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EDITORIAL

By the grace of almighty, I have finished a tedious and challenging Job of editing and publishing *The Journal of BGC Trust University, Volume 06, 2022*. In this volume 17 articles have been included in different areas of academic interest. Although Journal of a university should be published regularly, due to the delays in earlier days caused by many unavoidable reasons such as, Pandemic situation and others, this Job could not be done by any means as expected.

The responsibilities of teachers at the university level are to involve themselves in knowledge creation, knowledge dissemination, and academic administration of programs offered by the entities. Among this three, the most important is 'knowledge creation' which is performed by them through conducting research and publishing them timely. Journal publication of a University is being done with a view to engaging teachers in research and development, and finally ensuring high quality of education at the university as a whole. The continuous publication of the journal of a university is a testimony to the efforts of the faculty in creating and disseminating knowledge in different fields of interest. Our aim, since the beginning, has been to maintain our integrity, and publish the highest quality of research using ethical standards of publishing. Our consistent efforts are aimed towards increasing the visibility, impact, editorial cycle time, and the overall quality of our journal.

In this Journal, seventeen articles have been selected by covering the areas of current Issues in science and engineering, social sciences, arts, law and business of the local and global arena. All the articles have been chosen by following the principles and guidelines enacted by the competent authority of BGC Trust University. The editorial board has been formed by nominating members from senior faculties of different public universities, foreign universities, private universities, and from BGC Trust University also. The editorial board has conducted several meetings to scrutinize and reviewed the submitted articles and then selected the reviewers for their valuable comments. The authors were asked to incorporate necessary changes as mentioned by the reviewers. The revised articles were further reviewed and checked by the editorial board members before going for final publication.

A publication of this nature and standard does not come without the help of relevant people. Honorable Trustee Board of BGC Trust University has provided us with total financial support and necessary cooperation for publishing this journal timely. I am expressing my heartiest gratitude and thanks to our honorable chairman of BGCTUB Trustee Board and the chief patron of this journal Engr. Md. Afsar Uddin and all other members of Trustee Board of BGCTUB as well. We express our gratitude to

the researchers for their valuable submissions and to the ones who have shown their interest in our journal. The Members of the Editorial Board have devoted much to the process of publishing *The Journal of BGC Trust University, Volume 06, 2022*. The efforts and professional expertise of respected board members have made it possible to ensure high quality and enrich the standard of the journal. I, as an editor of this journal, am pleased to express heartfelt thanks to honorable members of the board. The editorial board acknowledges the professional efforts of all reviewers in reviewing and providing valuable comments and recommendations. The Editorial Board is also thankful to Mr. Khaled Bin Chowdhury, Chairman, Department of English, BGCTUB and the faculties of the same department for their best efforts in correcting all linguistic errors and proofreading of all research articles submitted by concerned authors. I am oblige to Prof. Dr. Md. Sarwar Uddin, Chairman, Department of Business Administration, and Md. Salahuddin Shahariar, Deputy Registrar, BGCTUB for performing the last time necessary editing and proof reading before printing the journal finally. Last, but not the least, Md. Shahabuddin, Proprietor, Fatema Printers, deserves thanks for taking and finishing the task of printing the journal properly.

I, as the executive editor of the issue feel honored to announce the publication of the present issue of the Journal of BGC Trust University.



Professor Dr. A.F.M. Aowrangazab
Executive Editor
The Journal of BGC Trust University
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Contents

01. **Cosmological Components in the Presence of Perfect Fluid for Robertson-Walker Cosmological Model in General Relativity** 9-20

Shamsun Nahar Shoma
Munmun Biswas

02. **Examining the Relationship between Liquidity and Profitability of Islamic Commercial Banks: An Empirical Evidence from Bangladesh** 21-36

Md. Siraz Meah
Umma Salma Hoque

03. **Analyzing the Optimality Conditions for Nonlinear Semi-Infinite Multi-objective (Pareto) Optimization Problems Involving Generalized Invex Functions** 37-50

Mamun-Or-Rashid
Syed Anayet Karim

04. **In Silico Molecular Docking and ADME/T Analysis of Selected Bioactive Compounds from Leucas Zeylanica Against Breast Cancer** 51-66

Mycal Dutta
Tajnoba Akter
Mohammad Nezam
Arkajyoti Paul
Md. Sohel Rana

05. **In Vivo Toxicity, Hypoglycemic Activities along with In Vitro Anti-Arthritic and Antibacterial Potential of Fractionated Elatostema Papillosum Wed. and Holigrana Longifolia Roxb** 67-84

Md. Zia Uddin
Subrata Chowdhury
Arkajyoti Paul
Jewel Mallick
Shahadat Hossain
Md. Sohel Rana

06. **University Students' Reticence in English Language Classes and Outside: A Micro-level Study from Socio-Economic Perspectives** 85-110

Md Khaled Bin Chowdhury
Kazi Shahidul Islam
Md Abdur Rashid

07. **Impact of Climate Change on Dengue Transmission in Bangladesh: A Critical Review** 111-130

Anowara Jenny
Sajal Chakraborty
Akser Alam Siddiqua Maya
Joysree Das
Sharmin Akhter
Prodiptho Chakraborty

08. **English Loan Verbs in Bangla: Patterns of Accommodation** 131-146

Sarwar Morshed
Mahamuda Akter

09. **Rohingya Identity Crisis: History and Reality- A Legal Analysis** 147-164

Syeda Khadijatul Kobra
Md. Touhidul Islam

10. **Challenges of CSR Practices in Bangladesh: A Study on Selected Private Sector Enterprises** 165-192

Sujan Kanti Biswas
Subhankar Chowdhury

11. **Tertiary Students' Grammatical Errors: A Small-scale Empirical Study** 193-210
Kawsar Farjana

12. **Relationship of Intrinsic Reward Practices to Employees' Job Satisfaction and Creative Performance: An Empirical Study on Private Universities of Bangladesh** 211-230
Rana Karan
Md. Moazzam Husain
Md. Sahidur Rahman

13. **Relationship between Professional Stress and Teaching Performance Based on the Demographic Factors: A Study on the Teachers of Some Selected Universities Located in Chittagong, Bangladesh** 231-258
Mohd. Kamal Uddin
Md. Sahidur Rahman

14. **Faculty Attributes and Student Achievement in Tertiary Education: An Empirical Study on Universities in Bangladesh** 259-280
Mohd. Kamal Uddin
Mohammad Jonaed Kabir

15. **Factors Affecting the Use of Alternative Delivery Channels: A Study on the Customers of Private Commercial Bank in Bangladesh** 281-318
Sanjida Nusrat Lovely
Nazmoon Akhter

16. **PLS-SEM Based Analysis of Customer Satisfaction of Mobile Banking in Bangladesh: A Study on Users' Perspective** 319-348
Golam Shahria
Nusrat Jahan

17. **An Analysis of the Year Wise Movement of Foreign Direct Investment and Its Forecasting Trends in Bangladesh: Period 2020-2029** 349-364
Mahmudul Islam
Md. Siraz Meah

Cosmological components in the presence of perfect fluid for Robertson-Walker cosmological model in general relativity

Shamsun Nahar Shoma *
Munmun Biswas **

Abstract

Different types of cosmological constants are considered for analyzing perfect fluid. Different gravitational variable and the cosmological constant are considered within sight of perfect fluid for the Robertson-Walker universe by utilizing Einstein's field equations. The cosmological term to be proportional to R^{-m} (R is a scale factor and m is a constant). Varieties of cosmological components are presented for the presence of perfect fluid in the equation of state.

Key Words: Perfect fluid, Robertson-Walker metric, Cosmology, Gravitational variable, Equation of state.

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1. Introduction

At the present time, it is a challenging issue to explain the small positive value of the cosmological constant for the energy density of the vacuum. The observed fluid variable value 7 x 10^{-30} cm^{-3} is over in various 120 orders sample that magnitude is smaller than the Planck density (10^{93} g cm^{-3}). This value of the universe is risen up out of the big bang and its value is set at that time. These particles of the universe are decaying every day. A number of models with different decaying laws for the variation of cosmological terms were investigated in previous. The variation in the fluid is joined by a variation of G. Several authors investigated Friedman-Roberson-walker (FRW) models and Bianchi models using this approach [1, 3, 16, 26, 30, 32, 35, 38, 39]. In previous research have considered that the cosmological term is proportional to the Hubble parameter in the FRW model and the Bianchi type-I model with variable G and Λ[10]. Classification of the FRW universe with a cosmological constant and a perfect fluid in the equation of state have been examined and proposed the idea of a variable gravitational constant G in the framework of general relativity[13, 14]. Previous researcher working in the structure of general relativity, proposed an adjustment connecting the variation of G with that of Λ[18]. Several researchers proposed a modification approach that allows us to use Einstein's field equations' form, which is unchanged in cosmological scenarios with a time varying Λ. Recently, we have considered [35, 36, 37] whether the cosmological term is corresponding to the Hubble parameter in the Bianchi type-I model and FRW model with varying G and Λ. In this paper, we think about homogeneous R-W space-time with variable G and Λ containing matter as a perfect fluid with a scale factor. Here we represent the relationship between growth rate and time in the presence of perfect fluid for the matter dominated universe and the radiation dominated universe. We obtain solution from the field equations assumption that the cosmological term is proportional to $\mathfrak{R}^{-m}$ (where $\mathfrak{R}$ is a scale factor and m is constant). This paper is organized as follows. Basic equations of the models are given in section 2; and their solution is in section 3; we examine the model in section 4 and conclude our outcomes in section 5.

2. The model and field equations

Robertson-Walker (R-W) model is the standard model of the universe for homogeneous and isotropic condition. The spatially homogeneous and isotropic Robertson-Walker (R-W) model is given by

$$ds^2 = dt^2 - \mathrm{R}^2(t)\left[\frac{dr^2}{1-kr^2} + r^2(d\theta^2 + sin^2\theta d\emptyset^2)\right], \qquad (1)$$

where the scale factor is R (t) and the curvature parameter k for an open, flat or closed universe is $k = -1, 0$ or $+1$ respectively.

We assume that the energy-momentum tensor of a perfect fluid which is represented for cosmic matter,

$$T_{\eta\mu=(\rho+p)u_\mu u_\mu - p g_{\eta\mu,}} \qquad (2)$$

where ρ is the energy density of cosmic matter, p is its pressure, and u_η is the four velocity vector such that $u_\eta u^\eta = 1$. We consider the equation of state

$$p = (\lambda - 1)\rho, 1 \leq \lambda \leq 2. \qquad (3)$$

The Einstein field equations with variable G and Λ are given by Weinberg (1972)

$$\mathrm{R}_{\eta\mu} - \frac{1}{2}\mathrm{R}g_{\eta\mu} = 8\pi G(t)T_{\eta\mu} + \Lambda\,(t)g_{\eta\mu.} \qquad (4)$$

In a commoving system of coordinates, using the metric equation (1) and energy – momentum tensor equation (2) the field equation (4) yields,

$$-\frac{2\ddot{\mathrm{R}}}{\mathrm{R}} - \frac{\dot{\mathrm{R}}^2}{\mathrm{R}^2} - \frac{k}{\mathrm{R}^2} = 8\pi G p - \Lambda\,, \qquad (5)$$

$$\frac{3\dot{\mathrm{R}}^2}{\mathrm{R}^2} - \frac{3k}{\mathrm{R}^2} = 8\pi G\rho + \Lambda\,. \qquad (6)$$

Since the divergence of Einstein tensor is vanishing, we have

$$8\pi G\left\{\dot{\rho} + 3(\rho + p)\frac{\dot{\mathrm{R}}}{\mathrm{R}}\right\} + 8\pi\rho\dot{G} + \dot{\lambda} = 0\,. \qquad (7)$$

The law of energy conservation equation $T^{j}_{i,j} = 0$ yields.

$$\dot{\rho} + 3(\rho + p)\frac{\dot{\mathrm{R}}}{\mathrm{R}} = 0\,. \tag{8}$$

So that equation (7) reduces to

$$8\pi\rho\dot{G} + \dot{\Lambda} = 0. \tag{9}$$

The expression of equation (9) implies that Λ is a constant whenever G is constant.

Putting the values of p from equation (3) in equation (8) and then integrating, we get $\rho = \frac{k_1}{\mathrm{R}^{3\lambda}}$, (10)

here k_1 is a constant of integration. Equations (5) and (6) can be modified as far as Hubble parameter H and deceleration parameter q for zero curvature (k=0) as,

$$H^2(2q-1) = 8\pi G p - \Lambda\,, \tag{11}$$

$$3H^2 = 8\pi G\rho + \Lambda\,, \tag{12}$$

where $q = -1 - \frac{\dot{H}}{H^2} = -\frac{\mathrm{R}\ddot{\mathrm{R}}}{\dot{\mathrm{R}}^2}$ and expansion scalar $\theta = 3H = \frac{3\dot{\mathrm{R}}}{\mathrm{R}}$. The critical density ρ_c, vacuum density ρ_v and density parameter Ω was defined[23] as

$$\rho_c = \frac{3H^2}{8\pi G}\,, \tag{13}$$

$$\rho_v = \frac{\Lambda}{8\pi G}\,, \tag{14}$$

And $$\Omega = \frac{\rho}{\rho_c} = \frac{8\pi G\rho}{3H^2}\,, \tag{15}$$

3. Solution of the field equations

The system of equation (3), (5), (6) and (8) supply only four equations in five unknown's $(R, \rho, p, G\ and\ \Lambda)$. One additional equation is expected to explain the framework totally. The phenomenological Λ decay scenarios have been considered by a number of authors[11, 15] consider $\Lambda \propto \mathrm{ą}^{-2}$(ą is the scale factor of the Robertson–Walker metric). Consider $\Lambda \propto \mathrm{ą}^{-3}$ while $\Lambda \propto \mathrm{ą}^{-m}$ (ą is the

scale factor and m is a constant) was considered by several researcher[9, 20, 22, 24, 28, 29].

Thus we take the decaying vacuum energy density

$$\Lambda = \frac{ą}{Ř^m}, \tag{16}$$

where ą is constant. From equations (9), (10) and (16) one finds that

$$G = \frac{ąŘ^{3\lambda-m}}{8k_1(3\lambda-m)} \equiv G_0 Ř^{3\lambda-m}. \tag{17}$$

There equations (5) and (6) can be written in the form of perfect fluid

$p_{eff} = (\lambda_{eff} - 1)p_{eff}$, With

$$p_{eff} = \left(k_1 G_0 + \frac{ą}{8\pi}\right)\frac{1}{G_n Ř^m}, \tag{18}$$

where G_n is the Newtonian Gravitational constant and λ_{eff} can be given explicitly regarding different constants .Using Equations (3), (11), (12) and (16) we get a differential equation

$$2\dot{H} + 3\lambda H^2 - \frac{ą\lambda}{Ř^m} = 0 \tag{19}$$

On integrating equation (19), the scale factor obtain that

$$Ř = \left(\frac{m}{2}\sqrt{\frac{ą\lambda}{3\lambda-m}}\,t + t_0\right)^{2/m}, \tag{20}$$

where t_0 is a constant of integration. The integration constant is related to the choice of origin of time.

Since $1 \leq \lambda \leq 2$ now we analyze the scenarios of cosmological components for $\lambda = \frac{3}{2}$

3.1 Solution of cosmological components for $\boldsymbol{\lambda = \frac{3}{2}}$

For $\lambda = \frac{3}{2}$ from equation (20), we obtain the scale factor

$$\text{Ŗ} = \left(\frac{m}{2}\sqrt{\frac{3ą}{9-2m}}t + t_0\right)^{2/m} \tag{21}$$

In this case, the spatial volume V, matter density ρ , pressure p, gravitational constant G, and cosmological constant Λ and others cosmological components are given by the following:

solution for $\lambda = \frac{3}{2}$ at m=1
$$\text{Ŗ} = \left(\frac{m}{2}\sqrt{\frac{3ą}{9-2m}}t + t_0\right)^{2/m}$$ $$= \left(\frac{1}{2}\sqrt{\frac{3ą}{7}}t + t_0\right)^2 \quad (22)$$
$$V = \left(\frac{m}{2}\sqrt{\frac{3ą}{9-2m}}t + t_0\right)^{6/m}$$ $$= \left[\frac{1}{2}\sqrt{\left(\frac{3ą}{7}\right)}\ t + t_0\right]^6 \quad (23)$$
$$\rho = \frac{k_1}{\left(\frac{m}{2}\sqrt{\frac{3ą}{9-2m}}t + t_0\right)^{9/m}}$$ $$= \frac{k_1}{\left(\frac{1}{2}\sqrt{\frac{3ą}{7}}t+t_0\right)^9} \quad (24)$$

$$p = \frac{1}{2}\frac{k_1}{\left(\frac{m}{2}\sqrt{\frac{3ą}{9-2m}}t + t_0\right)^{9/m}}$$

$$\frac{1}{2}\frac{k_1}{\left(\frac{1}{2}\sqrt{\frac{3ą}{7}}t+t_0\right)^{9}} \tag{25}$$

$$G = G_0\left(\frac{m}{2}\sqrt{\frac{3ą}{9-2m}}t + t_0\right)^{\frac{9}{2}-m}$$

$$= G_0\left(\frac{1}{2}\sqrt{\frac{3ą}{7}}t + t_0\right)^{\frac{7}{2}} \tag{26}$$

$$\Lambda = \frac{ą}{\left(\frac{m}{2}\sqrt{\frac{3ą}{9-2m}}t + t_0\right)^{2}}$$

$$= \frac{ą}{\left[\frac{1}{2}\sqrt{\left(\frac{3ą}{7}\right)}t + t_0\right]^{2}} \tag{27}$$

$$\theta = \frac{3\sqrt{3ą}}{\sqrt{9-2m}}\left(\frac{m}{2}\sqrt{\frac{3ą}{9-2m}}t + t_0\right)^{-1}$$

$$= \frac{3\sqrt{3ą}}{\sqrt{7}}\left[\frac{1}{2}\sqrt{\left(\frac{3ą}{7}\right)}t + t_0\right]^{-1} \tag{28}$$

$$\sigma = \frac{c_1}{\sqrt{3}}\left(\frac{m}{2}\sqrt{\frac{3ą}{9-2m}}t + t_0\right)^{6/m}$$

$$= \frac{c_1}{\sqrt{3}}\left(\frac{1}{2}\sqrt{\frac{3ą}{7}}t + t_0\right)^{6} \tag{29}$$

The vacuum energy density ρ_v and critical density ρ_c are given by $\rho_v = \frac{ą}{8\pi G_0}\left(\frac{m}{2}\sqrt{\frac{3ą}{9-2m}}t + t_0\right)^{9/2}$, $\rho_c = \frac{9ą}{8\pi G_0(9-2m)}\left(\frac{m}{2}\sqrt{\frac{3ą}{9-2m}}t + t_0\right)^{-\frac{13}{2}+m}$, The density parameter is given by $\Omega = \mathrm{m} - 2$	The vacuum energy density ρ_v and critical density ρ_c are given by $\rho_v = \frac{ą}{8\pi G_0}\left(\frac{1}{2}\sqrt{\frac{3ą}{7}}t + t_0\right)^{9/2}$, (30) $\rho_c = \frac{9ą}{56\pi G_0}\left(\frac{1}{2}\sqrt{\frac{3ą}{7}}t + t_0\right)^{-\frac{11}{2}}$, (31) The density parameter is given by $\Omega = -1$ (32)
The deceleration parameter q for the model is $q = \frac{m}{2} - 1$.	The deceleration parameter q for the model is $q = -\frac{1}{2}$ (33)

We examine that for $0 < m < 4$ the spatial volume V is zero att $= \mathrm{t}^*$, where $t^* = -2t_0/\left(\sqrt{\frac{3ą}{7}}\right)$ and expansion scalar θ is infinite, which shows that the universe starts evolving with zero volume at $\mathrm{t} = t^*$ with an infinite rate of expansion. The scale factor also vanishes at $\mathrm{t} = t^*$, hence the space-time exhibits point type singularity in the initial epoch. The energy density and hence the space-time exhibits point type singularity in the initial epoch. The energy density and shear scalar move away at the initial singularity. The scale factor and spatial volume increases however expansion scalar decreases as t increases. Thus, the rate of extension backs off with increasing time. Moreover $\rho, \sigma, \rho_v, \rho_c$ and Λ decrease as t increases. As $\mathrm{t} \to \infty$, the scale factor and volume become infinite, $\rho, \sigma, \rho_v, \rho_c$ and Λ tend to zero. Therefore, the model would basically give a vacant universe for substantial time t. Gravitational constant $G(t)$ is zero at $t = t^*$ and as t increases, $G(t)$ also increases. Therefore, the universe starts with decelerating extension changes and the development changes from a decelerating stage to an accelerating one. Here we represent

cosmological behavior for m=1which satisfies the cosmological scenario is in agreement with SNe Ia astronomical observations [17, 27, 34] and it presents a unified description of the evolution of the universe.

4. Discussion

In this work, we have presented a variety of solutions to a spatially homogeneous and isotropic R-W line element with variable gravitational constant G(t) and cosmological constant Λ(t). By using law of variation of scale factor with a variable cosmological term, i.e. a cosmological term that scales as $\Lambda \propto \mathrm{R}^{-m}$ (where R is a scale factor) the field equations have been solved exactly. In sections 3.1 exact $R - W$ models have been obtained for m=1. Some important cosmological parameters were obtained for the model and the physical behaviors of the model were discussed in detail in sections 3.1 by mathematical expression. In the cases, the models represent a shearing, non-rotating and expanding model of the universe with a big-bang start which approaches isotropy at late times. It is interesting that the proposed variety law gives an elective way to deal with getting exact solutions of Einstein's field conditions. It shows a unified description of the development of the universe which begins with a decelerating extension and grows with acceleration at late times. Recent observational information [16, 17] strongly suggests this acceleration occurs. Also, gravitational constant G(t) is zero at the initial singularity and it is increasing with time. The cosmological constant Λ (t) $\propto 1/t^2$ follows from the model of [4, 5, 7, 16] .This form of Λ is physically reasonable as observations suggest that Λ is very small in the present universe. Finally, the solutions presented in the paper are new and useful for a better understanding of the evolution of the universe in $R - W$ space-time with variable G and Λ.

5. Conclusion

In this paper, we have generalized the solution that an equation of state for perfect fluid is spatially homogeneous and isotropic R-W line element with variable gravitational constant G (t) and cosmological constant Λ (t). The field equations have been solved exactly by using a law of variation of scale factor with a variable cosmological term, i.e. a cosmological term that scales as Λ $\propto \mathrm{R}^{-m}$. The exact $R - W$ model has been obtained in sections 3.1. The models represent a shearing, non-rotating and expanding model of the universe with a big-bang start which approaches isotropy at late times. In section-3.1 m=1 for the universe spatial volume V is zero at t=t* where $t^* = -2t_0/\left(\sqrt{\frac{3a}{7}}\right)$ and expansion scalar θ is infinite, which demonstrates that the universe begins developing with zero volume at t= t^*, with an infinite rate of expansion. Thus the expansion rate increases as time increases.

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Examining the Relationship between Liquidity and Profitability of Islamic Commercial Banks: An Empirical Evidence from Bangladesh

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Abstract

This study examines the relationship between liquidity and profitability of islamic (shariah based) commercial banks operating in Bangladesh. The authors have collected the data from 07 islamic banks' annual report over the year 2013 to 2017. Return on asset average (ROAA) and return on equity average (ROEA) were considered as profitability indicators (dependent variables) and cash position ratio average (CPRA), liquid security ratio average (LSRA) and capacity ratio average (CRA) were considered as liquidity ratios (independent variables). The data were analyzed with the help of statistical package of social science (SPSS 23 version). As statistical tools, descriptive statistics, Pearson correlation, and multiple linear regression analysis were used to find out the result. The authors have found the inverse relationship between profitability indicators and liquidity ratios (CPRA, CRA) but linear relationship is found between profitability ratio and liquid security ratio (As liquidity ratio). Limitations and future direction for research are also discussed here.

Key Words: Liquidity, Profitability, Islamic commercial banks.

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Introduction

Financial disaster that took place from the length 2007 to 2009 triggered a deep issue among the bank regulators. They came up with Basel 3 accord that aims at maintaining extra reserves in terms of liquid property for banks to face future financial crisis (BCBS, 2009). Basel Committee made new policies for numerous types of risks and liquidity risk is one of them (Simone, 2011). In financial economics, a liquidity risk refers to a severe shortage of money.

According to Business Dictionary, "Probability of loss arising from a situation where (1) there will not be enough cash and/or cash equivalents to meet the needs of depositors and borrowers, (2) sale of illiquid assets will yield less than their fair value, or (3) illiquid assets will not be sold at the desired time due to lack of buyers". The liquidity of a financial institution is its capability to fund all contractual responsibilities as they fall due. These may additionally consist of lending and funding commitments and deposit withdrawals and liability maturates, within the regular course of business (Lartey, Antwi, & Boadi, 2013; and Amengor, 2010).

On the other hand, Bank profitability is the ability of a bank to generate revenue in excess of cost, in relation to the bank's capital base. A sound and profitable banking sector is better able to withstand negative shocks and contribute to the stability of the financial system (Athanasoglou, 2005). In other words, this is a company's capability of generating profits from its operations. It serves as a measurement of efficiency, and a guide to further improvement (Tabari, Ahmadi, & Emami, 2013).

Liquidity and profitability are key variables, which provide information concerning the performance and survival of the business. In order to obtain a long-term survival and healthy growth of any business, both of them should go hand in hand (Ahmad, 2016).

On the other hand, liquidity and profitability are two contradictory concepts. One cannot be effective without the other. But excess of one may slows down the other (Khan, 2013). Liquidity is necessary for uploading financial performance, maintaining and improving the market share of an entity (Bordeleau & Graham, 2010). By increasing profitability, there the probability of reducing a firms' liquidity and an extensive interest on liquidity would tend

to have an effect on the profitability (Panigrahi, 2014). A firm will not be able to fulfill its immediate obligations when it is making low profits due to the high liquidity that it gains. Thus the profit diminishes with increase in liquidity and vice versa (Maina, 2012).

But liquidity management of Islamic banks are very restricted in the interbank market due to prohibition of interest bearing instruments. For this reason, Islamic banks depend havily upon murabaha (murk up basis), sukuk, ijarah and parallel salam for managing liquidity (Ayub, 2007; and Ariffin, 2012). This study aims to find out the liquidity indicators in the selected Islamic bank in Bangladesh from 2015 to 2017 so as to examine the relationship between liquidity and profitability of Islamic banks.

Literature Review

Many studies (details are provided appendic-2) have been conducted on the relationship between liquidity and profitability in the banking industry. But some studies found no significant relationship between liquidity and profitability (Aloy, 2012; Junaidu, & Aminu, 2014; and Afia, & Mahmud, 2014). On the other hand, the following studies have found positive as well as negative relationship between liquidity and profitability of islamic commercial banks.

Chowdhury and Zaman (2018), studied Effect of Liquidity Risk on Performance of Islamic banks in Bangladesh. They analyzed the effect of liquidity risk on the islamic banks performance for the period of 2012 to 2016 by using the liquidity ratios (loan to deposit ratio, liquid risky asset to total asset, capital to total asset ratio) and profitability ratios (return on asset, return on equity). They found negative relationship between bank performance and liquidity indicators.

Alzorqan (2014) studied the relationship of liquidity chance and financial institution's overall performance for 2 banks of Jordan. Return on assets (ROA) and return on equity (ROE) have been used as indicator of Bank overall performance. Current ratio and loan to deposit had been used as liquidity measures over the year 2008 to 2010. The relationship between loan to deposit with ROA and ROI are found positive.

Saeed and Rahman (2015) analyzed the effects of liquidity risk on performance of 21 commercial banks in Malaysia for the period of 2005 to 2013. Return on assets (ROA) and return on equity (ROE) are applied as indicator to identify bank performance. Loan to deposit ratio, liquid risky asset to total asset and capital to asset ratio are used as liquidity indicators. They found liquid risky asset to total asset has negative relation with bank performance. Capital to asset ratio has mixed results on bank performance. The study concluded that the effects of liquidity indicators on bank performance are mixed and could not draw a clear result.

Mamatazakis and Bermapi (2014) analyzed the relationship between liquidity risk and Bank performance in G7 countries and Switzerland. The analysis took sample of 97 banks and found that liquidity risk negatively affected bank performance but positive relationship was found in other studies (Musiega, Olwney, Mukanzi, & Mutna, 2017; Bourke, 1989; and Alphar & Anber, 2011).

Umar, Muhamm ad, Asad and Mazhar (2015) analyzed the influence of liquidity risk on 2 Pakistani Conventional Banks for period of 2009 to 2013.The study found that current ratio was negatively correlated to banks performance. It was also found in the study of Areffin (2012).

From the above literature review, it can be said that studies examining the relationship between liquidity and profitability in case of Islamic banks have been very limited compared to the conventional banks. But this study plays an important role to enrich the literature on the risk management of the Islamic banks operating in Bangladesh. Moreover, some studies have proved that there are contradictory relationship between the liquidity and profitability of islamic (sharia based) commercial banks operating in Bangladesh (Maina, 2012; Khasharmeh, 2018; and Iqbal, 2012). That is why; the authors are interested to do this type of research.

Conceptual Framework

Liquidity is the ability to raise funds easily by selling assets. It is a measure of how easily an asset can be turned into cash. An increasing cash asset enhances liquidity and reduces liquidity risk. This risk stems from the description of banking operations (Chaplin, Emblow, & Michael, 2000)**.** Overall profitability of bank can be affected by it adversely. For this reason, the authors consider

cash position ratio average (CPRA) as a liquidity indicator. But large holdings of cash assets clearly decrease profits because of opportunity cost of forgone investment income. So banks can purchase short-term marketable and government securities that increase liquidity, but at the expense on higher potential return (Hasan, 2003). The authors consider it liquid security ratio average (LSRA). On the other hand, the authors encounter capacity ratio average (CRA) which is really a negative liquidity indicator because loan (inverstment as sharia view) and leases are often among the most illiquid assets a bank can hold (Ross, 2002). Therefore, to improve its profitability, it is imperative for a bank to increase its liquidity. The above discussion gives rise to the following objectives of our study.

Objectives of the Study

The main objective of the study is to examine the relationship between the liquidity and profitability of islamic (sharia based) commercial banks with empirical evidence from Bangladesh. To achieve the main objective, the following specific objectives are identified:

1. To examine the relationship between cash position ratio and profitability of Islamic banks.
2. To measure the relationship between liquid security ratio and profitability of Islamic banks.
3. To analyze the relationship between capacity ratio and profitability of Islamic banks.

Research Materials and Method

Sample Selection: At present, there are 08 (eight) islamc (sharia based) commercial banks are operating in Bangladesh. Except one (Union Bank), all are listed in CSE and DSE. So, the authors have excluded Union bank for sample selection. For conducting the study and well established data, the total numbers of seven (07) listed islamic commercial banks operating in Bangladesh were selected. The data were collected from the annul website of 07 islamic banks from the year 2013 to 2017.

Econometric Model: The econometric model used to obtain the objectives is: $Y1 = a + \beta1X1 + \beta2X2 + \beta3X3 + €$

Here Y=Bank performance measured by (ROAA and ROEA), a = Constant, β1-β3= Regression Co efficient of Independent Variables, € = Error term. Beta and standard deviation are used as the important measures of the risk factor as proposed by Modigliani and Pogue (Modigliani & Pogue, 1974), where Beta is the relative measure of the risk and standard deviation is the measure of the total risk.

Data Analysis and Discussion

Descriptive Statistics

Table-02: Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
ROAA	7	.40	2.71	1.2614	.79413
ROEA	7	9.22	15.00	12.1614	2.41685
CPRA	7	.13	4.86	1.1086	1.68666
LSRA	7	.02	.09	.0471	.02984
CRA	7	.20	1.30	.6200	.38777
Valid N (listwise)	7				

Source: Authors' own calculation

In this descriptive statistics (table 02), minimum, maximum, mean, standard deviation etc. are shown. The descriptive statistics gives the information of both dependent variables (profitability) and independent variables (liquidity) ratios. In this table, total observation no. is 07. Mean values indicate the average (5 year average) result of each and every variables (details in appendic-2).

Standard deviation also shows the spread available in data. Except CPRA for all factors, standard deviation is low, that indicate less risk in the model.

Correlation Analysis

Table-03: Correlation between ROAA & Liquidity

	ROAA	CPRA	LSRA	CRA
ROAA	1			
CPRA	-0.460	1		
LSRA	0.122	-0.188	1	
CRA	-0.334	0.640	-O.387	1

Source: Authors' own calculation

Table-04: Correlation between ROEA & Liquidity

	ROEA	CPRA	LSRA	CRA
ROEA	1			
CPRA	-0.460	1		
LSRA	0.005	-0.188	1	
CRA	-0.191	0.640	-0.387	1

Source: Authors' own calculation

The above table 03 and table 04 show the correlation between return on assets average (ROAA) and return on equity average (ROEA) & liquidity respectively. Table 03 (correlation between ROAA & Liquidity) shows that cash position ratio average (CPRA), liquid security ratio average (LSRA) and capacity ratio average (CRAA) were found correlation with ROAA (r = - 0.460,

r = 0,122, r = - 0.334) respectively. It indicates that CPRA and CRA were negatively correlated and LSRA was positively correlated with profitability (ROAA). On the other hand, the table 04: (correlation between ROEA and Liquidity) shows that CPRA, LSRA & CRA were also found correlation with ROEA (r = - 0.460, r = 0.005, r = - 0.191) respectively. It indicates that CPRA and CRA were negatively correlated and LSRA was positively correlated. So, it can be said that, except LSRA, remaining liquidity ratios (CPRA & CRA) were negatively correlated with bank profitability (ROAA & ROEA).

In order to measure the significance of the independent variables (liquidity ratio) on the dependent variables (profitability ratio), and to find out individual contribution of three ratio of liquidity on the two ratios of profitability, the author have extended the analysis to multiple regression model.

Regression Analysis

Table-05: Regression summary based on ROA (model-1)

Predictor/ liquidity ratio	Unstandardized Co-efficient		Value of R	Value of R^2	F - Test	Sign
	Beta	S. Error				
CPRA	-0.197	0.315	0.463	0.215	0.273	0.575
LSRA	0.544	14.822				0.973
CRA	-0.120	1.448				0.974

Source: Authors' own calculation

Table-06: Regression Summary based on ROE (model-2)

Predictor/ liquidity ratio	Unstandardized Co-efficient		Value of R	Value of R^2	F-Test	Sign
	Beta	S. Error				
CPRA	-O.976	0.895				0.355
LSRA	-2.665	42.160	0.56	0.314	0.458	0.954
CRA	1.457	4.148				0750

Source: Authors' own calculation

The above two tables (table 04 & table 05) provide useful information about regression analysis. The column labeled "Unstandardized Coefficients" reveals the unstandardized regression coefficients. The F-test in terms of ROAA and ROEA tell whether the regression coefficient is not different enough from zero to be statistically significant at the level (0.000). There is no high degree of correlation (value of R is 0.463, 0.56 respectively) between independent variables in terms of ROAA and ROEA. So there is no multicollinearity problem in the regression model (Kothari, 2011) because Kennedy (2008) identified that multicollinearity is a problem when the correlation is above 0.705. 'R' square states the proportion (percentage) of the (sample) variables in the dependent variables that can be attributed to the independent variables. Here, 'R' square is 0.215 in term of ROAA and 0.314 in term of ROEA respectively. So, 21.5% variance in term of ROAA and 31.4% variance in term of ROEA in the profitability ratios of islamic banks (dependent variables) are explained by the liquidity measures (independent variables) respectively. Hence, it can be said that larger portions of variance in the three (03) ratios of liquidity measures were unexplained. The reason for unexplained variance suggests that there were other more implied variables that account for variance in liquidity measures in terms of ROAA and ROEA. In general, R square always increases as independent variables are added to a multiple regression model.

By considering the value of unstandardized coefficients beta, the value of CPRA and CRA is negative but LSRA is positive. The beta coefficient of CPRA is -0.197. It means that every time CPRA increases by 1 unit, the profitability of islamic banks will decrease on an average by 0.197 unit. On the other hand, the beta coefficient of CRA is -0.120. It means that every time CRA increases by 1 unit, the profitability of islamic banks will decrease on an average by 0.120 units but the beta coefficient of LSRA is 0.544. It means that every time LSRA increases by 1 unit, the profitability of Islamic banks will also increase on an average by 0.544 units. Hence, it can be said that there is negative relationship between liquidity ratios (CPRA and CRA) and profitability but positive relationship between liquidity ratio (LSRA) and profitability of Islamic banks in Bangladesh.

At last, it can be said that the authors intend to examine the relationship between the liquidity risk and profitability of islamic banks operating in Bangladesh. The first objective of the study was to examine the relationship between cash position ratio and profitability of islamic banks. The obtained result from the above analysis (first & third objective) indicated that there is inverse relationship between cash position ratio and profitability of islamic banks. The findings are consistent with other studies (Umar, Muhammad, Asad & Mazhar, 2015, and Areffin, 2012).On the other hand, the positive relationship was found in the second objective. The findings are consistent with other studies (Musiega, Olweny, Mukanzi, & Mutua, 2017; Bourke, 1989; and Alper & Anbar, 2011).

Conclusion

The study examines the relationship between liquidity and profitability of 07 (sample size) Islamic banks which operate in Bangladesh. This study has explored cash position ratio, liquid security ratio, capacity ratio as liquidity indicators and return on asset and return on equity as profitability indicators. The finding of the study showed that cash position ratio and capacity ratio are negatively related with the profitability. On the other hand, liquid security ratio is positively related with the profitability. The study will contribute to the field of risk management in the banking (sharia based) sector of Bangladesh. It is also expected that future liquidity risk of the banking (sharia based) sector could be overcome by having adequate disclosure in the annual reports, particularly liquidity risk information.

Limitation and Further Research

The model has failed to get clear result about the study. In this regard, sharia based banks requires more variables for liquidity indicators which will create avenue for further research. On the other hand, variables are not significant statistically. Furthermore, more variables could be considered for improving the reliability of the model. So, Analysis of Moment Structures software (dependent variable is more than one) will get better result than statistical package of social science software (spss).

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Appendices:

Appendic-1 (Calculation of Ratio)

ROE	IBBL	EXIM	FSIBL	SIBL	AAIBL	ICBIBL	SJIBL	AVERAGE
2013	11.36	10.18	15.37	11.01	14.15	14.73	17.01	13.40
2014	8.85	11.38	9.99	15.68	12.80	14.35	12.67	12.24
2015	7.00	8.68	8.08	16.00	12.82	13.80	6.60	10.42
2016	9.28	11.78	6.91	16.16	15.70	15.72	10.78	12.33
2017	9.63	12.19	7.40	16.16	14.07	15.11	12.40	12.42
ROA	IBBL	EXIM	FSIBL	SIBL	AAIBL	ICBIBL	SJIBL	AVERAGE
2013	0.96	1.04	0.42	1.67	1.31	4.76	1.44	1.6
2014	0.67	1.15	0.38	2.36	1.10	2.04	1.00	1.24
2015	0.44	0.84	0.31	2.08	1.08	1.11	0.59	0.92
2016	0.59	1.09	0.51	2.06	1.23	2.21	0.98	1.23
2017	0.55	1.06	0.41	1.40	0.99	3.44	1.02	1.26
CPR	IBBL	EXIM	FSIBL	SIBL	AAIBL	ICBIBL	SJIBL	AVERAGE
2013	0.94	0.97	0.93	0.09	0.12	0.91	0.87	0.69
2014	0.93	0.13	0.97	0.09	0.11	0.93	0.88	0.57
2015	0.92	0.15	1.01	0.10	0.14	0.11	0.85	0.46
2016	0.94	0.12	1.01	0.08	0.15	0.98	0.13	0.48
2017	0.93	0.11	0.94	0.08	0.16	1.03	0.76	0.57
LSR	IBBL	EXIM	FSIBL	SIBL	AAIBL	ICBIBL	SJIBL	AVERAGE
2013	0.11	0.04	0.03	0.04	0.04	0.01	0.04	0.04

2014	0.15	0.03	0.04	0.33	0.03	0.01	0.03	0.08
2015	0.13	0.03	0.04	0.03	0.02	0.01	0.03	0.04
2016	0.06	0.03	0.04	0.04	0.02	0.01	0.03	0.03
2017	0.03	0.03	0.04	0.04	0.02	0.01	0.03	0.02
CR	IBBL	EXIM	FSIBL	SIBL	AAIBL	ICBIBL	SJIBL	AVERAGE
2013	0.92	0.84	0.02	0.80	0.72	0.35	0.03	0.52
2014	0.01	0.85	1.94	0.80	0.79	0.35	0.04	0.68
2015	0.02	0.84	2.20	0.83	0.74	0.39	0.02	0.72
2016	0.02	0.85	2.36	0.83	0.73	0.40	0.97	0.88
2017	0.03	0.85	0.02	0.80	0.70	0.42	0.14	0.42

Appendic-2 (summary of literature review)

Previous study	Liquidity risk indicator	Profitability indicator	Result
Alzoubi (2017)	CASH; SEC; SIZE; SIZE2; ROA; EQTY; BAD	Lower liquidity cost.	Positive relationship with liquidity.
Alzorqan (2014)	Current ratio and loan	ROA, ROI	Positive relation with profitability.
Arif & Anees (2012)	Deposit, cash, Liquidity gap and NPL	Net profit before tax.	Negative relationship with profitability.
Bashir (1999)	Bank size	ROA, ROE, ROD.	Statistically significant relationship with profitability.

