing of Group Difference after Step 3					
Faculty		FCDSET	FALS	FGBM	FTED
FCDSET	F		3.736	9.094	6.974
	Sig.		.012	.000	.000
FALS	F	3.736		4.969	8.893
	Sig.	.012		.002	.000
FGBM	F	9.094	4.969		2.600
	Sig.	.000	.002		.053
FTED	F	6.974	8.893	2.600	
	Sig.	.000	.000	.05	

c. 3, 234 degrees of freedom for step 3.

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Table 9. Results from step 4 of stepwise four-group discriminant analysis.

Overall Model Fit				
	Value	*F*-value	Degrees of Freedom	*P*
Wilk's Lambda	.830	7.629	6,470.000	.000

Variable Removed/Entered at Step 4					
Variables Entered	Min. D^2	*F* Value	*P*		Between groups
Competency	.214	3.201	.043		FGBM and FTED

Note: At each step, the variable that maximizes the Mahalonobis distance between the closest groups is entered.

Variables in the Analysis after Step 4				
Variable	Tolerance	F to Remove	D^2	Between groups
Health	.744	8.723	.030	FALS and FTED
Inclusivity	.744	9.397	.034	FCDSET and FTED

Variable Not in the Analysis after Step 4					
Variable	Tolerance	Mi.Tolerance	F to Enter	Min D^2	Between groups
Regeneration	.737	.645	1.439	.296	FGBM and FTED
Infrastructure	.752	.683	2.469	.371	FCDSET and FALS
Pedagogy	.700	.621	.415	.246	FGBM and FTED
Competency	.711	.666	2.619	.262	FGBM and FTED
Safety	.659	.658	1.319	.252	FGBM and FTED
Connectivity	.806	.623	18.497	.447	FALS and FGBM
Services	.600	.600	1.303	.311	FCDSET and FALS
Environment	.792	.687	1.617	.222	FGBM and FTED
Performance	.613	.613	2.231	.227	FGBM and FTED
Involvement	.710	.676	1.021	.297	FGBM and FTED
Discipline	.640	.640	1.188	.301	FCDSET and FALS
Image	.708	.661	1.088	.231	FGBM and FTED
REI	.699	.649	.576	.222	FGBM and FTED
Satisfaction	.660	.619	.772	.242	FGBM and FTED
Graduates	.529	.529	.235	.221	FGBM and FTED
Quality	.278	.278	.769	.258	FGBM and FTED

Significance Testing of Group Difference after Step 4					
Faculty		FCDSET	FALS	FGBM	FTED
FCDSET	F		4.499	9.463	9.036
	Sig.		.012	.000	.000
FALS	F	4.499		6.494	13.375
	Sig.	.012		.002	.000
FGBM	F	9.463	6.494		3.201
	Sig.	.000	.002		.043
FTED	F	9.036	13.375	3.201	
	Sig.	.000	.000	.043	

d. 2, 235 degrees of freedom for step 4.