Quest Journals
Journal of Education, Arts, Law and Multidisplinary
Volume 16 ~ Issue 6 (Nov. – Dec. 2026) pp: 18-31
ISSN(Online): 2347-2895
www.questjournals.org

Research Paper

Scenario Analysis of Academic Performance in Tertiary Education System of Bangladesh: Evidence from Transition Probability Matrix

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Abstract
The determinants of academic performance among tertiary students in Bangladesh are multifaceted, with socioeconomic, institutional, and personal factors playing critical roles in overall educational outcomes. Here, evaluation of students' academic performance is a continuous process. In general students' performance depends on their concentration on academic activities, knowledge about mathematical courses, perfect classroom teaching capacity, time management etc. This study was accomplished to find out the determinants of educational performance of graduate Students of Public Universities in Bangladesh. For these reasons, graduate students of all semester of some selected universities were considered. Both qualitative and quantitative research design has been used for this study. The objective of using the qualitative research is to gain insights into the problem and using the quantitative research is to find out the actual findings of the problem. Different socio-economic and educational information were collected from survey using a structured questionnaire. For calculating students' education performance, the pooled transition probability matrix and to detect the determinants of students' academic performance logistic regression analysis has been used. Here, the study had investigated the academic performance of the students' changes from semester to semester. From transition probability matrix, the study detects that the student who got grade 'A' in last semester has 50% chances to decline his grade 'A⁻'. The result of contingency coefficient analysis revealed that improvement tendency with immediate semester of the students, poor mathematical knowledge significantly relates to academic performance. The findings of Logistic regression also support those results and also indicate that age and gender of the students are also significant determinants that influence the academic performance of graduate students. The study suggests that targeted institutional support mechanisms, increase awareness about proper utilization of time by the students, and more concentration of authorities about the improvement of students' residence quality and academic environment.

Keywords: *Academic performance, contingency coefficient, Logistic regression, transition probability matrix*

*Received 02 Nov., 2026; **R**evised 11 Nov., 2026; **A**ccepted 13 Nov., 2026 © The author(s) 2026.*
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I. Introduction

The last two decades Bangladesh have seen develop both public and private universities at a fast pace. The expansion of higher education access has created larger educational opportunities, but it has exposed critical gaps in educational standards throughout the country. Educational institutions continue to practice traditional teaching methods which emphasize memorizing information instead of developing students' ability to think critically and solve problems and apply knowledge. In the global knowledge economy, higher education has a crucial role in nurturing human capital. Higher education has enormous potential to promote prosperity in the

developing nations (Monem *et al*., 2011). Higher education ensures economic growth, leads social transformation and finds solutions to national development challenges (Chaudhary *et al.*, 2009). The education system is considered as an effective method towards the development of a country. Professional competence is achieved through university education. Higher education in Bangladesh takes place at 55 governments, 116 private and 3 international universities. Mission of the all Universities have been to generate new idea by engaging in cutting-edge research and to promote academic growth by offering state-of-the-art undergraduate, postgraduate and doctoral programs, and to develop human potential to its fullest extent so that intellectually capable and imaginatively gifted leaders can emerge in a range of profession. Vision of the Universities have been to make a positive change to our city, our region, our nation and our world. A significant number of graduates have already passed out from the both public and private universities and have started to contribute in building up the nation. Every year the public universities set higher standard result criteria for fresher based on overall SSC and HSC result of whole Bangladesh to be eligible to apply for admission test. Students get admitted through competitive entrance exam with previous good results. But it is a matter of sorrow that a large portion of them fail to keep pace with academic curriculum and can't achieve minimum standard grade. The term switching tendency of academic performance indicates that the semester wise academic performance of different Universities is more volatile in recent past and large portion of students can't able to obtain minimum passing grade at first chance and so improvement become inevitable for them to acquire the degree. The research study investigates some determinants while assessing their functional effect to develop evidence-based guidance for policy makers and university leaders and educators who need to boost higher education standards in Bangladesh. To build a better tomorrow, policy makers need to develop a flawless education system. The insight flaws and reasons for poor performance of students must be addressed first to make good policy. So, the study is conducted to find out the major reasons behind switching tendency of students' academic performance and find a strategic way out to resolve the problem.

