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INTERPRETING CAUSES OF ATTRITION IN AN INFORMATION TECHNOLOGY (I.T.) UNDER GRADUATE DEGREE PROGRAM WITHIN A GULF STATE REGIONAL UNIVERSITY

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Abstract

Recruitment and retention of students are multifaceted problems involving two parties - the student and the institution. This paper draws on surveys conducted in spring 2016 which examined factors linked to attrition rates and retention ratio with implications on what motivates students to continue learning in an Information Technology (IT) program. During the initial evaluation, several areas of potential relevance were analyzed, including the geo-demographic characteristics of students and their achievements once enrolled in the program. Two particular factors were clearly correlated with attrition: the course teaching methodology/preferences of students and the default instructional mode of course delivery. The study analyzes the academic and demographic characteristics of admitted, matriculated degree-seeking students (N = 150) from spring to summer 2016 and limited to four-year baccalaureate degrees with setting at a regional University in Ajman, UAE.Demographic variables analyzed were age, gender, and

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ethnicity, while the academic variables analyzed were program delivery mode, instructional delivery method, and teaching strategies, including communications in learning, classroom management, students' assessment plans, and grade point average at time of dropout. Logistic regression analysis showed age, instructional delivery format, and effective communications have significant unique effects beyond other predictors on dropout or classroom motivations in the Information Technology program overall. Language barriers or family commitments also had significant unique effects beyond other predictors on dropout or motivations to continue or complete the program. While few demographic factors were found to be strong indicators of attrition, two other factors, such as, course delivery mechanisms and effective instructional methodologies were significantly correlated with specific variables, such as; course methodology or program preference and instructional delivery methods which also influenced educational performances. The fact that the B.S. degree in Information Technology offers a wide range of courses with diverse students' population makes it imperative to develop diverse and quality instructional delivery modes or methods in order to ensure effective attrition ratio, improved retention rates, effective motivation for continuing to study and provision of consistent program standards.

Keywords:Attrition; Attrition rate;Teaching strategy;Instructional delivery;Students' drop-out.

1. Introduction

There are several factors that affect retention rates at universities. Universities exclusively control faculty recruitments, administrative policies, course delivery mechanisms, and instructional methodologies. Thus, increased retention becomes the goal of many institutions' quality assessment and improvement standards and efforts. Attrition rates amongst Bachelor of Science (B.S.) degree students in Information Technology are relatively high across Universities.The need to raise students' retention is imperative to the survival of many academic institutions [1]. Accordingly, "Student success" has become an important factor in determining higher education quality, especially the quality of academic programs in the Gulf States region and the United Arab Emirates in particular. The purpose of this study was to examine how the mode of instructional delivery (in terms of quality and methods) and classroom management at a

campus' face-to-face teaching-learning environment affected students' attrition ratio through incidences of dropout or degree completion relative to students' academic and demographic characteristics. Invariably, the ultimate focus was to study students' retention based upon delivery mechanisms and identifies instructional methods that positively impact retention and improve attrition in Information Technology courses

Many researchers have argued that the increased focus on attrition ratio in higher education has been based on "outcomes rather than instructional mode of delivery, teaching strategies and structures". Although student success has been defined in a variety of ways, most definitions include the idea of "persistence to the completion of the student's program" [2]. For some students, dropping out is the culmination of years of academic hurdles, missteps, and lack of motivations [3]. For others, the decision to drop out is a response to conflicting academic alignments – language barriers which broadens conflicts in use of English language versus native Arabic language. Results of the study found that unevenly motivated students through lack of diverse instructional methods were significantly more likely to dropout than students who trained under a diverse and instructional delivery motivated instructors. Utilizing value-added modeling and binomial logistic regression, the study measures alignment of instructional delivery quality and students' performance, failure or completion, and the number of semesters remaining until completion of the degree or the number of courses completed at time of withdrawal or dropout. Variables related to dropout relating to diverse instructional methods, adequate use of textbooks for training, effective course delivery all have significant effects on attrition ratio and course completion. Logistic regression analyses showed age and delivery format to have significant unique effects beyond other predictors on dropout in the program overall, while age and GPA had non-significant effect. The result reveals the need to revamp the courses in the College of Information Technology and its programs to meet with modern technological requirements and trends, and potentially to identify low preference students as at-risk from the commencement of their studies. The researcher believed that "attrition can be lessened by altering course delivery mechanisms and instructional methods" [4]. The College should set up an advisory committee to provide needed academic help to at-risk students identified in their first year. The impact of "individual subject failure suggests a need for greater monitoring and benchmarking to ensure horizontal equity among subjects" [5]. By determining how "delivery mechanisms and

instructional methods affected student retention in IT courses, financial and institutional support can be channeled into those educational venues" (effective use of academic textbooks, audio-visual instructional support and classroom participation) where student retention is most likely to occur.