Chowdhury & Zaman (2018)	LTD, Liquid risky asset to total asset, Capital to total asset ratio.	ROA, ROE.	Negative relationship with profitability.
Kasharmeh (2018)	CTDA, CDTD, INVSTA, INVSTD	ROA, ROE, ROD.	Both negative and positive relationship with profitability.
Lartey,Antwi and Boadi (2013)	TIR	ROA	Positive relationship with profitability.
Maina (2012)	Total loans to assets.	ROA	Both positive and negative relationship with profitability.
Rahman and Saeed (2015)	Loan to deposit ratio, liquid risky asset to total asset and capital to asset ratio.	ROA, ROE	Mixed relationship.

Analyzing the Optimality Conditions for Nonlinear Semi-Infinite Multi-objective (Pareto) Optimization Problems Involving Generalized Invex Functions

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Syed Anayet Karim **

Abstract

This research investigated the invexity and generalized invexity to analyze the Optimality Conditions for the new classes of nonlinear optimization problems of the so-called nonlinear semi-infinite programming (NSIP). In this study, Fritz-John (FJ) and Karush-Kuhn-Tucker (KKT) type optimality conditions are also established under this invexity. Finally we recall the definition of a class of generalized invex functions and then we apply them to nonlinear semi-infinite multi-objective programming (NSIMP).

Key Words: Nonlinear semi-infinite multi-objective programming, Invexity and generalized invexity, Invex functions, Fritz-John and Karush-Kuhn-Tucker type, Optimality conditions.

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1 Introduction

This paper concerns the study of new classes of nonlinear optimization problems of the so called Nonlinear Semi-infinite Programming (NSIP). This types of problems are generally defined on either infinite dimensional spaces of decision variables or contains infinitely many of equality and inequality constraints with arbitrary (may not be compact) index sets (but not both). So the Semi-infinite programming (SIP) allows us for either infinitely many constraints or infinitely many variables but not both. An Infinite programming (IP) problem can be reduced to semi-infinite programs in case of finite dimensional spaces of decision variables.

In optimization theory, a Semi-infinite programming problem is also an optimization problem which occurs in many branches of science, engineering, and economics as well as in other areas. Due to the growing number of theoretical and practical applications in which constrains are depend on time or space and thus can be formulated as Semi-infinite programming. SIP has recently become one of the most substantial research areas in applied mathematics and operation research [1]. Although the origins of SIP optimization are related to Chebyshev approximation, to the classical work of Haar on linear semi-infinite system [2], and to the Fritz John optimality conditions [3], the term SIP was coined in 1962 by Charnes, Cooper and Kortanek in some papers devoted to LSIP [4,5,6]. But in the mean time G.B.Dantzig (1963) solved the standard convex problems with SIP. Gustafson and Kortanek proposed, during the early 1970s, the first numerical methods for SIP models arising in applications [7]. A large class of engineering design problems such as electronic circuit design, seismic-resistant structure design, and single-input single-output control system design etc can be formulated as nonlinear semi-infinite program (see Polak, 1981). The theory of SIP was developed in the last two decades due to its important applications.

A common approach to SIP which yields the global convergence is the use of SQP techniques in conjunction with an exact penalty function [8,9,10,11]. The methods given in papers [9,10,11] use the implicit function theorem on each semi-infinite constraint to test convergence. The main purpose of this article is to highlight the nonlinear semi-infinite problem and their characteristics on the

connection with optimality or KKT conditions. It is interesting that the semi-infinite programming is an extension of finite nonlinear programming. Many solution methods in finite optimization are based on the KKT system. The invexity and generalized invexity plays a central role in optimization theory and mathematical economics.

2 Theoretical Backgrounds

In this section we consider the following so-called Nonlinear Semi-Infinite Programming problem (NSIP):

(P) Minimize $f(x)$. (2.1)

Subject to, $g(x,u) \le 0$, $(\forall x \in X, u \in U)$.

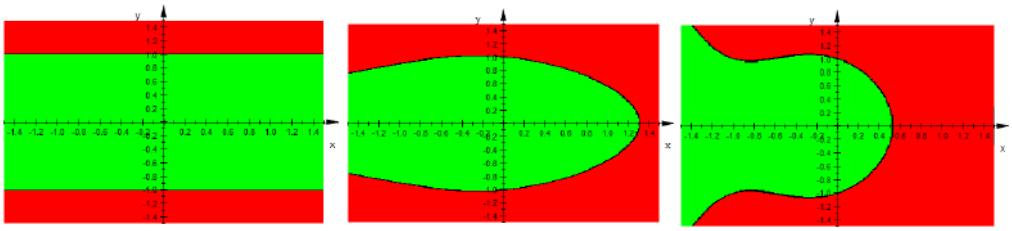
Where, $x \in X \subset R^n$ is a nonempty set and $U \subset R^m$ is an infinite parameter countable set and does not depend on x. Let f can be taken as $f = (f_1, f_2, \ldots . f_p) : R^n \to R^p$ and $g : R^n \times U \to R^p$. This two functions are assumed to be real valued nonlinear (may not both) functions and at least twice continuously differentiable with respect to x and u respectively. We can also define a NSIMP as multi-objective optimization problem (MOP) for given p objective functions which have to be minimized. In that case, the set of optimal compromises with respect to the objective functions is called the Pareto set. Any point $x \in R^n$ in parameter space will be called a Pareto point if there is no other point which is at least as good as x through all the objectives and strictly better in at least one objective functions.

Example 1: Consider the problem like (P), and the following problem satisfies all the conditions of (P): Minimize $z = f(x) = \frac{1}{3}x_1^2 + x_2^2 + \frac{1}{2}x_1$

Subject to, $u^2 x_1 + x_2^2 - (1 - x_1^2 u^2)^2 \ge 0$, $u \in [0,1]$.

This problem holds for all condition of the type of problem (P). In this problem there are finite number of variables and infinite number of constraints

depending on $u \in [0,1]$. With $[x_1^0, x_2^0] = [1,2]$ and optimal solution is $[x_1^*, x_2^*] = [-0.75, -0.618034\ ]$.



(a) (b) (c)

Figure 2.1: Feasible regions (green shaded) of the above Example 1, the NSIP constraint depending on $u \in [0,1]$, fig.(a) for u= 0, fig.(b) for u=0.5, and fig.(c) for u=1.

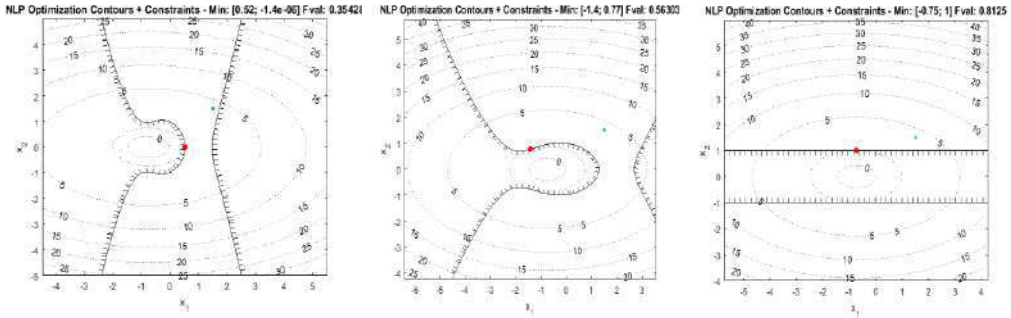


Figure 2.2: The optimal solution of the above NSIP problem found by using MATLAB depending on only three values of u (for u=1, for u=0.5 and for u=0 respectively).

2.1 Optimality conditions for NSIP:

The feasible set of the above problem (P) can be written as

$$S = \left\{ x \in X \middle| g(x, u^i) \leq 0, x \in u^i \in U \right\}$$

In this section we use the generalized convex functions. An important generalization of convex function termed as symbolically convex function was first introduced by Ewing[12]. Kaul and Kaur[13] defined symbolically quasi

convex and pseudo convex. We also follow Weir and Mond[14] , Yang[15] and Li [16] which is related with preinvex function.

Definition 1: Let $f : X \to R^n$ be any function, then we can say that the set $X \subset R^n$ is an η – locally starshaped set at $x, x^* \in X$ If for any $x \in X$ there exist $0 < a_\eta(x, x^*) \leq 1$ such that $x^* + \lambda\eta(x, x^*) \in X$ for any $\lambda \in [0, a_\eta(x, x^*)]$.

Definition 2 (Hayashi and komiya[17]): Let $f : X \to R^n$ be any function, then it said to be a convexlike function if for any $x_1, x_2 \in X$ and $\lambda \in [0,1]$ then there exist $y \in X$ such that $f(y) \leq \lambda f(x_1) + (1-\lambda) f(x_2)$.

Definition 3: Let $f : X \to R^n$ be any function, where $X \subset R^n$ is an η – locally starshaped set at $x^* \in X$. Then we say that f is η – *semidiffer entiable* at any $x^* \in X$, if $\nabla^+ f(x^*, \eta(x, x^*))$ exist for each $x \in X$ such that

$$\nabla^+ f(x^*, \eta(x, x^*)) = \lim_{\lambda \to 0^+} \frac{1}{\lambda}\left[f(x^* + \lambda\eta(x, x^*)) - f(x^*)\right]$$

(The right derivative at x^* along the direction $\eta(x, x^*)$

And if f is semi differentiable at any $x^* \in X$, then f is said to be η – *semidiffer entiable* at x^* on X .

Theorem 1: Let $x^* \in X$, be a local weak minimum solution for the problem:

$$\text{Minimize } (f_1(x), ..., f_p(x)),$$

$$\text{subject to } g(x, u^i) \leq 0, i \in I$$

$$x \in X \subset S,$$

Here $U \subset R^m$ is an infinite countable set, $f = (f_1, f_2, ..., f_p) | X \to R^p$ and $g | X \times U \to R^m$ are η – *semidiffer entiable* at x^* . Also consider that $g(x, u^i)$, $i \in J(x^*)$ is a continuous function at x^* and $\nabla^+ f(x^*, \eta(x, x^*))$ and

$\nabla^+ g\left(\left(x^*, \eta\left(x, x^*\right)\right), u^i\right)$ are convex like functions on X, where $I = \left\{i : g\left(x, u^i\right) \leq 0, x \in X, u^i \in U\right\}$, the set of i for which the active constraint is $I\left(x^*\right) = \left\{i \middle| g\left(x, u^i\right) = 0, x \in X, u^i \in U\right\}$ and $J\left(x^*\right) = \left\{i \middle| g\left(x, u^i\right) < 0, x \in X, u^i \in U\right\}$ if $g\left(x, u^i\right)$ satisfies a regularity condition at x^* (see[Definition 3.2][18] then there exist $\lambda_0 \in R^p$ and $\left(\lambda_i\right)_{i \in I} \in R^m$ such that

$$\lambda_0^T \nabla^+ f\left(x^*, \eta\left(x, x^*\right)\right) + \sum_{i \in I} \lambda_i \nabla^+ g\left(\left(x^*, \eta\left(x, x^*\right)\right), u^i\right) \geq 0 \text{ for all } x \in X,$$

$$\sum_{i \in I} \lambda_i g\left(x^*, u^i\right) = 0, g\left(x^*, u^i\right) \leq 0,$$

$$\lambda_0^T e = 1, \lambda_0 \geq 0, \left(\lambda_i\right)_{i \in I} \geq 0, \text{ where } e = (1, \ldots\ldots 1)^T \in R^p.$$

2.2 Necessary optimality conditions for NSIP:

Lemma 1: Let $x^* \in X \subset S$ be a local weak minimum solution for (P) and let there exist $x_1^* \in X$. Further we assume that $g\left(x, u^i\right)$ is continuous at x^* for any $i \in J\left(x^*\right)$and f, g^* are $\eta - semidiffer entiable$ at x^*. Then the system

$$\nabla^+ f\left(x^*, \eta\left(x, x^*\right)\right) < 0$$

$$\nabla^+ g^*\left(\left(x^*, \eta\left(x, x^*\right)\right), u^i\right) < 0, \tag{2.2}$$

has no solution at $x \in X$.

Proof: Let x^* be a local weak minimum solution for (P) and suppose that there exist $x_1^* \in X$ such that $\nabla^+ f\left(x^*, \eta\left(x_1^*, x^*\right)\right) < 0$ (2.3)

$$\nabla^+ g^*\left(\left(x^*, \eta\left(x_1^*, x^*\right)\right), u^i\right) < 0, \tag{2.4}$$

Now consider a function $\phi\left(x^*, x_1^*, \lambda\right) = f\left(x^* + \lambda\eta\left(x^*, x_1^*\right)\right) - f\left(x^*\right)$

Then we obviously get $\phi\left(x^*, x_1^*, 0\right) = 0$ and the right differential of $\phi\left(x^*, x_1^*, 0\right)$ with respect to λ at $\lambda = 0$ we get the following result and which is given by

$$\lim_{\lambda\to 0}\frac{1}{\lambda}\left[\phi\left(x^*, x_1^*, \lambda\right)-\phi\left(x^*, x_1^*, 0\right)\right]=\lim_{\lambda\to 0}\frac{1}{\lambda}\left[f\left(x^*+\lambda\eta\left(x_1^*, x^*\right)\right)-f\left(x^*\right)\right]$$

$$\Rightarrow \lim_{\lambda\to 0}\frac{1}{\lambda}\left[\phi\left(x^*, x_1^*, \lambda\right)-\phi\left(x^*, x_1^*, 0\right)\right]=\nabla^+ f\left(x^*, \eta\left(x_1^*, x^*\right)\right)$$

Using (2.3), we get $\lim_{\lambda\to 0}\frac{1}{\lambda}\left[\phi\left(x^*, x_1^*, \lambda\right)-\phi\left(x^*, x_1^*, 0\right)\right]<0.$

Therefore, $\phi\left(x^*, x_1^*, \lambda\right)<0$ if λ lies in some open interval, i.e. $\lambda\in\left(0,\delta_1\right)$, $\delta_1>0$ so we get

$$f\left(x^*+\lambda\eta\left(x_1^*, x^*\right)\right)<f\left(x^*\right), \text{ for } \lambda\in\left(0,\delta_1\right).$$

Similarly, we get another result $g^*\left(\left(x^*+\lambda\eta\left(x_1^*, x^*\right)\right), u^i\right)<g^*\left(x^*, u^i\right)=0$ for $\lambda\in\left(0,\delta_2\right)$, $\delta_2>0$. Now since $i\in J\left(x^*\right)$, $g\left(x, u^i\right)<0$ and $g\left(x, u^i\right)$ is continuous at x^*, so there exist another positive integer $\delta'>0$ such that $g\left(\left(x^*+\lambda\eta\left(x_1^*, x^*\right)\right), u^i\right)<0$, $\lambda\in\left(0,\delta'\right)$, for any $i\in J\left(x^*\right)$, Consider $\delta=\min\left(\delta_1,\delta_2,\delta'\right)$, then

$$x^*+\lambda\eta\left(x_1^*, x^*\right)\in S_\delta\left(x^*\right)\subset N_\delta\left(x^*\right),\ \lambda\in\left(0,\delta\right), \tag{2.5}$$

Where $S_\delta\left(x^*\right)$ is a hyperplane around x^* and $N_\delta\left(x^*\right)$ is a nbd. of x^*. So we obviously get

$$f\left(x^*+\lambda\eta\left(x_1^*, x^*\right)\right)<f\left(x^*\right), \tag{2.6}$$

$$g\left(\left(x^*+\lambda\eta\left(x_1^*, x^*\right)\right), u^i\right)<0, \text{ for any } \lambda\in\left(0,\delta\right) \tag{2.7}$$

Now from (2.5) and (2.7), we have

$$x^*+\lambda\eta\left(x_1^*, x^*\right)\in X\cap N_\delta\left(x^*\right), \text{ for any } \lambda\in\left(0,\delta\right).$$

Again using (2.6), for $B(x)=\left(f_1(x),\ldots\ldots, f_p(x)\right)$, we get the following result

$$B\left(x^*+\lambda\eta\left(x_1^*, x^*\right)\right)<B\left(x^*\right).$$

But this contradicts the assumptions that, x^* is a local weak minimum solution for (P). Hence there is no solution like $x \in X$ satisfying the system (2.2).

Proposition 1 (FJ type necessary conditions): In case of problem (P), let us consider that $g(x,u^i)$ is continuous at x^* for $i \in J(x^*)$, $\nabla^+ f(x^*, \eta(x,x^*))$ and $\nabla^+ g^*((x^*, \eta(x,x^*)),u^i)$ are convex like functions on X. If x^* is a local minimum solution for (P), then there exist $\lambda_0 \in R^p$ and $\lambda = (\lambda_i)_{i\in I} \in R^m$ such that

$$\lambda_0^T \nabla^+ f(x^*, \eta(x,x^*)) + \sum_{i\in I(x^*)} \lambda_i \nabla^+ g^*((x^*, \eta(x,x^*)),u^i) \geq 0 \text{ for all } x \in X, \quad (2.8)$$

$$\sum_{i\in I} \lambda_i g(x^*, u^i) = 0 \quad (2.9)$$

$$(\lambda_0, \lambda) \neq 0, (\lambda_0, \lambda) \geq 0. \quad (2.10)$$

Proof: If x^* is a (local) weak minimum solution for (P), then by Lemma 1, the system (2.2) has no solution at $x \in X$. But the assumptions hold (Hayashi and komiya[19]) also holds and since the system (2.2) has no solution at $x \in X$

Then we obviously get the following result, i.e. there exists $\lambda_0 \in R^p, \lambda_i \in R$ $(i \in I(x^*))$, such that $\lambda_0 \geq 0, \lambda_i \geq 0$ $(i \in I(x^*)), (\lambda_0, (\lambda_i)_{i\in I(x^*)}) \neq 0$ with

$$\lambda_0^T \nabla^+ f(x^*, \eta(x,x^*)) + \sum_{i\in I(x^*)} \lambda_i \nabla^+ g^*((x^*, \eta(x,x^*)),u^i) \geq 0 \text{ for all } x \in X, \quad (2.11)$$

Now if we put $\lambda_i = 0$ for $i \in J(x^*)$, by (2.11) we obviously get (2.8).

Finally, the relation (2.7) follows obviously and hence the proof.

Proposition 2: (KKT type necessary conditions): In case of problem (P), let us consider that $g(x,u^i)$ is continuous at x^* for $i \in J(x^*)$, $\nabla^+ f_j(x^*, \eta(x,x^*))$ $j = (1,2,...., p)$ and $\nabla^+ g^*((x^*, \eta(x,x^*)),u^i)$ are convex like functions on X. If g satisfies (GSCQ) at x^*.and If x^* is a local minimum solution for (P), then there exist $\lambda_0 \in R_+^p$ and $\lambda \in R^m$ such that

$$\sum_{j=1}^{p}(\lambda_0)_j \nabla^+ f_j\left(x^*, \eta\left(x, x^*\right)\right) + \sum_{i\in I} \lambda_i \nabla^+ g^*\left(\left(x^*, \eta\left(x, x^*\right)\right), u^i\right) \geq 0 \text{ for all } x \in X,$$

$$\sum_{i\in I} \lambda_i g\left(x^*, u^i\right) = 0 \quad g\left(x^*, u^i\right) \leq 0$$

$$\lambda_0^T e = 1, \lambda_0 \geq 0, \lambda \geq 0, \text{ where } e = (1, \ldots\ldots 1)^T \in R^p.$$

Proof: If x^* is a local weak minimum solution for (P), then applying Theorem 1 to the problem (P) we can write that there exist $\lambda_0 \in R_+^p$ and $\lambda \in R^m$ such that

$$\sum_{j=1}^{p}(\lambda_0)_j \nabla^+ f_j\left(x^*, \eta\left(x, x^*\right)\right) + \sum_{i\in I} \lambda_i \nabla^+ g^*\left(\left(x^*, \eta\left(x, x^*\right)\right), u^i\right) \geq 0 \text{ For all } x \in X, \quad (2.12)$$

$$\sum_{i\in I} \lambda_i g\left(x^*, u^i\right) = 0 \quad (2.13)$$

$$g\left(x^*, u^i\right) \leq 0 \quad (2.14)$$

$$\lambda_0^T e = 1, \quad (2.15)$$

$$\lambda_0 \geq 0, \lambda \geq 0 \quad (2.16)$$

Thus completes the proof.

2.3 Sufficient optimality conditions for NSIP

In this section we use the concept of (locally) weak optimality, and give some sufficient optimality results for the so called problem (P).

(Hayashi and komiya[17]) and we will follow the definitions of Mishra et al.[20]

Definition 4: In case of problem (P), let $f : X \to R^n$ be a function, where $X \subset R^n$ is an η – locally starshaped set at $x^* \in X$. Then we say that f is:

i. Semilocally preinvex (slpi) at x^* if, corresponding to x^* and each $x \in X$, there exist a positive number $d_\eta\left(x, x^*\right) \leq a_\eta\left(x, x^*\right)$ such that

$$f\left(x^* + \lambda\eta\left(x, x^*\right)\right) \leq \lambda f(x) + (1-\lambda) f\left(x^*\right) \text{ for } 0 < \lambda < d_\eta\left(x, x^*\right);$$

ii. Semilocally quasi-preinvex (slqpi) at x^* if, corresponding to x^* and each $x \in X$, there exist a positive number $d_\eta\left(x, x^*\right) \leq a_\eta\left(x, x^*\right)$ such that $f(x) \leq f\left(x^*\right)$ for $0 < \lambda < d_\eta\left(x, x^*\right)$; implies $f\left(x^* + \lambda\eta\left(x, x^*\right)\right) \leq f\left(x^*\right)$.

Definition 5: In case of problem (P), and this problem is $\eta - semidiffer entiable$ type I-preinvex at x^* if for any $x \in X$, then we get

$$f_j(x) - f_j\left(x^*\right) \geq \nabla^+ f_j\left(x^*, \eta\left(x, x^*\right)\right), \forall j \in J = \{1,2,..., p\},$$

$$-g\left(x^*, u^i\right) \geq \nabla^+ g\left(\left(x^*, \eta\left(x, x^*\right)\right), u^i\right), \ i \in I$$

Definition 6: In case of problem (P), and this problem is $\eta - semidiffer entiable$ pseudo-quasi-type I-preinvex at x^* if for any $x \in X$, then we get

$$\nabla^+ f_j\left(x^*, \eta\left(x, x^*\right)\right) \geq 0 \Rightarrow f_j(x) \geq f_j\left(x^*\right), \forall j \in J$$

$$-g\left(x^*, u^i\right) \leq 0 \Rightarrow \nabla^+ g\left(\left(x^*, \eta\left(x, x^*\right)\right), u^i\right) \leq 0, \forall i \in I$$

The problem (P) is $\eta - semidiffer entiable$ pseudo-quasi-type I-preinvex on X if it is $\eta - semidiffer entiable$ pseudo-quasi-type I-preinvex at any $x^* \in X$.

Theorem 2: In case of problem (P), let us consider that $x^* \in X$ be η – symbolically type I-preinvex at x^*. Also we can assumed that there exist $\lambda_0 \in R^p$ and $\lambda = (\lambda_i)_{i \in I} \in R^m$ such that

$$\sum_{j=1}^{p} (\lambda_0)_j \nabla^+ f_j\left(x^*, \eta\left(x, x^*\right)\right) + \sum_{i \in I} \lambda_i \nabla^+ g^*\left(\left(x^*, \eta\left(x, x^*\right)\right), u^i\right) \geq 0 \text{ for all } x \in X, \quad (2.17)$$

$$\sum_{i \in I} \lambda_i g\left(x^*, u^i\right) = 0 \quad (2.18)$$

$$\lambda_0^T e = 1, \tag{2.19}$$

$$\lambda_0 \geq 0, \lambda \geq 0 \tag{2.20}$$

.

Then x^* is a weak minimum solution for the problem (P).

Proof: First of all we have to proceed by contradiction. Let us consider that $\widetilde{x} \in X$ such that

$$f_j(\widetilde{x}) < f_j(x^*) \text{ for any } j \in J \text{, where } J = \{1,2,..., p\}. \tag{2.21}$$

Since the problem (P) is η – symbolically type I-preinvex at x^*, then we get the following result

$$f_j(\widetilde{x}) - f_j(x^*) \geq \nabla^+ f_j\left(x^*, \eta(\widetilde{x}, x^*)\right), \forall j \in J = \{1,2,..., p\}, \tag{2.22}$$

$$-g(x^*, u^i) \geq \nabla^+ g\left(\left(x^*, \eta(\widetilde{x}, x^*)\right), u^i\right), \ i \in I \tag{2.23}$$

Now multiplying (2.22) by the condition $(\lambda_0)_j \geq 0, j \in J, \lambda_0 \in R^p$ and (2.23) by $\lambda_i \geq 0, i \in I$, and then summing the obtained result of the relations is given by

$$\sum_{j=1}^{p} (\lambda_0)_j \left(f_j(\widetilde{x}) - f_j(x^*)\right) - \sum_{i \in I} \lambda_i g(x^*, u^i)$$

$$\geq \sum_{j=1}^{p} (\lambda_0)_j \nabla^+ f_j\left(x^*, \eta(\widetilde{x}, x^*)\right) + \sum_{i \in I} \lambda_i \nabla^+ g\left(\left(x^*, \eta(\widetilde{x}, x^*)\right), u^i\right) \geq 0,$$

In the above relation we observe that the last inequality is according to the relation (2.17). So we obviously get the following result

$$\sum_{j=1}^{p} (\lambda_0)_j \left(f_j(\widetilde{x}) - f_j(x^*)\right) - \sum_{i \in I} \lambda_i g(x^*, u^i) \geq 0. \tag{2.24}$$

Since $x \in X$, $\lambda \geq 0$ so by (2.18) and (2.24) we obtain

$$\sum_{j=1}^{p} (\lambda_0)_j \left(f_j(\tilde{x}) - f_j(x^*) \right) \geq 0 . \tag{2.25}$$

Now using (2.19), (2.20) and (2.25) we get that there exist $j_0 \in J$ such that

$f_{j_0}(\tilde{x}) \geq f_{j_0}(x^*)$ But this is the contradiction to (2.21).

Thus the theorem is proved and we can easily state that x^* is a weak minimum solution for the problem (P).

Theorem 3: In case of problem (P), let us consider that $x^* \in X$, $\lambda_0 \in R^p$ and $\lambda \in R^m$ such that the conditions (2.17)-(2.20) of the Theorem 2 hold. Moreover let us assume that the problem (P) is $\eta - semidiffer\ entiable$ pseudo-quasi-type I-preinvex at x^*. Then x^* is a weak minimum solution for the problem (P).

Proof: First of all assume that x^* is not a weak minimum solution for the problem (P), then there exist $\tilde{x} \in X$ such that

$f_j(\tilde{x}) < f_j(x^*)$ for any $j \in J$, where $J = \{1,2,..., p\}$.

Now for the Definition 5 i.e. by the $\eta - semidiffer\ entiable$ pseudo-quasi-type I-preinvex of (P) at x^*, we immediately get the following result

$$\nabla^+ f_j(x^*, \eta(\tilde{x}, x^*)) < 0 \text{ for any } j \in J$$

Again using the conditions, $(\lambda_0)_j \in R_+^p$, $\lambda_0^T e = 1$ we obtain that

$$\sum (\lambda_0)_j \nabla^+ f_j(x^*, \eta(\tilde{x}, x^*)) < 0 . \tag{2.26}$$

Now for $i \in I(x^*)$ and $g(x^*, u^i) = 0$ and it follows that

$$-g(x^*, u^i) \leq 0 \text{ , for any } i \in I(x^*).$$

And for η – *semidiffer entiable* pseudo-quasi-type I-preinvex of (P) at x^*, we get the result

$$\nabla^+ g\left(\left(x^*, \eta\left(\tilde{x}, x^*\right)\right), u^i\right) \leq 0 \text{ , for any } i \in I\left(x^*\right).$$

Since, $\lambda \in R_+^m$ and, putting $\lambda_i = 0$ and for any $i \in I\left(x^*\right)$, we get

$$\sum_{i \in I} \lambda_i \nabla^+ g\left(\left(x^*, \eta\left(\tilde{x}, x^*\right)\right), u^i\right) \leq 0 \tag{2.27}$$

Now using (2.26) and (2.27) we obviously obtain

$$\sum_{j=1}^{p} \left(\lambda_0\right)_j \nabla^+ f_j\left(x^*, \eta\left(\tilde{x}, x^*\right)\right) + \sum_{i \in I} \lambda_i \nabla^+ g\left(\left(x^*, \eta\left(\tilde{x}, x^*\right)\right), u^i\right) < 0 \text{ ,}$$

But it is contradiction to (2.17).

Thus x^* is a weak minimum solution for the problem (P) and hence the theorem is proved.

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In Silico Molecular Docking and ADME/T Analysis of Selected Bioactive Compounds from *Leucas Zeylanica* Against Breast Cancer

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Abstract

Breast cancer is the most common invasive cancer and the second leading cause of cancer death in women. It develops from the breast tissue and the signs may include a lump in the breast, dimpling of the skin, a change in breast shape, fluid coming from the nipple etc. From the literature review, it had been found that estrogen receptor alpha (ER-α) is one of the main responsible cause for breast cancer. The study aimed to screen out the effective bioactive compounds from Leucas zeylanica. Thirty seven compounds were identified by gas chromatography–mass spectrometry and among them, fourteen bioactive compounds were selected for in silico analysis against ER-α using Schrödinger Suite-Maestro v10.1.Among all the compounds 3-azabicyclo [3.2.2] nonane showed the best docking score towards ER-α. So, 3-azabicyclo [3.2.2] nonane may be the best compound for selective inhibitors of ER-α. Further in vivo investigations are needed to identify potent lead compounds.

Key Words: Breast cancer; *in silico*, *Leucas zeylanica*, estrogen receptor alpha; Schrödinger Suite-Maestro v10.1.

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1. Introduction

Breast cancer, with a frequency of 10.4% percent is the utmost prevalent type of cancer where normal breast cells have the receptors to bind estrogen and progesterone circulating in the blood.[1] These blood circulating hormones bind to the receptors and produce a growth response in the form of a signal cascade leading to cell proliferation and growth. Their role in cancerous cells cannot be undermined as estrogen function with oncogenes and tumor suppressor genes causing the cell to grow out of control.[2] Breast cells that are estrogen and progesterone receptor positive (i.e., ER+ and PR+) are more likely to respond hormonal therapy and have a better prognosis than cancers that are hormone receptor negative. Recently it has been studied that the compounds from natural sources are of great importance for their ant carcinogenic properties because of their less toxicity and vast abundance[3] and fortunately 35% of all of the cancer cases can be addressed by the variation of dietary habits as well as phytochemicals for BCs.[4,5] In addition, the phytochemicals have high selective biological actions and they are easy to extract.

By reviewing literature it was found that, different plants of subfamily Lamioideae and family Lamiaceae have anticancer activity specially *Leucas aspera*[6] but less attention has been paid on the plant *Leucas zeylanica* regarding bio-active compounds isolation and anticancer activity specially activity against breast cancer.

Leucas zeylanica, commonly known as Ceylonslit wort, is a herbaceous aromatic plant which is small, annual, tufted, terrestrial in nature and is of the family Lamiaceae. The herb isbitter in taste and the indigenous tribes use *L. zeylanica* for fever, jaundice, and for scorpion and snake bites.[7]

Through the process of gas chromatography-mass spectrophotometry (GC-MS) several compounds had been isolated for molecular docking. Molecular docking methodologies are of terrific importance in the making plans and layout of new drugs. These strategies goal to expect the experimental binding mode and affinity of a small molecule within the binding site of the receptor target of

interest. A successful docking methodology must be able to correctly predict the native ligand pose the receptor binding site (i.e., to find the experimental ligand geometry within a certain tolerance limit) and the associated physical-chemical molecular interactions.[8]

The principal aim of this study was to find out theeffective bioactive compounds from the GC-MS compound list of *L. zeylanica*, which could be the probable inhibitor of estrogen receptor alpha (ER-α).

2. Materials and Methods

2.1. Protein Preparation

Three-dimensional crystal configuration of estrogen receptor alpha (PDB id: 3ERT) was downloaded in pdb (Protein Data Bank) file format from the protein data bank. The structure was further refined with the help of protein preparation wizard of Schrödinger Suite-Maestro v10.1. Furthermore, the bond orders and charges along with the addition of hydrogen to the heavy metals, selenomethionines conversion to the methionine were done and at last water were deleted by the use of force field OPLS_2005 and minimization was carried out by setting maximum heavy atom root mean-square-deviation to 0.30 Å.[9]

2.2. Ligand Preparation

The gas chromatography helps to separate mixture of components into individual and mass spectrometry identifies molecules based on their mass. So, GC-MS is a chemical analysis technique combining two instruments to provide for powerful separation and identification. From GC-MS thirty-seven (37) compounds had been identified (Figure-1) and among which only fourteen (14) bioactive compounds were enlisted and subjected to play their role as ligands. Their lists as well as structure and PubChem Id number is given in (Table-1).

Figure-1: Total ionic chromatogram (TIC) for the methanolic extract of the aerial parts of *L. zeylanica* via gas chromatography–mass spectrometry.

Biomedical and Toxicological Research Institute

IFST, BCSIR, Dhaka-1205

Sample Information

Analyzed by : Admin

Analyzed : 6/18/2019 4:09:52 PM

Sample Type : Unknown

Sample Name : LZ

Sample ID : LZ

Injection Volume : 1.00

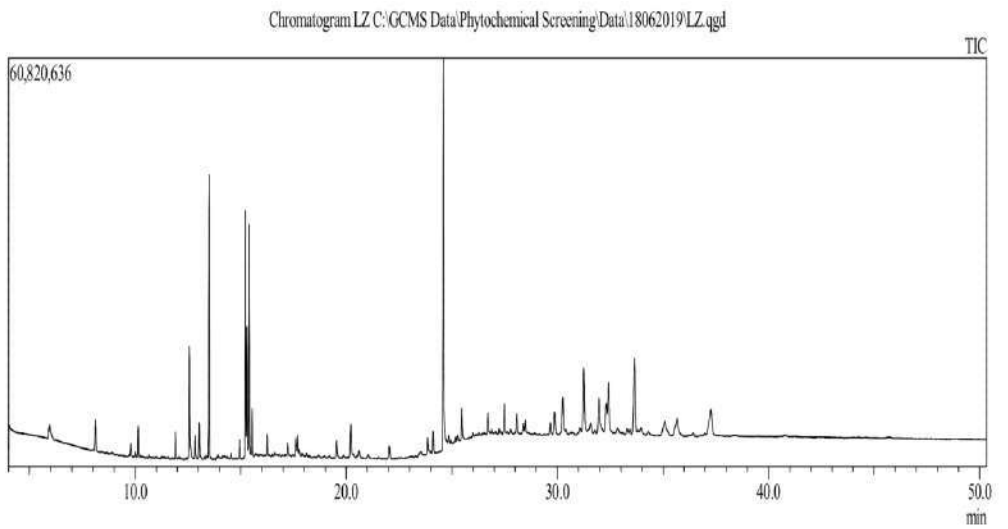
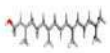
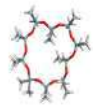
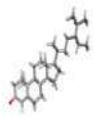


Table-1: Compounds list and structure (2D) along with their PubChem Id number.

Sl. No.	Compound Name	Compound structure(2D)	PubChem Id(CID)
01.	3,7,11,15-tetramethyl-2-hexadecen-1-ol		5366244
02.	3-azabicyclo[3.2.2]nonane		5384531
03.	Methyl 6-octadecenoate		11109696
04.	Methyl (E)-octadec-6-enoate		5284421
05.	11-oxa-dispiro[4.0.4.1]undecan-1-ol		558562
06.	13-docosenamide		5365371

07.	Eicosamethylcyclodecasiloxane		519601
08.	Tetradecamethylcycloheptasiloxane		7874
09.	Octadecamethylcyclononasiloxane		11172
10.	Methyl hexadecanoate		8181
11.	Methyl stearate		8201
12.	Phytyl acetate		6428538
13.	Stigmast-4-en-3-one		5484202
14.	11-bromoundecanoic acid methyl ester		223913

Compounds were retrieved from PubChem databases (Access date: 11.8.2019). The 2D structures for these were built by using Ligprep2.5 in Schrödinger Suite 2015 with an OPLS_2005 force field. Their ionization states were generated at pH7.0±2.0 using Epik2.2 in Schrödinger Suite. Up to 32 possible stereoisomers per ligand were retained.

2.3. Receptor Grid Generation

Receptor grids were analysed for prepared proteins such that various ligand poses bind within the predicted active site through docking. In Glide, grids were created keeping the default parameters of van der Waals scaling factor 1.00 and charge cutoff 0.25 subjected to OPLS_2005 force field. A cubic box of specific dimensions placed round the centroid of the active site residues was generated for the receptor. The bounding box was set to 15 Å × 15 Å × 15 Å for docking experiments.

2.4. Glide Standard Precision (SP) Ligand Docking

With the help of Schrödinger Suite-Maestro v10.1 the ligand docking was carried out which were furthermore applied to non-cis/trans amide bonds and the van der Waals scaling factor and partial charge and cut-off were selected.[10,11] Final scoring was presented on energy-minimized poses and displayed as Glide score. The best-docked pose with lowest Glide score value was recorded for each ligand.

2.5. ADME (absorption, distribution, metabolism, and excretion) and Toxicity Analysis

The pharmacokinetic characteristics of all identified phyto compounds were evaluated and screened for drug candidacy using Lipinski's rule of five (RO5). According to Lipinski's RO5, a compound may exhibit optimal drug-like behavior if the selected parameters are within the specified limit and do not violate more than one of the following five criteria: molecular weight <500 g/mol; ≤5 hydrogen bond donors; ≤10 hydrogen bond acceptors; lipophilicity <5; and molar refractivity between 40 and 130. The web-based tool Swiss ADME, which is considered to be a convenient drug discovery tool, was used to analyze the drug likeness criteria of the detected biological compounds. Compounds that pass Lipinski's RO5 can be considered suitable candidates for

the development of new drug entities.[12] For the evaluation of Pharmacokinetics (ADME) analysis the absorption, distribution, metabolism, and excretion of the compounds 3-azabicyclo [3.2.2] nonane, 11-bromoundecanoic acid methyl ester, methyl stearate, 11-oxa-dispiro [4.0.4,1] undecan-1-ol along with their toxicity were evaluated.