II. Statement of the Problem

In the context of Bangladesh, higher education institutions are under increasing pressure to meet international standards and produce graduates equipped with skills relevant to the rapidly evolving job market. While some private universities in Bangladesh have initiated OBE frameworks, the extent of implementation and its impact on education quality remains uneven and largely unexplored. Public universities, meanwhile, often face challenges such as outdated curricula, insufficient faculty training, and lack of proper assessment mechanisms (Rahman, 2018; Ahmed & Kabir, 2020). Sustainable economic growth of a country depends on skill human resources especially qualified graduates who can change the dimension of development policy facing the challenging issues. Public Universities in Bangladesh is responsible for producing competent graduates who will uphold the flag of prosperity keeping economic stability and favorable business environment applying their expertise throughout the country. Last couple of year statistics of patently indicates that academic performance of students is not satisfactory which means that graduate isn't competent enough for the deceitful in different fields. Even a large portion of students can't able to obtain minimum passing grade at first chance and so, improvement become inevitable for them to acquire the Honours degree. If this trend continues then graduates will be inefficient and can't get any job in wily industry that will then be bound to hire some analyst from abroad that is an indirect threat to our national development. But there are some Universities premier seat for higher education and research and its main task is to tone up the quality and standard of higher education and to produce first rate graduates, scientists and researchers who will take the responsibilities of sustainable economic growth of the country. The above-mentioned contrasting scenario dictates that academic performance of students' need to be analyzed properly and all the determinants, constraints related to poor academic performance must be addressed immediately and solution should be found out accordingly. So, this study empirically tested relevant components from the perspective of graduate students. Therefore, the information from this study will help planners and policy makers to arrange appropriate education system in order to produce more efficient graduate in the competitive market choice.

III. Literature Review and Research Gap

The development of a modern society depends to a large extent on the nature and standard of higher education. Higher education has enormous potential to promote prosperity in the developing nations like Bangladesh (Monem *et al.* 2011). The quality university education is fundamental of the quality education in all levels and the skills of mid to top level executives in all sections of the national economy (Ahmed, 2010). But, the academic performance of students depends on the product of socio-economic, psychological and environmental factors. There was significant relationship between family monthly income, sex of student, occupation of family head, politics, residence, lab facilities, income source and CGPA ($p<0.05$). In ordinal logistic regression model of academic achievement in HSTU students' sex, political status, involve in group study, mobile use on study purpose and involve in extra curriculum activities as significant variables. Mst.

Dilara Pervin, *et., al* (2024). Hijazi and Naqvi (2006) have pointed that student performance is affected by different factors such as learning abilities because new paradigm about learning assumes that all students can and should learn at higher levels but developing society faces some constraint factors especially race, gender, sex that can affect student's performance. Outcome-Based Education (OBE) has become a significant reform initiative in the higher education system of Bangladesh, aiming to improve the overall quality and effectiveness of tertiary education. Unlike traditional education systems that primarily focus on content delivery and teaching processes, OBE emphasizes the achievement of clearly defined learning outcomes. This approach ensures that students acquire specific competencies, skills, and knowledge that are measurable and aligned with academic and industry requirements. The growing demand for employable graduates with practical and analytical abilities has further accelerated the adoption of OBE across universities in Bangladesh, making it highly relevant to studies exploring determinants and impacts of educational quality. The challenges prevent educational institutions from experiencing the complete advantages which Outcome-Based Education gives to their students. The research contributes to existing academic research by presenting empirical evidence which establishes the elements that determine OBE implementation success in Bangladesh (N. Meher.,2026).

As students' academic performance was influenced by many factors, the results of regression analysis depicted that among the seven covariates, birthplace, number of siblings, study time and regular library visit were significantly correlated with students' academic performance. Similarly, birthplace also positively associated with students 'academic performance and the study found that academic performance of urban students was higher than rural students and it is consistent with the findings of previous study that revealed students whose parents reside in rural areas have lower performance, (R., Shaharior., & *et.al.,* 2026).Guimar and Sampaio (2011) narrated Brazilian experience where family background and study environment were key determinants of student performance. However, the academic performance was characterized by performance in tests, in course work and performance in examination of undergraduate students (Cambridge Unirsity, 2003). Few studies reveal that the academic performance in mathematical and quantitative courses of students are relatively poor for giving less attention on Statistics, Quantitative Analysis, MIS and there are many determinants affecting students' characteristics and their environment, teacher characteristics and background, teaching style and materials (Maliki *et al.* 2009).Lastly, In the context of tertiary Education system, skilled faculties play an even more important role because they are responsible for translating curriculum outcomes into practical classroom experiences. Biggs and Tang (2011) emphasize that effective teaching depends on constructive alignment, where instructors ensure that learning activities and assessments are aligned with intended outcomes. Similarly, Harden (2007) highlights that the quality of tertiary education system largely depends on teachers' ability to apply outcome-based teaching strategies, continuous assessment, and feedback mechanisms in the classroom. Skilled faculties contribute significantly to educational quality by improving student engagement, critical thinking, and competency development. Tam (2014) argues that educational outcomes improve when teachers actively implement student-centered and outcome-focused teaching practices. This issue is particularly salient in Bangladesh. Public universities in Bangladesh enroll a large share of academically high-performing students but operate under chronic infrastructural constraints. Severe shortages of on-campus housing mean that only a fraction of students can be accommodated in university halls, which are often overcrowded and poorly resourced. Many students therefore reside in private mess accommodation near campus or commute from family homes located at a distance. These residential arrangements shape students' daily lives, influencing sleep patterns, access to reliable internet, and the ability to attend classes regularly (D., C., Apu, &et., al., 2026).