2. Significance of this study

Instructional deliveriesrelative tostudents' performance and standards, classroom management and teaching strategies are fundamental processesin any University. One researcher [6] argued that since "education involves helping a novice develop strong, readily accessible background knowledge, it is absolutely important that background knowledge is well rehearsed and tied to other knowledge". It concluded that "the most effective teachers ensured that their students efficiently acquired, rehearsed, and connected background knowledge by providing a good deal of instructional support" [7]. What is significant here is that instructors should be capable of motivating the students to learn. Another researcher [8] concluded that instructors should be capable of teaching and providing"new instructional material in manageable amounts, modeling, guiding student practice, helping students when they made errors, and providing for sufficient practice and review" (pg. 8).The ability to use textbooks effectively in classroom learning and other publishers' suggested additional teaching materials will help reduce dropout rates hence increasing the retention rates amongst all students.Gaining insight into the students' demographic and academic factors would guide the College's administration in providing appropriate policies that will train and motivate the academic staff in the domain of quality instruction delivery, classroom management and lecturing strategies. This will foster student's overall performance and as a result raise the students' retention rates.

3. Related Work

The attrition rate among Baccalaureate students is a problem that has been well documented. The need to raise students' retention rates confront every University [4][5][6]. It has also been suggested that "meeting this need requires an understanding of the underlying reasons for student disengagement, transfer and withdrawal". Other researchers like [7][8][9] [10] suggested that factors influencing withdrawal may relate to the characteristics of the students, their educational background, environmental factors, or their teaching and learning experiences (pg.21). It has also

been noted that "while some causes of attrition can be identified at the institutional level, retention rates vary considerably by course". The cost to academic institutions, students, and the overall IT programs when students drop out is significant [11]. Researchers like [12] [13] believed that attrition can be lessened by altering course delivery mechanisms and instructional methods (pg.17). The researchers also concluded that institutions should determine "how delivery mechanisms and instructional methods affected student retention in IT courses, financial and institutional support can be channeled into those educational venues where student retention is most likely to occur, and these effective delivery mechanisms and Instructional methods can be duplicated in other programs" [14]. According to [15[16] examined age and provided analysis showing how "with mature age students often recording higher rates of withdrawal than school leavers (p. 3). The researchers concluded that there may be "greater difficulties of transition for younger students, while older students typically have more family and work commitments and are more likely to enroll part-time, which is itself a risk factor". Other researchers examined alignments between different instructional delivery modes.Researchers like [15] [16] implied that central to preventing attrition, is the ability to predict attrition. According to [17], explained that "Professions represent those occupations requiring specialized skills or training (pg.6). The researchers explain further that "survival of a profession is dependent upon having a unique and needed skill set, attracting new professionals, educating these newcomers, and retaining and supporting current professionals". Information technology profession must be capable of attracting interested persons through increased motivation from the trainers or quality instructional delivery from institutions, adequately prepare them to practice and then retain them as skilled workers. According to another researcher [18] implied that other research had shown that student satisfaction during the first one or two introductory courses was the major factor in determining whether a student continued in a program or motivated to continue (pg.16). However, what motivates a student to enter University of learning was beyond the parameters of this study.

4. Effective Learning Styles

Since demographic factors were tested and measured in this study, it is pertinent to look closely at learning styles. According to [19] [20] explained the importance of intrinsic personality traits that predispose different learners to particular "media, modes, and strategies for learning" (pg.8).

The same researchers also concluded that "if the concepts and subject matter are presented according to a learner's preferred media, modes and strategies, learners will learn more effectively and efficiently; a concept that learning styles proponents call *meshing" (pg.9-10).* Several researchers have written and debated about the learning styles hypothesis. However, researchers like [21] [22] [23] [24] outlined two major meta-studies - skills that focus on higher order outcomes and need for that skills to be aligned with the meta-outcomes that cut across the different learning domains. (pg.6).In one article [25], a more in-depth look at learning styles, specifically the Felder-Silverman learning style model included the four dimensions which are - active-reflective, sensing-intuitive, visual-verbal, and sequential-global. Other researchers suggested that "educators may structure lessons to appeal to a range of learning styles by exploring various teaching strategies" [26]. Another important strategy is the use of group work and project which will appeal to active learners while journaling provides an avenue for reflective learners to process information [27]. Noted methods for IT students include the "Hands-on activities" as this concept maps may "interest intuitive learners while visual learners will appreciate demonstrations, charts, or movies and verbal learners will value writing projects and discussion [28]. Other researchers suggested "outlines and ordered presentations which will be helpful for sequential learners while overviews and connections to other materials or applications will support global learners" [29].