3. Results

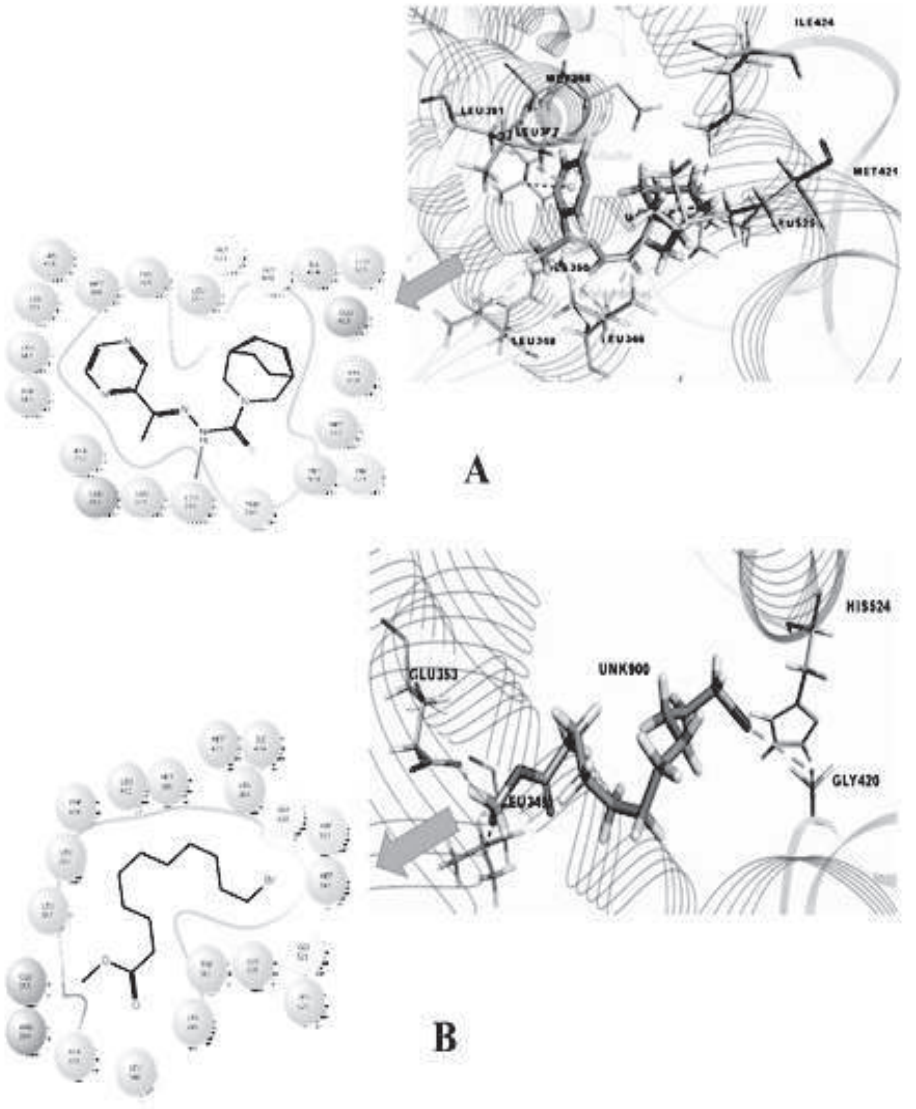
3.1. *In silico* Molecular Docking Analysis

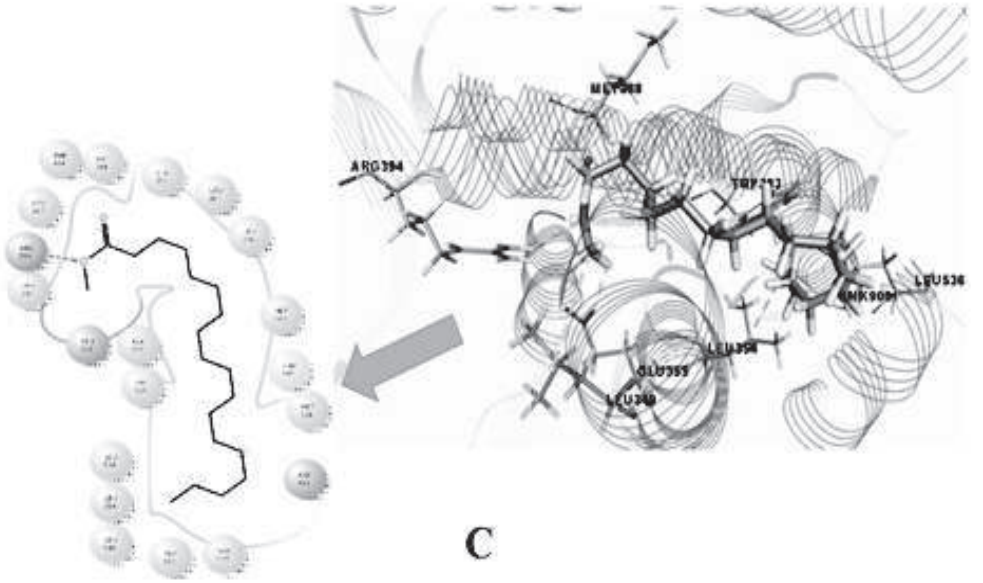
The use of computational techniques for virtual screening has a significant impact on the drug discovery process. With the utilization of docking and scoring of each of the compounds from a set of data, the prediction of binding modes and binding affinities of the ligand to the receptor can be optimized by means of docking to an X-ray crystallographic structure.[13] Grid created docking study was used to investigate the binding modes of molecules with the amino acids adjacent in the active pocket of the protein.[14] In order to study the interaction of the compounds 3-azabicyclo [3.2.2] nonane, 11-bromoundecanoic acid methyl ester, methyl stearate, 11-oxa-dispiro [4.0.4,1] undecan-1-ol with ER-α we performed Glide docking analysis by Schrödinger Suite-Maestro v10.1., where among of these compounds 3-azabicyclo [3.2.2] nonane showed highest docking score shown in Table-2. The negative and low value of free energy of binding demonstrates a strong favourable bond between3ERT (ER-α receptor) and3-azabicyclo [3.2.2] nonane in most favourable conformations. As lower the binding energy values, stable is the complex. Here the result reflects least binding with Methyl stearate and as binding energy is a positive value as that means the binding is energy consuming and it occurs only if the required energy was available. The results of docking analysis are shown in Table-2 and Figure-2.

Table-2: Docking score of 3-azabicyclo [3.2.2] nonane, 11-bromoundecanoic acid methyl ester, methyl stearate, 11-oxa-dispiro [4.0.4,1] undecan-1-ol with ER-α.

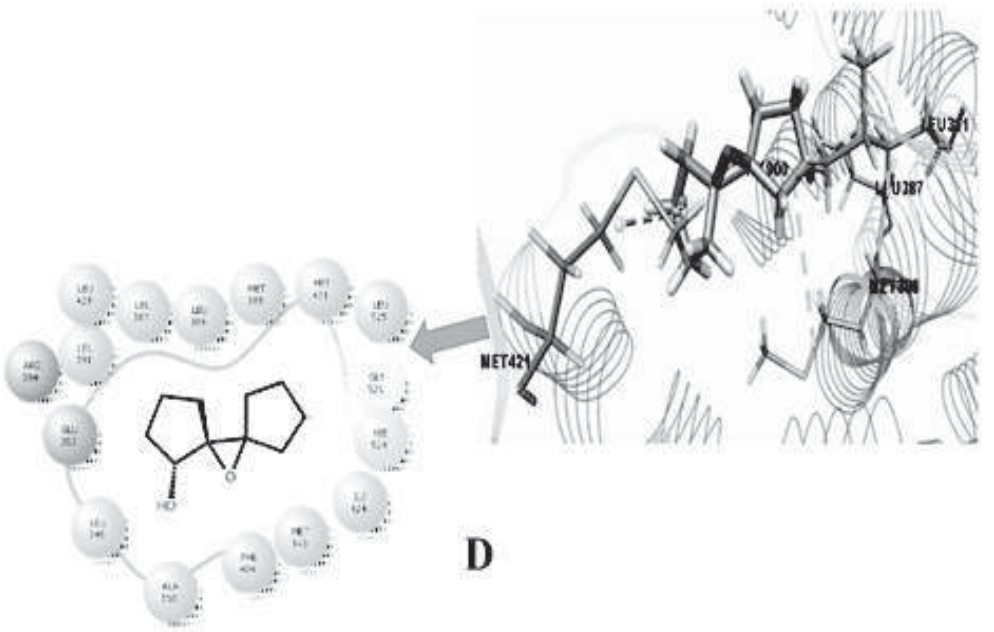
Sl. No.	Name of the Compound	Docking Score
1.	3-azabicyclo [3.2.2] nonane	-7.989
2.	11-bromoundecanoic acid methyl ester	-2.342
3.	Methyl stearate	1.389
4.	11-oxa-dispiro [4.0.4.1] undecan-1-ol	-7.034

Figure-2: 2D and 3D figures showing 3-azabicyclo [3.2.2] nonane binding with ER-α (A), 11-bromoundecanoic acid methyl ester binding with ER-α (B), Methyl stearate binding with ER-α (C), 11-oxa-dispiro [4.0.4,1] undecan-1-ol binding with ER-α (D)





C



D

3.2. ADME and Toxicity Analysis

The ADME properties of the 3-azabicyclo [3.2.2] nonane, 11-bromoundecanoic acid methyl ester, methyl stearate, 11-oxa-dispiro [4.0.4,1]undecan-1-ol are shown in Table-3. The selected properties are well-known to influence cell permeation, bioavailability and metabolism. Here, predicted properties of these four compounds are found in the range to satisfy the Lipinski's rule of five to be recognized as drug like potential.

Table-3: Toxicity and ADME analysis of the compound isolated from *L.zeylenica* by Swiss ADME analysis.

Compound name	Molecular weight[a] (g/mol)	H-donor[b]	H-acceptor[c]	LogP value[d]	Molar refractivity[e]
3-azabicyclo [3.2.2] nonane	125.21	1	1	1.99	43.06
11-bromoundecanoic acid methyl ester	279.21	0	2	4.26	68.95
Methyl stearate	298.50	0	2	6.72	94.73
11-oxa-dispiro [4.0.4,1] undecan-1-ol	168.23	2	2	2.42	46.16

[a]Molecular weight accepted range < 500, [b]Hydrogen bond donor acceptable range ≤ 5,[c]Hydrogen bond acceptor acceptable range ≤ 10, [d]High lipophilicity (expressed as LogP, Acceptable range < 5), [e]Molar refractivity should be between 40 -130.

4. Discussion

Medicinal plants have been used as ideal sources of therapeutic agents for thousands of years. Through computational studies, researchers can predict the activities of several phytocompounds that might be effective for several diseases. From the statistics, it has been seen that breast cancer is the second major cause of death in case of women and the main cause of this cancer is the over expression of estrogen receptor alpha. Hence, it is necessary to find out the compounds which have the higher binding affinity with estrogen receptor alpha to stop their over expression and ultimately for the prevention of breast cancer.[15] By the process of molecular docking, the researchers get an idea to virtually screen out of structures to predict the strongest binding scores computer aided drug designing (CADD) which helps the researcher through decreasing the time and money for drug designing projects.[16]

Molecular docking is very helpful in studying the interactions of ligand molecules with the target protein before their *in vitro* tests. Docking is performed through computer programs like Maestro.[11,12,17] In the current study, we docked several identified phytochemicals present in *L. zeylanica* methanolic extract with the estrogen receptor alpha (PDB ID: 3ERT) with the help of Schrödinger Suite-Maestro v10.1. The methyl stearate had shown lesser binding affinity with estrogen receptor alpha whereas 3-azabicyclo [3.2.2] nonane showed the highest binging affinity in comparison with 11-bromoundecanoic acid methyl ester and 11-oxa-dispiro [4.0.4.1] undecan-1-ol.

There are specific ranges to study the ADME/T analysis i.e., molecular weight accepted range should be less than 500 dalton, there should be less than 5 hydrogen donors, the hydrogen bond donor acceptable range should be less than or equal to 5,high lipophilicity is acceptable (expressed as LogP, acceptable range should be less than 5) and molar refractivity should be between 40 -130.[18] From the results, it can be suggested that the ADME/T profile of the four bioactive compounds were in range according to Lipiniski's rule and as the

targeted natural compounds are also within the reported criteria, indicating that these compounds may be evaluated as potential drug molecules.

5. Conclusions

We used a methodology for computer-aided drug design to detect potent estrogen receptor alpha (ER-α) inhibitors following the *L. zeylanica* phytochemical analyses. Our research showed that several of the identified phyto compounds from *L. zeylanica* followed Lipinski's RO5 and were therefore assessed as promising therapeutic molecules. Among the bioactive compounds, four compounds docked with the targeted receptor ER-α and among them 3-azabicyclo [3.2.2] nonane showed highest docking score and may be the best compound for selective inhibition of estrogen receptor alpha. Due to a lack of trust in scoring algorithms to provide correct binding energies, molecular docking is severely constrained. This is due to the fact that some intermolecular interaction parameters, such as solvation effect and entropy change, cannot be predicted properly. Following additional investigations in biological laboratories, these compounds may possibly be developed into effective therapeutic candidates against breast cancer.

6. Conflict of interest

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

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In Vivo Toxicity, Hypoglycemic Activities along with *In Vitro* Anti-Arthritic and Antibacterial Potential of Fractionated *Elatostema Papillosum* Wed. and *Holigrana Longifolia* Roxb

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Shahadat Hossain[2], Md. Sohel Rana[3]

Abstract

Current research was planned to explore the biological activities like acute toxicity, hypoglycemic, anti-arthritic and antibacterial potentials of two plants namely Holigrana longifolia and Elatostema papillosum. Biological activities were assessed for crude methanol extracts along with its different soluble fractions like petroleum ether (PESF), carbon tetrachloride (CTCSF), chloroform (CSF) and aqueous soluble fraction (AQSF) of both plants by following different established protocol. In vivo acute toxicity and hypoglycemic effects were performed in experimental and alloxan-administered diabetic rats respectively where as in vitro anti-arthritic and antibacterial actions were done by protein denaturation inhibitory and disc diffusion methods respectively. It was observed that no rats exhibit any types of lethality which reveal the safety of plant fractionates. It was also seen that fractionates of both plant showed insignificant ($p > 0.01$) activity against hyperglycemia compared to standard glibenclamide. On exploration it was observed that crude methanol and its CS fraction of E. papillosum and only CS fraction of H. longifolia significantly ($p < 0.05$) inhibited denaturation of bovine serum albumin protein compared to standard diclofenac sodium. Again it was observed that crude methanol extract and its CS fraction of E. papillosum showed significant inhibitory action on growth of all gm (+) ve bacteria where as PES fraction highlighted inhibitory zone of 26.7 and 24.7 mm respectively towards Bacillus subtilis and Staphylococcus aureus. But all fractionates of H. longifolia expressed inconsequential activity towards bacterial type of all gm (+) ve and gm (-) ve compared to standard ciprofloxacin.

Key Words: *Holigrana longifolia*, *Elatostema papillosum*, antibacterial, anti-arthritic, hyperglycemia.

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1. Introduction

World Health Organization (WHO) says, about 80% of the world population specially in developing countries mostly depend on the traditional medicine from plants for their healthcare[1] in the form of tea, decoction or extracts with water, milk (or) alcohol[1] and WHO has also recommended to use plants as medicines where the conventional medicine is not easily available[2]. The holistic practice of medicine like Ayurveda, homeopathy, siddha, unani are in practice of using the plant herbal formulations to treat various ailments. Diabetes is one of the most prevalent metabolic disorders characterized with elevated level of blood glucose and inappropriate metabolism[3,4]. Insulin is released by the pancreas which utilizes blood glucose into the cells for energy production. Without presence of insulin, glucose level gets elevated in blood and soon after eliminated through the urine.

Diabetes also causes different types of additional problems like retinopathy, neuropathy and neuropathy. These problems commonly originate due to DNA damage caused by free radical generation[5]. It is also associated with high heart risks caused by means of improper cholesterol metabolism which in turn leads to hyperlipidemia[6] and hence it is necessary to search for a molecule which can lower blood glucose level, scavenges free radical and decrease hyperlipidemia. This need prompted us the current investigation.

In the modern world, human beings are affected by numerous metabolic diseases. Among the metabolic diseases, one disease affecting most of the people is arthritis. Rheumatoid arthritis is a chronic disease characterized by the hyperactive state of some specific reactions related with immune system, chronic synovitis and in most cases, it causes deposition of rheumatoid factor (RF) an auto antibodies to self-antigens [7, 8] . It affects about 1% of world population and the prevalence of RA is highly in adult men of age between 30-50 years. The prevalence of RA in women are about 0.8%, it is more prevalent in women than men[9]. The most commonly used drugs in the conventional modern medicine are Non-steroidal anti-inflammatory drugs (NSAIDS) which shows potent injurious effects like stomach irritation, malfunction of the kidney, urticaria, liver disorders, hematological abnormalities and gastrointestinal problems which includes ulcers, bleeding, heartburn, diarrhea, retention of fluid and perforation of stomach or intestine[10]. Based on the

traditional information many of the plant extracts (or) and active fractions were tested in experimental animal models of arthritis and inflammation. This urgency prompted us about the current research.

Infectious diseases are major causes of morbidity and mortality in the developing world and accounts for about 50% of all deaths. Wide ranges of plants were extensively used for multidimensional diseases due to the presence of big content of bioactive compounds [11,12].

Holigrana longifolia Roxb. (locally known as Borola/Katebel) , is a member of Anacardiaceae family. It is a tall tree with smooth ash-colored bark and acrid resin oozing when wounded and grows in evergreen rainforests, often near the streams. *Elatostema papillosum* Wed., a member of Urticaceae is a suberect herb, up to 30 cm long. Both plant species occur in the forest areas of Sylhet, Chattogram and Chattogram Hill tracts. Traditionally *H. longifolia* is used for the healing of nasal polyps whereas *E. papillosum* is used in the treatment of cirrhosis, liver cancer, paralysis, rheumatic arthritis, rheumatism and scabies [13].

With the development in techniques and recent researches, various compounds in plants have been proved to have a varied pharmacological activity such as neuroprotective, anti-diabetic, anti-inflammatory, anti-arthritic, antinociceptive, antioxidant, antidiarrhoeal, antimicrobial, and cytotoxic properties[14]. In this context, this is a matter of interest to evaluate the pharmacological properties like antibacterial, anti-arthritic, antidiabetic activities and toxicity study of different fractionated extracts of *H. longifolia* Roxb. and *E. papillosum* Wed.

2. Materials and Methods

2.1. Preparation of crude extract and it's different fractionates

Leaves of *E. papillosum* and *H. longifolia* were collected from Chattogram Hill tracts area. Both plants were taxonomically authenticated by Department of Botany, University of Chittagong. Methanol extracts of both plants were extracted through cold extraction process by following standard procedures [15] with some modifications by using rotary vacuum evaporator at a temperature of (40 - 45 °C) under compact pressure. Concentrated methanol extracts (ME)

of both plants were partitioned by the modified Kupchan method [16] and the resultant soluble fractionates i.e., PESF, CTCSF, CSF and AQSF were isolated.

2.2. Phytochemical group tests

Phytochemical group tests were done to ensure the presence of secondary metabolic constituents which was identified by characteristic color changes using standard procedures described by Ghani, Sofowara, Trease and Evans and Harborne [17, 18, 19, 20, 21].

2.3. Experimental animals

Wistar Albino rats of both sex of 150-200 g weight were employed in this research. The rats were nurtured in a wire meshed plastic cages prior to commencement of the experiment for 4 to 5 days at ambient temperature (28 ± 5 °C). During the regimen of experiment, recommended pellet diet with water *ad libitum* were given to the rats as normal diet.

2.4. Experimental procedure for *in vivo* acute toxicity study

Acute toxicity study has been performed through the method described by Harizal *et al.* in 2010[22]. *In vivo* acute toxicity study was employed by 423 guiding principles (Acute toxicity class method) set down by OECD (Organization of Economic Cooperation and Development). Albino rats with sound physical state were indiscriminately alienated into eight classes where each class had six (6) rats. The animals were reserved fasting for the night with plenty of water, thereafter with extracts of *E. papillosum* and *H. longifolia* with increasing doses (100, 200, 300, 400, 500, 600, 700 and 800 mg/kg body weight) with the aid of intragastric tube in order to determine the safe doses by up and down staircase method. To identify any lethality and death, experimental rats were examined incessantly after 1 h, then repetitively for 4 hs and latterly of 24 hs.

2.5. Experimental procedure for anti-diabetic activity

Hypoglycemic effects of both plants fractionates have been investigated on diabetic rats by the method prescribed by Kannur *et al.* in 2006[23].

2.5.1. Experimental design

A total of 138 male albino Wistar rats were employed and arbitrarily separated into 23 sets of 6 (n=6) rats in every set:

Group I: Normal control (untreated with dimethylsulfoxide [DMSO, 3 ml/kg]).

Group II: Diabetic control (alloxan administered).

Group III: Diabetic control + Glibenclamide (0.5 mg/kg body weight once a day orally for 10 days).

Group IV: Diabetic control + *E. papillosum* methanol extract.

Group V: Diabetic control + *E. papillosum* PES fraction.

Group VI: Diabetic control + *E. papillosum* CTS fraction.

Group VII: Diabetic control + *E. papillosum* CS fraction.

Group VIII: Diabetic control + *E. papillosum* AQS fraction.

Group IX: Diabetic control + *H. longifolia* methanol extract.

Group X: Diabetic control + *H. longifolia* PES fraction.

Group XI: Diabetic control + *H. longifolia* CTS fraction.

Group XII: Diabetic control + *H. longifolia* CS fraction.

Group XIII: Diabetic control + *H. longifolia* AQS fraction.

Group XIV: Normal rats receiving *E. papillosum* methanol extract.

Group XV: Normal rats receiving *E. papillosum* PES fraction.

Group XVI: Normal rats receiving *E. papillosum* CTS fraction.

Group XVII: Normal rats receiving *E. papillosum* CS fraction.

Group XVIII: Normal rats receiving *E. papillosum* AQS fraction.

Group XIX: Normal rats receiving *H. longifolia* methanol extract.

Group XX: Normal rats receiving *H. longifolia* PES fraction.

Group XXI: Normal rats receiving *H. longifolia* CTS fraction.

Group XXII: Normal rats receiving *H. longifolia* CS fraction.

Group XXIII: Normal rats receiving *H. longifolia* AQS fraction.

Oral doses of 400 mg/kg for 3 hours for all extracts were used in this experiment. The extracts were administered to the respective groups through oral route using intragastric tube for 3 hours.

2.5.2. Induction of experimental diabetes and treatment

An intraperitonial solution of Alloxan monohydrate (10 mg/ml) was induced in the rats within the interval of 5 mins at a dose of 50 mg/kg body weight. Ice-cold citrate buffer of 0.1 M of pH 4.5 was used for preparing the solution of alloxan.

Alloxan was chosen to induce diabetes due to its availability and widely reported in previous research [24, 25]. After 48 h of administration, diabetic model rats with hyperglycemia and glycosuria were taken for the experiment.

2.5.3. Hypoglycemic activity test

Diabetic rats of alloxan-administered were reserved fasted for 8 hours with the access of plenty of water. After accomplishment of fasting stage, fasting diabetic blood glucose (FBG) levels of the rats were estimated with the help of glucometer kit (Clever Check, Germany). Consequently, diabetes was introduced by intraperitoneal administration of alloxan at a dose of (70 mg/kg) [26]. Blood was drawn after 1h, 2h and 3h consecutively from each rat by tail snipping for determining diabetic level of blood glucose. Animals with blood glucose level ≥10 mmol/dl were marked as hyperglycemic and used for the study.

2.6. Experimental procedure for *in vitro* anti-arthritic activity

Following subsequent steps were maintained for the evaluation of anti-arthritic activity:

1. 0.5 ml of test solution, control solution and product control were made of 0.45 ml of Bovine serum albumin (5% W/V aqueous solution) and 0.05 ml of test solution (250 µg/ml), 0.05 ml of distilled water along with 0.05 ml of test solution (250 µg/ml) respectively .

2. Similarly 0.5 ml of standard solution was made with 0.45 ml of Bovine serum albumin and 0.05 ml of Diclofenac sodium (250 µg/ml). All solutions were accustomed to pH 6.3 with 1N HCl. All solutions were kept at 37 °C for 20 minutes and heat was augmented to 57 °C for 3 minutes. Subsequent to cool, 2.5 ml of phosphate buffer was added to all of the solutions. Finally optical density was measured by UV-Visible spectrophotometer at the wavelength of 416 nm [27, 28].

The % of protein denaturation inhibition can be expressed as,

% of protein denaturation inhibition = [100- (absorbance of test solution – optical density of product control) ÷ (optical density of test control)] × 100

Here control stands for 100% denaturation of protein.

2.7. Antibacterial activity

Antibacterial activity of plant extracts was evaluated by disc diffusion method explained by Bauer *et al.*, (1966) [29]. In this study four Gram (+) ve and six Gram (-) ve bacterial strains were used. A measured amount (4 mg) of crude extract, different fractionates (400 µg/disc) and ciprofloxacin (30 µg/disc) as standard antibiotic were used in the present study. The bacteria cultures were nurtured in Nutrient Broth medium at 37 ºC. After 6 hours, culture of every microorganism was inoculated on the plane of Mueller-Hinton agar plates. Filter paper discs of 4 mm in diameter were then soaked with esteemed quantity of test substances (400 µg/disc) by using micropipette. Discs of test sample were then sited on agar plate medium unvaryingly germen with the experimental microorganisms. Discs drenched in relevant solvent were marked as positive control. The plates were then reserved at 4 ºC temperature for two to four hrs to permit highest distribution of molecule. The experimental plates were subsequently kept in 37 ºC for 24 hours to allocate utmost expansion of tested microorganisms. A clear distinct zone around the disc reflects the antibacterial activity of test materials.

2.8. Statistical analysis

Statistical investigation was evaluated with Graph Pad Prism software package, version 5.0. All the statistics were articulated as mean ± standard error mean (SEM). The comparisons within groups were evaluated utilizing independent

student t-test and one-way analysis of variance (ANOVA). The values of $p < 0.05$ or $p < 0.01$ were regarded as statistically significant.

3. Results

3.1. Screening of phytochemicals

From phytochemical screening it was observed that *E. papillosum* contains alkaloids, tannins, saponins, glycosides and higher percentage of flavonoids and steroids whereas *H. longifolia* contains flavonoids, steroids, glycosides and higher percentage of saponins (Table 1).

Table-1: Presence of phytochemicals in crude methanol extracts of *E. papillosum* and *H. longifolia.*

Serial No.	Secondary metabolites	Name of the species	
		E. papillosum	*H. longifolia*
1	Alkaloids	+	-
2	Flavonoids	+	+
3	Steroids	+	+
4	Tannins	+	-
5	Saponins	+	+
6	Phlobatannins	-	-
7	Glycosides	+	+

"+" indicates presence of secondary metabolites whereas "-" denotes the absence of secondary metabolites

3.2. Acute toxicity study

Acute toxicity study was employed on healthy male albino rats. The animals were reserved fasting for the night with plenty of water supply, thereafter with extracts of *E. papillosum* and *H. longifolia* with increasing doses (100, 200, 300, 400, 500, 600, 700 and 800 mg/kg body weight) with the aid of intragastric tube in order to determine the safe doses. No lethality and death was observed which indicates that both plant extracts showed no toxicity in rats

3.3. Anti-diabetic activity

All fractionated extracts of both plants were administered serially to all 23 groups of rats and then diabetic level was measured after 1st, 2nd and 3rd hour using glucometer. It was observed that all fractionates showed no hypoglycemic effects on alloxan induced diabetic rats. Here all the statistics were presented as mean ± SEM. Table 2 and 3 presents the results of anti-diabetic activity.

Table-2: Hypoglycemic actions of different fractionates of *E. papillosum* and *H. longifolia* compared to standard glibenclamide.

Sample	Hypoglycemic Activity (mmol/L)							
	***E. papillosum* (400 mg/kg)**				***H. longifolia* (400 mg/kg)**			
	Initial	60 min	120 min	180 Min	Initial	60 min	120 min	180 min
ME	15.5 ± 1.23	13.5 ± 1.58	12.0 ± 1.23	11.3 ± 1.91	16.8 ± 1.45	12.9 ± 1.24	12.2 ± 1.31	11.2 ± 1.55
PESF	14.4 ± 1.76	14.4 ±1.23	13.3 ± 1.44	12.1 ±1.51	16.4 ±1.67	12.7 ± 1.08	12.1 ±1.12	11.3 ± 1.25
CTCSF	16.8 ± 1.67	13.5 ±1.76	12.8 ± 1.14	12.3 ±1.57	16.1 ± 1.12	13.4 ± 1.19	12.3 ± 1.31	11.3 ± 1.23
CSF	16.2 ± 1.79	12.2 ± 1.31	11.9 ± 1.49	10.6 ±1.33	16.7 ± 1.71	13.0 ± 1.54	12.7 ± 1.33	11.2 ± 1.35
AQSF	15.9 ± 1.32	11.1 ±1.12	10.9 ± 1.47	9.3 ± 1.11	15.7 ± 1.14	13.5 ± 1.13	12.8 ± 1.56	12.3 ± 1.67
Control (1% Tween-80 solution in saline)					16.7 ± 1.34	6.8 ± 1.67	6.2 ± 1.12	5.6 ± 1.32
Standard (5 mg/kg glibenclamide)					16.3 ±1.42	3.4 ± 1.21	2.6 ± 1.21	2.5 ± 1.78

SEM = standard error of mean, n = 5. Values in the table are articulated as mean ± SEM, *p < 0.05, significantly different in comparison with standard. The data was analyzed by ANOVA followed by Dunnett's test.

Table-3: Statistical analysis of hypoglycemic effects of different fractionates of *E. papillosum* and *H. longifolia* compared to standard glibenclamide.

Sample Code	***E. papillosum***		***H. longifolia***	
	p-value	Level of significance	p-value	Level of significance
STD	0.0214	Statistically significant	0.0214	Statistically significant
ME	0.9345	Statistically not significant	0.885	Statistically not significant
PESF	0.7687	Statistically not significant	0.6672	Statistically not significant
CTCSF	0.7364	Statistically not significant	0.7241	Statistically not significant
CSF	0.6431	Statistically not significant	0.6998	Statistically not significant
AQSF	0.5451	Statistically not significant	0.6412	Statistically not significant

3.4. Anti-arthritic activity

In this investigation it was observed that crude methanol and its CS fraction of *E. papillosum* showed statistically significant ($p < 0.05$) and only CS fractions of *H. longifolia* showed statistically significant ($p < 0.05$) anti-arthritic activity compared to standard diclofenac sodium. The results are given in Table-4.

Table-4: Percent inhibition of denaturation of protein by different fractionates of *E. papillosum* and *H. longifolia* compared to standard diclofenac sodium.

Sample	Concentration (mg/ml)	% of Inhibition of protein denaturation			
		E. papillosum	**p-value**	***H. longifolia***	**p-value**
ME	200	54.34 ± 2.34*	0.038	23.54 ± 2.32	0.065
PESF	200	29.45 ± 1.34	0.057	18.67 ± 1.17	0.059
CTCSF	200	21.24 ± 3.67	0.076	12.23 ± 1.59	0.097
CSF	200	46.48 ± 2.43*	0.029	38.18 ± 2.78*	0.043
AQSF	200	12.3 ± 2.95	0.094	13.87 ± 2.63	0.091
Diclofenac Na	50	74.93 ± 1.12			

SEM = standard error of mean, n = 5. Values in the table are articulated as mean ± SEM, *p < 0.05, significantly different in comparison with standard. The data was analyzed by ANOVA followed by Dunnett's test.

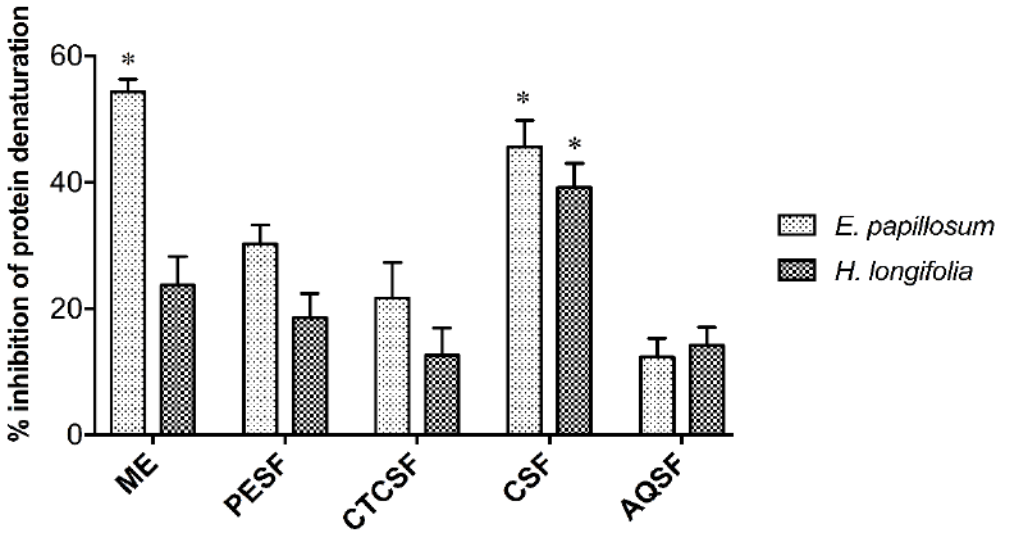

Figure-1: Comparison of the activity of different fractionates of *E. papillosum* and *H. longifolia* on the percentage of inhibition of protein denaturation.

3.5. Antibacterial activity

Antibacterial activity against gm (+) ve and gm (-) ve bacterial type have been carried out through disc diffusion method. Here methanol extract and CS fractions showed significant zone of inhibition in petri plate against gm (+) ve bacteria whereas PES fraction of *E. papillosum* showed moderate activity towards *B. subtilis* and *S. aureus* and all fractionates exhibited poor activity towards gm (-) ve bacterial type. But all the fractionates of *H. longifolia* showed poor activity against all gm (+) ve bacteria and exhibited poor activity towards all gm (-) ve bacterial type compared to standard ciprofloxacin. The results are showed in table-5.

Table-5: Zone of inhibition showed against gm (+) ve and gm (-) ve bacterial type by different fractionates of *E. papillosum* and *H. longifolia* compared to standard ciprofloxacin.

Bacterial Type		**Gm (+) ve type**				**Gm (-) ve type**					
		Bacillus cereus	*Bacillus megaterium*	*Bacillus subtilis*	*Staphylococcus aureus*	*Escherichia coli*	*Pseudomonas aeruginosa*	*Slmonella paratyphi*	*Slmonella typhi*	*Shigella dysenteriae*	*Vibrio cholera*
(*E. papillosum*) Diameter of Zone of Inhibition (mm)	ME	25.1	21.1	27.4	24.3	12.4	15.7	17.4	12.7	13.5	14.1
	PESF	16.5	17.5	26.7	24.7	13.6	14.6	12.4	11.2	13.1	10.2
	CTSF	5.7	5.3	4.6	1.2	---	---	---	2.8	---	1.4
	CSF	22.3	24.6	26.3	21.6	13.4	14.6	10.3	16.7	13.8	11.6
	AQSF	---	---	8.4	---	---	8.9	---	---	---	3.9
(*H. longifolia*) Diameter of Zone of Inhibition (mm)	ME	10.3	12.4	13.2	18.8	3.6	5.4	3.7	5.8	4.8	5.2
	PESF	6.2	8.5	9.3	10.2	5.3	4.9	6.4	3.5	3.7	5.4
	CTSF	---	2.8	3.3	---	---	---	2.7	2.2	---	---
	CSF	11.5	16.8	15.9	19.8	10.1	9.2	14.4	10.7	14.9	10.8
	AQSF	9.1	---	10.8	---	---	---	---	---	6.92	4.7
Diameter of Zone of Inhibition (mm) for Standard Ciprofloxacin		47.3	43.3	45.6	48.3	46.3	43.6	45.6	48.6	49	45.3

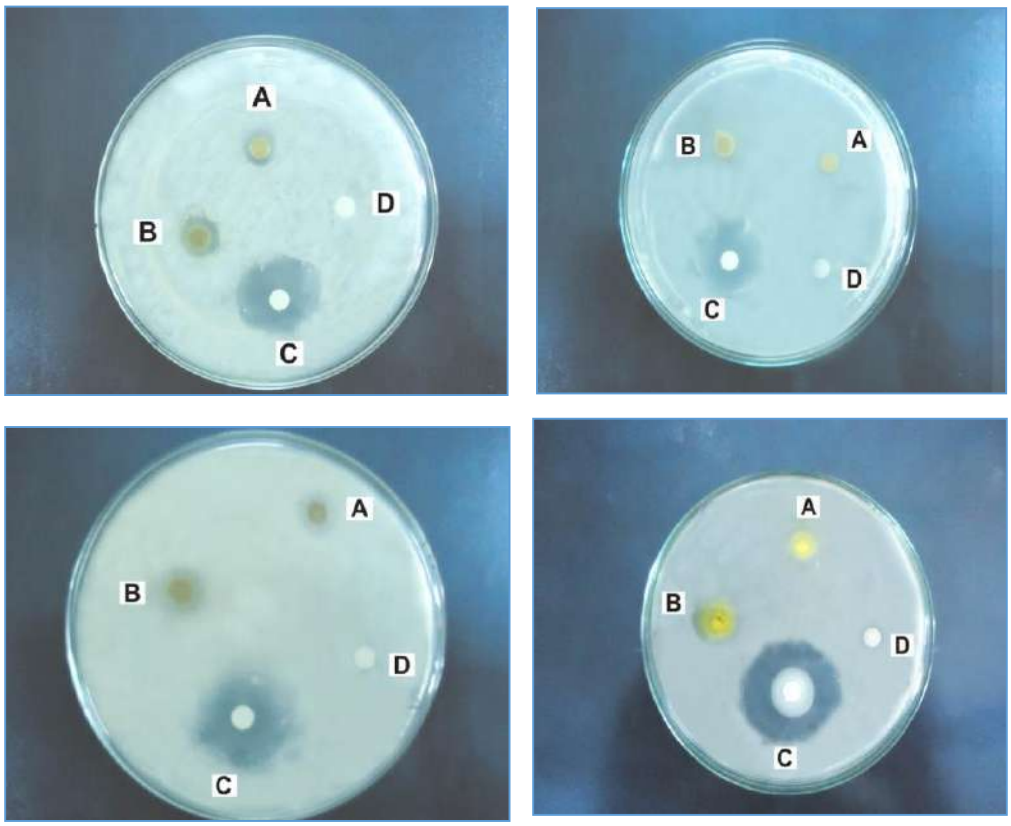

Figure: Antibacterial activity of (A) ME, (B) PE, (C) CTC and (D) CF against (a) *Bacillus megaterium* (b) *Bacillus subtilis,* (c) *Staphylococcus aureus, (*d) *Escherichia coli*

4. Discussion

From the beginning of civilization, medicinal plants have become part and parcel of human society. A large number of herbal therapy have stood particularly for the treatment of infectious, inflammatory, metabolic, allergic and degenerative diseases associated with aging. Keeping pace with the herbal therapy here, we have conducted various in vivo and in vitro experiments to assess the acute toxicity study, anti-diabetic, anti-arthritic and antibacterial activities of methanol extract with its different fractionates like PESF, CTCSF,

CSF and AQSF of *E. papillosum* and *H. longifolia*. At first acute toxicity study of both plant fractionates was done by applying higher doses (100, 200, 300, 400, 500, 600, 700 & 800 mg/kg body weight) of all fractionates of both plants on experimental rats and it was observed that no rats exhibit any types of lethality or abnormalities which reveals about the safety of plant fractionates. Determination of *in vivo* hypoglycemic activity was performed in alloxan-induced diabetic rats. And it was seen that fractionates of both plant showed insignificant ($p < 0.01$) activity against hyperglycemia in diabetic rats compared to standard glibenclamide which indicates that fractionates of both plants have no hypoglycemic effect against alloxan induced diabetic rats. In, in vitro anti-arthritic activity percent inhibition of protein denaturation was estimated spectrophotometrically. It was observed that crude methanol ($p = 0.038$) and its CS fraction ($p = 0.029$) of *E. papillosum* and only CS fraction ($p = 0.043$) of *H. longifolia* significantly ($p < 0.05$) inhibited denaturation of bovine serum albumin compared to standard diclofenac sodium. Investigation of antibacterial activity was carried out with the help of disc diffusion method and it was observed that crude methanol extract and its CS fraction of *E. papillosum* showed significant zone of inhibition towards all gm (+) ve bacteria where as PES fraction exhibiteded 26.7 and 24.7 mm of zone of inhibition towards *B. subtilis* & *S. aureus.* But all fractionates of *H. longifolia* showed poor activity against all gm (+) ve bacteria and exhibited poor activity towards all gm (-) ve bacteria compared to standard ciprofloxacin. From phytochemical analysis of both plants, we came to know that phytochemicals like alkaloids, tannins, quinones, flavonoids and phenols are responsible for antibacterial activity where as presence of steroids & flavonoids are responsible for anti-arthritic activity of the plant[27]. So, some of these phytochemicals might be concerned behind the experimental activities of *E. papillosum* and *H. longifolia*.