Most of the mentioned literature focused on measuring academic performance of tertiary students with influential determinants like socio-economic, psychological, environmental factors, out-come based education system, learning abilities, family background, and study environment at the perspective of foreign students of different universities, but they did not focus on Bangladeshi students of different universities. This study has been focused on this area at the perspective of Bangladeshi students of different Public Universities which remained as an unexplored field. Moreover, in Bangladesh no deep research conducted yet so far in this regard. So, the researcher of this study has been tried to fill up the gap by using stochastic approach for evaluating the switching tendency of academic performance and also to explore some considerable determinants which directly affect on academic performance of Public Universities students in Bangladesh.

IV. Objectives of the Study

The main objective of the study is to measure switching tendency of academic performance with corresponding determinants which influenced on academic performance of Public Universities students in Bangladesh. The specific objectives are to evaluate current academic performance of Public Universities students from semester to semester; identify the different influential determinants related to academic performance of the students of business studies; and recommend some policy options for quality improvement of the graduate students of public Universities in Bangladesh.

V. Significance of the Study

The study identifies crucial determinants which affect on academic performance of graduate students' success, and it demonstrates their direct impact on educational quality across public and private universities through its academic research. The educational authorities and policymakers can use the research results for their educational planning activities which aim to improve quality of education through the development of university programs that meet national and international educational standards. University administrators and faculty can apply the research results to enhance their teaching methods and create effective curricula which includes assessment techniques that lead to better student learning results. Sustainable development of Bangladesh depends on confident and proficient personnel and steady growth of economy especially rely on highly educated graduate. Moreover, performance of the tertiary students has an overwhelming direct impact on major macroeconomic objectives like employment generation, poverty alleviation and human resource development. Some Public Universities have taken the vital responsibility of producing graduate ensuring potentiality of analyzing the tricky job market, visualizing the probable future market condition and having the skill of taking strategic decision accordingly. But the switching behavior of academic performance of graduate students of different public Universities is a direct intimidation in achieving culminating success. So, this switching tendency of graduate students' must be immediately taken into consideration and insight factors hindering in producing skillful graduate need to be identified immediately for finding out fruitful solutions regarding the threading problem.

VI. Methods

This empirical research has been considered both qualitative and quantitative approaches to achieve various objectives of the research. Students of the faculty of business studies of Comilla University have been considered as the stimuli materials in this study. Two pretests were conducted to identify necessary stimuli for this study. Both qualitative and quantitative research design has been used for this study. The objective of using the qualitative research is to gain insights into the problem and using the quantitative research is to find out the actual findings of the problem. Quantitative research design helps researchers to use fully structured or formal methods for obtaining information from respondents. Target population is the collection of elements or objects that possess the information sought by the researcher and about which inferences are to be made. Students of different faculties in Public Universities (like University of Dhaka, University of Rajshahi, University of Comilla and University of Chittagong) are the target population of the study. Non-Probability purposive sampling has been used to collect the 230 primary data from the (first year, second year, third year and fourth year) students of different department from Public Universities in Bangladesh Both structured and unstructured questionnaires and three categories' questions: such as some of them are introductory or opening questions, informative and sensitive questions has been incorporated under the questionnaires. Four (04) Key Informant Interview (KII) and four (04) Focus Group Discussion (FGD) were conducted to find out the policy options of improving students' academic performance. The collected primary data has been analyzed by using Statistical Software SPSS, STATA where necessary. Microsoft Excel also has been used. To achieve **objective-I,** descriptive statistics (Ratio, percentage, arithmetic mean, standard deviation, bar diagram and pie chart) has been used to evaluate current situation of academic performance of graduate students of Public Universities. Transition probability matrix has been generated to find out the switching tendency of academic performance of graduate students of Public University.

Transition Matrices of Student's Educational Performance:

Markov chain models were used to study students' educational performance over time (Asmussen, 2003). Besides, behavior of a Markov chain depends on the transition matrix which contains transition probabilities. In most practical studies the transition matrix is unknown and estimated from the empirical distribution. However, one of the important objectives of this study is to assess the students' performance over time (semester to semester). Transition matrices have been developed on the basis of the academic results (grade point averages (GPA)) of 4th year students of the different Public Universities in Bangladesh. Let R_n be the states of grade point averages whose possible values are A+, A, A-, B+, B, B-, C+ and C. The transitions from one state to another state depend only on the present state, not the previous one. Therefore, it is reasonable to consider {Rn} as a Markov chain with eight states.