5. Statistical Methodology

Several variables were tested and measured which apply to data collection and methodology in this study to achieve the research objectives.

i. Do demographic factors statistically affect or influence IT students' retention rates?

ii. Which Academic variables (instructional delivery mode, students' performance, language of instruction, classroom management, instruction delivery quality, students' assessment mode, students' GPA, administrative policies and faculty recruitment) are statistically significant in influencing College of IT students' retention rates?

iii. What are the correlations between Performance and Motivation of students and Classroom lectures delivery?

iv. What correlation exists between demographic factors and the information technology students' retention rates?

v. What relationships are there between performance factors and the information technology students' retention rates?

In this study, a sample size of 150 was deemed fit due to limited population at study setting. Simple random sampling design was used to select the 150 students since it is generally impossible to study an entire population of allUniversity students or every geographic area. Out of 150 students sampled, only N=112 were received. This represents 75% response on the anticipated sample size which is significant. The study variables were grouped as dependent variables, independent variables and intervening variables. The dependent variable represents the retention rates (Dropout rates) while independent variables were mainly academic factors; instructional delivery mode, students' performance, language of instruction, classroom management, instruction delivery quality, students' assessment mode, students' GPA, administrative policies and faculty recruitment. The intervening variables were mainly the demographic factors which were: age, gender, year of study, ethnicity, family socio-economic background and number of semesters completed.

6.Data Collection and Operationalization of values

The quantitative data collection procedure using survey methodology deployed used 0pen-ended questions and have less structured protocols as researcher retained the ability to change the data collection strategy by adding, refining, or dropping techniques or informants.The use of triangulation also helped to increase the credibility of the findings by relying on multiple data collection methods to check the authenticity of the results.This helped in ensuring that the findings are not generalizable to any specific population, rather each survey produces a single piece of evidence which was then used to seek general patterns related to the research objectives. The questionnaires were structured to two sections: demographic data and data concerning the five research questions. The questionnaires were tested for validity and reliability using pretest methods, piloting and revision methods. The questions were specific, measurable, reliable and brief to avoid ambiguity. The responses to some of the questions had choices scaled using the 5-point Likert scale. Researcher ensured that variables in the research questions were operationalized and also ascertains missing values or abnormal values before using SPSS interface for analysis. The demographic data was first organized using frequency tables and cross

tabulations. Data relating to the research questions were analyzed using correlations and logistic regression. The correlation coefficient (r), the beta values (β) and their respective p-values were used to test the research hypothesis derived from the research questions. The results of data analysis were interpreted in order to come up with findings of the study that generated the study conclusions.

7. Data analysis, results and interpretation of results

Reliability, Bias and validity tests

Questionnaires were tested for validity and reliability using pretest methods and piloting methods. It was however a prerequisite to test the data for reliability, validity and bias. This was accomplished by using the Cronbach's test for reliability. Table 1.1 below shows the reliability and validity tests results concerning the data collected in the three dimensions: dependent variable (students' retention rates) independent variables (academic factors) and intervening variables (demographic factors).

Table 1.1. Reliability and validity Statistics

Retention		**Demographic factors**		**Academic factors**	
Cronbach's Alpha	N of Items	Cronbach's Alpha	N of Items	Cronbach's Alpha	N of Items
0.921	112	0.858	112	0.830	112

The results show that the Cronbach's alpha for retention rates was 0.921 with a sample size of 112 respondents, the Cronbach's alpha for demographic factors was 0.858 with the same sample size, and the Cronbach's alpha for academic factors was 0.830 with the same sample size. This proved that the research (survey data) was highly reliable and valid since the Cronbach's alpha was more than 0.8.