5. Conclusion and future plan

To the best of our knowledge, very few data regarding *E. papillosum* and *H. longifolia* has been published, though additional studies are compulsory to elucidate the mechanism behind these effects. As previously no data regarding this plant was published so we may say that both plants may be an exemplary sample for alternative therapeutic source of drugs. In this regard we have to elucidate the structure of secondary metabolites present in the plants and give

emphasis on novel compounds as therapeutic components. This report may serve as a footstep on this aspect.

6. Conflict of interest

The authors report no conflicts of interest. The authors only are answerable for the content and inscription of the paper.

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Author's contribution

This exertion was employed in teamwork of all authors. All the authors have accepted responsibility for the entire content of this submitted manuscript and approved the submission. Authors MZU, MSR, SC and AP performed experiments. Authors MZU, SC and JM collected the plants and prepared the extracts and fractions. MZU and AP performed the anti-arthritic activity and antibacterial activity. MZU, MSR, and JM performed the anti-diabetic activity and hypoglycaemic activity. MZU, SC and AP performed statistical analysis. MZU, MSR, SH, SC and AP conceived the study and designed the experimental procedures. MSR, and SH designed, planned and supervised the experiments. MZU also acted for all correspondences. MZU, MSR, SH and AP participated in the manuscript draft and has thoroughly checked and revised the manuscript for necessary changes in format, grammar and English standard. All authors read and approved the final version of the manuscript.

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University Students' Reticence in English Language Classes and Outside: A Micro-level Study from Socio-Economic Perspectives

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Abstract

Students' verbal participation in class is of paramount importance for fruitful learning. It also helps students to achieve interpersonal skills. But, students tend to remain reticent in classes across the world. The reasons for this problem has long been studied from cognitive, affective and socio-cultural perspectives. But learners are not merely biological entities with only cognitive and psychological attributes. They also belong to society and their learning behavior is influenced by socio-economic factors too. The reticent behavior of learners are similarly influenced by the Socio-Economic Status (SES) of the learners and their parents. This study aims to investigate whether the tertiary level students' reticent behavior is influenced by parents' socio-economic factors as well as by the cognitive and affective factors. This study follows the mixed approach to research. Surveys were conducted among students and interviews were conducted among teachers of the English Department of a university to investigate the real reasons for the students' reticent behavior in language classes. The findings reveal the fact that the students' reticent behavior is mostly due to their anxiety created by financial stress. It was also investigated to see if there is any link between parents' educational qualification and students' overall academic achievement. A positive correlation was found between these two variables. It was found that parents' higher academic qualifications have a positive impact on their children's success in the English language. Though this study investigates the reticent behavior, its recommendations can be applied to find out the reasons for students' under-achievement in any subject. It can also be applied to know whether difference in parents' financial capability impacts their children's academic success.

Key Words: Reticence; Oral participation; Socio-Economic status; Parental income; Parental education.

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1. Introduction

To make the acquisition of English effective and successful students' oral engagement is important in the classrooms. This claim is compatible with the conceptualization of the Communicative Language Teaching (CLT) approach of teaching English, which considers language being taught as a system for expression of meaning (Nunan, 1999). The 'communicative competence' of students can be developed in the classrooms through various activities (Hymes, 1972; Larsen-Freeman, 2000; Chang & Goswami, 2011). For this reason, students 'verbal contribution is very important. On the basis of the belief that verbal participation contributes to learning, students are encouraged by their teachers to participate in the classroom discussion, and their participation is often assessed in terms of the 'amount and quality' of their discussion (Warayet, 2011). Students' oral contribution is considered as a criterion for teachers 'success in conducting a good lesson. Although student participation may have different forms and patterns according to the nature of 'interactional activities', the ultimate objective is somewhat to 'increase student involvement' (Bean & Peterson, 1998).

Generally through teachers' 'encouragement and efforts', students are always expected to be able to fully participate in the 'classroom discourse'. In spite of that, the ESL classroom may be a disappointing place if most students remain silent in class, and only a few of them actually participate (Fritschner, 2000). Many teachers experience a great deal of silence in the EFL classroom. This situation is usually called 'reticence.' This creates an uncomfortable feeling for the teachers since it reflects negatively on their teaching practice. Many teachers explore appropriate strategies to encourage their students to participate more in classroom discourse. This reticence has always been construed as a problematic attribute that hinders the development of oral proficiency in the English language. Many Asian EFL teachers who are experiencing this phenomenon at various degrees in their classrooms have always attempted to seek an answer to it. This reticent behavior also extends to the extra-curricular activities of the students. Those who are reticent in classes are so in extra-curricular activities. However, the explanations given are normally simplistic and termed as a stereotypical characteristic of passivity or lack of cooperation (Harumi, 2001). It is simply explained from a linguistic, cognitive perspective.

But it is found that many fluent students also do not want to participate in oral activities. That is why, there is an urgent need to examine this problemfrom other points of view to have a better understanding of this behavior.

The university students of Bangladesh are no exception to this phenomenon described above. The students in the language classes are not interested in verbal participation. Though they are scoring satisfactory marks in the English language courses, their speaking skill does not develop as it should. They are found to be reticent, quiet in the language classes. There is a common trend to blame teachers for their inability to engage students in verbal interaction. The common reasons always attributed to are students' lack of confidence, skill and interest in participation. Most of the research also have focused on these issues. But, the researchers think that this problem may be explained from the socio-economic perspectives too. But what about the non-participation in extra-curricular activities? The socio-economic status (SES) of the students' parents, such as, education, income, is a strong factor in this regard. Our hypothesis is that the students' sense of anxiety derived from financial constraint acts as a strong barrier to their verbal interaction. So, our study aims to investigate the problem from a socio-economic perspective and find out if there is any co-relation between parents' financial constraint and the students' under-achievement including non-participation in classroom interaction.

Objectives of the Research

In tune with the current popular theoretical perspectives of Second Language Acquisition (SLA) which highlights the importance of interaction and communication, as well as L2 pedagogy calling for open participation in class, there is a growing demand for oral classroom participation in higher education. That is why, many researchers and teachers generally consider the orally non-participating students reticent and unmotivated (Cao, 2009). Hence, it is important to explain the ESL and EFL students' reticence in L2 classrooms as a complex phenomenon, not merely a behavioral and cognitive problem. We all know that learners belong to a society and their socio-economic constrains influence all their behaviors. Their learning is both accelerated and weakened by factors which are always neither under their control nor that of their teachers.' But, few research is there to correlate reticence with socio-economic factors in higher education level. Most of the research dealing with this issue

concentrates on the students' linguistic, cognitive and behavioral factors. The socio- economic factor that has a strong correlation with teaching-learning in general has been ignored in previous research. So, this research attempts to investigate whether the students' reticence has been mainly influenced by the parental poor economic condition and the subsequent anxiety among students. It aims to find out whether the low income parents' children tend to remain reticent in the language classes. It also aims to investigate if there are other reasons for reticence in class among university students.

We should explain why we have focused on mainly the reticent behavoiur, not on the overall academic achievement? The stereo-typical concept of university graduates has changed worldwide. Only subject- specific knowledge or content knowledge is not enough for graduates to survive in a competitive world. They need interpersonal skills. In the backdrop of the demand for all-round graduates, universities are re-designing their curriculum to incorporate these requirements so as to produce graduates with these attributes. These attributes are the ability to interact, work in group or team and present viewpoints in public.

Research Questions

Given the scarcity of research in this area, this study was undertaken to investigate students' reticence in EFL classrooms at the tertiary level. To achieve this aim, the following research questions have been framed.

1. Are the poor students more reticent than the rich ones?

2. Does the students' reticent behavior change over time?

3. What are the problems that contribute to the university students' reticence in the classrooms and outside?

Literature Review

Reticence

Reticent people tend to be silent or uncommunicative in speech. They are reserved and restrained in expression and presentation. It is though a personality-related or behavioral characteristics, some social factors influence this behavior.

Gerald M. Phillips published the first article on reticence in 1965 stating that some individuals face difficulties while communicating in various situations (Keaten & Kelly, 2000). It was a starting point for the communication researchers to further study reticence in newer perspectives. This construct has gone through revisions and re-conceptualizations ever since. Phillips's original conceptualization considered reticence as a behavior and anxiety related disorder. In his later work, however, the focus has been shifted away from personality-based perspective to a poor communication skills-related issue (Phillips, 1984, 1997).

Based on Phillips' works, Keaten and Kelly (2000) re-conceptualized reticence. Their newly proposed theoretical model added affective component with behavioral and cognitive dimension. Keaten et al. (1999), in a study mentioned that in comparison with non-reticent people, reticent individuals have higher levels of anxiety for negative evaluation and a 'heightened sensitivity' to the views of others. Thus, the reticent people have the tendency to remove the problem of fear by remaining silent as they are afraid of the threat of negative evaluation by others.

Reticence among the Asian Students

Asian students are often portrayed as reticent in the English language classrooms with the minimum or no participation in the classroom discourse (e.g. Li & Jia, 2006; Liu & Jackson, 2009, Arafat, 2013). Most of them are blamed for being irresponsive to their teachers or not being interested in whole-class and group discussions. In different studies conducted across the Asian regions, many reasons for ESL/ EFL students' reticence in class have been identified. Among the common reasons reported include 'fear of losing face', 'low proficiency', 'negative evaluation', cultural beliefs regarding appropriate behavior in classroom contexts, 'incomprehensible input', teacher's 'teaching techniques', 'lack of confidence', 'introversion', 'anxiety', 'perceived communicative competence', etc. (Tsui, 1996; Li & Jia, 2006; Jenkins, 2008; Liu & Jackson, 2009; Xie, 2009; Li & Liu, 2011; Delima. In other words, most of these studies attribute reticence to students' linguistic competence, socio-cultural, psychological, behavioral and pedagogical factors. Such a huge number of reasons identified in the present literature has motivated researchers to find out the real reasons for students' reticence.

Do All Proficient Learners Speak in the Classroom?

But, do all proficient learners participate in classroom interaction? Do all learners who do not participate in oral interaction learn nothing? We also see that some of the proficient learners are also found not to be engaged in conversation using English in classroom although sufficient communication opportunities are provided there. Wen and Clement (2003) found mismatch between students' strong command over grammar and vocabulary and weakness in carrying out English conversations.

Familiarity with Topic

Does familiarity with the topic motivate the students to participate in conversation? The topic of the tasks in the classroom significantly affects L2 use (MacIntyre et al. 1998). Lack of knowledge about a topic of discussion may inhibit learners' self-confidence, and consequently, decrease the possibilities for communication, affecting situational willingness to communicate (WTC). Interest in the topic has also been found to influence learners' decision to speak. In Kang's (2005) study, learners were more likely to engage in a conversation when they feel comfortable and secure about the topic of discussion. Kang suggested that when the topic is of intrinsic or instrumental interest to the learners, they may enjoy getting involved in the discussion. Similar findings were reported by Cao (2011), who found that learners were reluctant to talk about uninteresting topics. Cao and Philip (2006) showed that familiarity with and interest in the topic discussed affected learners' WTC. Correspondingly, in her study on international teaching assistants' (ITAs)'s view of the content of the discussion and its impact on WTC, Compton (2007) concluded that learners were more interested to communicate when the knowledge about the content was common or if they felt confident in their L2 speaking ability.

Anxiety

Anxiety, a psychological illness, is a kind of nervousness. It makes people feel worried about a whole range of issues. It's a long-term condition and people living with anxiety usually feel anxious most days. There are times when people feel more anxious than others, but it tends to last longer than nervousness. It can respond to specific events. However, anxiety doesn't have to be in response to a specific event. It can emerge with almost no warning at all.

What makes anxiety different from nervousness is the length of time that people experience. With anxiety, people's feelings and symptoms are usually fairly constant. On the other hand, nervousness is usually a short-term feeling. It isn't usually constant. A sense of insecurity gives birth to anxiety among people. Financial insecurity also creates anxiety. It cannot be removed within a short time and lasts until it is eradicated. Moreover, anxiety causes changes in human behavior.

Learner silence has been thought to expose foreign language anxiety and hence unwillingness to communicate. Indeed, some researchers (Horwitz, Horwitz, & Cope, 1986) described L2 speaking as profoundly anxiety-provoking, so the relation between silence and anxiety is justified. A learner who remains silent in language class is construed as experiencing high levels of anxiety in apprehension of real or anticipated communication. Hence, there is a question, do students prefer one kind of interaction to another? Do students try to avoid specific pattern of classroom interaction? In majority of the cases, students prefer talking to their peers to speaking in front of the whole class. In their study, over one third of their participants reported that they felt anxious in their English class and feared being negatively evaluated. (Horwitz, Horwitz, & Cope, 1986).

Socio-Economic Status and Academic Achievement

Dubow, E. F., Boxer P. and Huesmann, L. R. (2009) mention that there are a number of theories and models that deal with the inter relationship between family socio-economic status and children's behavior. Family process models (e.g., Conger et al., 2002; McLoyd, 1989) stipulate that indices of family SES, including parent education determine the quality of family interactions and child behavior. The social-cognitive-ecological models (e.g., Guerra & Huesmann, 2004; Huesmann, 1998; Huesmann, Eron, & Yarmel, 1987) reveal that "parental education, the quality of family interactions, and child behavior mould, by late adolescence, educational achievement and desire for future educational and occupational success." The Eccles's expectancy-value models (Eccles, 1993; Frome & Eccles, 1998) highlight that ''late adolescent ambition for future success affects real educational and professional success in adulthood.''

There has been a growing body of research which investigated how EFL students' English achievement is affected by parents' poor socio-economic status. Educational achievement is not independent of family influence. It is a well-known fact that family is a social institution since the development of our civilization. Therefore, we cannot ignore the direct and indirect influence of family on children's education. Rollande, D., Pierre, P. and Danielle, L. (1999) say that there are researches that proclaim that children and adolescents from 'lower income, less educated, single-parent and large families' achieve less in school than those from 'higher income, better-educated, two-parent and small families' (Astone & McLanahan, 1991; Dombusch, Ritter, Mont-Reynaud &Chez, 1990; Sputa &Paulson, 1995; Violette, 1991).

Abigali and Ifeoma (2013) say that family background is a collective terminology comprising social class or status, family size, family structure, the level of parental education, occupation and other factors pertaining to family life. The research finding of this study is novel because unlike the previous major studies in this field (Triventi 2011; Carneiro et al. 2013; Gonzalez et al. 2017; Wigfield et al. 2006; Hamid & Baldauf 2008; McLachlan et al. 2013; Kyriacou & Zhu 2008, Meir 2004; Han 2007; Byrner & Gelman 1991; Easter brooks &Baker 2002; Gardner 1985), it has highlighted the involvement of parents in L2 learning and performance of children.

Ahmed and Bose (2005), cited in Hamid and Baldauf (2008) have identified this reality and pointed out that a large number of secondary students in rural Bangladesh are either poor or disadvantaged and their families cannot afford to invest for their education, and such socio-economic realities largely influence academic performance of children. Parent's level of income is the most strong parental factor to influence children's academic achievement ata school. According to Mayer, " … the children of affluent parents are more expected to succeed in life than those of disadvantaged parents probably because the rich parents invest more than poor parents on their children and these "investments" lead to better outcomes for their children.'' (cited in Machebe, C. H., Ezegbe, B. N. & Onuoha, J.(2017).

Dubow, E. F., Boxer P. and Huesmann, L. R.(2009) opine that children living in 'achievement oriented behavior' (e.g., obtaining advanced degrees, reading frequently, encouraging a strong work ethic) and enjoying 'achievement-

oriented opportunities' (e.g., library and museum trips, after-school enrichment programs, educational books and videos) form the belief that achievement needs to be 'valued, pursued, and anticipated'. This belief ultimately leads to fruitful outcomes along development, including 'high school graduation, the pursuit of higher learning, and the acquisition of high-prestige occupations'. There are positive relations between parents' educational levels and the expectations for their children's achievement (Davis-Kean, 2005), which indicates that more highly educated parents motivate their children to 'develop high expectations of their own.' On the contrary, McLoyd's (1989) review found that parents experiencing stressful economic condition have children who are more hopeless about their educational and professional futures (Dubow, E. F., Boxer P. & Huesmann, L. R. (2009).

McLoyd's (1989, 1998) important literature reviews have shown how poverty and low SES are related to a range of inadequate learning outcomes, including 'low IQ, educational attainment and achievement, and social emotional problems.' Parental education being an important criterion of SES determines children's 'educational and behavioral outcomes.' However, McLoyd has pointed out that among the different indices of family SES, including 'parental degree, longtime versus temporary poverty, income, and parents' professional status', income level and poverty might be the more powerful predictors of children's cognitive outcomes in comparison with other SES indices (e.g., Duncan et al., 1994; Stipek, 1998).

A study by Sirin (2005) reviewed the literature on the relation between socioeconomic status and educational achievement in journal articles published between 1990 and 2000. The sample included 101,157 students, 6,871 schools, and 128 school districts collected from 74 liberated samples. The results found a medium to strong relation between 'economic status and academic achievement' (Sirin, 2005).

Young (1994) mentions that parents can play an important role in improving children's positive thinking towards foreign languages. Parents' attitudes towards foreign languages dictate their children's success in multilingual competence. Both the way in which parents think about foreign languages and the way they treat them have effects on their children's 'linguistic development'

(Young, 1994). But, there is no remarkable research that investigates the impact of parental SES on university students' classroom reticence.

Socio-Economic Status and Reticence

The amount of research regarding parents' socio-economic status with students' reticence in classroom is very scant. (Asgari and Mustapha (2011), Butler (2013), J. Am. Coll. of Health (2016).

Asgari and Mustapha's (2011) study investigated the primary students' speaking performance. In their study most of the participants in their study stated that their parents were their first teachers, who had helped them in having primary knowledge about L2, providing good facilities either at home or in school to improve their vocabulary, reading and speaking. The study of Butler (2013) finds that while the parents' socioeconomic status(SES) does not have much effect on their children's listening, reading and writing performance during their elementary school years, it indicates an effect on their speaking abilities at the fourth-grade level, if not earlier.

Adams, D. R., Meyers and Beidas (2016) investigated the reason for university students 'anxiety. This study applied a cross-sectional survey methodology with a sample of university undergraduates to investigate the relationships among financial stress, felt stress, psychological symptoms, and academic and social immersion at college. Students reported that four out of the five top stressors in their lives involved personal finances, and that these stressors affected their academic progress and performance. Furthermore, unmet financial needs may require low-income and/or first-generation students to work full-time jobs and live off campus, which may hinder their academic and social interaction on campus as well as increase the probability for attrition.

Methodology

The research follows the mixed method. It relied on both survey and interview. The survey was conducted in the English Department of a private university in Chattogram. Questionnaires were collected from students. Questionnaires were collected from 117 students of 3rd, and 4thsemesters. The time of the data collection was January, 2019. From among the student samples, 80 were selected through random sampling for input and analysis. Data were also

collected from 4 teachers. Interview was used for the teachers. The teachers' interview contains 5 questions. The students' questionnaire contains 19 questions in two parts. The first part has questions related with demographic ones and the part two has questions related with academic issues. The questions in the first part are related with place of residence, family members, parental education and income, reasons for studying at the English Department of the university. Though two important demographic factors were not included in the questionnaire during the collection of data, these two factors were analyzed later on from the input. As all respondents are the regular students of 3rd and 4the semesters, their age range ids between 20 and 21. Another factor, that is gender was identified from their names and it was found that 56 respondents are male and 24 respondents are female. The second part is related with their score in two previous language courses, views on participation in classroom and extra-curricular activities in school, college and the present rate of participation in classroom activities and extra-curricular activities at university, the reasons for their non-participation in these activities. All the questions were close-ended. Students were also asked to write their grade points in two language courses as well. Teachers' interviews were recorded and, later on, transcribed. The teachers are named as teacher -A, teacher-B, teacher-C and teacher –D. The syllabus and course books of the two language courses were checked. There are a lot of activities that require interaction like pair work, group work and discussion.

Analysis of Questionnaire

Teachers' Interview:

In response to the question, How many students do you usually have in your class, all teachers say that their classes have 41 to 50 students. All teachers say that they try to engage their students in interaction 'sometimes' in classroom activities involving pair work / group work/ project. While mentioning the percentage, who enthusiastically participate, they say that 21-30 percent of the students willingly participate in interactive activities. In response to the question, "Do the course books you follow have interactive activities?" all agree that they have.

In response to the question, "What according to you, are the reasons for students non-participation in the interactive activities in the class?" teachers mostly attribute this to the students' nervousness as well as the students' cognitive and language-related factors.

Teacher- A ascribes it to anxiety of the students and students' socio-economic backwardness. Teacher- B attributes it to anxiety of the students and students' socio-economic backwardness and students' lack of interest in interactional activities. Teacher-C says that students' lack of proficiency in English as a medium of interaction, anxiety of the students and students' socio-economic backwardness are the key problems. Teacher-D ascribes it to students' lack of proficiency in English as a medium of interaction and anxiety of the students.

So, from the four teachers' interviews, it becomes crystal clear that three count anxiety and the students' socio-economic backwardness as the reasons for students' non-participation in interactive activities in the class. On further enquiry, two teachers said that as many students always remain worried about their educational expenses, they remain de-motivated and unenthusiastic about classroom participation.

Analysis of Students' Questionnaire

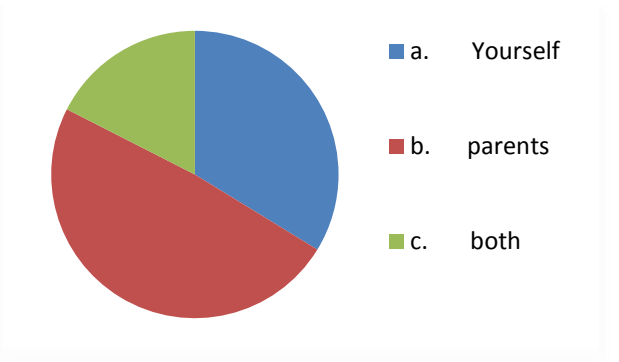
It was found that all respondents are between 20 and 21 years of age and 56 respondents are male and 24 are female. Out of 80 students, 66 are from Chattogram. 50 students are from rural area and 30 students are from urban area. There is a general perception that affluent people live in city. Regarding the number of family members, 26 students have family with five members. 20 students have family with more than six members. Only 3 students' family consists of 3 members. Bigger family is supposed to have negative impact on economic solvency and affordability to maintain educational cost.

In response to the question, "Why did you decide to study English at this university?" 32 students' choice is related to the economic factor, i.e. the two options: affordable tuition fees and monthly tuition fees. The factor 'nearness to the residence' is rated by 20 students which is also linked with the socio-economic factor because it also involves cost. 21 opt for the fame of the Department and the University. Interest in the subject counts for only 7 students.

Regarding parental education it was found that 43 students' fathers are between HSC and below SSC. On the other hand, 37 students' fathers have graduation and post-graduation. Regarding mothers' educational status, only 14 students' mothers are graduate and above graduate. On the other hand, 66 students' mothers are between HSC and below SSC.

Regarding the approximate monthly income of parents, 32 students say that their parents' monthly income is between 21 and 25 thousand taka, followed by 17 having below 20 thousand monthly income. 10 say their parents' income is between 26 and 30 thousand taka and 9 have between 31 and 35 thousand taka. However, only 12 parents' monthly income is more than 40 thousand taka.

In response to the question, who bears your present educational expenses, 27 students have to bear their own educational expenses which is unique. 14 say that their expenses are borne by both parents and themselves. If we add these two categories, the number is 41 which is almost half of the total samples. 39 students say that their parents bear their educational expenses.



Pie chart-1: Source of educational expenses

Regarding the question, "Do you have to worry about your educational expenses?" majority, i.e. 56 students say Yes. In response to the question, "Do you have to help your family with money or household chores or in any other form?" 48 students say they have to finance their families and do household chores.

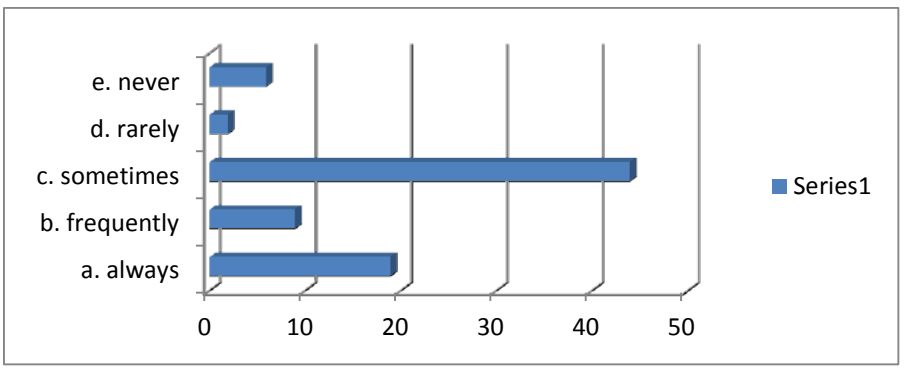
Regarding the average GPA in two language courses at the university, the students mentioned the following results-

a. 2.25-2.50	47
b. 2.50-3.00	23
C. 3.00-3.25	10

Table-1: Students' Results

This score does not reflect the satisfactory achievement in any way. Regarding the question, "Did you participate in any classroom activities, i.e. pair work / group work project work in your school/ college life?" 67 say they participated in those activities in their college and school lives.

In response to the question, "How frequently did you participate in those classroom activities?" 72 students state that they did it with different frequency, if we combine the number of students who did it always, frequently and sometimes.



Bar chart- 1: Rate of participation in extra-curricular activities

While replying to the question, "Did you participate in extra-curricular activities at school/ college?" 64 say that they did. In response to the question, "How often did you participate?" 70 students altogether say they did it in different frequency, 17 always, 11 frequently and 42 sometimes.

Regarding the question no. 16, "Do you now participate in extra-curricular activity at university?" only 33 say that they participate in extra-curricular activities. But, 47 say they do not participate. In response to the question no.17, 47 reply in the negative and only 33 students say Yes.

Yes	33
No	47

Table- 2: Rate of participation in extra-curricular activities at the University

Regarding the question, how frequently they participate, 6 say always, 7 say frequently and 20 say sometimes. Regarding the reason for non-participation in the interactive activities in the class, out of 47 respondents, 32 attribute to their financial anxiety followed by lack of interest by only 6.

While mentioning the reason for their non-participation in the interactive activities in the class, they reveal the following reasons.

a. Your lack of interest	3
b. Course teachers' inability to engage you in such activities	2
c. Financial anxiety	32
d. Your course teacher was not friendly	3
e. Classmates were not cooperative	4
f. Other	3
Negative evaluation by classmates	
The class size is very large	
The teaching materials /activities do not require interaction	

Table-3: Reasons for non-participation in interactive activities

The table above indicates that among the 47 responses as included here, 32, which is, 68.08 percent, mention their financial anxiety as the reason for their skipping interactive activities. Other factors are not significant at all to be mentioned.

Discussion

If we compare the demographic questions with the academic ones in the students' questionnaire, we see that there is no significant relation between gender and reticence among the students. Among the 80 respondents, 56 are male and 24 are female. The female students in rural areas are assumed to be reserved because they do not tend to open up and express their opinions in public. But the number of male respondents being 56, does not seem to be a strong variable to have a significant impact on student reticence here. If further comparison is done between the demographic questions and academic questions, the relations between socio-economic factors and students' academic achievement in English becomes clear. We see that there are 26 students whose family consists of 5 members and 20 students who have more than six members. Similarly, 50 students say that they are from rural areas. If we correlate it with the number of the students who rate the three reasons for choosing the university, the number is almost the same, that is, 52. This again corresponds with the number of students whose parents' monthly income is very small. The number of parents whose income is less than 30 thousand taka is 49.

Again, if we see the number of students who have to bear their own educational expenses, it is 27. In addition to that, 14 say that they have to contribute too to their educational expenses in addition to their parents' contribution. In addition to bearing own educational expenses, 48 say that they have to help their family financially. If that is the case, how can these huge number of students concentrate on their studies without any anxiety? This fact is corroborated strongly by the GPA in two courses where 47 students' GPA is between 2.5 and 2.75.

Furthermore, if we compare the rate of interaction in classroom and participation in extra-curricular activities in two levels, i.e. school/college and university, a point becomes clear. The number of students who participated in

school/college is much more than the number who now participate in university. Regarding the reasons for non-participation in interactive activities in the class, out of 47 respondents, 32 attribute it to the anxiety followed by 6 who say that they do not have any interest in participation. The most important reason they mention for their reticence is financial anxiety. Their participation declined at university level because they are now mature and conscious enough to realize the brunt of financial pressure. 47 students are not seen to participate. This number is around 49 whose parents' monthly income is between Tk. 25 thousand and below. It again corresponds well with the percentage of students who have to bear their own educational expenses. Again the fact that 27 students have to bear their educational expenses themselves and 14 have to share the expenses with their parents, corresponds well with the number of students. McLoyd's (1989) also found that parents who experience stressful economic condition have children who are more hopeless about their educational and professional lives and pointed out that among the different indices of family SES, including 'parental degree, longtime versus temporary poverty, income, and parents' professional status, income level and poverty seem to be the more powerful predictors of children's cognitive outcomes in comparison with other SES indices (Duncan et al., 1994; Stipek, 1998).

The presupposition that parents 'low academic qualification is a strong predictor of children's academic achievement is proven in our study. Here in our study we see that 43 fathers are between HSC and below. On the other hand, 60 mothers are between HSC and below. It corresponds well with the students' score in two language courses. In our study it is proven that parents' education and higher income have a positive impact on their children's better achievement. Parental motivation and support is a crucial factor in motivating students to do better results. These views go well with (Davis-Kean, 2005) who found that more highly educated parents motivate their children to 'develop high expectations of their own.' Asgari and Mustapha's (2011) study is relevant here though it is concerned with the primary level students. In their study most of the participants stated that their parents being their first teachers gave them primary knowledge about L2, providing good scope either at home or in school to 'improve their vocabulary, reading and speaking' (Asgari and Mustapha (2011). Butler (2013) finds the effects of parents' socio-economic status (SES) on their children's speaking abilities, though not on their listening, reading and

writing performance, at the fourth-grade level, if not earlier. Adams, D. R., Meyers & Beidas (2016) also mention that unmet financial needs may require low-income and/or first-generation students to work full-time jobs and live off campus, which may hinder their academic and social interaction on campus.

To sum up, the findings of this study indicate that gender does not count as a significant factor for the students' non-participation in interactive activities. But the financial anxiety of the students as they grow and transition through primary, secondary, higher secondary and finally tertiary level of studies, grows gradually and that factor works as a great stressor in their academic and personal lives. The huge number of students whose parents are not only from low-income group but also less educated are seen to perform worse than those who have parents from high-income and educated class. The respondents who are rather contributing to their educational expenses are seen to participate less in their classroom interaction as is evident from the data. So, parents' socio-economic status (SES) works as a strong factor in their children's academic achievement and participation in interactive and collaborative activities inside and outside of the classroom.

Limitations of the Study

This study depends on questionnaire and interview. It would be more reliable if a number of classes were observed to have a first-hand knowledge about the pattern and nature of classroom interaction. In absence of that, we relied only on the teachers' opinion and the students' replies. There might be other factors such as, class size, students' lack of interest for students' non-participation in classes. For example, how a teacher can execute interactive activities in a class of 40 or above students is a pertinent and important question.

Conclusion

Students' educational achievement depends on multiple factors which include the learners' cognitive, affective aspects as well as socio-cultural and socio-economic issues. We have found from our study that the cognitive, affective attributes of the learners must be supported by the home and family environment. The parental education and income are the strong factors that may either support or weaken the learners' morale, motivation and effort. The data analyzed in this study show that financial stress of the students acts as the most

powerful de-motivator for the students not only in opening up and joining discussion in the class, but also in having satisfactory score as is evident from the results of the samples of this study in two language courses. So, by ignoring the learners' Socio-economic Status (SES), it is not possible to ensure students' oral participation in the class. Students cannot have good score even in their writing examination where they do not need to show their speaking skill. Again, even though they may fare well in the written examination, their oral performance does not improve and morale and confidence in the long run become weaker. It also affects their future career performance and prospects. Though the soft skills can be cultivated through proper teaching –learning and extra-curricular activities, students do not want to participate in the interactive activities in the classroom and the extra-curricular activities of the institution when they are constrained by financial difficulties.

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Annexure-1

Teachers' Interview Questions:

Factors behind Withdrawal from Classroom Interaction and Extra-curricular Activities

1. How many students do you usually have in your class?
2. Do you engage your students in classroom activities involving pair work / group work/ project?

1. Always 2.often 3.sometimes 4. Rarely 5.never

3. If your answer is yes, mention in percentage, the number of students who enthusiastically participate in interactive activities, i.e. Pair work, group work in your class.
4. Do the course books you follow, have interactive activities?
5. What according to you, are the reasons for students' non-participation in the interactive activities in the class?

Annexure-2

Students' Questionnaire:

Factors behind Withdrawal from Classroom Interaction and Extra-curricular Activities

Demographic Information

1. Home District

2. Are of residence?

a. City	
b. Village	

3. No. of Family members ----------

4. Why did you decide to study English at this university? Rate according to importance-

a. Name and fame
b. Nearness to your place
c. Affordable tuition fees
d. Monthly tuition fee payment system
e. Easy admission policy of the university
f. Fame of the Department and University
g. Others

5. What is your father's educational status. Tick the right one.

a. Below SSC
b. SSC
c. HSC
d. Pass /Hon's
e. Masters

6. What is your mother's educational status. Tick the right one.

a. Below SSC
b. SSC
c. HSC
d. Pass /Hon's
e. Masters

7. How much is the approximate monthly income of your parents in BDT?

a. Below 20 thousand
b. 21-25 Thousand
c. 26-30 Thousand
d. 31-35 Thousand
e. 36-40 Thousand
f. More than 40 Thousand

8. Who bears your present educational expenses?

a.	Yourself
b.	parents
c.	both

9. Do you have to worry about your educational expenses?

a. yes
b. No

10. Do you have to help your family with money or by doing household chores or in any other form?

a. Yes
b. No

Academic Information:

11. What was your average GPA in two language courses at 1st and 2nd semester at the university?

Course-101

Course -201

12. Did you participate in any classroom activities, i.e. pair work / group work project work in your school/ college life?

a. Yes
b. No

13. How frequently did you participate in those classroom activities? Tick the right one.

a. always b. frequently c. sometimes d. rarely e. never

14. Did you participate in extra-curricular activities, debate, sports/ cultural programs in school/college?

Yes-

No-

15. How often did you participate?

a. always b. frequently c. sometimes d. rarely e. never

16. Do you participate now in extra-curricular activities, debate, sports/ cultural at university?

Yes
No

17. Do you participate now in pair work / group work project work at your university?

Yes
No

18. How often do you participate in pair work / group work/ project work?

a. always b. frequently c. sometimes d. rarely e. never

19. Mention the reason for your non-participation in the interactive activities in the class. Mention according to importance. You may mention more than one.

a. Your lack of interest
b. Course teachers' inability to engage you in such activities
c. Financial anxiety
d. Your course teacher was not friendly
e. Classmates were not cooperative
f. If others, specify-

Impact of Climate Change on Dengue Transmission in Bangladesh: A Critical Review

Anowara Jenny *
Sajal Chakraborty ** Akser Alam Siddiqua Maya **
Joysree Das * Sharmin Akhter * Prodiptho Chakraborty **

Abstract

Dengue fever is a mosquito-borne tropical disease caused by The Ades mosquitoes carrying dengue viruses. The associations between climate conditions and dengue transmission have been found in many studies. However, the impression of climate change on dengue transmission is being discussed in this paper. This literature examined epidemiological evidence on the climate-dengue relationship with an emphasis on quantitative methods for evaluating possible climate change impacts on dengue transmission. Two systematic reviews were performed. We had searched Pub-Med, literature sources for documenting dengue outbreaks that are geographically identified. We also looked for finding out model the possible effects of climate change on dengue transmission through Pub-Med and Google scholar. We gathered evidence from researches that met the inclusion criteria and draws our conclusions. It is found that most studies showed dengue transmission is highly sensitive to climatic change. This analysis found some primary methodological issues and current knowledge gaps.

Key Words: Climate change, Dengue, Models, Projections, Dengue fever (DF).

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Introduction:

Dengue is the fastest spreading, mosquito-borne viral infectious disease worldwide with remarkable morbidity and mortality after malarial infection.[1] In recent decades, the spatial spread of dengue has been reported from urban to suburban or rural.[2] Dengue fever is an acute illness due to four forms of dengue virus (DENV1, DENV2, DENV3, DENV4) most of which are transmitted by *Aedes aegypti* and *Aedesal bopictus* tohumanhosts.[1] Several complex risk factors including host immunity, vector capacity, DENV circulation, environment or atmosphere, dengue control capability, and population movement influence the dynamics of dengue transmission.[2] Weather variables effect of dengue epidemiology through their indirect impact on mosquito biological aspects and DENV incubation periods in mosquitoes.[2] Temperature influences vector growth rates, survival and behavior and regulates mosquito viral replication variability in precipitation affects the availability of habitat for species *Ae.aegypti* and *Ae.albopictus* larvae and pupae.[3] Climate change alters DENV ecology spatial and temporal dynamics, possibly by increasing the flying range of vectors, increasing the vector activity length.[2] As the main evaporation regulator, temperature also interacts with rainfall, thus also impacting the quality of water ecosystems. Indirectly, the effect of heavy rainfall, increasing temperature and moisture content of land can encourage or hinder the growth of vector populations. [3] The rate of DF is correlated with indices of vegetation, tree cover and standard of housing and surrounding land cover. Change of climate could also alter how human interacts with nature, increasing its use also influence the extent of the mosquito population and the nature of the ecosystem. Consequently, literature predicting that climate change is one of the most significant changes in the environment will result in populations facing it in the coming decades.[1] DF is prevalent in tropical and subtropical regions.[1]In a recent analysis, it is observed that in each year 400 million people considered an endemic or infectious disease area.[1]

Approximately 52 % of people living in South-East Asia region countries are at the risk of dengue including Bangladesh.[4] There, since an initial epidemic in 2000, when 5551 cases and 93 deaths were reported, the disease emerge dasa major threat to public health.[4] Dengue fever was first identified in Bangladesh, during the late summer of 1964, an outbreak of a febrile disease called (Dacca

Fever); occurred in the capital (now Dhaka). Form 3 dengue virus has been isolated.[5] Sporadic cases and minor clinically suggestive out breaks of dengue occurred throughout the country between 1964 and 1999, but were not officially reported.[4] An outbreak in and around Dhaka started in the summer of 1999, followed by the first officially reported DF epidemic in 2000.[5] Severe dengue cases have also been reported. The epidemic was probably caused by a strain of the dengue virus from endemic countries in eastern Bangladesh. Dengue cases have been reported in all major cities in Bangladesh every year since2000.[4] Since 2002, the highest recorded outbreak occurred in 2002 with 6132 cases.[4] Notifications of hospital monitoring have decreased, although the true numbers of cases remain undetected. To understand how climate affects dengue is complex, the relationship between the present climate and diseases must be understood. The relationship between climate and diseases with different modes of transmission (vector, water, food, soil and airborne) was established with the strongest connections between climate and mosquito- borne diseases.[3] The goal of this study is to provide a systematic review of the scientific literature of Bangladesh on the occurrence of dengue and its connection to climate.

Research design:

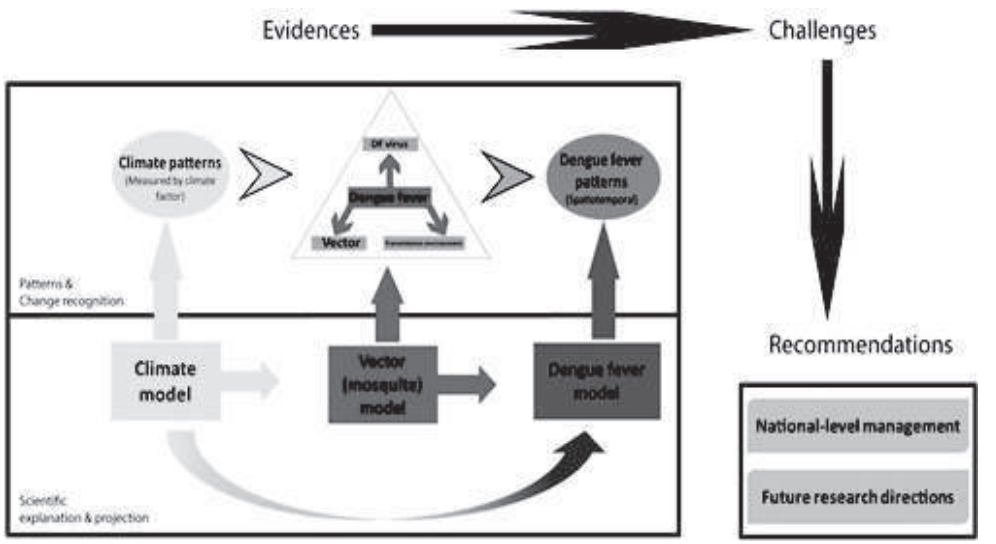

Fig-1. Tri-model supported the prediction of Dengue Fever distribution and patterns.