Testing the Stationarity of Transition Probability Matrix:

To test the equality of the transition probabilities over the time the null hypothesis is-

$H_0: P_{ij}^t = p_{ij}$ where *t = 1, 2, ..., T*

The likelihood ratio test statistic is given below-

$$-2 \ln \Lambda = 2[L(\hat{P}_{ij}^t) - L(P_{ij})]$$

$$= 2 \sum_{t=1}^{T} \sum_{i=0}^{m-1} \sum_{j=0}^{m-1} n_{ij}^{t} \ln \frac{n_{ij}^{t}}{n_{i}^{t-1}}$$

Which follows χ^2 distribution with (T – 1) [m (m – 1)].

To achieve **objective-II,** Binary logistic Regression Analysis has been used to find out the significant influential factors which influence on academic performance of business students.

Binary Logistic Regression Model: Let Y be a dichotomous dependent variable say satisfaction on academic performance where Y = 1, students satisfied on their academic performance and Y = 0 otherwise. Let X be the independent variables, the form of logistic regression model is

$$F = p(Y = 1/X) = \frac{e^{\beta_o + \beta_1 X}}{1 + e^{\beta_o + \beta_1 X}}$$

$$\text{and } 1 - p = p(Y = 0/X) = \frac{1}{1 + e^{\beta_o + \beta_1 X}}$$

$$\therefore Logit\ L_1 = \log\left[\frac{p}{1-p}\right] = \beta_o + \beta_1 X$$

For more than one independent variables-

$$Logit\ L_1 = \beta_o + \sum_{i=1}^{k} \beta_1 X_{i1} \qquad 1 = 1, 2, \ldots k, \text{ and } i = 1, 2, \ldots, n$$

To achieve **objective-III,** descriptive statistics for individual survey, FGD and KII were used.

VII. Findings and their Analysis

7.1 *Determinants of Switching Tendency of Academic Performance:*

The target of the Public University is to produce young, energetic and skilled graduates for industry, teaching, research and community of national and international arena. Through the alumni of different public universities have already taken position in different government, semi-government and non-government organization in Bangladesh, but the average academic performance of current graduate students is volatile in the semester to semester. The purpose of this study is to investigate the current switching pattern and the reasons behind the volatility of the academic performance of graduate students. The overall picture of the teacher-student ratio and teacher-staff ratio at each public university in the regular program at current situation is given below-

Table 1.1: Teacher Student ratio and academic nonacademic staff ratio

Department	**Number of teachers**	**Number of students**	**Number of non-academic staff**	**Number of students per academic staff (**teacher-student ratio)	**Academic-nonacademic staff ratio**
University of Dhaka	1992	40,000	3887	249:5,000	1:195
University of Rajshahi	1200	25,000	1614	6:125	200:269
University of Chittagong	1010	28,000	311	101:2800	3.247:1
University of Comilla	170	6,484	215	85:3242	34:43

Source: Field Survey

7.2 Evaluation of Current Situations

The teacher-student ratio (table 1.1) of the faculty of four universities is large compared to the top 100 universities in the world (Times Higher Education, 2020). Though the seat of the admission test at the undergraduate level in each department is uniform, the numbers of students in each semester in the different department are not the same due to different unavoidable reasons.

Table 1.2: Sex distribution of the respondents

Sex	**Number of students**	**Percentage (%)**
Male	140	60.86
Female	90	39.3

Table 1.3: Age distribution of the respondents

Age	Number of students	Percentage (%)
19	7	3.04
20	32	14.0
21	68	29.7
22	33	14.4
23	41	17.9
24	45	19.7
25	4	1.7

The study reveals that the maximum respondents 60.86% are male. The maximum number of students 29.7% are age limit 21 years (table 1.2 &1.3). Out of 230 sample students, the finding reveled that transition probability matrix has been constructed from semester to semester based on the student's cumulative grade point average (CGPA) who completed 8th semester for measuring switching tendency of academic performance of graduate students.

Table1.4: Transition probability matrix between "year-1 semester-1" to "year-1 semester-2"

Y1S1 to Y1S2	A	A-	B+	B	B-	C+
A	0.6	0.4	0	0	0	0
A-	0.142857	0.357143	0.428571	0.071429	0	0
B+	0	0.214286	0.5	0.25	0.035714	0
B	0	0	0.416667	0.333333	0.25	0
B-	0	0	0	0	1	0
C+	0	0	0	0	0	1

Table 1.5: Transition probability matrix between "year-1 semester-1" to "year-2 semester-1"

Y1S1 to Y2S1	A	A-	B+	B	B-
A	0.4	0.6	0	0	0
A-	0.214286	0.571429	0.071429	0.142857	0
B+	0.035714	0.214286	0.428571	0.25	0.071429
B	0	0	0.416667	0.5	0.083333
B-	0	0	0	1	0
C+	0	0	0	0	1

Table 1.6: Transition probability matrix between "year-1 semester-1" to "year-2 semester-2"