Table 1.2. Frequency Distribution of Demographic data and Analysis

		Frequency	Percent	Cumulative Percent
Gender	Male	66	58.9	58.9
	Female	46	41.1	100.0
	Total	112	100.0	
Age (years)	less 19	18	16.1	16.1
	19-20	38	33.9	50.0
	21-22	45	40.2	90.2
	23-24	8	7.1	97.3
	25+	3	2.7	100.0
	Total	112	100.0	
Year of study	1	25	22.3	22.3
	2	44	39.3	61.6
	3	34	30.4	92.0
	4	9	8.0	100.0
	Total	112	100.0	
Ethnic Groups	Middle Eastern Arabian	57	50.9	50.9
	Non Arabian Asians	31	27.7	78.6
	African Arabians	17	15.4	94.0
	Non-Arabian Africans	7	6.0	100.0
	Total	112	100.0	
Family background	Low	67	59.8	59.8
	High	45	40.2	100.0

Table 1.1. Reliability and validity Statistics					
Retention		**Demographic factors**		**Academic factors**	
Cronbach's Alpha	N of Items	Cronbach's Alpha	N of Items	Cronbach's Alpha	N of Items
socio-economic level	Total	112	100.0		

According to table 1.2 above, 58.9% of respondents were males while 41.1% were females. This showed that there was no gender parity among the students studying IT at AUST where the surveys were distributed. The bar chart below shows the result at a glance.

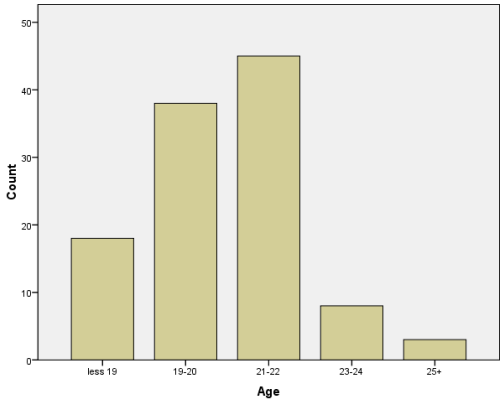

Figure1.1. *Bar graph showing Gender Distribution*

The results in table 1.2 and Fig 1.1 also indicated that most of the IT students were aged between 21 and 22 years (40.2%) followed by those aged 19-20 years (33.9%). The others were those less than 19 years (16.1%), 23-24 years (7.1%), and lastly those aged 25 years and more (2.7%). Concerning the year of study, Table 1.2 also shows that, 39.3% of the respondents were in the 2nd year, 30.4% in the 3rd year, 22.3% in the 1st year, and 8.0% in the 4th year of study. The year of study results showed that most of the respondents were 2nd year students studying IT at AUST. The results on the distribution of the year of study can also be shown using a bar graph.

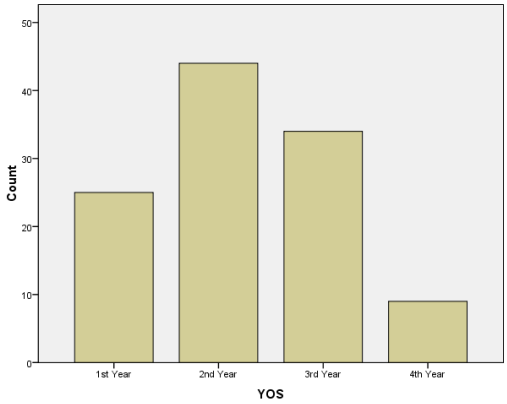

Figure 1.2. *Bar graph showing Year of Study (YOS) distribution*

The respondents were also found to be of different ethnic groups. Results in table 1.2 showed that 50.9% of the respondents are of the Middle Eastern Arabian ethnic group, 27.7% were of the Non Arabian Asian ethnic group, 15.4% were of the African Arabian ethnic group and 6.0% were the Non-Arabian African ethnic group. This showed that Asian ethnicity was perhaps the highest among students studying IT at AUST. These results can also be exhibited using a bar graph.

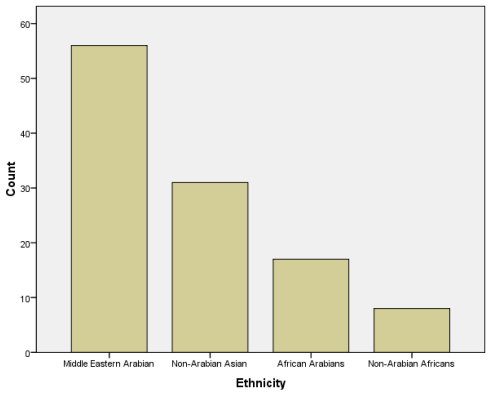

Figure 1.3. *Bar graph showing Ethnicity distribution*

Lastly, students were also asked about their family socio-economic background. According to table 1.2; 40.2% were found to be of high socio-economic background, while 59.38% were of middle or considered themselves to be from middle socio-economic background. These results showed that most of the students learning IT at the study setting in Ajman University of Science and Technology (AUST) were of middle socio-economic status.