The focus of this analysis is to survey the literature for scientific evidence on the impact of temperature change on DF distribution in Bangladesh, and to look at the standing of and wishes for modeling and prediction of DF in Bangladesh considering temperature change. Temperature change includes changes in climate factors and extreme weather events, each of which may affect the distribution of DF. Temperature change affects DF transmission through impacting its 3 essential bio-ecological aspects: (The virus, The vector, and transmission surroundings).Therefore, underneath standing the dynamics of DF under temperature change necessitates to correct modeling and prediction of climate change, that of vectorial (mosquito) abundance and capability in which DF incidence underneath weather, particularly climate model, vector (mosquito) model, and weather-based DF model. A framework (Fig.-1) named "Tri-model Supported Prediction of dengue fever Distribution and Patterns" so as this figure let's say the connections between the assorted components. Prediction of dengue fever virus (DENV) transmission and its spatiotemporal patterns should be supported acceptable weather-based DF model, dengue mosquito model, and climate model. The weather-based DF model describes the connection between DF incidence and climate factors. The weather-based DF model is being used for predicting the spatiotemporal patterns of DF distribution. Mosquito model quantifies the dynamics of mosquito distribution and population that is closely associated with weather. The climate model uses quantitative strategies to simulate the interactions of the vital drivers of climate. Climate model not solely generates predictions of climate patterns and dynamics of weather however conjointly provides inputs for the mosquito model, which can turnout outlooks of mosquito abundance and vectorial capability across the house and thru time. Projection of DF refers to predicting DF distribution or spatiotemporal patterns supported weather-based DF model, once climate factors and their magnitude are similar because the connected amendment in mosquito activity. Thus the general prediction of DF distribution patterns, despite its stress on patterns and alter prediction, is made upon the knowledge based mechanisms which will make a temperature change, mosquitos' vectorial capability and DF incidence. Our choice of literature and style of this review analysis are guided by this framework as illustrated in Fig. (1).Considering the primarily records happening of the DF case in Bangladesh was according to the late summer of 2000. Our literature survey covers papers

and reports associated with DF in Bangladesh that were being printed from 1998 to 2017. Following the framework on top of (Fig.-1), the keywords outlined by 3 sets of terms were not to screen the literature; the obtained results should contain keywords from a minimum of one in every three sets (Table-2). The primary set describes patterns and alters recognition of DF transmission driven by temperature change in an Asian country. The terms are associated with temperature change and therefore the 3 aspects of DF in the Asian countries. Keywords enclosed climate factors like temperature, humidness, a dengue fever, dengue fever virus, mosquitoes, transmission, occurrence, Bangladesh. The second set of terms describes models of DF transmission in the Asian countries, which concerned models of DF incidence and climate factors, mosquitos' models and climate models. Keywords enclosed DF model, mosquito's population model, climate model, and Asian countries. The third set of terms describes projections of DF transmission and distribution patterns in Bangladesh. Keywords enclosed projection of mosquito's population, prediction of DF incidence, and Bangladesh. A comprehensive literature search was conducted using Google Scholar, Research gate, PubMed. Fig.1 showed the method we tend to at first the challenges for Asian countries to higher perceive and predict the impact of temperature change on DF and our recommendations.

Scientific publication: Climate change & Dengue in Bangladesh
Keywords: Climate, Dengue, Scamaries, Models, Projections, DF
Inclusion criteria: Review & original papers published in national & international journals from 1990-2017, included in selected electronic database

↓

Article identification from datebase : 30
(included duplicated articles)
▪ Google scholar ▪ Pubmed ▪ Research gate

↓

Article included for this study : 9
After removing the duplicate & performed full text review based on inclusion criteria

Table-1: Summary of strategies, process, and results of the literature search

Table-2. The list of keywords used to screen the literature.

Sets	Categories	Keywords
Set-1: Impact of climate change on Dengue fever.	Three aspects of dengue fever transmission	Dengue virus DENV, vectors, mosquito, *Aedes aegypti, Aedes albopictus*, transmission
	Weather Factor	Climate factor, weather factor (temperature, humidity, precipitation, wind, air-pressure), Extreme weather.
	Geographical Location	Bangladesh
Set-2: Model of Climate change on dengue fever.	Weather-based dengue fever model	Dengue fever model, transmission, climate, weather
	Mosquito model	Mosquito, model, climate, weather, population
	Climate Model	Climate Model
Set-3: Projection of dengue fever		Projection, prediction, dengue fever incidence, future climate condition

The impression of climate change on Dengue in Bangladesh:

Climate change refers to statistical shifts of climate conditions over an extended period, including alternations of one or more weather factors like temperature, precipitation, humidity, wind velocity.[1] These changes impact the incidence of dengue fever through affecting the survival, replication, development or distribution of dengue virus and mosquitoes, also because of the means and process of dengue transmission. During this section, we offer a scientific

literature summary of the impacts of weather factors on DF from three bio-ecological aspects: impact on dengue virus, impact on dengue vector (mosquito) and impact on dengue transmission in the environment.[1]

Weather and vector ecology:

Temperature:

Temperature plays a crucial role in the Replication of Aedes species at a particular range.[6] Literature suggests some factors like survival rate, reproduction, development within the host, mosquito Density, biting activity, ovarian development, mosquito flying distance that depend on temperature. The presence of heat survival rate is increasing and therefore the replication of the dengue virus is also increased. Laboratory studies assessing that factors indicate that the perfect temperature range for the survival of all life phases of *Ae. aegypti* is between 20°C and 30°C.[7] The rising temperature reproduction rate is also increasing.[1] By increasing temperature, the development period of the intermediate host is shortened, for example, development with in the intermediate host takes 12 days at 30°C and seven days at 34°C.[1] On the other hand, the event period in the intermediate host is going to be longer with the decreasing temperature. *Aedesaegypti*, the vector of DENV, does not regulate its blood heat, which is directly hooked into ambient temperature.[1] So it is sensitive to a particular climate condition. According to the study, mosquito density increases with the increase of temperature. But when the temperature is above 32°C, the mosquito density decreases significantly.[1] It is found that biting activities limited to a temperature between 15°C - 35°C.[1] The optimal temperature for biting activities range between 25°C - 30°C.[1] Ovarian development is also regulated by temperature.[1] Changes in temperature can impact mosquitos' flying distance. The favourable temperature ranges between 20°C - 27°C, where mosquitoes can fly quite 400m.[1] By decreasing temperature (18°C) their flying distance also decreases, generally within 50m.[1]

Precipitation:

Studies show that precipitation was positively related to dengue incidence. Mosquito breeding has a co-relation with precipitation. Precipitation is important to supply essential breeding sites for mosquitoes developed a DF model and proved that the mosquito density is positively correlated to

precipitation.[4] National surveillance data usually shows that dengue increases from June to August which is the rainy season in Bangladesh.[4]

Humidity:

Humidity is positively associated with DF incidence.[1] It also affects DF incidence by altering mosquito behavior. Higher humidity is related to increase *Aedes aegypti* feeding activity, therefore survival and egg development.[3] From literature, in dry season mosquito bites on average 19 bites per hour and wet season 60 bites per hour.[1]

Wind velocity, It features the harmful effect of dengue fever incidence. When the wind velocity is increased, the mosquito density decreases.

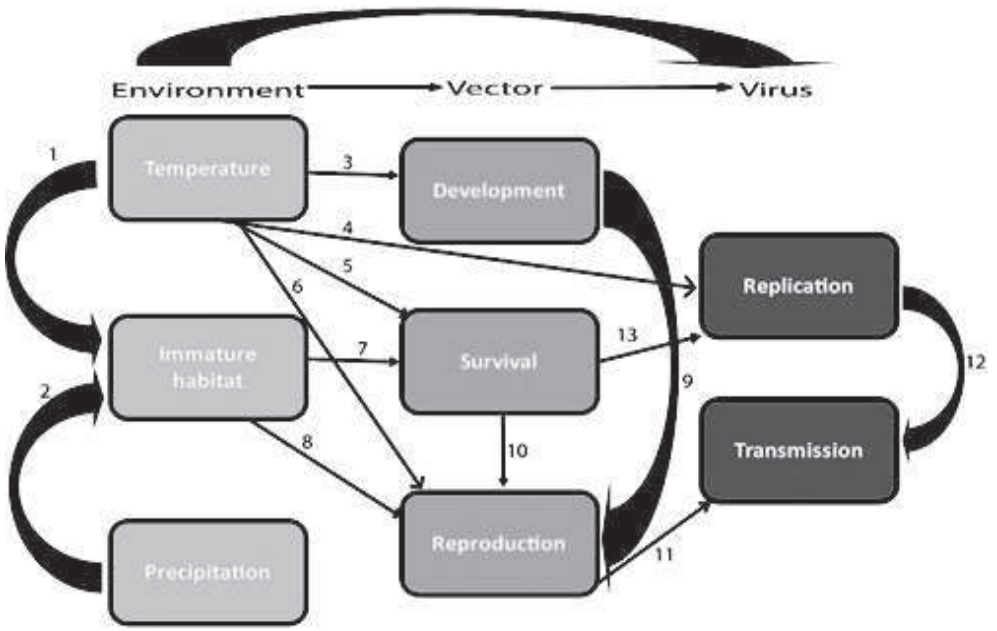

Fig.-2. Biophysical influences on dengue ecology showing the interactions between climate variables, vectors, and also the virus.

The numbers in figure: 2 identify relationships between variables supported by research within the field and under controlled laboratory conditions. Habitat availability for mosquito larvae is influenced by - (1) temperature through evaporation and transpiration, (2) incoming precipitation, Temperature could

be a major regulator of (3) mosquito development, (4) viral replication within infected mosquitoes, (5) mosquito survival, (6) the reproductive behavior of mosquitoes, Habitat availability is required for (7) survival, (8) egg- laying, Mosquito reproduction is accelerated by (9) faster mosquito development, (10) increased survival, Increased mosquito reproduction (11) enhances the likelihood of transmission by increasing the number of blood feedings, Faster viral replication (12) increases transmission by shortening the time for the virus to develop within the mosquito, increased survival of the adult mosquito (13) increases the number of viral replication. [7]

The studies on the connection between weather factors and DF are abundant, but the findings on the implications are not always consistent. Studies in several areas produced outcomes different from each other with relevancy the implications of similar weather factors.

Extreme weather factor:

Extreme weather events at the regional or local places in Bangladesh also can impact DF incidence. These events include drought, flood, cyclone and warmth wave. A study suggested that drought helps to reduce DF incidences by limiting the amount of mosquito breeding sites and therefore the growth environment of mosquitoes. Additionally, heat waves were found to be related to increase DF incidences and associated deaths, particularly within the riverside area. Similar extreme weather events may cause different health impacts, associated with the magnitude of change in climate factors. A study showed that flood tends to steer to rise in DF incidences and thus to increase mosquito habitats and high mosquito density. However, the flood also can damage mosquito habitats and flush away their eggs and larvae, which could decrease in the DF incidence.

To sum up, empirical studies on the connection between global climate change and therefore the three aspects of DF transmission are abundant and especially concerning DF vector. However, there are scarcity of investigations on the correlation between DF incidence and extreme weather events.[5] Moreover, there need for a transparent scientific prediction on how changes in extreme weather events may causes patio-temporal changes within the distribution of DF in Bangladesh.

Dengue incidence in Bangladesh:

Bangladesh is situated within the tropical and sub-tropical areas like other Southeast Asian (SE) countries.[5] It is located inside the south Asia and surrounded by India at the north, east, and west site. Southeast portion of Bangladesh is connected through Myanmar and the Bay of Bengal in south (Fig-3).[4] It is one of the principal appropriate countries for the habituation of the dengue vector.[4]



Fig.-3. Location of Bangladesh.[4]

In India, dengue fever has occurred in 1945 and in 1963 to 1964, a massive outbreak took place in Kolkata, about 567 km west of Bangladesh, partially coinciding with Dacca in Bangladesh. A most important outbreak of extreme dengue passed of fat Delhi in northern India in 1996. Myanmar had outbreaks at intervals of 3 to 5 years for the reason that the foremost outbreak in 1970. Dengue endemic international locations surround Bangladesh, placing it at chronic danger of importation of state-of-the-art dengue strains.[4] The first epidemic of dengue be falls in Bangladesh in 2000. During the epidemic 5551 reported instances and 93 deaths instances with 1.7% death rate were found in the country.[4] Dengue in 2000 in Bangladesh alongside 17 cities together with 4385 (79%) dengue and 1166 (21%) dengue hemorrhagic fever cases. The biggest epidemic came about in 2002 when 6132 cases mentioned with 1% death rate (61 deaths).[4] In 2010, 4097833 symptomatic infections came about however only 409 files officially registered. As countrywide surveillance is passive and hospital-based, it is eye-catching that incident cases are under-ascertained. From 2000 to 2009, 29 districts stated dengue instances with Dhaka constantly reporting the most vital range of cases (91%). From 2000 to 2014 an entire of 28000 cases pronounced with 242 dying cases occur. In 2017 the entire wide variety of instances were 40476 with 268 dying instances shown in Fig-4.[4]

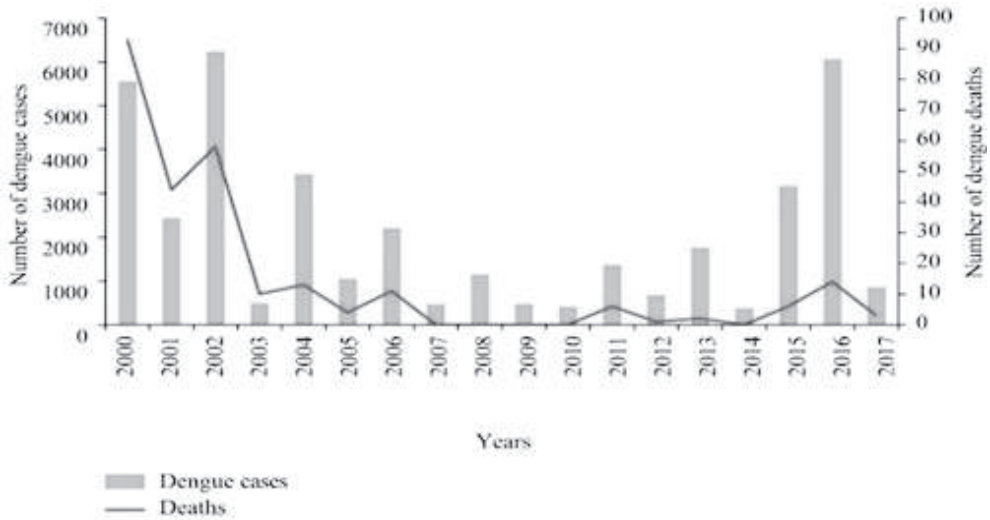

Fig-4: Trend analysis of report of dengue cases and deaths by years from 2000–2017.

The trend analysis, reported dengue cases and deaths by years from, 2000–2017 had shown in public and private health facilities by the control room, DGHS. It also showed that maximum number of deaths was in 2000 when dengue emerged as the first outbreak in Bangladesh, and the study analysis earmarked the period as the pre-preparation phase. The map also showed a sudden rise of dengue cases in 2016 and subsidence of dengue cases leads to an explosion of the Chikungunya outbreak for the first time in Bangladesh in 2017, which reflects the study hypothesis.[4]

The findings about the dengue incident is presented below by focusing on four (4) parameters. They are morbidity and mortality pattern, seasonal relationship, affecting dengue instances and deaths.

1. Morbidity and mortality:

The trends of dengue scenario in Bangladesh were analyzed from 2000 to 2017 in total 40476 verified dengue patients had been observed. Between 2002 and 2016 the utmost quantity of deaths happened in 2000. The bulk of deaths had been located in Dhaka city 93% and where percentage of men is 68% and within the 15 to 50 years age maturity corporations is 57%. Most causes of deaths (65%) have been reported as a complication due to dengue.[4]

2. Seasonal relationship:

There was an in-depth relationship between seasonal relationships and dengue instances in Bangladesh. From 2000 to 2017, 40476 patients stated the dengue cases have been broadly started in monsoon season (May to August) 49.73% and put up monsoon season (September to December) 49.22%. The peak season of dengue in Bangladesh is from July to October. From 2015 to 2017 the dengue instances reported in pre-monsoon season had been 7 times higher than that was evaluated in the previous 14 years. The dengue cases also high in the post-monsoon season to intermittent rainfall. Early onset of the monsoon and prolongation of monsoon. From literature, we found that, after 2014, rapid unplanned urbanization had been the robust predictors of an imbalance inside the existing ecology that had led to lengthening in dengue instances in 2016 [4] (Fig-5) (Table-3).

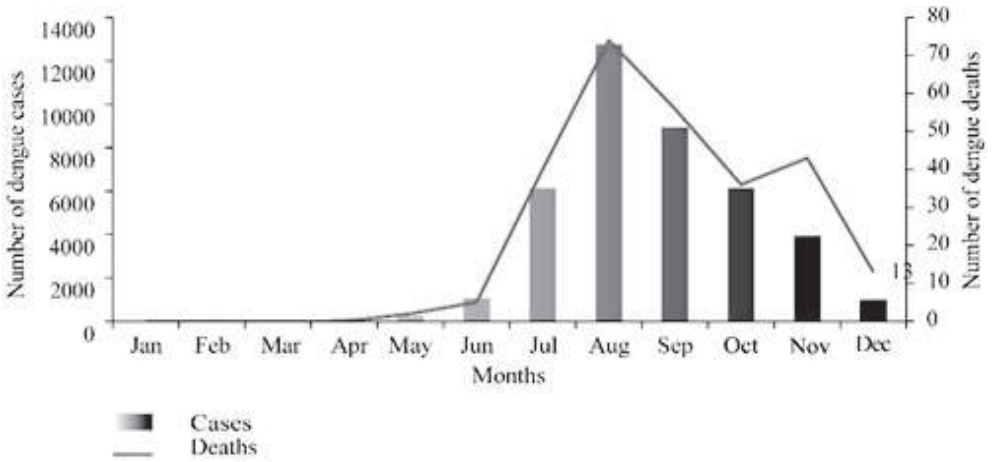

Fig.-5: Dengue cases and death ratio chart over the year (January–December, 2016)

Seasonal variation in the occurrence of dengue cases and deaths by month, 2000–2017, showed fewer cases in the pre-monsoon season (January–April), and maximum cases and deaths were reported in the monsoon season (May-August) and in the post-monsoon period (September–December). Figure-5 shows the peak season of dengue in Bangladesh is from July to October.[4]

Table-3: Seasonal variations of dengue cases: A comparison by year. [4]

Year	Pre-monsoon	Monsoon	Post monsoon	Total
2000-2002	0	7193	7020	14213
2003-2005	4	2802	2703	5509
2006-2008	0	2985	834	3819
2009-2011	0	1305	885	2190
2012-2014	43	1174	1587	2795
2015-2017	334	4671	6945	11950
Total (2000-2017)	381 (0.94%)	20130 (49.73)	19224 (49.22%)	40476

2. Dengue instances and deaths:

The total duration of the dengue deaths case is break up in two tiers pre-preparation phase (1998- 2002) and intervention segment (2003-2017). In the pre-preparation segment, the suggested case is used to be 14213 and deaths is 195. The case-fatality ratio is 1.38% in intervention phase. The whole case used to be 26263 and deaths are 173, in case of fatality ratio is 0.65%. In pre-preparation section there are an outsized quantity of cases and greater deaths with a case of fatality ratio (CFR) is 1.38% which is greater than the suitable and vary 73% of total deaths happened throughout this phase. Due to subsequent revolutionary motion taken with the aid of the CDC at some point in the intervention phase, a CFR under 1% (0.65%) used to be performed.

Table-4: Case fatality ratio (CFR) before and after the intervention by the operational plan from 1998- 2017.[4]

Phase	Cases	Deaths	CFR (%)
Pre-preparation phase			
1998-2002	14213	195	1.38
Intervention phase			
2003-2007	8530	38	0.44
2008-2012	4014	07	0.17
2013-2017	14121	28	0.19
Sub-total of intervention phase	26263	173	0.65
(2000-2017)	40476	268	0.66

*CFR = Case Fatality Ratio.

The dengue cases and death due to it are divided in to two stages. The first phase is pre-preparation segment where the duration of year is 1998 to 2002, here the suggested cases are used to be 14213 where The number of deaths is 195 and the case-fatality ratio is 1.38%.In second stage that is intervention phase the

whole cases used to be 26263 and deaths are 173 and the case fatality ratio is 0.65%. In pre-preparation section there are an outsized quantity of cases and greater deaths with a case fatality (CFR) of 1.38% which is greater than the suitable. Throughout this phase73% of total deaths happened. Due to subsequent revolutionary motion taken with the aid of CDC at some point in the intervention phase, a CFR under 1% (0.65%) used to be performed (Table-4).

Discussion on the findings of study:

One of the key findings from this study is Climate factors like Temperature, Precipitation, Humidity, Wind, Extreme Weather significantly associate with the transmission of dengue. It is found from the information analysis that 40,476 confirmed dengue cases reported in Bangladesh from 2000-2017 and the maximum cases are related to temperature. Different studies had shown that the elevated temperatures and relative humidity are determining factors in estimating changes of the dengue transmission.

High temperatures increase the larval development rate and decrease the emergence of adult mosquitoes, increase the biting rate of mosquito and reduce virus replication within the mosquito. Extreme higher temperatures may decrease the survival time of mosquito that would offset the positive impact on mosquito abundance. Evidence had shown that there is a relation between temperature and dengue incidence rates. Relative humidity is additionally a key factor that effect at different stages of mosquito life cycle. The combined effect of temperature and humidity remarkably affect the range of blood meals and also affect the vector survival rate and the chance that it will become infected and capable to transmit dengue. Literature showed that, relative humidity and temperature are the two most important factors with powerful impact on dengue transmission. Relative humidity has affected by a mixture of precipitation and temperature and affect the mosquito lifespan and thus the capacity for transmission of the virus. This literature had confirmed that annual average relative humidity was the foremost significant climatic predictor of worldwide dengue incident. Contrasting, precipitation failed to appear to play a crucial role because many breeding sites of *Ae. Aegypti* were more dependent to human behaviour than on precipitation for their development and survival.

Therefore, temperature, precipitation and relative humidity are important factors of the geographic limits within which dengue transmission is expected to sustain, mainly by their effects on the Aedes vector. Besides, within areas where minimum on set of those climate parameters is sufficient to maintain dengue transmission, seasonal fluctuations in these parameters are going to be important determinants of the duration and potentially the intensity of transmission. Different studies had shown that the elevated temperatures and relative humidity are determining factors in estimating changes of the dengue transmission. Contrasting, precipitation failed to appear to play a crucial role because many breeding sites of *Ae. Aegypti* were more dependent to human behaviour than on precipitation for their development and survival.

Another finding from this study, seasonal fluctuations is an important determinant in the transmission of dengue. Various surveillance data (fig: 5) shows that maximum cases and deaths occur from June to August which is the monsoon season in Bangladesh. The seasonal variation of dengue cases data (Table-3) from 2000-2017 shows that maximum dengue cases reported during the monsoon (49.73%) and post monsoon (49.22%) season. Furthermore, the seasonality of dengue transmission, periodic epidemics and more irregular intervals of outbreaks are usually observed. The information generated here were accumulated from different literatures, which provide only are strained scope for advanced analysis. It has been shown that 40,476 confirmed dengue cases reported in Bangladesh from 2000- 2017 and the maximum cases are related with temperature. The occurrence of dengue cases in Bangladesh show a noted seasonal variation, while this is often becoming less noted in current years. This study has demonstrated that maximum dengue cases occur within the monsoon and post-monsoon season. Such results of seasonal variation in dengue cases in Dhaka city were reported. The season-specific concentration of dengue cases was fairly indicated in many other similar studies in geographical region and in other countries. Within the pre-monsoon season for the last 14 years (2000–2014), a poor number of cases were reported; however, since 2015, the dengue cases began to be reported from early part of the year and within the last three years (2015–2017), the amount of dengue cases reported within the

pre- monsoon season is seven times higher than those reported within the previous 14 years. Additionally, in the early, a part of 2018, a dengue death occurred within the pre- monsoon season for the first time in Bangladesh and highest number of cases (10,148; although very relevant but not included within the study due to study time frame) were reported within last 18 years (Source: control room, DGHS), which is additionally in support of the study hypothesis. These findings both in terms of dengue morbidity and mortality are the evidence of an epidemiological trend in Bangladesh and surprisingly in 2017, we identified a deadly disease of chikungunya for the very first time in Bangladesh. So, we may assume that climate changes in precipitation, humidity and temperature since 2014 had caused an ecological imbalance within the environment that has resulted in an exceedingly major shift in disease incidence during the pre-monsoon season and facilitated the introduction of transmission of the chikungunya virus within the country. Another finding of our study is this work will help to control the fatality rate. The fatality rate comes down from 1.38% to 0.66% during 1998- 2017 after the intervention operational plan. From the study analysis, it reveals the increase in average and minimum rainfall which significantly correlated with a rise in dengue cases.

At the identical time, key findings of our review paper showed that the increase of average temperature was also linked to the increase of dengue infection. It is also known that temperature increases cause expansion of the area involved and also the number of cases of vector-borne diseases. Similarly, this study showed a highly significant correlation with humidity and also the increase in dengue cases. These conditions facilitate the growth and survival of mosquitoes needed for successful propagation of the virus within the environment. In our findings, the important reservoirs of vectors are almost same as in other Southeast Asian countries. It has shown that, within the pre-preparation phase (1998–2002), most lives lost because of sudden exposure to the dengue virus for the first time in Bangladesh. This was due to lack of proper management of the dengue cases in terms of lack of assessment. In subsequent years, we termed the intervention phase (2003–2017), the government took necessary steps to learn and develop capabilities to stay this emerging dengue situation in restraint successfully. The

aggregation of all these activities decreased the case fatality ratio to below 1%. This very satisfactory result was due to an aggregation of long-term efforts and interventions. It is therefore very difficult to evaluate the impact of any individual intervention. All the deaths reported within the last five years (2013–2017), more than 70% occurred within 24 hours. This is alarming in terms of case management of dengue-related complications, like DHF or DSS, and also the correct implementation of the disease- monitoring system. The results of our study revealed that 65% of the deaths were due to complications, like DSS or DHF. This study could not confirm such a difficulty owing to limited evaluation of information.

The problem in accuracy and efficiency of knowledge could be a clear challenge of this review work. Despite this data limitation, the information generated by the analysis has important implications at the policy level. Our study has some limitations, like we could not provide the specific data of individual district due to poor record keeping system. The model we used also has some limitations. Despite having data limitation, the information generated by the analysis has important implications at the policy level. This study will be helpful for prioritizing and targeting interventions at suitable times for dengue transmission control.

Conclusion:

This review paper summarizes the status of research regarding understanding, modeling and predicting the impact of climate change on Dengue fever (DF) in Bangladesh. Climate factors (e.g. temperature, precipitation, humidity, wind velocity, and air pressure) may affect DF through impacting its three essential bio-ecological aspects: Dengue fever virus, mosquitoes and transmission environment. The effects of climate change on DF are found to be varied spatially and temporally. Weather-based DF model, mosquito model and climate model are essential for the projection of DF considering climate change. Unique challenges exist for the three modeling aspects in Bangladesh. Conversely, human can play a very active role in controlling and preventing DF by spraying pesticides and using mosquito repellant as well as monitoring

systems. In addition, improvement in weather-based DF model, mosquito model and the climate model may help increase the accuracy of DF condition.

We believe this review paper will help in research world by gathering knowledge about dengue fever and its influential parameters, sessional influence in mosquito replication, death fluctuation ratio in every year (1998-2017) due to dengue and chikungunya and overall situation of dengue fever in our country in those mentioned years.

Finally, the study proposes four recommendations for future work on climate and DF in Bangladesh:

- To encourage more advanced research on the relationship between extreme weather events and DF.
- To develop regional-specific models for climate change, mosquito distribution and DF transmission for the high-risk regions in Bangladesh.
- To promote interdisciplinary collaboration between climate studies and health services.
- To enhance public health education and management at national, regional and local levels.

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English Loan Verbs in Bangla: Patterns of Accommodation

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Abstract

Though chronologically the English rank third among the European colonizing powers that crossed the seas to land on the shores of India, the late entrants completely outsmarted their Portuguese, French and Dutch counterparts in terms of their subjugation of India. The English colonization of India and their subsequent grip on the state power had left a tangible influence on all the domains of Indian life. This omnipresent English influence is strongly felt in the linguistic realm as well. Bangla is super-saturated with English loanwords. The lexical loans include nouns, verbs, adjectives, prepositions, conjunctions etc. Among the words, nouns outnumber other categories of English loanwords in Bangla. This view is endorsed by the study of Tadmor et al. (2010), who, in their classic research, have shown that the nominal category is more borrowable than the verbal word class. Anglicisms in Bangla conform to this observation. Despite the numerical superiority of nominal loanwords, the number of English verbal borrowings is not insignificant. This paper, by following the principles of qualitative research, attempts to trace the mechanisms by which Bangla accommodates English Loan Verbs (ELVs) into the fabric of its own verbal system. The findings of this study reveal that Bangla generally accommodates borrowed verbs from English in two ways – using the Light Verb Strategy and Indirect Insertion i.e.by affixing the English verbs with native suffixes.

Key Words: English Loan Verbs (ELVs), Light verb, Light Verb Strategy, Bilingual verbs, BCV, Lexical verbs, Do-construction.

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Introduction

Four European colonizing powers, namely, the Portuguese, the Dutch, the English and the French, trod the vast Indian landmass. From the quartet, the group that emerged as the ultimate winning side with a pyrrhic victory over their fellow European rivals was the English colonizers. The unprecedented success of the English and their centuries- long rule left their marks in almost all the domains of Indian life. The linguistic domain is one of the spheres where the English impression was strongly perceived.

The British rulers made Bengal the centre of gravity of their activities. From Bengal, they virtually transformed the rest of India into the hinterland of their colonizing mission. Because of this serious involvement of Bengal with the British colonizers, the Bangalis were instrumentally important to them. Initially, trade and later colonial rule cemented the relationship between the Anglophones and Banglophones.

As contact between the two groups kept maintaining an upward trend, the ambitious Bangalis started to learn English. The Britons recruited the aspiring Bangalis in different clerical and menial positions. The wealth, prestige and power accumulated by these people triggered a kind of anglomania among the ambitious Bangalis.

Anglomania, coupled with colonial contact, kick started an influx of English loanwords in Bangla. It was presumed that the torrent of Anglicism would come to a halt with the departure of the English rulers. But contrary to the assumption, the reverse has happened. Though the sun has set on the British Empire, the lexical sun of the British linguistic empire has gone beyond the diocese of temporal decadence. This can be attributed to a couple of factors – the status of English as a global lingua franca and the insurmountable height achieved by English as the language of science, technology, IT, business and diplomacy.

Among the bulk of English loanwords in Bangla, the majority belong to the nominal group. Though adjectives and verbs are also borrowed into Bangla, numerically, they enjoy a peripheral status. Among the three categories, verbs are the least to be borrowed. As it is very difficult to plug verbs into the grammatical system of the recipient language, their number is significantly less than nouns and adjectives. Despite the difficulties, verbal loans are also taken

by the recipient languages across the global linguistic landscape. Bangla is no exception in this regard.

Terminological Note

Loan verbs – All words that function as verbs in the donor language are treated as loan verbs. Loan verbs also include nouns from source languages which shift their word class in the new language. When transferred to a recipient language, in most of the cases, the loans are initially treated as nouns and are subsequently verbalized.

Bilingual verbs – Bilingual verbs are composed of two elements – a lexical item from the donor language and a helping or delexical item from the recipient language.

Light verb (LV) – A light verb is a verb which has very little semantic value. It usually forms a predicate with a noun. Common examples of LV are 'do', 'have', 'take' etc. A light verb also goes by the following names: Vector verb, empty verb, delexical verb, thin verb, operators, auxiliary verbs, semi-auxiliary verbs etc. Credit for coining the term 'Light Verb' goes to Otto Jespersen.

Compound verb – A compound verb, also known as a complex predicate, is a multi-word verb. One constituent part of the compound verb is the LV, and normally, the LV carries inflection indicating tense, mood or aspect. The main portion of the compound verb can be either a noun or a verb, and it carries the core meaning of the multi-word verb.

Light Verb Strategy – Light Verb Strategy is a popularly used way of integrating loan verbs into the recipient language. It also goes by the name of 'do'-strategy or 'do'- construction as 'do' is the most frequently used light verb. However, we use the broader term light verb as there are some other light verbs.

Theoretical Background

Though there is a plethora of research works on lexical borrowing and contact-induced changes in languages in contact, there is a paucity of researches on verbal borrowing. Among the researchers who have contributed to the body of literature on loan verbs include Moravcsik (1975), Muysken (2000), Myers-Scotten (2002), Wohlgemuth (2009), Pugh (1999) and Mifsud (1995).

In his attempt to typologize verbal loans, Wohlgemuth (2009) has offered a rudimentary taxonomy of mechanisms involved in integrating loan verbs into a recipient language. The number of strategies attested by him includes the following – Direct insertion, indirect insertion, Light verb strategy and Paradigm transfer.

Direct insertion refers to plugging the verb directly into the verbal system of the recipient language. Indirect insertion is the strategy of accommodating a loan verb by attaching affixes. The third type, known as Light Verb Strategy, is the most frequently used technique of borrowing verbs into a recipient language. Normally a verb, noun or adjective from a donor language is juxtaposed with a light verb (like 'Do', 'Make' etc.) from the recipient language, and thus it forms a new bilingual verb. The last category, which researchers claim to be very rare, refers to the cross-linguistic transfer of a verb along with its aspectual properties.

Rationale of the study

Verbal borrowings have been typologized by cross-linguistic research data from languages like German, French, Spanish, Arabic, Turkish etc. From the subcontinent, researches have been conducted on Panjabi, Urdu, Pashto and Hindi in relation to their verbal loans from English. Even though Bangla is one of the few Indian languages to enjoy a privileged status from the Britons, no researches have yet been conducted on the patterns of English verbal borrowings into Bangla. Chatterji (1926) and Musa and Ilyas (2002) discussed the topic in their works peripherally. This research aims at filling up that void and hopes to contribute to the existing database for the typologization of loan verbs.

Literature review

Pioneering research on verbal borrowings is the work of Moravscik (1975). She claimed that verbs from one language cannot be borrowed into another language as verbs. If a verb is transferred from one language, initially, it is treated as a noun, and with the help of verbalizers, it regains the verbal status of the source language. Campbell's (1993) research on borrowing endorses the claim of Moravicsik.

Muysken (2000) has made a significant contribution to the loan verb literature. He has confirmed that loan verbs are innovative and productive. According to him, the construction of loan verbs displays some distinctive qualities which are absent in both the matrix and embedded languages.

Another outstanding research work that occupies a remarkable place in loan verb literature is the work of Mifsud (1995). Here, the researcher has discussed the integration patterns of English and Italian loan verbs into Maltese, a peripheral Arabic dialect severed from its source language.

Pugh (1999) is an in-depth study of the structural properties of loan verbs.

Annamalai (1978) and Romaine (1986) have in their works shown how English has influenced Tamil and Panjabi. They have shown that heavy lexical borrowings from English caused an increase in the number of loan verbs in the two Indian languages.

Chatterjee (2014) is an interesting work on bilingualism, language contact and change. In her research, she discusses the behavior of Bilingual Complex Verbs (BCVs) in Bangla in a passing manner.

Significance of the Study

Subcontinental languages like Hindi, Urdu, Panjabi, Tamil and Pashto have contributed to the projects aimed at typologization of loan verbs. This article can contribute to the attempts to create a typological database for verbal borrowing by presenting an organized discussion on the integration patterns of ELVs into the verbal system of Bangla.

Materials and Methods

In conducting this qualitative research, we have used mixed method materials. We have utilized some diachronic textual materials from the early period of English colonial rule (the quotation from Madhusudan Dutt's *Eke Ki Boley Sobhyota* is the earliest among the samples used in this paper. The play was first published in 1860) in the sub-continent to the year 2017. To make the research representative and to ensure the validity of the research results, we have used some online materials, i.e. some selected posts written in Bangla from the globally popular social media, Facebook. Resources from newspapers and FM Radio have also been used to diversify the data.

As there is a visible paucity of research materials on Bangla verbal borrowings, the researchers have utilized their native-speaking status in collecting data on English loan verbs in Bangla. The researcher's observation as an authentic source of data was introduced by Weinreich (1963). According to him, the best data can be collected through the observation of a good researcher.

Lexicographic materials used in this study include *Banglai Procholito Engrezi Shobder Obhidhan* (Musa and Ilyas, 2002), *Chalti Shobder Obhidhan* (Rashid, 2017), and Bangla Academy *Songkhipto Bangla Obhidhan* (Sharif, ed. 2015).

The major sources of data on which this research is based are affixed with this paper in the form of appendices. Appendix-1 is a mixed collection of textual and virtual data from 1860 to 2017. Appendix-2 is, on the other hand, comprised of extracts from literary texts and dictionaries. The last appendix is a collection of selected posts containing verbal loans from Facebook.

Discussion

- Let us first have a glimpse at the four extracts used in Appendix-1. In 1A, we see the presence of an English noun (abbreviated form of 'examination'), and this precedes the Bangla light verb 'dewa', forming a bilingual verb 'examine dibo'.

  1B is composed of five verbal loans – 'postpone koredisey', 'notice dile', 'investigate korte', 'reveal korechchen' and 'punishment ditehobey'.

  1C contains a bilingual verb – 'helpan'.

  The last extract in this section, 1D, has one verbal loan – 'pass korle'.

  In the example quartet used in Appendix1, we notice a common feature – the verbs have been borrowed into Bangla with the aid of a dummy verb i.e. the 'do' verb. We see the presence of two verbal structures here – V+V (light verb) and N+V (light verb). The verb in 1C is different from others.

- Now, let us turn our attention to the extracts used in Appendix-2.

The extract in 2A occurs in Madhusudhan Dutt's *Ekei Ki Bole Sobhyota*? It contains two loan verbs with the V+V structure – 'Excuse korte' and 'shoot korbo'.

2B is culled from Tagore's *Gorai Galad*, which was first published in 1892, and it has two English verbs, 'select' and 'marry'. They precede the Bangla light verb 'kora', and thus they have formed two bilingual verbs 'select korbe' and 'marry korbo'.

2C is composed of the following three structures – In addition to the much-used V+V and N+V structures, here the writer has employed another pattern, Adj.+V (Unwell houate).

In 2D, all the ten examples contain the V+V combination. In each case, an English lexical verb is combined with a Bangla light verb.

2E – The four examples here employ the V+V and N+V structures.

2 F – This extract has used the N+V and V+V structures.

2G – This quotation is a part of the announcement made by an RJ of a radio (FM) channel, and it contains the V+V structure used in the formation of a bilingual verb.

- Now let us have a glimpse at the resources collected from Facebook.

  The statuses of Mr Golam Hossain Habib contain N+V and V+V structures. The posts of Mr Tuhin Shuvra Sen and Dr Mohammed Rukan Uddin employ the V+V combination. The researcher's statuses also share the V+V structure with the trinity of facebookers. However, apart from using the dominant structure, the paper writer has used another peripherally used mechanism, i.e. morphological adaptation (Appendix-3 D iii & iv). The use of this technique, though marginal, has been attested by Rashid (2017).

Findings

All the extracts, excluding appendix 1C and appendix-3 D (iii & iv), both actual and virtual, employ the Light verb strategy in the form of three structures to borrow verbs from English. The three structures are – V+V, N+V, and Adj+V. In all the three combinations, the first word (verb, noun, adjective) is the lexical

item, and the second one is a light verb. It is worth noting that while the inflectional and aspectual function is performed by the light verb, the lexical item supplies the core semantic value.

A generalization can safely be reached from the data used in this paper. In the verbalization of English loanwords, Bangla uses the V+V structure in most of the cases. The use of the N+V structure is also noticeable, but the employment of the Adj+V combination is infrequent.