Y1S1 to Y2S2	A	A-	B+	B	B-	C+
A	0.4	0.6	0	0	0	0
A-	0.071429	0.642857	0.214286	0	0.071429	0
B+	0	0.321429	0.5	0.142857	0.035714	0
B	0	0.083333	0.333333	0.583333	0	0
B-	0	0	0	1	0	0
C+	0	0	0	0	0	1

Table 1.7: Transition probability matrix between "year-1 semester-1" to "year-3 semester-1"

Y1S1 to Y3S1	A	A-	B+	B	B-	C+
A	0.4	0.6	0	0	0	0
A-	0.214286	0.357143	0.357143	0.071429	0	0
B+	0	0.214286	0.535714	0.25	0	0
B	0.083333	0	0.25	0.583333	0.083333	0

B-	0	0	1	0	0	0
C+	0	0	0	0	0	1

Table 1.8: Transition probability matrix between "year-1 semester-1" to "year-3 semester-2"

Y1S1 to Y3S2	A	A-	B+	B	B-
A	0.4	0.6	0	0	0
A-	0.142857	0.571429	0.285714	0	0
B+	0.035714	0.321429	0.5	0.142857	0
B	0	0.083333	0.583333	0.25	0.083333
B-	0	0	1	0	0
C+	0	0	0	0	1

Table 1.9: Transition probability matrix between "year-1 semester-1" to "year-4 semester-1"

Y1S1 to Y4S1	A	A-	B+	B	B-
A	0.4	0.6	0	0	0
A-	0.285714	0.428571	0.285714	0	0
B+	0.035714	0.357143	0.392857	0.178571	0.035714
B	0.083333	0	0.333333	0.5	0.083333
B-	0	0	0.5	0.5	0
C+	0	0	0	0	1

Table 1.10: Transition probability matrix between "year-1 semester-1" to "year-4 semester-2"

Y1S1 to Y4S2	A	A-	B+	B	C+
A	0.2	0.8	0	0	0
A-	0.142857	0.642857	0.214286	0	0
B+	0.035714	0.321429	0.5	0.142857	0
B	0	0.166667	0.333333	0.5	0
B-	0	0	1	0	0
C+	0	0	0	0	1

Table 1.11: Transition probability matrix between "year-1 semester-2" to "year-2 semester-1"

Y1S2 to Y2S1	A	A-	B+	B	B-
A	0.6	0.4	0	0	0
A-	0.230769	0.538462	0.153846	0.076923	0
B+	0	0.32	0.44	0.24	0
B	0	0	0.333333	0.5	0.166667
B-	0	0	0.166667	0.666667	0.166667
C+	0	0	0	0	1

Table 1.12: Transition probability matrix between "year-1 semester-2" to "year-3 semester-1"

Y1S2 to Y3S1	A	A-	B+	B	B-	C+
A	0.6	0.2	0.2	0	0	0
A-	0.153846	0.538462	0.307692	0	0	0
B+	0.04	0.2	0.48	0.28	0	0
B	0	0.083333	0.333333	0.5	0.083333	0
B-	0	0	0.666667	0.333333	0	0
C+	0	0	0	0	0	1

Table 1.13: Transition probability matrix between "year-1 semester-2" to "year-2 semester-2"

Y1S2 to Y2S2	A	A-	B+	B	B-	C+
A	0.4	0.4	0.2	0	0	0
A-	0.076923	0.692308	0.153846	0.076923	0	0
B+	0	0.4	0.48	0.12	0	0
B	0	0.083333	0.333333	0.5	0.083333	0
B-	0	0	0.333333	0.5	0.166667	0
C+	0	0	0	0	0	1

Table 1.14: Transition probability matrix between "year-1 semester-2" to "year-3 semester-2"

Y1S2 to Y3S2	A	A-	B+	B	B-
A	0.4	0.4	0.2	0	0
A-	0.153846	0.692308	0.153846	0	0
B+	0.04	0.4	0.44	0.12	0
B	0	0	0.666667	0.25	0.083333
B-	0	0	0.833333	0.166667	0
C+	0	0	0	0	1

Table 1.15: Transition probability matrix between "year-1 semester-2" to "year-4 semester-1"

Y1S2 to Y4S1	A	A-	B+	B	B-
A	0.6	0.2	0.2	0	0
A-	0.307692	0.538462	0.076923	0.076923	0
B+	0.04	0.4	0.36	0.2	0
B	0	0.083333	0.5	0.333333	0.083333
B-	0	0	0.5	0.333333	0.166667
C+	0	0	0	0	1

Table 1.16: Transition probability matrix between "year-1 semester-2" to "year-4 semester-2"

Y1S2 to Y4S2	A	A-	B+	B
A	0.2	0.6	0.2	0
A-	0.230769	0.461538	0.307692	0
B+	0	0.52	0.36	0.12
B	0	0.166667	0.416667	0.416667
B-	0	0	0.666667	0.333333
C+	0	0	0	0