The Effect of Students' Demographic Factors on the Retention rates

Table 1.3. Correlations of DV with Demographic variables

		Retention	Age	Gender	YOS	Ethnicity	FSEB
Retention	Pearson Correlation	1	**.693**	**.121**	**.421**	**.217**	**.577**
	Sig. (2-tailed)		.000	.214	.003	.087	.000
	N	112	112	112	112	112	112
Age	Pearson Correlation	**.693**	1	.102	.512	.102	.089
	Sig. (2-tailed)	.000		.343	.000	.560	.698
	N	112	112	112	112	112	112
Gender	Pearson Correlation	**.121**	.102	1	.111	.233	.475
	Sig. (2-tailed)	.214	.343		.354	.039	.000
	N	112	112	112	112	112	112
YOS	Pearson Correlation	.421	.512	.111	1	.204	.173
	Sig. (2-tailed)	.003	.000	.354		.018	.040
	N	112	112	112	112	112	112
Ethnicity	Pearson Correlation	.217	.102	.233	.204	1	.252
	Sig. (2-tailed)	.087	.560	.039	.018		.003
	N	112	112	112	112	112	112
FSEB	Pearson Correlation	.577	..089	.475	.173	.252	1
	Sig. (2-tailed)	.000	.698	.000	.040	.003	
	N	112	112	112	112	112	112

Correlation is significant at the 0.05 level

Table 1.3 above shows the correlations between students' retention rates and their demographic attributes. For students' retention verses age, the correlation coefficient was 0.693. This indicates a strong and positive correlation between the students' retention rates and students age. The

correlation coefficient of retention rates against gender was 0.121. This indicates that there was no correlation between retention and gender attribute since p-value was more than 0.05. This is surprising since females were usually found to show more enthusiasm towards career in IT in one of the responses. The correlation coefficient of retention rates against year of study (YOS) was 0.421, indicating a moderate and positive correlation between retention rate and students' year of study. The correlation coefficient of retention rates verses ethnic groups that was 0.217 which indicates a lack of correlation between retention rates and ethnicity factor since p-value was more than 0.05. Lastly, the correlation between retention and family social economic background (FSEB) was 0.577 which indicates a moderate but positive correlation between retention rates and students' family social economic background (FSEB). In summary, students' retention rates were strongly affected by the age factor and moderately affected by year of study (YOS) and family social economic background (FSEB) demographic factors. It should also be noted that gender and ethnic group factors had no significant effect on the retention rates of students at the College of Information Technology.Having realized that, there exist some relationships between students' retention rates and some of the demographic variables, the relationships between students' retention rates and the academic variables were analyzed using correlations.

The effect of students' academic factors on the retention rates

Table 1.4. Correlations of DV with Academic variables

		Retention	Instructional delivery mode	language of instruction	classroom management	delivery quality	students GPA	Administr-ative policies
Retention	Correlation	1	.0.821	.644	.321	.817	.314	.222
	Sig. (2-tailed)		.000	.000	.000	.000	.000	.000
	N	134	134	134	134	134	134	134
Instructio	Correlation	.821	1	.582	.312	.390	.525	.475

nal delivery mode	Sig. (2-tailed)	.000		.000	.000	.000	.000	.000
	N	134	134	134	134	134	134	134
language of instruction	Correlation	.644	.582	1	.774	.633	.475	.496
	Sig. (2-tailed)	.000	.000		.000	.000	.000	.000
	N	112	112	112	112	112	112	112
classroom management	Correlation	.321	.312	.774	1	.480	.473	.564
	Sig. (2-tailed)	.000	.000	.000		.000	.000	.000
	N	112	112	112	112	112	112	112
delivery quality	Correlation	.817	.390	.633	.480	1	.352	.252
	Sig. (2-tailed)	.000	.000	.000	.000		.003	.003
	N	112	112	112	112	112	112	112
students GPA	Correlation	.314	.525	.475	.473	.352	1	.587
	Sig. (2-tailed)	.000	.000	.000	.000	.003		.000
	N	112	112	112	112	112	112	112
administrative policies	Correlation	.222	.475	.496	.564	.252	.587	1
	Sig. (2-tailed)	.047	.000	.000	.000	.003	.000	
	N		112	112	112	112	112	112
Correlation is significant at the 0.01 level (2-tailed)								