Another process of ELV accommodation is what Wohlgemuth (2009) calls Indirect insertion. Data used in appendix-1C (helpan) and appendix-3 D (ii) and (iv) confirm this. English verbs 'help', 'tag', 'comment', and 'share' have been transformed into 'helpan', tegano', 'commentano' and 'shearano' respectively by morphological processing. This integration pattern is colloquial and only noticeable on social media sites.

The patterns of loan verb accommodation that we find in this paper are in unison with the loan verb taxonomy proposed by Wohlgemuth (2009). From the four types of loan verb accommodation patterns confirmed by Wohlgemuth, we see that our corpus confirms the use of the Light Verb Strategy and Indirect insertion in borrowing verbs into Bangla. Our data do not record the use of Direct insertion and Paradigm insertion in verbal borrowing from English. This is in line with the observation of Wohlgemuth. According to him, languages vary in terms of their employment of loan verb accommodation strategy, and a single language may not use all the four techniques.

Limitations of the study

Although verbal borrowing from English is a common phenomenon in Bangla, during this research, it became evident that the extent of materials, both descriptive and research, on this topic is rather modest, limited to very brief mentions in scholarly works. Loan verbs have not received detailed treatment from Banglophone researchers, grammarians and lexicographers. Contrary to the dearth of research materials on this topic in Bangla, English has a substantial wealth of research works on loan verbs. This is attributable to the unique status and global dispersal of English. Despite the profusion of works on loanword research in English and other languages, studies in English and Bangla verbal

loans have not so far been done. As this is a beginning research on the topic, it requires a further spade of work.

The present study is not an exhaustive one. The database should be expanded in future studies.

This is a small-scale study of verbal borrowings from English to Bangla. As is the case with small-scale researches, it suffers from a number of limitations – time and space-constraints. Exhaustive and rigorous researches on this topic will aid learners and practitioners of Bangla and English.

Implications

Teaching and learning of a foreign language is significantly affected by the knowledge of the similarities and dissimilarities existing between the two languages concerned. The acquisition of the target language is expedited by the knowledge of similarities. On the other hand, the knowledge of dissimilarities helps students avoid the pitfalls. This study on the hitherto neglected area of verbal borrowing will help English and Bangla language teachers to trace and use identical verbal elements shared by the two languages.

Further research on borrowing of verbs from English is needed to be conducted to account for the patterns of accommodation of ELVs in Bangla. It is worth investigating why one pattern (Light verb strategy) outweighs others in the hierarchy of loan verb integration into Bangla.

Another interesting topic connected with ELVs that warrants our attention is factor(s) triggering verbal borrowings from English.

Some loan verbs in Bangla undergo semantic changes. For example, 'line mara' 'size kora', 'part loua', 'pose mara', 'system kora', 'fielding mara' etc. Studies shedding light on why some English loan verbs wear new semantic apparel will reveal the new life of some ELVs in Bangla.

Conclusion

The data used in this study show that Bangla uses two techniques to accommodate ELVs in its verbal system. The dominant pattern, as manifest from the corpus, is the Light Verb Strategy. In most of the cases, Bangla borrows loan verbs from English employing the 'do'-construction. The most

frequently used verbalizer in Bangla is 'kora' (do). This confirms the claim of Moravsick (1975) and justifies the nomenclature of the structure as the 'do'-construction'. Structurally speaking, Bangla uses the V+V, N+V and Adj+V combinations in accommodating ELVs. Other combination(s) are also possible. For example, 'Shey amader doley kibhabe in korlo? (Prep. + V)', 'Batsman runner khata kholar agey out hoye gelo' (Prep. +V+V). But the use of these structures is very limited.

Another process of loan verb accommodation seen in Bangla is the Indirect insertion. Here, a native grammatical particle is suffixed with the alien verb, and through this morphological processing, the verb is Banglicized. For example, 'tegano', 'shayarano', etc. This integration pattern is, however, only seen on the social media sites like Facebook.

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Appendices:

Appendix-1

A. ছেলে ঘুমোল পাড়া জুড়োল

ফাস্টবুক এল দেশে

বানান-ভুলে মাথা খেয়েছে

একজামিন দেবো কিসে।

- Tagore (2011:18)

B. ঢাকা বিশ্ববিদ্যালয়ের এক ছাত্রী বলেছে, 'আমাদের টিচার হঠাৎ ক্লাস **পোস্টপোন করে** দিছে। সে তো একটা নোটিশ দিলে পারতো।' অন্য এক ভর্তিচ্ছু ছাত্র শিক্ষককে জিজ্ঞেস করছে, 'মামা, ডিনের অফিসটা কুনহানে?'

এক উদ্বিগ্ন স্টক মার্কেট বিশেষজ্ঞ একটি বেসরকারি টিভি চ্যানেলে বললেন, 'স্টক মার্কেট ক্রাইসিসের রিজনগুলো **ইনভেস্টিগেট করতে** হবে। যে সব বিগএক্টর ও প্লেয়ার ব্যাকগ্রাউন্ডে রোল **প্লে করছে,** যাদের নাম ইব্রাহিম সাহেব তাঁর রিপোর্টে **রিভিল করেছেন**, তাদের প্রপার **পানিশমেন্ট দিতে** হবে।'

- Islam (2012: 23)

C. টেকি ভাইরা, **হেল্পান**।

- Rashid (2017: 64)

D. যারা কয় এই পরীক্ষাগুলা বাতিল করো, তারাই নিজে গো পোলাপাইন **পাশ করলে** সরাসরি বা ইনায়া বিনায়া সেই কথা বুক ফুলায়া জানায়। নটোব্যাডো।

- Facebook status of Mr. Golam Hosain Habib (posted on 30.12.17)

Appendix 2

A.

ললিত: I admire your cheek,বিনু। তুমি wife **select করবে** আর আমি **marry করব?**

- Tagore (Quoted in Sarkar, 2003:104)

B.

সকলে। (সকলে গাত্রোত্থান করিয়া) **হিপহিপহুরে।**

কালী। (প্রমত্তভাবে) হুরে, হুরে।

নব। বসো, ভাই, সকলে বসো। (সকলের উপবেশন) দেখ ভাই, আজ আমাদের **একসকিউজ করতে** হবে, আমাদের একটু কর্ম ছিল বলে তাই আসতে দেরি হয়ে গেছে।

শিবু। (প্রমত্তভাবে) **দ্যাটস এ লাই।**

নব। (ক্রুদ্ধভাবে) হোয়াট, তুমি আমাকে **লাইয়র বল**? তুমি জাননা, আমি তোমাকে এখন **শুট করবো**?

- Dutta (1860: 250)

C.

আমার father yesterday কিছু unwell হওয়াতে Doctorকে call করা গেল, তিনি একটি physic দিলেন। Physic বেশ operate করেছিল, fourtimes motion হল, অদ্য কিছু better বোধ করছেন।

- Anonymous (Quoted in Musa & Ilyas, 2002:09)

D.

তোমাকে অনেক বার **ডায়াল করে** পাইনি।

আপনি বিষয় গুলো একসাথে **পুট করুন।**

তাকে **অনার করা** যথার্থ হয়েছে।

আমরা বাজে শব্দ ইউজ করিনা।

অপরাধীকে **আইডেন্টিফাই করা** হয়েছে।

তোমার বক্তব্যটা আরেকটু **মডিফাই করে** উপস্থাপন করো।

বিরাট বাড়ীটা তিনি একাই **অকুপাই করে** আছেন।

চমৎকার পারফরম্যান্সের জন্য তোমাকে **কনগ্রাচুলেট করছি।**

ইন্সটিটিউটের হিসাব পত্র **অডিট করার** ব্যবস্থা করা হবে।

- Musa & Ilyas (2002)

E.

ও এত আক্রমণাত্নক যে ওকে **আনফ্রেন্ড তো** করেছিই**, ব্লকও মাইরা দিছি।**

আরে অত **পার্ট নিও না** …. আমরা সব জানি।

চিন্তার কোন কারণ নাই, আমি **লাইন করে** দেব।

ওরে এমন **সাইজ করব না**, আর এদিকে আসবে না।

- Rashid (2017)

F.

….. তরুণ তার তরুণী বান্ধবীকে পার্কের গাছগাছালীর নির্জনতায় বসে আদুরে গলায় বলবে – 'একটা সং করতো, কিংবা কী যে সং **প্লে করলে।**'

- Ahmed Rafik (Quoted in Bhattacharya, 2016:31)

G.

একটি এফ এম রেডিও থেকে আরজে বলল, 'ফ্রেন্ডসরা, এই অফার কিন্তু ভ্যালিড টিল ফোরটিন্থ। **সো মনে রেখো।** লাইক ইটস আ **ফাটাফাটি ইভেন্ট।** সো **সেন্ড করো**…'

- Islam (2012:35)

Appendix-3

The following is a collection of Facebook posts containing ELVs.

A.

Mr. Golam Hossain Habib

i. ছাত্র কাম কলিগ বলল, আপনার এতো নেতিবাচক **স্ট্যাটাস দেখে** তো তরুণরা অনুবাদে আসতে ভয় পাবে। বললাম, ১. যদি গর্ত না দেখিয়ে দেই তাহলে পরে সেই গর্তে পড়লে তারাই অভিযোগ করবে সেসবের কথা না জানানোর জন্য! ২. তাদের অনেকেই আমার চাইতে চালাক; যেসব অনুবাদে ভালো রিটার্ন আছে সেগুলোই তারা বেশি করছে। ৩. সরি ফর সেল্ফ এডভার্টাইজিং, খালি নেতিবাচক **স্ট্যাটাস দেই না**, টুকটাক দুই অক্ষর অনুবাদের চেষ্টা করি, অপাঠ্য হলেও, বই বিক্রি না হলে ও... (Posted on 12.01.18)

ii. বাঁচতে হলে **আনফলো** করতে হবে... (04.01.18)

iii. পরিবার থেকেই বাচ্চারা **জাজ করা** শেখে, যখন বাপ-মা বলে সে দেখতে সুন্দর না, ও দেখতে খুব সুন্দর, ও ওকে বিয়ে করল কেন, ওর সঙ্গে প্রেম করে কেন? মেয়েদের সিগারেট খাওয়া উচিৎ না, অমুক সম্প্রদায়ের লোকের চাইতে আমরা ভালো... (12.12.17)

B.

Mr. Tuhin Shuvra Sen

i. গেইটে সবার এডমিট কার্ড **চেক করা** হচ্ছে। ব্যস্ততা আর গাম্ভীর্যের ভান চেহারায় নিয়ে দারোয়ান আর পুলিশের মুখোমুখি হলাম। টানটান উত্তেজনা মনের ভিতর। ঘাম দিয়ে জ্বর আসে আসে অবস্থা। পার হতে পারব কি? এক সেকেন্ড, দুই সেকেন্ড...

তারপর দারোয়ান বলল," স্লামালাইকুম স্যার"।

নিজের অভিনয়ে নিজেই মুগ্ধ! নিজের পিঠ নিজে চাপড়ে দিয়ে ডীন অফিসে বিজয়ীর বেশে প্রবেশ।

(এডমিশনটেস্ট কাহিনি-৪) (26.10.17)

ii. আজকের বিডি আর সাউথ আফ্রিকার খেলার স্কোর দেখে অনেক দিন আগের আমি নিজে খেলার সময়কার একটা চালু স্লোগান মনে পড়লঃ

যখন সাউথ আফ্রিকা **ব্যাটিং করে**, তখন মন বলে,"বাজ্যায়দে, বাজ্যায়দে"।

যখন বাংলাদেশ **ব্যাটিং করে**, তখন মন বলে, "ঝাঁখারিদে, ঝাঁখারিদে"।

(প্রথমটার সাথে মারার, আর পরেরটার সাথে কুল গাছ থেকে কুল পাড়ার সম্পর্ক আছে) (22.10.17)

C.

Dr. Muhammad Rukan Uddin

i. অবাক হই যখন দেখি মানুষ অপ্রয়োজনীয় স্ট্যাটাসে **লাইক দিচ্ছে, কমেন্ট করছে**। (30.10.17)

ii. ব্যস্ত রাস্তা **ব্লক করে** তারাবি পড়ার ব্যাপারে শরঈবিধান কী? (11.06.17)

D.

Mr. Sarwar Morshed

i. **লাইক পড়ে** টাপুর টুপুর, ফেবুনদে এল বান। (19.08.17)

ii. বাংলাদেশের অবস্থা হয়েছে গরীবের সুন্দরী বউয়ের মত – সব সুযোগ সন্ধানীর ভাবী। Half-chance কে Full chance করে কাছে আসবে, পেয়ারী পেয়ারী বাত করে **flirt করবে**। কিন্তু তার ইজ্জতে কেউ হাত দিলে বলবে, কুলটা সবাইকে নষ্ট করে ছাড়ল! চীন, ভারত, রাশিয়ার কথা বলছি। (08.09.17)

iii. তোমাদের যত সাধ' **ট্যাগাইতে' আর 'শেয়ারাইতে' আর 'কমেন্টাইতে' আর 'রিএক্টাইতে' থাক**, আমি রয়ে যাব এই বাংরেজির 'do construction' এ। (22.08.17)

iv. আমাকে **ট্যাগাতে** যদি এত লাগে ভালো…. (26.01.18)

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Rohingya Identity Crisis: History and Reality- A Legal Analysis

Syeda Khadijatul Kobra *
Md. Touhidul Islam **

Abstract

The Rohingya of Myanmar, mostly persecuted people in the world, is living in a realm of statelessness for generations. The Rohingya crisis stemmed from the question of citizenship which is the identity of a national. The denial of citizenship to the Rohingya Muslims by the Myanmar government is one of the most profound human rights tragedies of the 21st century. Social science testifies that ethnic identity is not intrinsically given and fixed. It may change as people migrate and adapt to new places and cultural differences. Since independence, Myanmar has been plagued by ethno-religious armed conflict for ignoring this reality of generating ethnic identity. Rohingya Muslims are denied of ethnic identity as well as deprived of citizenship by the Citizenship Law of 1982. Who are the Rohingyas and what is the nature of the conflict they face in Myanmar, these are the questions, this paper strives to explore.

Key Words: Rohingya, identity crisis, Citizenship, United Nations, Kofi Annan, Sheikh Hasina.

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1. Introduction:

Myanmar, formerly known as Union of Burma, is a multi-national, multi-religious and multi- cultural country. It is amply blessed with natural resources. Since its birth as an independent country, it has been ragged by various ethno-religious conflicts. Rohingya issue is one of them that brings the country in the spotlight all over the world. The Rohingya people are an ethnic minority who live mostly in the Rakhaine state north-western coastline of Myanmar. For years, they are facing not only threat and oppression but genocide and ethnic cleansing from the sides of majority Buddhists and the government as well. So, they have often been described as one of the world's most persecuted minorities. The doleful history of Rohingya dates back two centuries and can be categorized in three stages such as pre-colonial, colonial and post-colonial. In pre-colonial period, the Rohingya lived in harmony and peace with the people of other cultures and religions. The scenario deteriorated after colonization by the British regime following the first Anglo-Burmese war in 1825 which worsened during the II World War as the Rohingya expressed their loyalty to the British whereas the Arakanese supported the Japanese. During post-colonial period, with the emergence of Burma as an independent country, the anti-Rohingya campaign was patronized and backed by the government resulting in the increase of division. They are really an ill- fated race in the world history who have none to save them from the oppressive arbitrary rule of the local and central government, who have no safe place of their own in this world to take shelter, who have no real friend to stand beside themselves and speak as spokesman. If they really had one, they wouldn't be oppressed and tortured for generation to generation. It's a shame for humankind and a blow on the face of modern civilization.

2. Objectives of the Research:

Myanmar government claims the Rohingyas are the migrant from Bangladesh so they are not citizen of Myanmar and Bangladesh denies the claim treating them as refugees. So, the question here is which country they belong to and what is their identity? This paper strives to explore the fact and reality in this regard analyzing the authentic history of Myanmar. This research also probes into why Rohingya problem has been forlorn so far by exploring the appropriate reasons of the crisis in the context of international politics and Bangladesh-

Myanmar relations.

3. Methodology:

The study is analytical in nature based on diversified secondary data which have been cumulated from pertinent books, reports, websites, national and international journals, case laws, opinion of adept etc. The study has been accomplished by systematic method of analysis and fertilization of understanding.

4. Who are Rohingyas:

Arakan, now Rakhaine is the very province among the fourteen provinces of Myanmar where Muslims are majority. More than half of Muslims in Myanmar take up their abode in Arakan. There are predominantly two major ethnic races in Arakan- the Rohingyas and the Rakhains (Maghs). Rohingyas are not the people who abruptly emerged in Arakan. The group has its own language and cultural practices. The history of the Rohingya people is inextricably linked to the history of Myanmar. The Rohingya comprising indigenous, trader Arab diasporas and Indo-Bengal immigrant origins have been living in Arakan state for centuries. The descendants of the mined marriages between the local people and Arabs founded the roots of Rohingyas in Myanmar specially in Arakan. The settlement of Muslims in Arakan dated back to 7th century A.D. Phayre (1844) states that the historical evidences ensure that the arrival and settlement of the Rohingya Muslims in Arakan predated the arrival and settlement of many other ethnic races inhabiting in Arakan. In a manuscript related to the family history of Arakanese King Ra-dz-wang,[1] it is noted that during the regime of Arakanese king Mahat-y-ing Chanday at (780-810 A.D), several foreign ships were wrecked upon the island of Ranree and the people who boarded on them were said to be Muslims. These ship-wrecked Muslim sailors settled in the villages of Arakans the Arakanese King ordered when they were taken before him.[2] Hall (1936) further states that with the passage of time, the number of muslims in Arakan begins to increase. Hall (1936) further states that gradually these Muslims have developed bonhomous bond with the native people and intermingled by establishing marital relationship. It was a long- established custom that foreign residents and even visitors to Burma by shipwreck or for commercial reason, were encouraged to form matrimonial alliances with the

women of the country but on the strict understanding that when they would leave the country, their wives and children might not be taken away with them.[3] Historical resources thus explained how Rohingyas got root in Arakan. The derivation of the term 'Rohingya' also bears a great deal of importance to fathom who Rohingyas are. Historians firmly clinch that – the term Rohang/ Roshang is the corrupt form of the word "Mrohaung", the ancient name of the capital of Arakan. Afterwards, the inhabitants of Roshang are termed as Roshangee or Rohingya.

In the medieval Bengali literary works the term 'Roshang' is repeatedly used in lieu of Arakan. Among the Bengali poets like Qazi Daulat, Mardan, Shamser Ali, Quraishi Magan, Aminullah, Syed Nasir, Abdul Gani and the immigrant poet Alaol, they all have made references to 'Roshanga Shahar' meaning the capital of Arakan in their literary works. So, it is crystal clear that the term 'Rohingya' stems from 'Roshanga' which is a corruption form of 'Mrohang> Rohang > Rosang or Rosanga'.

There is another historical definition of Rohingya. Some historians say that, Rohingya is corrupted form of Arabic term 'Rahami'. They say that some Arab ships were wrecked along the shores of Arakan. As the wretched people asked for help uttering the word 'Rahan'; bit by bit, it changed from Rahan to Rohang and eventually Rahingya or Rohingya.

5. **Whether Rohingyas are citizen or not:**

Myanmar doesn't recognize Rohingya as citizen rather considers them immigrants from Bangladesh who came to Arakan during British rule. The country's census in 2014 didn't count them instead they are told to register as Bengali indicating their origin in Bangladesh. Chowdhury (2006) states that the history of the Rohingya reveals that they developed from different stocks of people who concentrated in a common geographical location. They have more than 1200 years old tradition, history, culture and civilization of their own expressed in their shines, cemeteries, sanctuaries, social and cultural institutions found scattered even today in every hook and corner of theland.[4]

Grantham (1923) shows the evidence that in the 1911 census, the Rohingyas were included with the Indian population as an ethnic group of Indian origin.

The reason given was that they looked more like the Indian than like the Burmese. But the census of 1921 mentions the Rohingyas as really Arakanese.[5] Unfortunately, such type of census obliqueness of treating the Rohingyas as Indians no doubt paved the way to the controversy of today. The present government of Myanmar claims that the Rohingyas are not indigenous people but have migrated from Bangladesh. It also claims that it has eight major ethnic communities subdivided into 135 ethnic races and these people are descendants of Mongolian races only. The government categorically denies that Myanmar has any indigenous ethnic race belonging to Asian stock including Rohingya. However, even prior to 1962, Rohingyas have government issued identity cards and British issued ration cards which signify that they are citizens of Myanmar. Then on the pretext of checking these identity cards were forcibly taken and torn to bits just to deny them their legal identity.[6]

Attempt to deprive the right of citizenship to Rohingya commenced shortly after the independence of Union of Burma. The union Citizenship Act, 1948 defined Myanmar citizenship and recognized certain ethnic groups as indigenous races of Myanmar who were allowed to get citizenship. The list unfortunately didn't include Rohingya. However, the Act allowed people to apply for identify cards whose families had lived for two generations in Myanmar. At the very beginning, many Rohingyas got citizenship or Identity cards under this provision. After the military coup in 1962, the government began giving documentation to fewer and fewer Rohingya children, refusing to recognize fully new generations of the Rohingya population.[7] Two major Acts were legislated to deprive the Rohingyas from their rightful rights-namely the 1974 Emergency Immigration Act and the 1982 Burmese Citizenship Law. The 1974 Emergency Immigration Act required all citizen to carry an identity card called a 'National Registration Cards but allowed Rohingya to obtain only Foreign Registration cards. Until 1982, the Rohingya Muslims enjoyed some degree of citizenship. Citizenship Law in 1982 specifies three categories of citizens: - 1) Full citizen 2) Associate citizen 3) Naturalized citizen. According to section- 3, under the chapter II of the Act, full citizens are the people who are descendants of inhabitants who settled in Burma prior to 1823 or are been to parents who are both citizens. Associate citizens are those persons who have gained citizenship through the union Citizenship Act, 1948. Naturalized citizens are those who have been in the country before January 4, 1948 but applied for

citizenship after 1982. The crux of the Act, 1982 is here that as per section-4 of the Act, the decision as to whether any specific ethnic group is 'Full citizen' or not, doesn't depend on the verdict of the court but rests on the verdict of the 'Council of State'. The Burmese military government arbitrarily threw away 'Rohingyas' from the list of citizens overlooking their honored history of establishment in the country. Because of forced displacement and massive violence on Rohingyas involving burning down of houses, villages, belonging to them, most of the Rohingyas have lost their many important documents needed for acquiring citizenship.

Today the million-dollar question is how this conundrum as to citizenship of Rohingya can be solved amicably. The solution lies in the Rohingyas millennia old settlement in Arakan. In 1947, when section-11 of the constitution of the Union of Burma was being framed qualms as to whether the Rohingyas of Arakan come under the purview of section-11 sub-clauses i, ii, iii, arose and an objection was put in to have the qualms cleared in respect of the term 'Indigenous' as used in the constitution. But it was revoked on the commitment of the President of the constituent assembly who said "Muslims of the Arakan certainly belong to one of the indigenous races of Burma which you represent. In fact, there is no pure indigenous race in Burma and if you don't belong to indigenous races of Burma, we also cannot be taken as indigenous races of Burma."[8] Before independence and particularly after independence, there have been a number of Muslim Member of Parliament and always two Muslim ministers were in the cabinet till 1962 military coup. But during the army regime from 1962 to 1995, not a single Muslim was appointed as a minister or even as deputy minister.[9]

On November, 4, 1959, the Supreme Court of Burma had issued orders to release Hasan Ali and Mahar Ali who were arrested on citizenship ground. It had been observed by the court that in Union of Burma, there were races who couldn't speak the Burmese language and who nevertheless were citizen of the Union of Burma.[10] To say 'Rohingyas' are not citizen of Myanmar denying historical records and evidences is nothing but a blatant lie. Myanmar's history and the elected government's statement unambiguously and unequivocally prove that the 'Rohingyas' constitute one of the indigenous races of Myanmar living in Arakan and other parts of the country. In the first democratic constitution of

1947-48, in Burma, there was no mention of indigenous group. Those who lived in Burma during eight of the last ten years, have been provided with full citizenship of Burma. So, the question of citizenship in 1948 independent Burma was based on residence, there was no question of ethnicity, whether they lived in Burma or not.[11] The conclusion can be drawn that Rohingyas are, by all parameters, not only nationals of Myanmar but an indigenous ethnic group as well. Culture, tradition and history of Rohingyas are quite enough to support that they are as much citizens of Myanmar as anyone else in the country. They had been acknowledged as such by the preceding elected governments having members from Rohingya in parliament and cabinet.

6. Aggression upon Rohingya: Genocide or Not?

Genocide is understood to be the greatest crime against humanity. It is the mass extermination of a whole group of people, an endeavor to wipe them out of subsistence. If we look at the history of the term 'genocide', we would see that it is the union of Greek word 'genos' (race, people) and Latin term 'cide' (act of killing). The term was coined in 1943 by the Jewish-Polish lawyer Raphael Lemkin. After experiencing the diabolical consequences of the Holocaust in which all members of his family except his brother were murdered, Dr. Lemkin campaigned to have genocide acknowledged as offence under international law. The bone-chilling and horror stories streaming from months of Rohingya Muslim fleeing Myanmar's Rakhaine state reveal that mass killings and gang rapes are going on in this state. Not only that, from media report, we came to know that teenagers are executed with rifles, babies are drowned in rivers, villages of Rohingyas are set ablaze by armed forces and Buddhist militias, dead bodies of Rohingya Muslims are burnt to conceal evidence and most importantly, Rohingyas are facing indiscriminate use of bullets, bayonets, firing from helicopter gunships and their homes, hearths livestock, crops are being snatched away by their Rakhaine cohorts.[12] In several national and international newspapers, untold horror stories of Rohingya have been narrated and it appears to be barbaric carnage led by Myanmar armed forces. Satellites have identified images of such whole villages burnt to the ground. Bangladeshi Foreign Minister, Abul Hasan Mahmood Ali has mentioned the oppression of Myanmar government upon Rohingya as "crime of all crimes". If we take into consideration the Myanmar governments systematically oppressive policies

and practices in regards to the Rohingya from the 1980's onwards, a very clean picture emerges of intent to eradicate this group.

Article-2 of the Convention on the Prevention and Punishment of the Crime of Genocide (1948) defines genocide as- "any of following acts committed with the intent to destroy in whole or in part, a national, ethnic, racial or religious group as such a) killing members of the group b) causing seriously bodily or mental harm to members of the group c) deliberately inflicting on the group conditions of life calculated to bring about its physical destruction in whole or in part, d) imposing measures intended to prevent births within the group and e) forcibly transferring children of the group to another group". In the light of the above definition of genocide, acts of man killing and gang rapes of ethnic Rohingya Muslims by Myanmar army only for their ethnicity patenty amounts to genocide. As the Myanmar military is engaged in committing genocide and crimes against minority, therefore an international legal war should be declared by the International Criminal Court against the perpetration of this crime to uphold international justice. The UN Convention introduced international law to declare international legal war against the perpetrations of genocide to prevent and punish genocide. Article-1 of the UN Convention on the Prevention and Punishment of the Crime of Genocide provides- "The contracting parties confirm that genocide whether committed in time of peace or war, is a crime under international law which they undertake to prevent and punish."

7. Aggression on Rohingya- a Text Book Example of Ethnic Cleansing:

The exodus of Rohingyas since the pre-colonial (1799) and colonial (1942) periods and more importantly since 1978, causing their infinite pain, pangs and plight in term of fundamental need of life or human rights is a multi-dimensional issue- humanitarian, racial, regional and global in globalized world. The oppressive and bloody exodus has been generated and geared up by some zealot Buddhist monks and savage armed forces of the communal and racist Myanmar government by dislocating, torturing and murdering the civilian Rohingyas what the international community has been witnessing over the years. The world has not experienced such feral atrocities upon any ethnic groups, sections or races before in world history throughout centuries, even in pre-historical ages perhaps. Systematic human abuses by the military forces by Myanmar over the past years were designed to instill terror in the mind of the

Rohingyas and compelled them either to live in fear of death or to leave everything simply to survive.

Ethnic cleansing is a phrase populated in 1990s and it was first widely used to mention on the actions of the Bosnian Serbs against Muslim during the Bosnian war. Ethnic cleansing indicates the mass expulsion or killing of a certain ethnic or religious group in an area by another, be it the apparatus of the state like army or police or a private militia group. In November, 2017, prime minister of UK, Thresa May said about Myanmar tragedy, "This is a major humanitarian crisis which looks like ethnic cleansing".[13] At the end of a four-day visit to Bangladesh Andrew Gilmour, The UN Secretary General for Human Rights said, "The ethnic cleansing of Rohingya from Myanmar continues. I don't think we can draw any other conclusion for what have been seen and heard in Cox's bazar." He further said "The nature of the violence has changed from the frenzied blood-letting and mass rape of last year to lower intensity campaign of terror and forced starvation that seems to be designed to drive the remaining Rohingya from their homes".[14]

The Myanmar government claims that the Rohingyas are responsible for recent crisis as a group of Rohingya militants invaded security forces which left 12 troops dead. The Myanmar government's clarification is not fully true. A number of evidences collected for years proves that recent assault on Rohingya is completely premeditated, an "orchestrated campaign" which is planned in advance.[15] In September, 2017, in the midst of the operation, Myanmar military chief Min Aung Hlaing publicly referred the Rohingya issue as a threat "a long-standing one which has become as unfinished job" a job it deems that he and his fellow officers were determined to complete once.[16] Now, it appears that the Myanmar military is determined to finish the unfinished job by forcibly expelling the remaining Rohingya from the territory of Myanmar. Journalists have provided one of the most thorough accounts of the military's advanced preparation for its efforts to drive the Rohingya out of Myanmar. The reporters found proof that the military had already deployed its most feral infantry divisions across the Arakan province by 10th August, 2017, well before the insurrectionist invasions. The divisions sent had already earned dark reputation for their ruthless counter insurgency campaigns against other ethnic minorities.[17]

8. Roots of Ethnic Conflict and Civil Unrest in Rakhaine State:

The matter of utmost concern as to Myanmar is the deteriorated human right situation. The Rohingya crisis is a human rights crisis having humanitarian consequences. In 2013, the special adviser of secretary general on the prevention of genocide warned that failing to address the immediate consequences and root causes of violence between Rakhaine Buddhist and Rohingya Muslim could have 'serious consequences which are solemnly promised to prevent'.[18] Nothing has remarkably been changed since democracy has come back. No one can change the fate of the ill-fated Rohingya until the root causes of the conflict are addressed and initiative are taken to solve this issue. These words are also echoed from the mouth of Noble laureate Aung San Suu Kyi in a fine afternoon of June 2012, at the time of delivering Noble lecture and uttered the very fundamental truth of any conflict, "whenever suffering is ignored, there will be the seeds of conflict, for suffering degrades and embitters and enrages". The leading reasons for the conflict in Myanmar can be discussed under following heads:

8.1. Arbitrary deprivation of nationality:

The right to nationality is a fundamental human right.[19] A state's prerogative to grant or remove nationality is constrained under international law. The 1982 citizenship law is discriminatory and contravenes the prohibition of arbitrary deprivation of nationality. It violates the right of every child to acquire nationality.[20] The narrative of Myanmar is that the Rohingyas are not sons of the soil and illegal immigrants from Bangladesh. The crux of the crisis lies here and the systematic discrimination against them has been continuing since the promulgation of the 1982 Citizenship Law.

8.2. Forced displacement:

Looking at the fleeing of tens of thousands of Rohingya's young, old and new born, men and women only to save their lives from bloody Myanmar Army, one may argue if we have come away from the age of Halagu Khan. To materialize displacement of Rohingyas state sponsored violence has been happening since independence of Myanmar. In pursuance of Rohingya elimination plan, notorious operation named 'Nagarnin' or 'King Dragon Operation' has been carried out in 1978 to intimidate the Muslims and compel

them to leave Myanmar. Such kind of heinous activities to displace or eliminate Rohingya by Myanmar government have been witnessed by the world over the years.

8.3. Restriction of Myanmar and policy to control population:

To control population growth of Rohingya, a law for Rakhaine state has been passed in 1990 to get permission for marriage. Though the law is for all people of Rakhaine, it is enforced only against Muslim people of the state inreality.[21] The worse scenario of the law is that men and women must maintain the rules to gain marriage license which conflict with their religion's belief. Since 2005, the government has been allowing marriage license to the couples if only they agree to have not more than two children and who dare not to abide by the law, they are subjected to imprisonment up to tenyears.[22]

8.4. Forced labor:

Though Myanmar has taken some significant initiatives to stop forced labor, the practice is yet existing in Rakhaine state. The Nasaka, a security force, forces Rohingya either to pay a weekly fee to avoid work, a fee that many Rohingya cannot afford or to perform manual labor such as construction work, agriculture work, pottering or serving asguards.[23]

Denial of citizenship has led the Rohingyas to the deprivation of many other rights as follows:

a) Unable to take the opportunity of government jobs.

b) Subject to strict restrictions in case of movement within Myanmar and even in inter- cities or intracity.

c) Compelled to live in campus and ghettos.

d) Unable to access basic human needs for instance education and healthcare.

e) No right to take part in politics and to exercise right to franchise.

f) No right to claim protection of life and liberty.

g) No right to own land.

9. Response of Bangladesh in the Crisis:

Bangladesh has been on the receiving end of the Rohingya crisis for decades. Since 1978, several waves of refugees from Myanmar, have come in Bangladesh for shelter. With the continued in flux of Rohingya refugees, this has become a humanitarian catastrophe of gargantuan proportions with far reaching economic, political and social implication for Bangladesh. Despite fragile economy and critical level of population density, Bangladesh has always demonstrated positive gesture in this regard and signed an agreement with Myanmar in 1992 with the involvement of the United Nations High Commissioner for Refugees (UNHCR) where Myanmar agreed to allow the return of Rohingyas to Arakan.[24] Unfortunately, the Myanmar government never showed due respect to the agreement. Consequently the current Rohingya situation in Bangladesh has become one of the most protracted labyrinths in the world. The longer this crisis lingers, the greater the possibility of radicalization of some members of this displaced community. As the most affected country, Bangladesh has to take the lead and national interest demands robust action as soon as possible. The recent diplomatic initiative is a welcome development. But Bangladesh has to develop a careful strategy in this regard bearing in mind that no one will do the bidding for Bangladesh. Prime Minister of Bangladesh, Sheikh Hasina has tabled five-point solution at the UN General Assembly to resolve the long-standing manmade problem in Rakhaine state. Those are:

a) Myanmar must unconditionally stop the violence and ethnic cleansing in Rakhaine state immediately and permanently.

b) Sending an investigating team of the United Nations Secretary General to Myanmar immediately.

c) Ensuring safety for all the citizens, irrespective of race and religion, and building a security zone in Myanmar under the supervision of UN.

d) Make sure the safe return and rehabilitation of all Rohingyas, who were forced to drive out from Rakhaine state, safely and securely with dignity.

e) Unconditional implementation of the Kofi Annan Commission recommendations.[25]

10. International Response in the Crisis:

Rohingyas are friendless and hopeless within Myanmar and only international pressure can save them now. So the Prime Minister of Bangladesh, Sheikh Hasina, rightly solicited to international community to move beyond the rhetoric and act as a body to save lives of the Rohingyas in Myanmar and to speak in one voice to help end the policy of forced displacement. Fortunately, the world leaders, with a very few unfortunate exceptions, have condemned Myanmar government. The United Nations unequivocally recognized the recent killings as ethnic cleansing, France has recognized it as genocide, OIC leaders urged Myanmar to show respect to human rights, few Muslim-majority countries, especially Turkey, Malaysia and Indonesia, not only expressed their serious concerns but tried to rally support as well, ASEAN has spoken out about the Rohingya situation, UN Human Rights chief Zeid Ra'ad al Hussein urged Myanmar to halt its brutal security operation against the Rohingya in Rakhine, calling it a "textbook example of ethnic cleansing." Regrettably, the deafening silence of the Myanmar's two close neighbors, India and China, is disappointing. Russia is also steadfast booster of the current regime. In December, 2016, like many other earlier occasions, both China and Russia vetoed the United Nations Security Council motion to censure Myanmar. Despite this gloomy picture, Bangladesh as the affected country, must keep the UN Security Council fully involved in solving the problem permanently and peacefully. It would be a folly if Bangladesh attempts to resolve this issue bilaterally with Myanmar since Myanmar is reluctant to comply with 1992 bilateral agreement with Bangladesh in this regard. The international community could take into account activating the possibility of UN Security Council Resolution, 1674, are iteration of the "Responsibility to Protect" (R2P) people who are undergoing human rights abuses from their own government. On November 11, 2019, the Gambia filed a case against Myanmar in the International Court of Justice under article- 9 of the Convention on the Prevention and Punishment of the Crime of Genocide seeking provisional measures to protect against further irreparable harm to the rights of Rohingyas.[26] In response, the Court directed the government of Myanmar to "take all measures within its power" to prevent the commission of acts defined in the Genocide Convention.[27]

11. Kofi Annan's Commission and Rohingya Crisis:

Myanmar government under severe pressure from the world community, formed the "Rakhine Advisory Commission" mostly consisted of Myanmar citizens, chaired by former UN chief Kofi Annan. The Commission, popularly known as "Annan's Commission" made its recommendations in 63-page report titled "**Towards a Peaceful, Fair and Prosperous Future for the People of Rakhine**" after one year of consultations held throughout Rakhine State as well as in other parts of the country. The Commission urges concerted action by the government and all sectors of society to implement the following recommendations:

a) **Socio-economic development**: The Commission recommends the government invest in infrastructural fields such as electricity, drinking water, roads and internet access for socio-economic development of Rakhine State.

b) **Create a path to citizenship for the Rohingya**: The Commission urges Myanmar to review the Citizenship Law. It suggests bringing it into line with international standards, re-examining the current linkage between citizenship and ethnicity and considering provisions to allow for the possibility of acquiring citizenship by naturalization. The Commission also recommends greater political representation for ethnic minority groups, stateless and displacedcommunities.[28]

c) **Enhance freedom of movement**: The Commission suggests the government to ensure freedom of movement for all irrespective of religion, ethnicity and citizenship.

d) **Instigate a calibrated approach to security**: The Commission also urges for a calibrated approach which combines political, developmental, security and human rights approaches that address the root causes of violence and reduce inter-communal tensions.

e) **Dialogue between communities**: The Commission also calls for

fostering talks between all communities in Rakhine State and activities which have positive impact to generate environment for such dialogue.

The Kofi Annan's Commission has painstakingly worked out to search a realistic path for restoring peace in Rakhine State between two conflicting groups. Now the world will be watching, to what extent, Myanmar pays heed to the recommendations of this Commission it said at the time of forming the Commission.

12. Conclusion:

It is naive to say that laws of the land should always be respected as sacrosanct and violence in all forms should be shunned. If the country abuses its authority in the name of law and suppress its own people, the laws lose their sanctity. The Citizenship Act, root of ongoing crisis, is nothing but a tool in the mighty hand of the government to oust the Rohingya Muslims ignoring their past history of origin. The present situation signifies that the crisis can't be solved overnight but at the same time, the abject condition can't be allowed to go on furthermore. Farsighted initiatives must have to be adopted by major or influential global as well as regional actors to exert pressure on Myanmar government not only to bring back the Rohingyas but also to ensure human rights of the Rohingyas as well as other minorities following special criterion under the United Nations R2P framework. It is now well perceived by all stakeholders that routine statements by different countries and organizations won't resolve the crux. Rather, the international community should exert pressure on Myanmar government so that state-sponsored violence on the Rohingya community stops once and for all. The situation claims that something out of the conventional method is to be done to intimidate Myanmar authority. It may be the right time for the United Nations to step in and find out a durable and amicable solution based on its experiences of analogous circumstances in the other parts of the world. Annan's Commission recommendations should be taken into account

and Rohingyas must have their legal rights as citizens of Myanmar among other things restored. Altogether, victims of Myanmar tragedy should be given a chance to see justice being brought upon perpetrators of genocides. It is high time for international community to echo in the outcry of conscience and humanity before it becomes too late.

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Challenges of CSR Practices in Bangladesh: A Study on Selected Private Sector Enterprises

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Abstract

The prime objective of this study is to examine the challenges of CSR practices and remedies to overcome these. To fulfill the objectives of the study,data were collected from 23 executives of different private sector enterprises through printed questionnaires. The respondents were also interviewed wherever and whenever possible. To analyze and interpret the data, the study uses means, standard deviations, and cross-tabulation of the responses of different respondents on identical issues. An important finding of the study is that sampled companies are well-concerned regarding challenges to CSR practices. Important steps like increasing the awareness programs, governmental support, making suitable rules and regulations and ensuring their implementation, and nurturing a positive attitude towards CSR practice could be effective in removing the current challenges of the CSR practices in Bangladesh. The most important implication of the study is that the business organizations, government, policy makers, and managers may consider the findings of the study in their policy-making and business practices. Implications and future research directions are also discussed in the study.