Table 1.17: Transition probability matrix between "year-2 semester-1" to "year-2 semester-2"

Y2S1 to Y2S2	A	A-	B+	B	B-	C+
A	0.5	0.5	0	0	0	0
A-	0	0.705882	0.235294	0.058824	0	0
B+	0	0.333333	0.611111	0.055556	0	0
B	0	0.058824	0.352941	0.529412	0.058824	0
B-	0	0	0	0.5	0.25	0.25

Table 1.18: Transition probability matrix between "year-2 semester-1" to "year-3 semester-2"

Y2S1 to Y3S1	A	A-	B+	B	B-	C+
A	0.5	0.5	0	0	0	0
A-	0.117647	0.294118	0.529412	0.058824	0	0
B+	0.055556	0.277778	0.444444	0.222222	0	0
B	0	0.058824	0.411765	0.529412	0	0
B-	0	0	0.25	0.25	0.25	0.25

Table 1.19: Transition probability matrix between "year-2 semester-1" to "year-3 semester-2"

Y2S1 to Y3S2	A	A-	B+	B	B-
A	0.333333	0.5	0.166667	0	0
A-	0.117647	0.647059	0.235294	0	0
B+	0	0.277778	0.5	0.222222	0
B	0.058824	0.117647	0.647059	0.176471	0
B-	0	0	0.5	0	0.5

Table 1.20: Transition probability matrix between "year-2 semester-1" to "year-4 semester-2"

Y2S1 to Y4S1	A	A-	B+	B	B-
A	0.666667	0.166667	0	0.166667	0
A-	0.117647	0.647059	0.235294	0	0
B+	0.111111	0.166667	0.5	0.166667	0.055556
B	0	0.235294	0.352941	0.352941	0.058824
B-	0	0	0.25	0.5	0.25

Table 1.21: Transition probability matrix between "year-2 semester-1" to "year-4 semester-2"

Y2S1 to Y4S2	A	A-	B+	B	C+
A	0.333333	0.5	0.166667	0	0
A-	0.058824	0.588235	0.294118	0.058824	0
B+	0.055556	0.277778	0.444444	0.222222	0
B	0	0.352941	0.470588	0.176471	0
B-	0	0	0.25	0.5	0.25

Table 1.22: Transition probability matrix between "year-2 semester-2" to "year-3 semester-1"

Y2S2 to Y3S1	A	A-	B+	B	B-	C+
A	0.666667	0.333333	0	0	0	0
A-	0.136364	0.454545	0.318182	0.090909	0	0
B+	0.047619	0.142857	0.571429	0.238095	0	0
B	0	0	0.307692	0.615385	0.076923	0
B-	0	0	1	0	0	0
C+	0	0	0	0	0	1

Table 1.23: Transition probability matrix between "year-2 semester-2" to "year-3 semester-2"

Y2S2 to Y3S2	A	A-	B+	B	B-
A	0.666667	0.333333	0	0	0
A-	0.045455	0.590909	0.363636	0	0
B+	0.047619	0.285714	0.52381	0.142857	0
B	0.076923	0.076923	0.461538	0.307692	0.076923

B-	0	0	1	0	0
C+	0	0	0	0	1

Table 1.24: Transition probability matrix between "year-2 semester-2" to "year-4 semester-1"

Y2S2 to Y4S1	A	A-	B+	B	B-
A	1	0	0	0	0
A-	0.136364	0.545455	0.272727	0.045455	0
B+	0.095238	0.238095	0.428571	0.190476	0.047619
B	0	0.153846	0.230769	0.538462	0.076923
B-	0	0	1	0	0
C+	0	0	0	0	1

Table 1.25: Transition probability matrix between "year-1 semester-1" to "year-1 semester-2"

Y2S2 to Y4S2	A	A-	B+	B	C+
A	0.666667	0.333333	0	0	0
A-	0.045455	0.727273	0.227273	0	0
B+	0.047619	0.238095	0.52381	0.190476	0
B	0	0.076923	0.461538	0.461538	0
B-	0	0.5	0.5	0	0
C+	0	0	0	0	1

Table 1.26: Transition probability matrix between "year-3 semester-1" to "year-3 semester-2"

Y3S1 to Y3S2	A	A-	B+	B	B-
A	0.5	0.5	0	0	0
A-	0.071429	0.714286	0.214286	0	0
B+	0.04	0.24	0.64	0.08	0
B	0	0.133333	0.533333	0.333333	0
B-	0	0	0	0	1
C+	0	0	0	0	1

Table 1.27: Transition probability matrix between "year-3 semester-1" to "year-4 semester-1"

Y3S1 to Y4S1	A	A-	B+	B	B-
A	0.833333	0.166667	0	0	0
A-	0.214286	0.642857	0.071429	0.071429	0
B+	0	0.28	0.6	0.12	0
B	0	0.133333	0.266667	0.466667	0.133333
B-	0	0	0	1	0
C+	0	0	0	0	1