In Table 1.4 above, the results show the correlations between students' retention and the academic variables. For students' retention and instructional delivery mode, the correlation coefficient was 0.821. This indicates a very strong positive correlation between the students'

retention and instructional delivery mode. The correlation coefficient of students' retention against language of instruction (Communications in English Language and Arabic) was 0.644. This indicates a strong but positive correlation between students' retention and language of instruction. The correlation coefficient of students' retention verses classroom management was 0.321 indicating a weak but still positive correlation between students' retention and classroom management. The correlation coefficient of students' retention verses content delivery quality was 0.817. This is equally a very strong but positive correlation between students' retention and content delivery quality. The correlation coefficient of students' retention verses students' GPA was 0.314. This shows a weak and negative correlation between students' retention and students' GPA. Lastly, the correlation coefficient of students' retention against administrative policies was 0.222. This also indicated weak and negative correlation between students' retention and administrative policies. Therefore, it can be generalized that instructional delivery mode, content delivery quality and language of instruction strongly affected retention rates of IT students. It is also worth noting that classroom management, students' GPA and administrative policies had some influence on the retention rates but not substantive enough to justify of IT students.

The Correlation between Performance, Motivation and Classroom lectures strategic delivery

Table 1.5. Correlations

		Lectures strategic delivery	Performance	Motivation
Lectures strategic delivery	Pearson Correlation	1	.783	.717
	Sig. (2-tailed)		.000	.000
	N	112	112	112
Performance	Pearson Correlation	.783	1	.888
	Sig. (2-tailed)	.000		.000
	N	112	112	112
Motivation	Pearson Correlation	.717	.888	1
	Sig. (2-tailed)	.000	.491	.
	N	112	112	112

Table 1.5 above shows that the correlation between lectures' delivery strategy and the students' performance is 0.783. This indicates a strong, positive and significant correlation between the lectures' delivery strategy and students' performance. The correlation coefficient of lectures' delivery strategy against students' motivation was 0.717. This indicates a strong, positive and significant correlation between lectures' delivery strategy and students' motivation.

8.**Logistic Regression Model Tested/Analysis on Relationships between Demographic factors, Academic factors and the Retention rates.**

Since there was a statistically significant relationship between students' retention rates and some of the demographic and academic variables, a logistic regression analysis was conducted to measure the statistical ratio of retention per student. A valued addition model provided how each significant variable adding value to the retention rates was portrayed. The logistic regression results presented two tests: the model significance and the effects of other variables on the dependent variables as depicted.

Table 1.6. Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	107.767[a]	.676	.752

In Table 1.6 above shows that the Cox's R-squared is 0.676 while Nagelkarke's R-squared is 0.752. Accordingly, Cox and Nagelkarke shows the variation in the dependent variable based on the model range of 67.6% to 75.2%. Based on this result, it was concluded that 67.6 – 75.2 % of Students' retention rates can be predicted using the demographic variables and academic variables. This indicates a "strong prediction". A determination of the significant variables that can be used to predict the outcome of students' retention rates in the model was also modeled using the significant variables obtained from the correlation analysis [43].

Table 1.7 below shows the contribution of each independent variable to the model and its statistical significance.

Table 1.7. Variables in the Equation

		B	S.E.	df	Sig.	Exp(B)
Demographic variables	Age	.711	.024	1	.000	2.036
	Year of Study	.073	.147	1	.084	1.076
	Family Socio-economic Background	-.735	.107	1	.004	.479
Academic variables	Instruction delivery mode	.564	.054	1	.000	1.568
	Language of instruction	.223	.032	1	.002	1.250
	Classroom management	.018	.301	1	.089	1.018
	Content delivery quality	.335	.044	1	.000	1.400
	Students' GPA	-1.032	.253	1	.012	0.356
	University's administrative policies	-0.002	.000	1	.141	1.000
	Constant	-.615	1.268	1	.628	.541

Variable(s): Age, Year of Study, Family Socio-economic Background, Instruction delivery mode, Language of instruction, Classroom management, Content delivery quality, Students' GPA and Administrative policies.