Key Words: CSR, Challenges, Growth, Bangladesh, Economy, Impact, Private Sector Enterprises (PSEs).

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1.0 Introduction

Most of today's organizations spend a huge amount of money from their financial surpluses and invest a great deal of time and effort to satisfy their stakeholders as well as to perform the task of 'corporate social responsibility'. These activities of social responsibility facilitate the firm by providing longer survival of life, greater acceptance of products, services and firms in society, and ultimate financial benefit through greater market share. Social responsibility is defined as "the set of obligations and organization has to protect and enhance the society in which it functions" (Anderson, 1986).It is an obligation, beyond that required by the law and economics, for a firm to pursue long-term goals that are good for society (Decenzo & Robbins, 1995). Corporate Social Responsibility (CSR) includes all those claims made on an organization by the interest groups such as the community, suppliers and creditors, owners and stockholders, customers and clients, unions and government and finally employees (Reitz & Jewell, 1995). Corporate social responsibility is playing a vital role in today's business to expose sustainable competitive advantages and becoming a vital issue of regular business practices that ultimately helps to ensure the better market positioning of a firm. Social responsibility is defined as "the set of obligations an organization has to protect and enhance the society in which it functions" (Anderson, 1986).

In the era of the 21st century, all the organizations have to give much concentration on CSR practices besides the various activities of business organizations. CSR is a concept whereby companies integrate social and environmental concerns into their business activities (Julie, 2002). The CSR movement has gathered great momentum over the past years and is now regarded to be at its most prevalent (Willaims, 2005). Not only has the issue received academic attention, but it also has quickly moved up the corporate agenda (Knox, Marklan, & French, 2005).

One of the major purposes of business is to make a profit. However, the profit motive is sometimes viewed as less than virtuous because it emphasizes self-interest. Nevertheless, self-interest is not the same as selfishness, which emphasizes one's own interests at others' expense. Self-interest is simply a concern for financial reward and is arguably necessary if society is to be maximally productive and efficiently allocates its resources (Geoffrey, 2002).

Profit rewards hard work and innovation, incentives that most people need; otherwise, it would be irrational to save and invest rather than consume. Consequently, business organizations cannot operate successfully without the cooperation of the society in which it is located. The corporate world has some of the brightest minds in the world and it possesses tremendous financial resources (Ahamed, 2010). Thus, businesses should utilize some of their human and financial capital in order to "make the world a better place". According to Alimullah (2006), "Corporate Social Responsibility is one of the new dimensions in corporate management once if the focus was on financial Management". According to Bowen (1953), most of that time, people were saying that maximization of profit is the main objective of the company, but in modern times, we do not speak like that. Researchers feel that the company's corporate management's main objective is to achieve the corporate goals and incentives. CSR is for progressive companies and definitely they will look after the privileged people, the distressed people and those who don't have the capacity to survive in this society.

CSR indicates that the companies have an important social role in the various segments of the society that are directly or indirectly affected by the company Mohammad (2006). It emphasizes that the corporate entities must not exist only for the sole motive of profit but have to devote some of their precious resources and time to the well-being of society. Social responsibility of business is not a new concept in our country that has been developing gradually for two decades. In the past whenever there was famine or tidal-bore, or natural disasters, the leading businessmen of the area would literally throw open their business premises to provide food and other assistance to the needy Blyth (2005).

Corporations are necessary for economic growth and development, to the extent that the problems of society be solved by proving more and better jobs, higher income levels for more people, and a large supply of goods and services; Such organizations may be expected to halt the pollution of the environment by their industrial waste, train hard core unemployed and lean up the slums because ultimately such actions will affect the business favorably. In this circumstance, corporations act as trustees of the public interest out of self-interest. Such trusteeship may cause management to forego immediate profit for the sake of the public good and for the sake of the corporation's long-term goals and

profits. With the increasing complexities of society, the route to profit also has become more complex (Gill & Leinbach, 1983).

CSR in Bangladesh can also contribute a lot to community development. The corporate house can develop the community by creating employment, providing primary education, contributing to infrastructure development like roads and highways and addressing environmental concerns (Arif, 1990). This is more relevant to a country like Bangladesh where the government interventions in these fields augmented by corporate alliance can go a long way in developing the economy, society and environment. Business and society live together. If there is no society, there is no business and vice versa. Thus it is understood that CSR is important for the business now.

2.0 Literature Review

The term Corporate Social Responsibility (CSR) has become a buzzword in the corporate world. Social responsibility of business is now being widely recognized and emphasized for practice although its origin dates back to a long past. In today's competitive economy, CSR has been getting importance to managers for the sake of their stakeholders' changing expectations, which are incorporated into business strategy formulation. As for a common understanding, all terms speak about some basic notions of a business's role in proving some 'good' to society in the form of jobs, growth, philanthropy, law abidance, environment stewardship, rights protection, and other expectations. This study considers some of the scholarly works and thinkers who have been influential in CSR debate during the past 50 years or before and bring together fundamental thoughts in the field of CSR that have a considerable resource for contemporary business practices. This discussion is followed by an overview of major theories and models of CSR, CSR drivers and so on.

Research on Corporate social responsibility (CSR) practices in Islamic banks of Bangladesh and their findings are CSR influences an organization in deciding its ethical approaches in the corporate practices and is also important to maintain sustainable development Bhuiyan, Darda & Hossain (2021).

Another research work conducted on Regulatory influences on CSR practices within banks in an emerging economy and the findings stated that over more than two decades, the practice of voluntary CSR practices and its reporting by

firms in Bangladesh has developed and increased, but the need for regulatory guidelines for CSR practices and continues to overcome the challenges of CSR practices. Furthermore, they stated that regulation would minimize the negative behavior regarding CSR practices because there is a lack of political will, an absence of accountability and there appears to be a lack of substantive commitment to ethical conduct amongst powerful board members Khan, Bose, & Rachel (2020).

An interesting research work conducted on measuring the impact of CSR practices on brand equity in the banking industry in Bangladesh: The mediating effect of corporate image and brand awareness and the results are the banking industry in Bangladesh is now conducting business under the growing pressure to conform to every aspect of corporate social responsibility (CSR) for the welfare of their clients and society and the results of the study also demonstrated that CSR has a significant direct effect on the corporate image and brand awareness Hafez (2018).

Ahmed, Jobair & Azad (2013) conducted another research work in the same field, Corporate Social Responsibility Practices of Commercial Banks in Bangladesh: A Case Study on Southeast Bank Ltd. and the findings are CSR is being seen as the source of a new competitive edge for the banking sectors of Bangladesh. Banks of Bangladesh practice CSR not only to improve community relations but also as a source of significant commercial benefit, so all the organization should take the proper steps to remove the challenges of CSR practices as quickly as possible.

In a research work Bishawjit (2011) stated that historically CSR has been viewed as a developed country phenomenon though this is not true. Furthermore, he stated literature review and search of the website has led to believe that managers in Bangladesh and all categories of stakeholders of developing countries were also showing interest though to a lesser extent compared to developed countries, to CSR issue. In this regard, the present researcher feels interested on conducting the study on the challenges of CSR practices by private sector enterprises especially in developing countries like Bangladesh.

Post and James (1996) did a research work on 'Business and Society, Corporate strategy, Public Policy Ethics' by collecting a sample of 435 randomly and concluded that CSR means that a corporation should be held accountable for any of its actions that affect people, their communities, and their environment. It may require a company to forego some profits if its social impacts are seriously harmful to some of the corporation's stakeholders or if its funds can be used to promote a positive social good. In this work the researchers mentioned the important things what issues were good for business and society under CSR practices but it could be more specific in issues and industries. One of the most important research work done by Windsor (2001) on "The Future of Corporate Responsibility", with the aim of knowing the key issues by collecting 125 samples of business houses in different industries regarding CSR practices that could be benefited for the business house and the findings that 'business leaders have since the 1920s widely adhered to some conception of responsibility and responsiveness practices.

Ahmed and Islam (2008) conducted another research work in the same field, "CSR in the Private Sectors' to know the impact on society and the challenges of business in the CSR field and the findings are a radical change in the relationship between business and society and the various barriers faced by the different organizations regarding CSR practicing. Prime drivers of this change have been the globalization of trade, increased size and influence of companies, repositioning of government and rise in the strategic importance of stakeholder relationships, knowledge and company reputation. The relationship between companies and civil society organizations has moved from paternalistic philanthropy to a re-examination of the roles, rights and responsibilities of business in society.

Sultana (2009) conducted a research work On "Corporate Social Responsibility in Bangladesh" with the aim of discovering the impact and relationship of Business and the stakeholders by collecting 378 samples through purposive sampling and she revealed that it was the awareness that business activities have an impact on society and the consideration of that impact by firms in decision-making. The study also showed that emphasizing profits, firms are concerned with social responsibility and voluntarily engage in activities that ensure the benefits of the society and also create new business opportunities, synergies,

and private- public partnerships, connecting customers, suppliers, stakeholders and communities.

A research work conducted by Raihan (2002) on "Corporate Responsibility Practices in Bangladesh: Results from a Benchmark Study" asserted that the PSEs could play a very important role in providing social goods and services to the masses at a very competitive price. Hence the PSEs are subjected to immense social pressure. Competitiveness of corporate entities of Bangladesh can be improved by involving more emerging concerns of CSR issues. It is no more with the expectations; rather, the responses should be more efficient and effective. Though the researchers in Bangladesh are interested in this topic, research at both academic and business levels is largely absent here.

Another research work conducted by Julie (2002) on "Corporate Social Responsibility in Bangladesh: Barriers and Opportunities experienced by SMEs when undertaking CSR" and he stated that the people of business enterprises have to be convinced that the arguments placed in favor of CSR practices are exaggerated. Rather, companies are aware that they can contribute to sustainable development by managing their operations in such a way to enhance economic growth, increase competitiveness, and ensuring at the same time environmental protection and promoting social rights. Thus CSR is a concept whereby companies integrate social and environmental concerns into their business activities. This research specially has encouraged the present researcher to identify the challenges of CSR practices by the PSEs in Bangladesh.

Stoner (1997) asserted the CSR concept in the book of Management that all business organization must recognize some division of social responsibility among the various segments of the society, including government and the business community. Most managers and other people believe that both the government and the business community do have some responsibility to act in the interest of society. As the two most powerful institutions in the country, the sheer size of business and government obliges them to address problems of public concern. Both corporations and governments depend upon acceptance by the society to which they belong. Lamy (2002) conducted a research work on "The Role of Corporate Social Responsibility" by collecting a sample of 323 through convenience sampling with the key aim of identifying the key impact

of CSR in the business and he concluded that the past twenty years had seen the globalization of trade, the increased size and influence of companies, the repositioning of government and the rise in strategic importance of stakeholder relationships, knowledge and brand reputation.

Hoque (2008) conducted a research work on "Social Responsibility of Business: Bangladeshi Business Enterprises" by collecting a sample of 127 through purposive sampling with the aim of addressing the scenario of CSR and to determining some recommendations for improving the situation. He concluded that the business enterprises in Bangladesh are divided into different groups according to the size of the operation, nature of the operation, ownership pattern and effort taken for operation. In this work the researcher mentioned that in Bangladesh both public and private sector enterprises should perform social responsibilities and unfortunately he identified the businessman of Bangladesh had been ignoring those responsibilities or they had miserably failed to discharge the responsibilities. He also mentioned that the factors responsible for not being socially responsible practices were economic, political, administrative and organizational and the researcher provided some recommendations. Researchers also found that few studies on challenges of CSR practices in the context of Bangladesh are remarkably absent. These research gaps have inspired the current study. That's why the present researcher has given the concentration on PSEs of Bangladesh regarding the challenges of CSR practices.

3.0 Objectives of the Study

The prime objective of the study is to investigate the current challenges of CSR practices by private organizations in Bangladesh. The specific objectives are:

1. To identify the challenges of CSR practices faced by the private sector enterprises.
2. To identify the present status of those challenges by having a deeper insight into them.
3. To identify the ways to overcome those challenges.

4.0 Scope of the Study

The study remained concentrated on the challenges of CSR practices by some large and medium scale PSEs in Bangladesh. Twenty three (23) companies in Bangladesh from different industries were purposively selected for this study. The study mainly covered fourteen issues to investigate the challenges of CSR practices by the business houses in Bangladesh.

5.0 Methodology

This section describes the methods and procedures of developing and administering the questionnaires and data collection procedures that are used to investigate the challenges of CSR practices and other necessary answers to the related questions regarding this study.

5.1 The Sample and their Selection

The focus of the study is mainly directed to challenges of CSR practices by sampled enterprises which are mostly based on primary data. In selecting the sample for this study, purposive sampling method was used. A total of 23 business houses from different industries were selected as sample organizations for the current study. All the sample enterprises in this study are engaged in any one of the business activities including producing and selling goods, importing raw materials from abroad, offering services to the people of the society in various forms. Samples selected for the study covered Bank, Financing Company, Real Estate, Insurance, Health Care Organization, Food and Beverage, Textile, Telecom Company, Pharmaceutical Company, and Steel Mill to fulfill the objectives of the study. Most of the companies are renowned and popular to the customers and society in their respective industries among which some of them secured the leading position from the view point of market share. In selecting the sample enterprises for this study, the size and numbers of employees of the organizations were important considering factors.

5.2 Questionnaire Design, Pilot Study and Data Collection

For collecting the primary data, top/mid-level executives from sampled organizations were selected regarding challenges of CSR practices by their respective organizations. About three months' time span (from January 2019 to March 2019) was dedicated to collect primary data for this study and to serve

the purposes of this study. Before administering the final questionnaires, a pilot survey was conducted to check question design, clarity of instructions and the time taken to complete the questionnaires. To meet the objectives of the study questionnaires for the executives were developed and pre-tested. The following steps were taken in developing the questionnaires. Firstly, the questionnaire was given to six fellow researchers at different universities who commented on the design and clarity of the instrument. Finally, a participating pre-test was conducted with four participants (executives working at different organizations of different professions).

Questions were multiple choices on a five-point Likert 'scale on agreement or disagreement and the extent from highest to lowest. Twenty three executives were provided questionnaires and interviewed personally for collecting data for this study. In order to explain the relevant issues, this study is partly based on secondary information that has been obtained from different sources like websites, research articles, published journals of several universities and organizations and thesis papers. The researcher carefully studied the related text, annual reports of different organizations, and other pertinent documents regarding CSR to serve the purpose of the research.

Table-1: List of Sample Enterprises with Their Categories

Sample	Name of the Private Enterprises	Category
Sample 1	Apollo Hospital Ltd. Dhaka	Health
Sample 2	United Hospital Dhaka	
Sample 3	Robi (Axiata)	Telecommunication
Sample 4	Banglalink	
Sample 5	Grameen Phone	
Sample 6	Dutch Bangla Bank Ltd.	Banking sector
Sample 7	Standard Chartered Bank	

Sample 8	HSBC	
Sample 9	Beximco Pharmaceuticals Limited	Pharmaceuticals
Sample 10	Square Pharmaceuticals Ltd	
Sample 11	KSRM	Steel
Sample 12	Bangladesh Steel Re-rolling Mill (BSRM)	
Sample 13	Metlife	Insurance
Sample 14	Delta Life Insurance	
Sample 15	CPDL	Real Estate
Sample 16	Equity Property Management Ltd.	
Sample 17	Lanka Bangla Finance	Non-banking (Financing Sector)
Sample 18	IDLC	
Sample 19	Pran Group	Consumer Goods
Sample 20	S. Alam Group	
Sample 21	Ispahani Group	
Sample 22	KDS Textile	
Sample 23	Desh Garments	

Source: Field study

5.3 Analysis and Interpretation Tools

In this study both qualitative and quantitative techniques have been employed for the analysis and interpretation of collected data. Data have been analyzed using descriptive statistics like mean, and standard deviation to explain the

respondents' answers. The respondents' views on the issue of challenges to practicing CSR have been analyzed by using the descriptive statistics. 'Statistical Packages for Service & Solutions (SPSS) has been used to analyze the collected data in this study.

6.0 Findings and Analysis Tools

To fulfill the objectives of the study questionnaires consist of both open and closed-ended questions. Data regarding challenges towards CSR and their probable remedies were sought out from the respondents through questionnaires and interviews.

Table-2: Demographic Information of Respondents

Demographic characteristics	Mean (in years)	SD (in years)	N	%
Respondents' experience	18.30	6.27	----	----
Respondents' gender:				
Male	----	----	22	95.6
Female	----	----	1	4.4
Total	----	----	23	100
Respondents' position level:				
Top	----	----	7	30.4
Middle	----	----	16	69.6
Total	----	----	23	100
Respondents' Academic qualifications				
Masters	----	----	22	95.6
Others	----	----	1	4.4
Total	----	----	23	100.0

Source: Field Study

The average years of work experience of respondents were 18.30 with SD of 6.27. Among 23 respondents, 22 (95.6%) respondents were male and only 1 (4.4%) of them was female. There were 7 (30.4%) and 16 (69.6%) representations by the top-level and mid-Level respondents, respectively. The respondents were well educated: 22 (95.6%) had completed Masters degrees, while only 1 (4.4%) showed other higher degrees.

6.1 Descriptive Statistics of Executives' Responses Regarding Challenges towards CSR Practices

A total of 23 business houses from different industries were selected as sample organizations for the current study. Samples selected for the study covered Bank, Financing Company, Real Estate, Insurance, Health Care Organization, Food and Beverage, Textile, Telecom Industry, Pharmaceutical Company, and Steel Mill. Most of the companies are renowned and popular to the customers and society among which some of them secured the leading position from the view point of market share.

6.2 Challenges towards CSR practices

The respondents (Top & Mid-level Executives of selected enterprises) were requested to rate the different critical issues regarding challenges to CSR practices of their respective companies. A five-point Likert-scale was designed to find out their response levels regarding those issues. The scale stratifies levels as, SA= strongly agree; A= agree; N=neutral; D= disagree; SD= strongly disagree. The responses were as follows

Table-3: Frequencies of Executive Responses on Challenges of CSR Practices faced by the Enterprises

Particulars	Negative Attitude of Management					Total	WAS	SD
	SA	A	N	D	SD			
Frequency	3	5	7	7	8	3	2.60	1.33
%	10%	16.7%	23.3%	23.3%	26.7%	10%		
Particulars	**Could not Realize by the Top-Management about Importance of CSR**					**Total**	**WAS**	**SD**
	SA	A	N	D	SD			
Frequency	4	3	10	5	8	23	2.67	1.35
%	13.3%	10.0%	33.3%	16.7%	26.7%	100%		
Particulars	**Creates the Conflict of Interest Among the Decision Makers**					**Total**	**WAS**	**SD**
	SA	A	N	D	SD			
Frequency	1	8	6	8	7	23	2.60	1.22
%	3.3%	26.7%	20%	26.7%	23.3%	100		

Source: Field Study

WAS= Weighted Average Score; SD= Standard Deviation.

From the analysis presented in Table-3, it is seen that among 23 respondents, 26.7%(8) and 23.3% (7) respondents were respectively strongly disagreed and disagreed that the negative attitude of management is one of the challenges the CSR Practices in the organizations, while 7 of the respondents remained neutral on the same issue. A significant number of respondents 8(26.7%), 7(23.3%) and 9(30%), rated their perception above the neutral point regarding all the above-mentioned issues respectively; this indicates that they agreed on these challenges of CSR practices.

Table- 4: Frequencies of Executive Responses on Challenges of CSR Practices faced by the Enterprises

Particulars	**Corporate People Do not have Enough Experience, Skills and Patience to Practice CSR**					**Total**	**WAS**	**SD**
	SA	A	N	D	SD			
Frequency	5	6	6	6	0	23	2.30	1.09
%	21.7%	26%	26%	26%	0%	100%		
Particulars	**Expensive**					**Total**	**WAS**	**SD**
	SA	A	N	D	SD			
Frequency	3	6	6	6	2	23	2.97	1.16
%	13.0%	26%	26%	26.6%	8.7%	100%		
Particulars	**Social Involvement of the Organizations is not Encouraged by Large Number of People of the Society**					**Total**	**WAS**	**SD**
	SA	A	N	D	SD			
Frequency	1	6	7	5	4	23	2.73	1.14
%	4.3%	26%	30.4%	21.7%	17.4%	100%		

Source: Field Study

WAS= Weighted Average Score; SD= Standard Deviation.

From the analysis table-4 it can be seen that among 23 respondents in each response area, remarkable number of respondents 26.0% (6) mentioned their position in agree point which indicates the moderate position about the challenges of CSR Practices in their organizations, while 6(26%) ,6(26%) and 7(30.4%) respondents remained neutral on the same issues. A significant

number of respondents 8(26.7%), 7(23.3%) and 9(30%) rated their perception above the neutral point respectively regarding all the above mentioned issues which indicate respondents put their strong position in favor the challenges of CSR practices.

Table- 5: Frequencies of Executives' Responses on Challenges towards CSR Practices by the Sample Enterprises.

Particulars	**Negatively Effect of the Business Efficiency**					**Total**	**WAS**	**SD**
	SA	A	N	D	SD			
Frequency	2	4	9	3	5	23	2.67	1.18
%	8.7%	17.3%	39.1%	13.3%	21.7%	100%		
Particulars	**Lack of Legal Obligation by the Government**					**Total**	**WAS**	**SD**
	SA	A	N	D	SD			
Frequency	1	7	9	4	2	23	3.13	0.94
%	4.3%	33.3%	39.1%	17.3%	8.7%	100%		
Particulars	**Lack of Available Organizational Resources**					**Total**	**WAS**	**SD**
	SA	A	N	D	SD			
Frequency	1	6	9	5	2	23	3.00	0.95
%	4.3%	26%	39.1%	21.7%	8.7%	100		

Source: Field Study

WAS= Weighted Average Score; SD= Standard Deviation.

In this table, executives of different organizations rated their companies about the challenges of CSR practices towards 'Negatively effect of the business efficiency', 'Lack of legal obligation by the government' and 'Lack of available organizational resources' by their respective organization it can be seen that, among 23 respondents equal number of respondents 9 (39.1%) agreed in 'neutral' in all three issues respectively however, not a remarkable portion of the respondents putted their opinion strongly in favor of the abovementioned issues.

Table-6: Frequencies of Executives' Responses on Challenges towards CSR Practices by the Sample Enterprises

Particulars	**Decreases the Profitability of the Organization**					**Total**	**WAS**	**SD**
	SA	A	N	D	SD			
Frequency	1	6	7	7	2	23	2.67	1.06
%	4.3%	26.0%	30.4%	30.4%	7.6%	100%		
Particulars	**Cannot Relate Towards the Organizational Benefits**					**Total**	**WAS**	**SD**
	SA	A	N	D	SD			
Frequency	2	3	9	8	1	23	2.80	0.93
%	8.6%	13.0%	39.1%	34.7%	4.3%	100%		
Particulars	**More Profit Seeking Mentality**					**Total**	**WAS**	**SD**
	SA	A	N	D	SD			
Frequency	3	6	8	6	0	23	3.20	0.96
%	13.0%	26.0%	34.7%	26.%	0%	100%		

Source: Field Study

WAS= Weighted Average Score; SD= Standard Deviation.

In this analysis table-6, executives of different organizations rated their companies regarding the challenges of CSR practices 'Decreases the profitability of the organization', 'Cannot relate towards the organizational benefits' and 'More Profit seeking mentality. It is revealed that, among 23 respondents 7 (30.4%) and 9 (39.1%) agreed in 'disagree' in the first two issues and 8(34.7%) neutral for last issue respectively. From this analysis table it also seen that a significant amount of respondents, 7(30.3%) and 9(39%), put their opinion in favor of the first and 3rd issues of the challenges of CSR practices, which can be good sources for future recommendations to overcome the situation and make it in favor of CSR practices.

Table-7: Frequencies of Executives' Responses on Challenges t towards CSR Practices by the Sample Enterprises

Particulars	**Think Burdensome Works**					**Total**	**WAS**	**SD**
	SA	A	N	D	SD			
Frequency	3	6	5	9	0	23	3.13	1.11
%	13%	26%	21.7%	39.1%	0%	100%		
Particulars	**Lack of Government Support**					**Total**	**WAS**	**SD**
	SA	A	N	D	SD			
Frequency	5	4	11	3	0	23	3.47	1.01
%	21.7%	17.4%	47.8%	13%	0%	100%		

Source: Field Study

WAS= Weighted Average Score; SD= Standard Deviation.

From table 7 it can be observed that almost 61% (14) and 87% (19) respondents gave their opinion opposite the disagreement level regarding both the issues to the challenges of CSR practices. This result revealed that respondents support both issues which are significantly responsible as challenges of CSR practices in their respective organizations. Furthermore, not a single person found in the issues who put their opinion in favor of strong disagreeableness, may be a good source of further recommendations to overcome the challenges of CSR practices.

Table-8: The Mean, Standard Deviations of Challenges towards CSR Practices by the Sample Enterprises.

SL	Particulars	Executives	
		Mean	SD
C1	Lack of government support	3.47	1.01
C2	More Profit-seeking mentality	3.20	0.96
C3	Lack of legal obligation by the government	3.13	0.94
C4	Think burdensome works	3.13	1.11
C5	Lack of available organizational resources	3.00	0.95
C6	Expensive	2.97	1.16
C7	Cannot relate towards the organizational benefits	2.80	0.93
C8	Social involvement of the organizations is not encouraged by large number of people in the society	2.73	1.14
C9	could not realize by the top-Management about the importance of CSR	2.67	1.35
C10	Negatively effect the business efficiency	2.67	1.18
C11	Decreases the profitability of the organization	2.67	1.06
C12	The negative attitude of management	2.60	1.33
C13	It creates a conflict of interest among the decision makers	2.60	1.22
C14	Corporate people does not have enough experience, skills and patience to practice CSR	2.30	1.09

Source: Field Study

WAS= Weighted Average Score; SD= Standard Deviation.

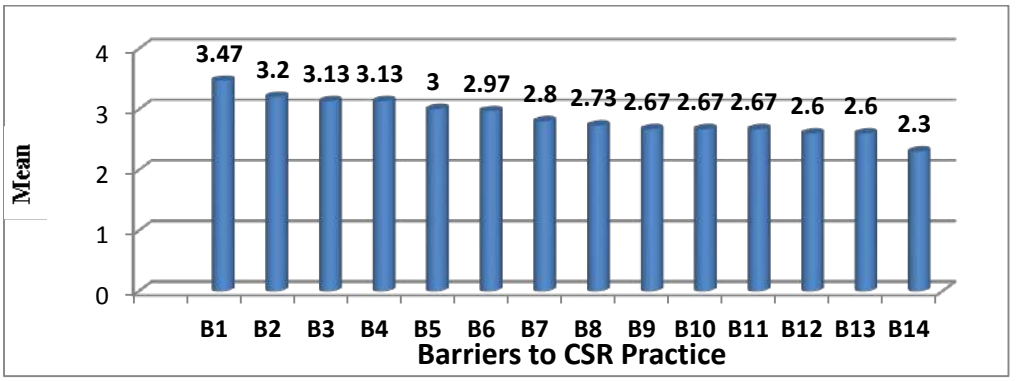

Figure: Mean of Challenges of CRS practices by the sample enterprises.

From the observation of table, the highest mean value (3.47) is found in the challenges to CSR practicing issue, 'Lack of government support'. The nearest highest (3.20) was found in case of the 'More Profit seeking mentality' issue. On the other hand, from the mean and SD table, lowest mean value (2.30) was found in the issue of 'Corporate people do not have enough experience, skills and patience to practice CSR' which indicated that executives considered this issue the lowest level which was very pragmatic from the Bangladesh industrial historical point of view.

7.0 Discussions

Regarding challenges towards CSR practices, the researcher has found that most of the executives' responses are not favorable to the given statements. It is clear to the researcher that among 14 statements regarding challenges towards CSR practicing nine issues i.e. expensive, cannot relate towards the organizational benefits, social involvement of the organizations are not encouraged by a large number of people of the society, cannot realize by the top-management about importance of CSR, negatively effect of the business efficiency, decreases the profitability of the organization, negative attitude of management, create the conflict of interest among the decision makers, and corporate people do not have enough experience- skills and patience to practice CSR, the companies think that these are not challenges to CSR practices. The sampled companies recognized mostly four issues which create challenges to practice CSR and these are lack of government support, more profit seeking

mentality, lack of legal obligation by the government and think burdensome works. One most interesting issue is that the executives are neutral about the challenges of lack of available organizational resources, which indicates a very good sign to enhance the CSR field aggressively in today's competitive environment. It has not been surprisingly noted to the researcher that the sampled companies don't think that the money involved in the CSR practices is not expensive, which can ensure the optimism in the CSR field to the growing companies. Finally, the most praising challenge to CSR practices according to the executives of sampled companies is 'lack of government support' which is not very much expected of an industrially developing country like Bangladesh. Based on analyses carried out and the findings made, the following recommendations are offered to encounter challenges of the CSR practices in the PSEs in Bangladesh and for Government to make policy and ensure the implementation regarding the same at the highest level.

1. In the year of presence competitive business field the companies of the private sector should emphasize on creating awareness of employees about environment related issues, i.e. producing safety products, managing waste efficiently, establishing water treatment plant, energy-saving technology, recycling facilities, renewable energy and more on all should be environment friendly. This is of great strategic importance in the interest of long-term survival in the market.

2. Government plays an important role in the development of the industry. In the case of CSR practices government may play an important role in ensuring the private sectors by providing special support to the industries and investors who intensively practice CSR. These may be training programs for investors to create awareness about CSR practices, technological support by research institutes for advancement of industrial environmental technology, free of cost, financial support for encouraging (tax holiday, low interest rate for credit) CSR related activities, incentives and rewards programs for CSR practitioners.

3. Another significant role can be played by the government through their institutions, by making and implementing rules and regulations in favor of

practicing CSR by all the private sector companies compulsorily in some particulars issues which must be friendly from the investors point of view, i.e. plantation, providing compulsory of profit for the wellbeing of society, green marketing etc.

4. Surely CSR practices involve cost, but it accrues more benefits to every practicing company. So the company should not consider the money involvement in the CSR field as expense; rather they must consider it as investment because CSR practices produce different types of benefits for the company i.e. direct social involvement having long-term self-interest of business, solving social problems can be financially benefited. It creates goodwill among public and businesses can be a partner with the government. So the government may nurture the investors and managers to change their attitude about CSR practice issues in a positive manner through some development programs.
5. Private sectors have to play a role to ensure the knowledgeable stakeholders of society about that to enhance the business sustainability through their CSR-related works because different studies revealed that CSR practices increase the possibility of business profitability and enhance the social image in the market place.
6. Today's world mostly depends on the availability of quality information in the right quantity and time, so the people should acquire the right information at right time which can ensure the support of long-term industrial development. On the other hand, a country's social, educational and economic development is mostly related to the cultural advancement, they should put emphasis on cultural development through their innovative long-term programs and the people should be more conscious about their culture through the education system, because without a strong culture no nation can be able to lay the foundation of their economic and social development.

7. Today's business is customer-oriented, so the companies should be aware of the customers' expectation to make their position stronger in the market. As the finding of this study indicates that company people are well-concerned regarding this issue.
8. Nurturing positive attitude toward CSR practices could be effective in removing the current challenges because research proved that CSR practices enhance the social acceptability of the business units which ensure the survivability of the business unit in the long-run.

9.0 Implications

This study mainly tries to investigate the challenges towards the CSR practices with a view to suggesting ways to encounter these challenges. The result of this study reveals some remedies to overcome the challenges of CSR practices in Bangladesh. The result of this study is relevant and informative for the private sector, government, policy-makers, the managers etc. This study was primarily conducted based on the perceptions of executives of selected private sector enterprises.Hence, their perceptions and suggestions are important to the concerned authorities of selected private enterprises, government institutions and other organizations. Policy makers can consider the factors while making related regulatory policies and framework for the enhancement of the CSR practices by the private sector. On the other hand, the authorities of the business and other institutions can appraise the findings of this study while formulating their business strategies. People of the society should be more conscious about CSR practices by the PSEs by getting proper information which provide by the regulatory bodies, which can be a real pressure to the PSEs to engage more in CSR activities.

10.0 Limitations and Directions for Future Research

The study has some limitations. In order to identify the challenges towards CSR practices by the PSEs it requires some useful tools. Although some tools and techniques for identifying the challenges to CSR practices were developed in western countries, the application of all such tools in developing countries like Bangladesh is questionable or not possible to identify in right manner. Furthermore, because of limited practices and consciousness about the

challenges to CSR practices in Bangladesh, it was really difficult to get opinions from executives of Bangladesh on most of the issues practiced in developed countries industries. Moreover, the opinion collected from the executives and employees might be biased to their own enterprises' practices. Subsequent studies could be attempted to investigate the challenges towards CSR practices by both public and private sector longitudinally. Future research would be benefited from a larger sample size, using a variety of samples. Current research did not study the public sector enterprises. Hence, research on comparative study and impacts of these two main types of public and private sector enterprises may produce more interesting results that may prove more helpful to the policymakers for taking better steps for developing the business positioning. Issues identified as challenges to CSR practices in the private enterprises and suggested issues related to overcoming these challenges may be researched distinctly for producing better results that will be more specific.

11.0 Conclusion

The economic dependency of Bangladesh over the last two to three decades has been shifting from agriculture to industrial sector. The major portion of GDP contributed by industrial sector; at the same time this sector has been contributing to the society in diverse ways. Continuously, the list of new investors and the amount of investment in this sector are increasing rapidly. The investment not only creates the employment opportunity for millions of people but also contributing to the wellbeing of society through CSR practices. For the existence of business organizations they must do CSR practices as one of their regular business activities in the long run. Both the company and government should emphasis equally on creating awareness and making rules and regulations to encounter the challenges of CSR practices. Even though the large companies are conscious about the challenges to CSR practices in Bangladesh, the small companies are not truly aware regarding CSR practices and their challenges as it brings extra costs for them. The management of these companies should consider CSR practices as a major investment rather than costs. In essence, a support and commitment from the top-management of an organization can play a vital role in practicing CSR and overcome the challenges regularly.

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Tertiary Students' Grammatical Errors: A Small-scale Empirical Study

Kawsar Farjana *

Abstract

This is a qualitative study aimed at finding out the grammatical error type and analyzing sources of the errors made by the students of the first semester, B. A. (Hons.) in English of the English Department of a university in Bangladesh. English is taught as a compulsory subject in Bangladesh from primary school to college. Despite learning English for about 12 years, students still make grammatical errors in their writing at the tertiary level. Limited studies have appeared on the grammatical errors made by tertiary students in their writings. This study deals with the grammatical errors made by 15 students in the first semester, B. A. (Hons.) in English in their paragraph writing. The paragraphs they produced in their mid-term examination were used as a sample for data collection and analyzed using content analysis approach. The outcomes revealed that their grammatical knowledge is not up to the mark, resulting in grammatical errors. The identified errors were categorized into seven categories as subject-verb agreement, nouns, adjectives, prepositions, articles, spellings and capitalizations. Their most frequent errors were spelling, followed by subject-verb agreement errors. These findings concluded that teachers should provide detailed and corrective feedback and use effective strategies to prevent students from making such grammatical errors.

Key Words: Grammatical Errors, Grammatical Knowledge, L1 Interference, Teacher Feedback, Error Analysis.

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Introduction

The world knows how important language's role is in Bangladeshis' hearts and minds. In 1952, Students sacrificed their lives to establish their mother tongue. Learning Second Language does not mean avoiding or disrespecting the mother language. To keep pace with the modern world, proficiency in English is a must. In this era of development, none can hold a farm and leading position without Excellency in English. Francis Bacon claims, "Reading maketh a full man, conference a ready man and writing an exact man". Here, by saying 'writing makes an exact man; Bacon implies that writing may contribute to making people 'exact' or 'precise'.

Nowadays, many companies seek candidates who are experts in maintaining many types of organizational communication such as presentations, reports, emails, sales materials, visual aids etc., that denote the excellence of English writing skills. Grammar is one of the most influential aspects of learning a language. The grammar of a language includes essential parts such as the existence of tenses, verbs, articles and adjectives and their order, how questions are phrased and much more. Samuel Kirkham, the author of one of the best-selling grammar books in nineteenth-century America, defines grammar as "The art of speaking and writing the English language with property". Further, he said, "In every situation, under all circumstances, on all occasions: when you speak, read, write or think a knowledge of grammar is an essential utility".

On the part of students, writing is viewed as a complicated and challenging task. Students express their thoughts and ideas through their writings. Students' writings need to be checked by teachers. Teachers correct them, which is viewed as a loaded work. Often it requires allocating extra time to correct the errors and returns those with feedback. If a teacher corrects the errors during and after the writing process immediately, students can better understand the sources of mistakes made.

Error analysis can express what aspects of grammar are challenging for the learners, and obtaining feedback stimulates their new attempt to approximate the target language successfully. In his paper, Myles (2002, p. 9) said, "Although reading an error-filled text can be tiring and disconcerting, errors can help us identify the cognitive strategies that the learner is using to process

information." So, this study aims at examining and categorizing common errors found in writing. The research objective is to find the answer to the following question:

What types of grammatical errors are committed by the students of the first semester in their paragraph writing?

Literature Review

Students cannot produce good writing if they have inadequate grammatical knowledge. Richards and Renandya (2002) state, "Writing is a complex process, and it consists of many constituent parts, and we need to consider which ones will be the most important for a course: content, organization, originality, style, fluency, accuracy or using appropriate rhetorical forms of discourse". In written approaches, grammatical errors can change the meaning conveyed. Jenwithinsuk (2009, p. 2) notes in his study, "Accuracy in the use of the language guarantees the better understanding between the sender and the receiver of the message. On the other hand, errors may cause misunderstanding, or even communication breaks down". According to an ad for an "amazing book" on usage, "Mistakes in English can cause you embarrassment, hold you back socially and on the job. It can make you awkward and hide your true intellect. Next, Brown (2000, p. 225-226) said, "A study of the speech and writing of learners is largely the study of learners' errors. "Correct" production yields little information about the actual linguistic system of learners, only information about the target language system that learners have already acquired".

Similarly, Ellis (2008) and James (1998) emphasized that errors are unnoticeable points for L2 learners. They reflect the gaps in the learner's knowledge because they cannot identify if the errors are correct or incorrect. The errors occur finally based on the severity of errors affecting communication. Brut (1975, p. 8-9) categorized errors into "Global" and "Local errors". Global errors "affect overall sentence organization and significantly hinder communication." where Local errors "affect a single element (a constituent) in the sentence and usually do not hinder communication". According to Corder (1981, p. 5-6), "There have been two schools of thought in respect of learners' errors. Firstly, the school maintains that if we were to

achieve a perfect teaching method, the errors would never be committed in the first place and therefore, the occurrence of errors is merely a sign of the present inadequacy of our teaching technique. The philosophy of the second school is that we live in an imperfect world and consequently errors will always occur in spite of our best efforts".

Error Analysis is one of the most influential theories of second language acquisition to study errors made by students. Error Analysis is different from error correction. Error analysis was established by Stephen Pit Corder and his colleagues' in1967. EA can discover good, appropriate and corrective techniques. The reason behind it is that through writing, one can evaluate language competency and capability to recall and think. In a study, P. Sobahle (1986, p. 25) states, "Error analysis is the study of errors made by a group of people who shared the same mother tongue when studying a second or third language. It consists of all the errors made that are peculiar to that group of people".

Next, Ellis (as cited in Ping Wang, 2008) viewed "EA as being based on the emergency of intra-language theory, which is known to be used to explain effectively the errors committed in second language acquisition process". Corder (1967, p. 19-27) illustrates that those errors are "important in and of themselves". In his opinion, the significance of EA is emphasized. He elucidated EA in his article entitled "The significance of learner errors". (1967). Further, he demonstrates that learners' errors are significant in three ways. First to the teacher, they tell him if he undertakes a systematic analysis, how far towards the goal the learner has progressed and what remains for him to learn. Secondly, they provide to the researcher evidence of how language is learned or acquired, what strategies or procedures the learner is employing in his discovery of the language. Thirdly, (and in a sense, this is their most important aspect) they are indispensable to the learner himself, because we can regard the making of errors as a device the learner uses to learn. It is a way the learner has of testing his hypothesis about the nature of the language he is learning.