Table 1.28: Transition probability matrix between "year-3 semester-1" to "year-4 semester-2"

Y3S1 to Y4S2	A	A-	B+	B	C+
A	0.333333	0.666667	0	0	0
A-	0.142857	0.714286	0.142857	0	0
B+	0	0.28	0.6	0.12	0
B	0	0.2	0.4	0.4	0
B-	0	0	0	1	0
C+	0	0	0	0	1

Table 1.29: Transition probability matrix between "year-3 semester-2" to "year-4 semester-1"

Y3S2 to Y4S1	A	A-	B+	B	B-
A	0.6	0.4	0	0	0
A-	0.238095	0.619048	0.142857	0	0
B+	0	0.148148	0.555556	0.296296	0
B	0	0	0.285714	0.428571	0.285714
B-	0	0	0	0.5	0.5

Table 1.30: Transition probability matrix between "year-3 semester-2" to "year-4 semester-2"

Y3S2 to Y4S2	A	A-	B+	B	C+
A	0.6	0.4	0	0	0
A-	0.047619	0.714286	0.238095	0	0
B+	0	0.259259	0.555556	0.185185	0
B	0	0	0.428571	0.571429	0
B-	0	0	0	0.5	0.5

Table 1.31: Transition probability matrix between "year-4 semester-1" to "year-4 semester-2"

Y4S1 to Y4S2	A	A-	B+	B	C+
A	0.5	0.5	0	0	0
A-	0	0.842105	0.157895	0	0
B+	0	0.2	0.7	0.1	0
B	0	0	0.5	0.5	0
B-	0	0	0	0.666667	0.333333

Table 1.32: Pooled Transition probability matrix of measuring switching tendency of academic performance of business graduates

	A	A-	B+	B	B-	C+
A	0.493	0.453	0.047	0.007	0	0
A-	0.129	0.596	0.243	0.03	0.002	0
B+	0.025	0.284	0.503	0.178	0.01	0
B	0.011	0.093	0.407	0.431	0.058	0
B-	0	0.011	0.422	0.378	0.133	0.056
C+	0	0	0	0	0.45	0.55

The study reveals that the academic performance of the students changes from semester to semester. From transition probability matrix 3.33, we detect that the students who got grade A in last semester has 50% chances to decline his grade A-. The almost same scenario is found for the students who got grade A- in last semester will be around 30% chance to fall his grade below A- in the current semester (table 1.32). So, it is important to diagnosis the reasons behind this switching tendency of academic performance.

7.3 Determinants of switching academic performance of business graduates

7.3.1 study hour of the students

Table 1.33 presents that 88.6% of students give their opinion that study hour influence on academic performance because a number of business students loss their times for extra activities (FGD output). But, the association between study hours and students' performance are not significant because of the value of the contingency coefficient is small and the probability of Chi-square test statistic is larger than 0.1.

7.3.2 Family problem of the student

Table 1.33 also reveals that 94.3% of students believe that family problems influence on academic performance. But, the association among the variables are not significant (p-value >0.1).

7.3.3 Improvement tendency with immediate semester of the student

From table 1.33, the number of 88.6% of students believes that academic performance is influenced by the improvement tendency with the immediate semester of the students. Here, the association between improvement tendency with the immediate semester of the student and academic performance are significant (p-value < 0.1) but the value of the contingency coefficient is 0.113 which reflect that the strength of the association is very weak.

Table 1.33: Measures of association between academic performance and related factors

Attributes related to academic performance of Business graduate	Student's opinion		Contingency coefficient	χ^2	
	Yes	No		Statistic	*p-value*
Study hour of the student	202 (88.6%)	26 (11.4%)	0.046	0.477	0.490
Family problem of the student	216 (94.3%)	13 (5.7%)	0.068	1.072	0.301
Improvement tendency with immediate semester of the student	203 (88.6%)	25 (10.9%)	0.113*	2.968*	0.085*
Emotional relationship with opposite gender of the student	181 (79%)	48 (21%)	0.016	0.056	0.813
Lack of concentration on academic activities of the student	227 (99.1%)	2 (0.9%)	0.019	0.081	0.776
Poor knowledge about mathematical courses of the student	199 (86.9%)	29 (12.7%)	0.148**	5.119**	0.024
Large volume of the syllabus of each course	180 (78.6%)	49 (21.4%)	0.017	0.064	0.800
Less perfect classroom teaching capacity	196 (85.2%)	33 (14.8%)	0.062	0.874	0.350
Poor handwriting of the student	159 (70%)	70 (30%)	0.040	1.365	0.546
Lack of time management of the student	220 (96.1%)	9 (3.9%)	0.028	0.182	0.669
Lack of self-confidence of the student	217 (94.8%)	12 (5.2%)	0.033	0.247	0.619
Involvement with politics of the student	160 (69.9%)	69 (30.1%)	0.026	0.155	0.693
Intensive use of mobile, Facebook and internet of the student	208 (90.8%)	21 (9.2%)	0.079	1.433	0.231

(Source: Field Investigation)

7.3.4 Emotional relationship with opposite gender of the student

Table 1.33 also reveals that 79% of students give their concern that emotional relationship with the opposite gender is an important influential factor related to student's results but insignificant (p-value > 0.1).