According to researcher [30], the beta statistic (B) and its respective p-value are used to determine statistical significance for each independent variable. Results from Table 1.7 show thefollowing sequence of demographic age with($\beta = 0.711$), Family socio-economic background with ($\beta = -0.735$), instructional delivery mode with($\beta = 0.564$), language of instruction with($\beta = 0.223$), content delivery quality with ($\beta = 0.335$) and students' GPA with ($\beta = 0. -1.032$)all have p-values (statistical significance) which are less than 0.05. Hence, age, family socio-economic background, instructional delivery mode, language of instruction, content delivery quality and students' GPA were statistically significant in predicting students' retention rates and attrition ratio. However, the Year of Study (YoS) with ($\beta = 0.073$) and p-value of 0.084, classroom management with ($\beta = 0.018$) and p-value of 0.089 and administrative

policies with ($\beta = -0.002$) and p-value of 0.141 were not statistically significant in modeling students' retention rates and attrition ratio since their p-values were more than 0.05.

In determining the actual effect of each of the six significant variables on the students' retention and attrition ratio or dropout rates, a determinant using the odds ratio derived from Exp(B) parameter were evaluated [31]. The odds ratio of having high students' retention rates when considering age factor is 2.036 (Exp(B) value). This value implied that the odds ratio of having high students' retention rates was 2.036 times better for younger students in age than the older students. The results also showed that, the Exp(B) for students' retention rates as per the family socio-economic background was 0.479 better. This signifies that the odds ratio of having high students' retention rates was 0.479 times better for students who had stronger family socio-economic background as opposed to those with middle or average family socio-economic backgrounds. However, while evaluating the significant academic variables in the model, it was realized that the odds ratio of having high students' retention rates was 1.568 times better for students who agreed with the instructional delivery mode as opposed to those who did not agree with it. Similarly, the odds ratio of having high students' retention rates was 1.250 times better for students who understood the language of instruction as opposed to those with difficulty in English communications. The odds ratio of having high students' retention rates is 1.400 times better for students who agreed with the content delivery quality as opposed to those who thought otherwise. Lastly, the odds ratio of having high students' retention rates was 0.356 times better for students who had higher GPA as opposed to those who had lower GPA.

In conclusion, it was realized that the logistic regression model obtained by modeling students' retention rates using both significant demographic and significant academic variables represent a strong significant indication of values which accounts for 67.5-75.2% of the outcomes. Age also represents the most significant demographic factor that influenced the retention rates of students and may perhaps be an influencing factor in the attrition ratio calculation. On the other hand, the instructional delivery mode and content delivery quality were the most significant academic variables that affected the students' retention rates and a stronger influencer of attrition ratio calculations.

The relationship between mode of lectures' delivery and the retention rates

Table 1.8. Variable equation					
	B	S.E.	df	Sig.	Exp(B)
Diverse Lecture delivery strategy	1.074	.264	1	.000	2.927
Constant	0.615	1.268	1	.028	1.851
Variable(s): Lectures delivery strategy					

Results in table 1.8 show that the logistic regression parameters: $\boldsymbol{\beta = 1.074}$, and $\boldsymbol{Exp(\beta) = 2.927}$ are significant in showing the relationship between lectures' delivery strategy and students retention rates since they exhibit a p-value of 0.000 which is less than 0.05. The Exp (B) shows that, the students retention rates improve by 2.927 times when diverse lectures' delivery strategies as related to audio-visual presentation, textbooks and publisher's additional resources, group projects are used. Therefore, diverse lectures' delivery strategies influence students' retention rates positively.

9. **Students' Performance using Value Added Modeling (VAM)**

A Binomial logistic regression was tested to develop the Value added Modeling of the Academic variable indicators. This helps in estimating value addition to students' performance (SP) [32].Table 1.9 below shows the VAM based on students' performance (SP) as tested on alignment of mode of Instructional Delivery Quality (IDQ), failure or completion of courses within the course duration (CC) and number of semesters completed (SC) at the time of withdrawal.

Table 1.9. Value Addition Model					
		B	Df	Sig.	Exp(B)
IVs	IDQ	0.740	1	.000	2.096
	CC	-0.735	1	.034	0.479
	SC	0.174	1	.000	1.190

Constant	0.981	1	.628	2.667

DV=students' performance (SP): IV[1]=Mode of instructional delivery quality (IDQ)

IV[2]=Course Completion (CC): IV[3]=Number of Semesters completed (SC)

The general VAM was stated as:

$$Y_i = \alpha + \sum_{i=1}^{n} \beta_i X_i + e_i [33]$$

Where;

Y_i represents "Students' performance (SP)"

α represents the binomial logistic regression constant

β_i represents the beta parameter showing the effect of each IV in the model

X_i represents the IVs in the model (IDQ, FC and SC).

e_i represents the statistical random error term

From the results obtained in our analysis according to table 1.9, the specific VAM was then stated as:

$$SP = 0.981 + 0.740 * IDQ - 0.735 * FC + 0.174 * SC$$

Where;

SP is students' performance

IDQ is alignment of mode of Instructional Delivery Quality

FC is Failure or Completion of IT studies

SC is number of Semesters Completed at the time of withdrawal

The VAM result shows that SP increased by one when IDQ was increased by 0.740 while other factors held constant. Similarly, the SP increased by a unit when SC was increased by 0.174. Also noted was the increase in SP by a unit when FC was decreased by 0.735 while other factors kept constant.

8.8. Summary of results. Table 1.10 below shows the data analysis results summary.

Table 1.10. Summary of results

	Research questions	Results
1	Which students' demographic factors affect the retention rates?	• Age strongly affects students' retention rates • Year of study moderately affects students' retention rates • Family social economic background (FSEB) moderately affects the students' retention rates
2	Which academic variables are significant in affecting the students' retention rates?	• Instructional delivery mode strongly affects retention rates • Content delivery quality strongly affects retention rates • Language of instruction strongly affects retention rates • Classroom management moderately affects retention rates • Students' GPA moderately affects retention rates • Administrative policies weakly affects retention rates
3	What is the correlation between performance, motivation and classroom lectures strategic delivery?	• There is a strong, positive and significant correlation between the lectures' delivery strategy and students' performance and motivation.
4	What relationships are there between demographic factors and the students' retention rates?	• Age is the most significant demographic factor that influences the retention rates. • The Odds ratio of having high students' retention rates is 2.036 times better for younger students in age than the older students.

5	What relationships are there between academic factors and the students' retention rates?	• Instructional delivery mode and content delivery quality are the most significant academic variables that affect the students' retention rates. • The Odds ratio of having high students' retention rates is 1.568 times better for students who agree with the instructional delivery mode as opposed to those who do not agree with it • The Odds ratio of having high students' retention rates is 1.400 times better for students who agree with the content delivery quality as compared to those who do not agree with it.
6	Which relationship exists between mode of Lectures delivery strategy and retention rates?	• The lectures' delivery strategy significantly influences the students' retention rates positively.
7	What Value Addition Modeling can be modeled from students' performance based on alignment of mode of instructional delivery quality, failure or completion of IT studies and number of semesters completed at the time of withdrawal?	$$\boldsymbol{SP = 0.981 + 0.740 * IDQ - 0.735 * FC + 0.174 * SC}$$ • **SP** is students' performance • **IDQ** is Instructional Delivery Quality • **FC** is Failure or Completion of IT studies • **SC** is number of Semesters Completed

10. Conclusion

Both Demographic and Academic factors significantly affected the retention rates and influence the attrition ratio as presented in this study. The demographic factors that affected the retention rates of students studying information technology at the study setting were: Age, year of study and family socio-economic background factors. It was however noted that age more significantly

influenced the retention rates of students as compared to family socio-economic background. From the research findings, younger students are 2.036 times better than older students in retention rates.The also study revealed the need to move beyond analysis of geo-demographic factors towards indicators of effective faculty recruitments, administrative policies, course delivery mechanisms, and quality instructional methodologies. However, subjects' failure, which resulted from ineffective course delivery mechanism and instructional methodologies, were also found to be the highest predictors of attrition.

On the other hand, the academic factors that affected the retention rates of students studying information technology were: instructional delivery mode, content delivery quality, language of instruction, classroom management, students' GPA and administrative policies. It was however noted that instructional delivery mode and content delivery quality more significantly influenced the retention rates of students as compared to other academic variables. The research findings show that the appropriate instructional delivery mode was 1.568 times better in students' retention rates as compared to non-appropriate instructional delivery methods.. Similarly, diverse lecture delivery strategy (Content delivery quality) mode were 1.400 times better in students' retention rates as compared to non-diverse lecture delivery strategies.

Lastly, the summary indicates that the Value Addition Modeling (VAM) can be implemented to determinestudents' performances based on alignment of mode of instructional delivery quality, failure or completion of studies and number of semesters completed at the time of withdrawal using the Binomial Logistic Regression using specific VAM formula such as:$SP = 0.981 + 0.740 * IDQ - 0.735 * FC + 0.174 * SC$. The significance of all these variables is an indication that a revamped program based on the statistical analysis would help improve retention rates for the Bachelor degree program as analyzed.

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