7.3.5 Lack of concentration on academic activities of the student

99.1% of students give their concern that lack of concentration on academic activities of the student and academic performance are associated **(table 1.33).**

7.3.6 Poor knowledge about mathematical courses of the student

From **table 1.33,** the number of 86.9% of students believes that poor knowledge about mathematical courses of the students is a significant factor related to the academic performance of business students (p-value < 0.1).

7.3.7 Large volume of the syllabus of each course

One of the findings from **Table 1.33** is that 78.6% of students have agreed that the volume of the syllabus is large for each course whereas 21.4% have disagreed this issue.

7.3.8 Less perfect classroom teaching capacity

Table 1.33 reveals that 85.2% of students have believed that classroom teaching capacity is less perfect in faculty of business studies whereas 14.8% have denied it.

7.3.9 Intensive use of mobile, Facebook and internet of the student

Table 1.33 presents that 90.8% of students give their opinion that intensive use of mobile, Facebook and internet of the student influence on academic performance because in COVID-19 pandemic situation students can present in their virtual classroom and increasing their academic knowledge.

7.3.10 Lack of time management of the student

96.1% of students agreed that there is a huge lack of the capacity of time management of the business students **(table 1.33).**

7.3.11 Lack of self-confidence of the student

94.8% of students believed that there is a huge lack of self-confidence of the business students **(table 1.33).**

7.3.12 Involvement with politics of the student

From table 1.33, the number of 69.9% of students believes that involvement with politics of the student is a factor related to the academic performance of business students but not significant (p-value < 0.1).

Table 1.34: Logistic regression to find the significant determinant of academic performance (1=increase or good, 2=decrease or poor)

Predictors	B	S.E.	Wald	df	Sig.	Exp(B)
Emotional relationship with opposite gender (ref: no=0)	.032	.388	.007	1	.935	1.032
Poor knowledge about mathematical courses of the student (ref: no=0)	-.993	.556	3.192	1	.074	.370
Large volume of the syllabus of each course (ref: no=0)	-.320	.394	.659	1	.417	.726
Involvement with politics of the student (ref: no=0)	.417	.348	1.434	1	.231	1.517
Age of the students	.373	.111	11.230	1	.001	1.452
Sex (ref: female=0)	-1.116	.337	10.930	1	.001	.328
Department	.167	.187	.798	1	.372	1.182
Improvement tendency with immediate semester of the student (ref: no=0)	-.725	.538	1.814	1	.178	.485
Poor handwriting of the student (ref: no=0)	.575	.351	2.683	1	.101	1.777
Lack of concentration on academic activities of the student (ref: no=0)	1.013	1.552	.426	1	.514	2.754
Constant	-7.232	2.980	5.891	1	.015	.001

The logistic regression reveals that poor knowledge about mathematical courses (p-value<0.1), age of the students (p-value<0.01), and sex (p-value<0.01) are the more influential significant factors related to academic performance. Here, the study has been also detected that the chance to perform better in academic arena of female is higher than male.

VIII. Recommendations

Based on findings some recommendations are provided for policymaker and decision-makers to set up right strategies for improving academic performance of graduate students. Public University should try to improve and update the teaching methods and lecture delivery pattern, question setup following Bloom Taxonomy in different ways. Such as teachers suggests to follow reference books, emphasis on case competition, presentation etc. for improving the communication skill of business graduate; awareness about the proper use of students' time in a class room, resident, computer lab and library should be increased by proper counseling; necessary and latest subject specific books should be increased in the central library, seminar library and hall libraries for improving and upgrading the knowledge and power of graduates of Public University; students' accommodation facilities should be increased and the environment of the existing halls of residence should be improved for developing the cognitive and affective responses; students should be attracted to extracurricular activities to cut down political involvement, Internet game and Face booking to a reasonable level; political unrests need to be minimized so that students may complete their degree without any interruption.

IX. Conclusion

The development of a country depends on effective and efficient personnel especially rely on highly qualified graduates. The aim of this study is to find out the current status, switching tendency of academic performance and it's behind causes of some selected and reputed public universities in Bangladesh. The study investigated that the performance of the students depends on the study hour, family problem, improvement tendency with immediate semester, emotional relation with opposite gender etc. All of the potential correlates available in survey data were explored for significant relation with students' educational performance. At last, this study has provided effective and efficient strategic directions which will be helpful for improving the academic performance of graduate students of different Public Universities in Bangladesh.

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