Between the 1940s to 1970s, Contrastive Analysis became extremely popular. The contrastive Analysis Hypothesis was formulated in Lado's Linguistics Across Cultures (1957). In this book, Lado (1957, p. 2) explains, "those elements which are similar to the learner's native language will be simple for

him, and those elements that are different will be difficult". While this was not a novel suggestion, Lado was the pioneer who provided comprehensive theoretical treatment and suggested a systematic set of technical procedures for the contrastive study of languages. According to contrastive analysis theory, teachers do contrastive analysis between the native language and the target language to predict the learning problems that will be faced by the students.

Learners' errors are a part of their learning process, and their error occurrence proves they are on the right track. Now this research investigates the possible reasons for their error occurrences. As Bangla (L1) and English (L2) are two different languages, their grammar is also different. Students commit errors when they transfer the grammatical rules of Bangla to English. It often happens. They create an intermediate grammar that is neither similar to Bangla nor English while learning a second language and commit errors. This intermediate grammar is called "Interlanguage grammar", and such errors are called "Interlingual errors".

Though Weinreich introduced it in 1953, many linguists, for example, Selinker (1969, 1972), Corder (1967), and Brown (2000) discussed it later. They all agree that there is a psychological structure latent in the brain. It reveals its existence while learning a second language. The term "interlanguage" shifted the psychological perspective of second language learning from a behaviourist to a mentalist one. Later on, this term gets named differently "Approximative System" by Nemser (1911), "Transitional Competence" and "Idiosyncratic Dialect" by Corder (1967, 1981). Interlingual errors (Brown, 2000) and "Intralingual and Developmental errors" (Richard, 1971) are two significant sources of error in second language learning. Interlingual error results from transfer from the mother tongue, called "Interference ". Students try to generalize their knowledge of L1 and experiences of L2 in learning the target language. Contrastive Analysis (CA) was based on the related theory of language transfer. Brown (2000, p. 97) states, "Negative Transfer occurs when previous performance disrupts the performance of a second task. The latter can be referred to as ' interference ' in that previously learned material interferes with a subsequent material; a previous item is incorrectly transferred or incorrectly associated with an item to be learned".

Richards (1971) proposed other possible sources of errors. He concluded that several types of errors are caused by the difficulty in the language itself and the immaturity of learner acquisition which in his term is called intralingual and developmental errors. Richards (1970, p.6) describes four causes of error occurrence of students. They are Overgeneralization, Ignorance of rule restrictions, incomplete application of rules, and false concept hypothesized. Overgeneralization covers instances where the learner creates deviant structures in the target language. Ignorance of rule restrictions refers to the failure to observe the restrictions of existing structures, that is, the application of rules to the context where they do not apply. Incomplete application of rules refers to structures whose deviancy represents the degree of development of the rules required to produce acceptable utterances. False concept hypothesized refers to a class of developmental errors derived from the faulty comparison of distinction in the target language".

Similarly, Selinker (1972, p. 215) states five psychological processes for error occurrences. They are Language transfer, Transfer of training, Strategies of second language learning, Strategies of second language communication, and Overgeneralization.

Methodology

These parts address the research design, participants, instruments, data collection and data analysis procedure.

Research Design

The researcher conducted this study based on a qualitative design. Fifteen written paragraphs were collected, and the grammatical errors were investigated. The writings were analyzed using content analysis.

Research Instruments

A research instrument is used to collect information to answer the research questions. Instruments facilitate the data collection procedure, and here students' written paragraphs were used as an instrument.

Participants

The participants in the study were 15 students of 1st semester studying BA (Hons) in English. Their age range was between 18-20 years, and they all studied English as a compulsory subject for 12 years, from primary to higher secondary level.

Data collection

The author collected the mid-term scripts of a course assigned to her named "Fundamentals of English I". In the composition part, they were told to write any one paragraph from the given two. The author needed to ask for permission from the chairman of the department of English to have those scripts for this analysis purpose.

Data Analysis

The data analysis procedure was followed using these steps- identifying, classifying, quantifying, and analyzing errors. Errors were identified compared with their correct form and classified into seven categories. Then to quantify errors, the frequencies of each error were numbered in percentage. Descriptive statistical analysis was applied to form the bar chart. Lastly, to find out the reasons the errors were analyzed.

Findings

The students of the first semester have made some grammatical errors categorized into seven fields. They are spelling errors, sub-verb agreement errors, noun errors, article errors, preposition errors, adjective errors and capitalization. The students have difficulty using the right form of verb. First, they face problems in choosing appropriate verbs according to the subject. The singular verb will follow the singular subject, and the plural verb will follow the plural subject. In their writing, for plural subjects, they are foundtouse singular verbs like- one participant uses the singular verb 'is" for the plural subject "half of the people of our country". The correct form will be plural verb "are". Another participant uses the singular verb "goes" for plural subject

"students". Plural verb "go" will be the correct form. Secondly, the gerund form is misused. Thirdly, they are weak in the usage of passive forms of verbs. Fourthly, they misuse verbs in context. Lastly, for their lack of knowledge, they omit verbs. Their grammatical errors are shown below.

Type	Example
Misuse of verbs	• Half of the people of our country are women. • Students goes to school, college.
Misuse of gerund	• In the morning, you find people walk. • By judge everything, I can say that city life is comfortable.
Misuse of passive forms of verbs	• About female education, this idea has changed but fate is not change. • Female education must need to develop a nation.
Misuse verbs in context	• Education is the backbone of a nation. We believe this line, but we do not work this.
Omission of verbs	• The people of the city do not enjoy life. • Our women lagging behind.

Table-1: Errors of using verb

In the usages of the noun, students find the problem in identifying singular and plural forms and misusing noun forms when it is not required. They face problems in differentiating between singular nouns and plural nouns. The singular subject will be followed by a singular verb, and the plural subject will be followed by a plural subject. Additionally, they tend to use noun forms where they should not.

Type	Examples
Confusion of singular and plural forms	• Now female are participating in the development of our country. • Village are made by God.
Misuse of noun form	• Female education is very important for every nation. • City men and rural men are very different.

Table-2: Errors of using nouns

In table-3, their mistakes in placing the article are given below. They misused placing articles according to rules, and then they used articles when it was not necessary. When the first letter of a word is a vowel, it is to use the indefinite article "an", whereas a word beginning with a consonant sound will carry the indefinite article "a" before it. This reveals their carelessness, along with their lack of knowledge.

Type	Example
Misuse of article	• Give me a educated mother. I will give you a educated nation. • Facebook is an social networking service.
Redundant use of article	• A city life is an very modern. • City life has a some disadvantages.

Table-3: Errors of using the article

While putting prepositions, students sometimes misused, redundantly used. Surprisingly, sometimes they missed placing prepositions. Students are seen to

be unconcerned about the preposition usage, and they do not even think that prepositions are to be used consciously. Misuse of phrases and idioms is also included in table no 4.

Type	Example
Misuse of preposition	• The people do not have time of family. • Poverty, illiteracy, religion etc. are the main barriers to female education.
Misusing preposition	• When a baby is born, mother always takes care.
Misuse of phrase and idiom	• An educated mother can teach the baby for good.

Table-4: Errors of using the preposition

Students' other two areas of making grammatical errors are adjectives and capitalization. Students should not ignore the importance of capitalization, and they are shown in Tables-5 and 6.

Type	Example
Misuse of determiner	• She was very busy for their job. • Some people are busy with their business.
Misuse of obj. form	• There should be no different of opinion regarding imparting education to women.

Table-5: Errors of using adjectives

Type	Example
However, using small letters at the beginning of a sentence	• female education is crucial for a nation. • city life is really different form village life.

Table-6: Errors of capitalization

In the findings, students also made mistakes in using conjunction and pronoun. Nevertheless, they are a few.

Error Type	Frequency	Percentage
Spelling	67	33.5%
S-V-Agreement	56	28%
Noun	22	11%
Article	17	8.5%
Preposition	12	6%
Adjective	8	4%
Capitalization	7	3.5%
Others	11	5.5%
Total	200	100%

Figure-1: Frequency of grammatical errors

The figure shows that the grammatical errors were categorized into seven categories: Sub-verb agreement, Noun, Article, Preposition, Adjective, Capitalization and Spelling. The analysis proves that 67 (33.5%) were spelling

errors, whereas 56 (28%) were sub-verb agreements. The sub-verb agreement held second place. After that, noun errors were 22 (11%), followed by article 17 (8.5%). It is followed by errors in adjective 8 (4%) and capitalization 7 (3.5%). Other 11 (5.5%) were errors of pronoun, conjunction, and omission of words. They are presented in the form of bar & pie charts in Figures-2 & 3.

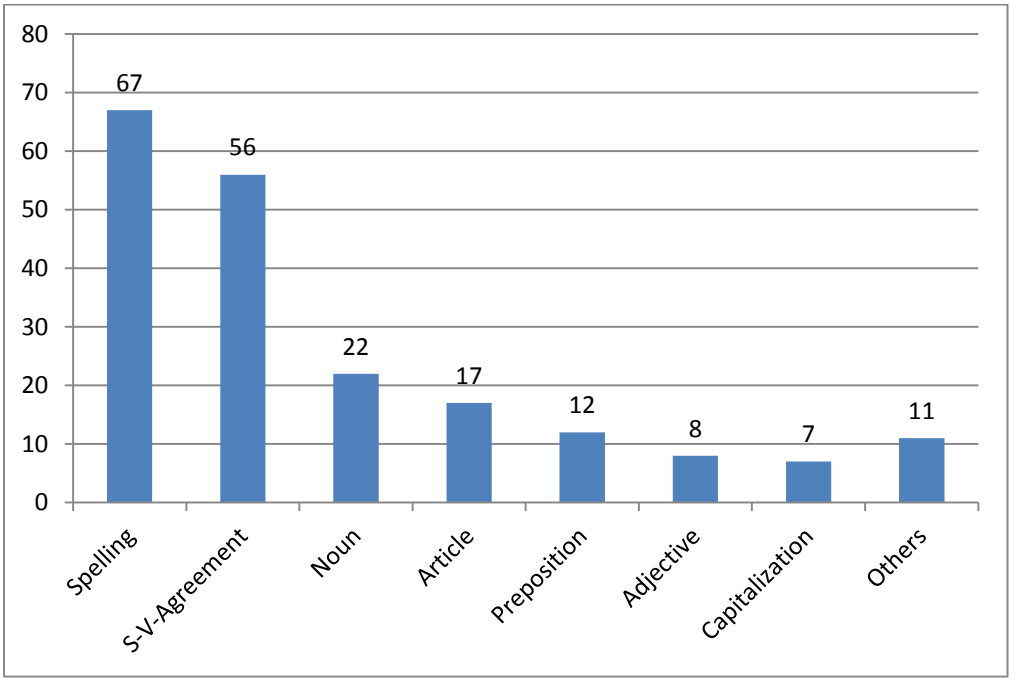

Figure-2: Frequency of grammatical error bar chart

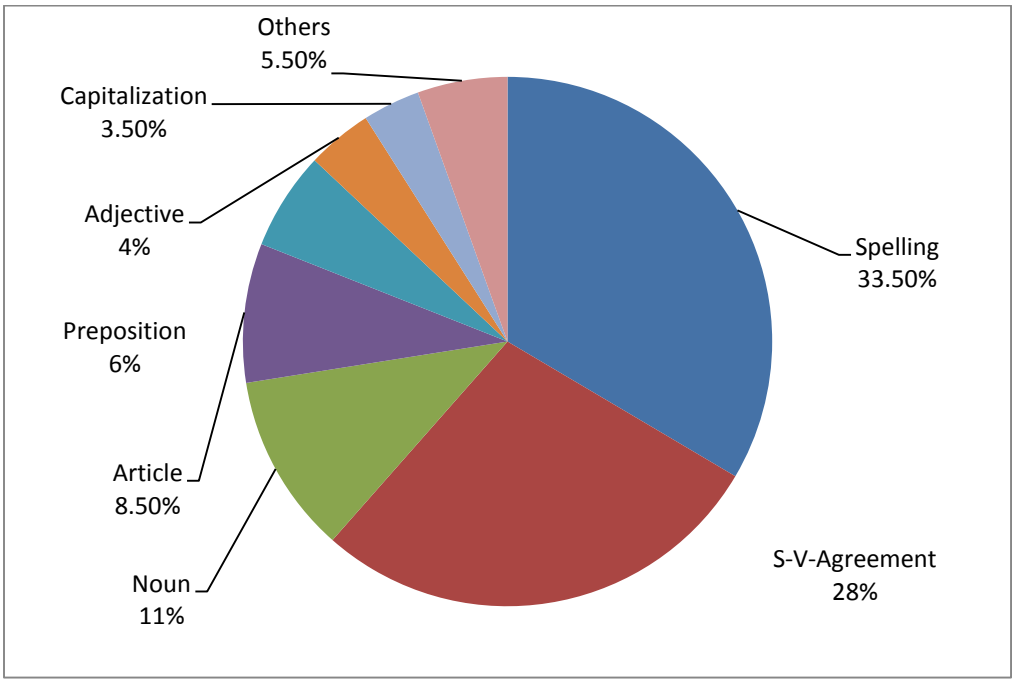

Figure-3: Percentage of the grammatical error pie chart

Discussion

After collecting the data and identifying them, the study's findings reveal that the students' grammatical knowledge in the first semester is very poor. Despite learning English at the primary, secondary and higher secondary levels, they still have problems, and thus grammatical errors have been found in their writing. Charanjit Kaur Swaran Singh (2017, p. 10) also found these types of grammatical errors. In her research, the most prominent error done by the students is the subject-verb agreement which is found to be the second prominent error done by students in this study. In both studies, students face problems in using the right form of verbs according to the demand of the subject. While constructing a sentence, the subject is followed by the verb. Students' lack of knowledge makes them trouble identifying the correct number of the subject. Not to be surprised, sometimes they make this mistake reversely. In this study, students misused verbs in the context, which was not common in Charanjit Kaur's study. In her study, students are found to misuse auxiliary

verbs. In this study, rather than improper use, they skipped auxiliary verbs. Students' lack of adequate grammatical knowledge is the reason for such occurrences in writing. Compared to the study of Charanjit Kaur regarding the findings of noun use, students could not differentiate between countable and uncountable nouns.

In contrast, in this study, students use nouns where they should not. In both cases, it reveals the shortage of grammatical knowledge. The application of appropriate prepositions is a common problem faced by the students in her study. According to Charanjit Kaur, for the students, prepositions do not affect the meaning of their sentences. I also believe that this is the probable reason for their indifference to appropriate prepositions in the sentences. To talk about spelling errors, due to the lack of proper knowledge, students are prone to produce incorrect spellings. In this study, spelling mistakes are dominant in the students' writing. Other mistakes like misplacement of articles, incorrect use of determiners and capitalizations are also noticeable. The analysis of the students' grammatical errors revealed that these students have a poor command of English. Errors are expected in the learning process, and it is essential to identify the reasons for them. The reasons for it are understandable. The students of Bangladesh primarily develop a negative attitude towards English from their childhood. They do not get interested in learning it. They only learn to pass the examination. Sometimes students have a fearful feeling, and they are less interested in writing classes. Their fear prevents them from participating actively in the class. Thus, this made them unconfident and prevented them from producing good writing. This study revealed that their errors are more frequent at the word level than at the sentence level. If we compare learning the English language to building a structure, we will find that a strong foundation is mandatory in both cases. A weak foundation can cause downfall.

Similarly, students must be conscious of studying the English language from the very beginning of their education. If a student has difficulty in alphabet level, he or she will also face difficulty forming words. Furthermore, difficulty in word formations will lead him to form improper sentence constructions. That student will face problems in the application of the English language not only in writing but also in speaking. Consequently, these become barriers to learning the language effectively. L1 interference is one of the leading causes, as also

claimed by Derakhshan (2015). Bangla and English both languages have different grammatical structures. Students cannot restrain their rules and knowledge of L1. The grammatical knowledge of L1 confuses them while producing writing in L2. They might transfer the rules, word orders and structures of L1 into English writing.

Overgeneralization is also seen in students' errors. They apply rules where the rules even do not need to be applied. Students tend to ignore grammatical rules where necessary as they are unaware of the rules and restrictions. Errors occur when students fail to learn more complex rules, and they think they can succeed in producing effective language using simple rules they learnt; thus, incomplete application of rules causes errors. False or wrong concepts about the target language can hinder the learning process of students. Such misconceptions often work as a barrier to comprehending distinctions in the target language and cause errors. Lado (1957) formulated contrastive analysis that has proved valuable in locating areas of interlanguage interference. Deficient strategies applied by teachers in teaching and strategies applied by students in learning are accountable for causing such errors. Along with these, overgeneralization and ignorance of rule restrictions also cause errors.

Recommendations

After knowing the students' errors, the author would like to recommend some ways to eliminate the students' errors. They are:

The English teacher who teaches a particular course should have adequate knowledge of both L1 and L2 to provide proper guidelines. If the teacher can understand and identify the students' weaknesses and errors in writing, he can employ practical approaches and methods to overcome those. In this case, 'needs analysis' can play a vital role. Need analysis finds out the weaknesses of the students. Through need analysis, the problems the students are facing in the class get revealed, and thus it helps the teachers to understand the problems. According to the needs of the students, teachers should give feedback and conduct the classes. Knowing the problems will make it easier for teachers to deal with. The teacher should motivate the students to overcome their fear regarding writing. For this, teachers are to be provided with training and enough seminars. If teachers are well trained, they can make their class environment

effective for learning and enjoyable for the students. Teachers should be trained to use effective teaching strategies such as writing conferences, grammar mini-lessons, partnership writing and peer response.

Students should practice more and more to have proficiency in grammar and writing. The more they practice, the more efficient they will become. The students can develop their writing knowledge if they pay more sincere attention. Students should realize the importance of using correct grammar. Appropriate feedback and explanation of the errors made by the students can enhance students' writing skills. Appropriate feedback can make students recognize their grammatical errors and help them to raise their awareness of producing meaningful text.

Conclusion

The study represents an analysis of grammatical errors made in the writing of 1st-semester students of tertiary level. Therefore, the outcomes reveal their frequent errors in spellings, sub-verb agreements, nouns, articles, adjectives and capitalization. This study identifies the reasons for such occurrences of errors. Since this study was conducted on a very small scale, the results are pretty significant. This is an undeniable fact that our students only learn English to pass the examination. For this, they tend to memorize answers. Thus, they get stuck when it is time to apply their learnt language knowledge. This is also true that there is a shortage of skilled and trained English teachers in Bangladesh. Mostly, teachers are not well informed, potential, well versed, and well equipped here. As a result, they cannot apply suitable approaches to teaching. At each level, some teachers still give notes and motivate students to memorize those, providing suggestions for the examination. During the examination, students answer the questions from their memory. This also seemed to be a significant problem. Our existing examination process, evaluation and assessment process, moreover syllabus design somehow force our students to choose the path of memorization rather than comprehending the language. So, proper guidelines, training sessions, and gateway for research should be given to our teachers. Though they are few, some dedicated teachers will also be found who passionately try to develop the inner capacity and bring out the creativity of the students. Regrettably, they cannot proceed much due to the established evaluation system. The syllabus and assessment process should be

improved to facilitate the students learning process rather than memorization. The students should practise more and more to overcome their errors. They should be more careful about grammar.

Moreover, the teachers' feedback should be positive and corrective regarding the errors, and students should go for rewriting after getting feedback from the teachers. Above all, modern facilities like computers, projection, and multimedia classrooms can also play a vital role in language learning. The author hopes that teachers and syllabus designers will benefit from this study's results to design and develop more suitable teaching materials and techniques.

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Relationship of Intrinsic Reward Practices to Employees' Job Satisfaction and Creative Performance: An Empirical Study on Private Universities of Bangladesh

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Abstract

Intrinsic reward practices are increasingly receiving a wide range of acceptance in today's organizations that could play a vital role in educational institutions, where employees' job satisfaction and creative performance are ever demanding. Hence, this study mainly intends to investigate the associations of intrinsic reward practices with employees' job satisfaction and creative performance. Data were collected from 101 teachers working in different private universities in Chattogram by administering structured questionnaires containing established scales of intrinsic reward practices, job satisfaction, and creative performance. Statistical analysis of the data collected for this study shows significant positive associations of intrinsic reward practices to employees' job satisfaction and creative performance. An important implication of the study includes the necessity of intrinsic reward practices to enhance satisfaction and stimulate an individual's creative performance. Limitations of the current study and directions for future research have also been pointed out.

Key Words: Intrinsic reward practices, job satisfaction, creative performance, educational institution.

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1.0. Introduction

Due to intensified global competition and changing business environments, mostly because of rapid technological advancement, organizations need to be more innovative to survive and grow in any industry. And plausibly, the survival and innovativeness of the firms largely depend on their employees' efforts, for which employees are hired and rewarded in different forms. However, one of the key challenges that organizations are encountering in today's highly competitive business environment is to be more creative and innovative (Muller & Välikangas, 2002). Employees' creativity is increasingly seen as a key driver of the firms' performance, growth, and competitiveness (Amabile, 1996; Gong, Zhou, & Chang, 2013). Indeed, employees' creative performance (CP) is widely recognized as a key asset (see Amabile, 1996; Gong, Zhou, & Chang, 2013; Rahim, Kim, Jasimuddin, Soranastaporn, & Rahman, 2014), and recognizing creativity is becoming more and more essential for competitive advantage (Luthans, 2011).

To ensure desired employees' performance, organizations need to pay a handsome amount of financial reward to their employees. Irrespective of size, nature, and types of organizations, HR managers are aware of the need for a strategic compensation structure –an essential but difficult HRM function – to attract, maintain, and retain their competent workforces in today's work environment. "Reward system of an organization includes anything that an employee may value and desire and that the employer is able or willing to offer in exchange for employee contributions" (Henderson, 2009, p.15). Rewards could be both extrinsic (e.g. salary, wage, incentives, etc.) and intrinsic (mostly considered nonfinancial, e.g. recognition). Even though both financial and non-financial incentives have an equally significant effect (Peterson & Luthans, 2006), considerable pragmatic evidence shows that financial offers might not be much significant for enhancing employees' performance (Camerer & Hogarth, 1999). Moreover, emphasizing only extrinsic rewards may not be a useful way to manage today's workforce completely. For instance, it is observed that even after a significant increment of the base salaries and bonuses to promote the recruitment and retention of the best turnover of the skilled human resources of information technology employees continued and was a problem (Martocchio, 2006). Moreover, despite the theorizing, results suggest

that pay level is only marginally connected to employee satisfaction (Judge, Piccolo, Podsakoff, Shaw, & Rich, 2010) and extrinsic rewards may negatively influence the employees' creativity and intrinsic motivation (Amabile, 1996; Deci, Koestner, & Ryan, 1999). Hence, intrinsic reward practices (IRP) could be a tool that may positively contribute to employees' job satisfaction (JS) and their CP. Moreover, employees are considerably recognizing intrinsic rewards (IR), for example, recognition, appreciation by managers, etc., besides the monetary rewards (e.g. salary, incentives, etc.) provided by their employing organizations. For example, "some employees value interesting work and recognition more than money" (e.g. Morris, 1996, as cited in Kreitner & Kinicki, 2004, p. 303).

A good number of firms in service industries are emerging with more creative business efforts and millions of workers are hired. To serve the organizations, more satisfied workforces are required who can positively and creatively contribute to organizations' performance. Hence, organizations need to explore issues having positive relationships with both employee JS and CP. During the last two decades, the number of higher educational institutions in Bangladesh has increased remarkably. And these institutions are contributing at the tertiary level of education and supplying a major portion of human resources to the current job market of this country where the teachers of these institutions are playing a vital role in transforming individuals into human resources. And teachers' satisfaction and creative performance are highly desired matters at any level of the education sector. It is asserted that improving employees' JS and loyalty result in organizations' higher productivity and profit (Silvestro, 2002). Similarly, teachers also need to be both satisfied and creative in their profession. It is found that academic employees are highly satisfied and motivated through recognition of their performances and achievements (Chikungwa & Chamisa, 2013). Luthans (2011) asserted that "there is a little doubt that the non-financials can be very powerful, but are often overlooked as a reinforce in behavioral performance management" (p. 391). Hence, it could be investigated whether the IRP has associations with teachers' JS and CP at the tertiary level of educational institutions in Bangladesh.

However, a study investigating the relationship of quality-supportive IRP with employee JS and CP in the education sector of Bangladesh could contribute to

the existing literature; previous research on IRP relating to employees' JS and CP in higher education made a limited contribution in the context of Bangladesh. These research gaps have led to pursuing the current study. Consequently, there is a scope to conduct a study on whether the IRP can contribute to JS and CP of university teachers. Moreover, a lucid understanding of literature regarding IRP, employees' JS, and CP will help the HR managers of such institutions manage their resources more effectively and efficiently. Therefore, examining the associations of IRP with JS, and CP is a significant area of investigation.

1.1 Research Objectives

The major objective of the study is to look into the associations of IRP with JS and CP of the teachers in the private universities of Bangladesh. To attain this main objective, the following specific objectives are set out:

1. to investigate the relationship between IRP and JS of the teachers,
2. to examine the association between IRP and CP of the teachers.

2.0. Literature Review

2.1 Intrinsic Reward Practices

"Intrinsic compensation reflects employees' psychological mind-sets that result from performing their jobs" (Martocchio, 2019, p. 3). "Principles of intrinsic compensation also provide the basis for nonmonetary recognition awards" (Martocchio, 2006, p. 5). In literature, diverse forms of non-monetary recognition (e.g. plaques, certificates, letters, etc.), recognition for employees' achievements or celebration to acknowledge the achievement of the worker, appreciation by the managers or leaders to acknowledge an achievement, seeking suggestions from the workers that give workers to have opportunities of taking part in the decision-making process or greater responsibility in decision-making, etc. as the different forms of IR (e.g. Allen & Kilmann, 2001; Kominis & Emmanuel, 2005). Intrinsic rewards are correlated to individuals' work engagement and could lead to high employee retention (Bhatnagar, 2007). The highly involved employees are found to be depended more on IR than

extrinsic ones (Wood, 1974). In another study, Absar, Sikder, Nimalathasan, and Bhuiyan (2010) suggested that non-financial benefits or rewards (e.g. challenging job, empowerment, recognition, job security, better working condition) should be necessary for both the public and private sectors of Bangladesh. In addition, employee participation in decision-making can positively contribute to individuals' involvement, awareness, and commitment (Damanpour, 1991; Glynn, 1996) too.

2.2 Job Satisfaction

Job satisfaction is "a pleasurable or positive emotional state resulting from the appraisal of one's job or job experiences" (Locke, 1976). Employees' JS is assumed to influence their opinion of "how interesting the work is, how well they are doing, and, in general, how much they enjoy doing it" (McCormick & Ilgen, 1985, p. 309). It is an attitude towards work-related conditions, facets, or aspects of the job (Wiener, 1982). Studies found that JS has positive impacts on job performance, positive work values, and high levels of employee motivation while it has negative impacts on absenteeism, turnover, and burnout of the employees (Begley & Czajka, 1993; Tharenou, 1993). In different studies, JS has been explored to be linked to different outcomes, e.g. lower turnover rates (Mobley, 1977), job performance (Judge, Thoresen, Bono, & Patton, 2001), and job involvement (Karan & Rahman, 2014). Inversely, a lack of workers' JS results in high absenteeism, high turnover, low performance, and decreased productivity (Koys, 2001). Various issues like security, pay, benefits, promotion, work conditions, supervision, type of work, vacation and holiday practices, relationships with co-workers, etc., are found to be related to JS (Misener, Haddock, Gleaton, & Ajamieh, 1996). Studies conducted in Bangladesh found that employee JS is correlated to ethical behavior (Lovely & Hoque, 2017), managerial attributes and service quality (Chakraborty & Rahman, 2013), executives' turnover intention (Karan, Rahman, & Biswas, 2018), and CP behavior (Chakraborty & Uddin, 2018).

2.3 Creative Performance

Great interest has been seen among scholars in social science regarding the factors that influence creative performance (Rahim et al. 2014). Lim and Choi (2009) define "CP as the behavioral manifestation of creativity" (p. 119), while creativity is the creation of ideas that are both novel and useful for the organization (Amabile, 1988). CP is associated with the creation of new and useful ideas regarding processes, procedures, strategies, products, and services (George & Zhou, 2001). "Creative performance is different from routine performance measures that involve decision-makers' day-to-day initiatives or routine operations, such as following standard operating procedures, resolving employee conflicts, signing documents, and so on" (Rahim, Civelek, & Liang, 2015, p. 52). Creativity and CP behaviors have positive impacts on organizational performance (Mishra & Singh, 2010). Studies found various factors like feedback (Zhou, 1998), social intelligence (Rahim, Civelek, & Liang, 2015), and cultural norms (Moorman, 1995) influence the CP or outcomes of the employees. Amabile (1988) asserts that organizations need to create a climate that encourages and stimulates employees' creative thinking. A study conducted by Chakraborty and Uddin (2018) revealed that job involvement has a significant influence on the CP behavior of individuals.

3.0 Development of Research Hypotheses

3.1 Intrinsic Rewards and Job Satisfaction

IR, which includes various forms of recognition, 360-degree rating, a celebration for the achievement of the employees, etc., is investigated in different studies (e.g. Allen & Kilmann, 2001). Intrinsic rewards that include non-monetary forms of recognition (e.g. plaques, certificates, letters, etc.) are also considered recognition given to someone for their achievement. Work recognition is found to be related to higher levels of employees' JS (Saunderson, 2004). When a manager appraises someone, it may work in the form of feedback regarding one's job performance that may influence the emotions of the employees and result in higher JS. Hence, recognition for quality performance may contribute to teachers' JS. Feedback regarding employees' performance contributes to employee motivation, JS, and performance management, too (Alma & Thomas, 2001). Moreover, IR

followed by extrinsic social rewards is a powerful predictor of overall work satisfaction (Mottaz, 1985). Thomas and Tymon, (1994) also found evidence for the association of IR and employees' JS. Considering the above evidence of the earlier studies, it may be assumed that there may be a positive association of IRP with the JS in Bangladesh too. Hence, the following hypothesis has been proposed:

> *Hypothesis 1: There is a positive relationship between intrinsic reward practices and job satisfaction of the teachers in the private universities in Bangladesh*

3.2 Intrinsic Rewards and Creative Performance

An organizational reward system plays a significant role in motivating employees' CP (Eisenberger, 1992). Several studies also showed that intrinsic motivation stimulates creativity (e.g. Amabile, 1985; Choi, 2004). In addition, innovation necessitates a higher level of involvement and participation (Damanpour, 1991). It is found that highly involved individuals depend more on intrinsic reward (Wood, 1974), and a positive relationship has also been found between job involvement and employees' CP behavior (Chakraborty & Uddin, 2018). Hence, it could be assumed that IRP could have an association with employees' CP. Rewards like recognition and appreciation have a significant role in motivating employees and increasing their performance (Deeprose, 1994). Thus, positive recognition or feedback from the institution or the supervisor may motivate employees to put more effort which may lead to CP. Literature reveals that feedback is an influential factor in stimulating CP (Zhou & George, 2001). Suppose institutions provide positive feedback (it may be in the form of celebration or recognition of employees' performance) regarding the creative efforts that may inspire them to take more new and innovative steps, even in their day-to-day activities. Moreover, employees who get the opportunities of participating in setting goals and making decisions perceive higher levels of work-environment creativity (Schepers & van den Berg, 2007). Similarly, if teachers get the opportunity to provide suggestions and participate in the decision-making process in their institutions, they may be motivated and may have a tendency to contribute more which may lead them to take more creative steps for the well-being of the institutions. Based on the above discussion, it may be hypothesized that IRP may have a relation with CP

in the context of Bangladesh too. Hence, the second hypothesis has been developed as follows:

> *Hypothesis 2: There is a positive association between intrinsic reward practices and the creative performance of the teachers in the private universities in Bangladesh*

Based on the literature review and hypotheses considered for the study, the following research framework is developed to illustrate the associations of IRP with JS and CP:

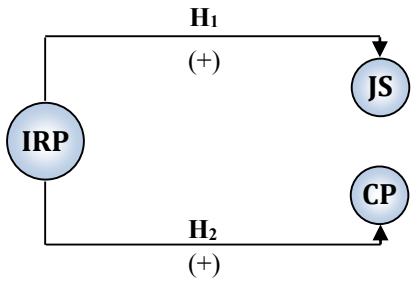

Figure-1: Research Framework

Note: IRP=intrinsic reward practices; JS=job satisfaction; CP=creative performance.

Source: Authors' contribution, 2019.

4.0. Research Methods

4.1. Participants

Teachers working in different private universities in the Chattogram City of Bangladesh were considered as the population of the research. Hence, data for this study were collected from 101 teachers working at five different private universities in Chattogram. The convenience sampling technique was used in selecting respondents for collecting data for this study. Respondents were requested to rate their perceptions regarding IRP in their current institutions, their JS, and CP at their current workplace. The respondents were also asked to provide their demographic information (i.e. age, gender, tenure, educational background, and organizational level). During data collection, information

regarding their designations and the names of their institutions were not sought out.

Respondents varied in the age ranging from 25 to 65 years, with a mean of 33.6 (SD = 6.8) years. The average job experience of the respondents was 6.7 years (SD = 5.1). Among 101 teachers, 53 (52.5%) were male while 48 (47.5%) were female. There were 5 (5%), 92 (91%), and 4 (4%) representations, respectively, by the top, middle, and lower-level participants. Among 101 teachers, 7 of them had completed Bachelor's degrees while 88 others had completed Master's degrees, and 6 of them held other higher degrees.

4.2 Tools Used for Data Collection and Data Analysis

In measuring IRP in the organizations, JS, and CP of the respondents, printed questionnaires were administered. All the instruments used in this study were measured on a 5-point Likert scale ranging from 5 (strongly agree) to 1 (strongly disagree). This study adopts the following measures to collect data from the participants.

4.2.1 Intrinsic Reward Practice

Quality is one of the most vital issues in any educational institution. Hence, to measure the IRP in institutions, seven items were adopted from the intrinsic reward practices scale developed by Allen and Kilmann (2001). Sample items of the IRP scale are "My organization frequently provides non-monetary forms of recognition to acknowledge achievement of quality improvement goals such as plaques, certificates, letters, complimentary tickets, merchandise, etc.", "My organization provides quality based promotions wherein promotions are based primarily on the achievement of quality-based goals as opposed to quantity-based goals" etc. The reliability of the IRP scale in this study was 0.79.

4.2.2 Job Satisfaction

To measure the respondents' job satisfaction, an eleven-item scale developed by Ather and Nimalathasan (2006) was used. Sample items were "I like the content of the work I do", "My achievement is recognized by my superior" etc. The reliability of the JS scale for this study was 0.89.

4.2.2 Creative Performance

In measuring the CP of the respondents, items were adopted from the thirteen-item scale developed by Zhou and George (2001). Sample items were "I come up with new and practical ideas to improve performance", "I promote and champion ideas to others" etc. The reliability of the CP scale for the current study was 0.92.

4.3. Data Collection Procedure and Analysis of Data

Printed questionnaires were distributed among 150 teachers working in diverse departments/faculties of different private universities in Chattogram. The participants were assured that their responses would be kept confidential and used only for research purposes. To maintain privacy respondents' names, designations, and the names of their institutions/departments were not sought out during data collection. Finally, 101 (67.33%) usable responses were received. To attain the objectives of the study, descriptive statistics, correlation, and regression analyses were used. The SPSS 18.0 was used to analyze the data. Due to some constraints, it was not possible to collect an equal number of responses from each of the concerned institutions.

4.4. Reliability of Scales and Validity of Data

The reliability of a measure indicates the stability and consistency with which the instrument measures the concepts and helps to assess the goodness of a measure (Sekaran, 2000). A value that is greater than 0.70 represents good reliability (Litwin, 1995; Oppenheim, 2003; Sekaran, 2000). In this study, Cronbach's alpha of IRP, JS, and CP were 0.79, 0.89, and 0.92. Hence, all these survey instruments were highly reliable for data collection. Validity is defined as a valid measure of what it is intended to measure (DeVaus, 2001). Validity was not essential because established survey instruments were adopted in this current study.

5.0. Data Analyses and Findings

The reliability (α) calculated for the IRP, JS, and CP, and correlations between the variables are presented in Table-1.

Table-1: Reliabilities of and Correlations between variables

Variables / Components	**Reliability (α)**	**Correlations**		
		1	**2**	**3**
1. IRP	.79	1		
2. JS	.89	.52**	1	
3. CP	.92	.47**	.54**	1

*** Correlation is significant at the 0.01 level; N = 101; IRP = intrinsic reward practices; JS = job satisfaction; CP = creative performance.*

Source: Authors own calculation, 2019.

The results presented in Table-1 indicate that there is a significant positive correlation ($r = .52$, $p < 0.01$) between IRP and JS. A significant positive relationship ($r = .47$, $p < 0.01$) between IRP and CP is also found in this study. Thus, it indicates that both hypotheses 1 and 2 were supported by the results.

Table-2: Summary of Regression Analysis of Socio-Demographic Characteristics with IRP, JS, and CP

Covariates	Co-efficient (β)			S.E. (β)			Value of t-statistic			Value of R^2			Value of F –statistic		
	IRP	**JS**	**CP**	**IRP**	**JS**	**CP**	**IRP**	**JS**	**CP**	**IRP**	**JS**	**CP**	**IRP**	**JS**	**CP**
Age	.004	.003	-.02	.03	.02	.02	-.16	-.11	-.86						
Gender	-.41	-.02	-.15	.16	.15	.13	-2.55*	-.10	-1.16						
Tenure	.00	.02	.03	.03	.03	.03	-.05	.65	.96	.12	.07	.04	2.5*	1.5	.84
Education	.44	.38	.19	.22	.20	.17	1.97	1.87	1.10						
Position	-.14	-.25	-.07	.26	.24	.20	-.54	-1.07	-.34						

*** Significant at the 0.01 level; * Significant at the 0.05 level; N = 101; IRP = intrinsic reward practices; JS = job satisfaction; CP = creative performance.*

Source: Authors own calculation, 2019.

A review of the Table-2 demonstrates that 12%, 7%, and 4% of the variances in IRP, JS, and CP respectively were explained by the socio-demographic characteristics (e.g. age, gender, tenure, education, and position). The results of this study indicate that a larger portion of variances in IRP, JS, and CP remain unexplained. The presence of unexplained variance suggests that there might be other potential variables that account for variations in IRP, JS, and CP.

Table-3: Summary of Regression Analysis regarding IRP (predictor), JS, and CP

Predictand	Intrinsic reward practices (Predictor)				
	Co-efficient (β)	**S.E. (β)**	**Value of t-statistic**	**Value of R^2**	**Value of F –statistic**
JS	.46	.08	6.1**	.27	36.31**
CP	.36	.07	5.32**	.22	28.33**

*** Significant at the 0.01 level; N = 101; JS = job satisfaction; CP = creative performance.*

Source: Authors own calculation, 2019.

Results shown in Table-3 indicate that about 27% and 22% of the variances in JS and CP are explained by IRP, respectively. Although a large proportion of variances in JS and CP were unexplained, it has been suggested that IRP might be the predictor in explaining the JS and CP.

6.0. Discussions and Implications

6.1 Discussions

The first purpose of this study was to investigate the relationship between IRP and JS. Hypothesis 1 stated that there is a positive relationship between IRP and JS. The result ($r = 0.52$, $p < 0.01$) of the current study supported this contention. This result also offers support for the theoretical argument that IRP may be an important factor in improving employees' JS. The second purpose of this study was to examine the association between IRP and CP and in the second hypothesis, it is hypothesized that there is a positive association between IRP and CP. The result ($r = 0.47$, $p < 0.01$) of this study shows positive correlation between the two variables. This tentative understanding is based on the theoretical assumption that IRP may be a precursor of employees' higher CP. The result of the study also indicates that 27% variance in JS and 22% variance in CP are explained by IRP. It specifies that individuals, who perceive that they are intrinsically rewarded, are more satisfied and tend to exhibit more CP.

6.2 Implications

Teachers working at the tertiary level of education need to be satisfied and creative in their profession to serve their institutions and institutions should also be aware of keeping their teachers satisfied and creative in their service. The current study emphasizes the necessity of implementing IRP that focuses on quality to enhance JS and CP of individuals. Thus, this study also suggests that policymakers of the institutions should put more effort into ensuring IRP which will ultimately lead to higher quality, JS, and CP of their teachers.

Concerning management and the heads of the programs, departments, or faculties may take the advantage of practicing intrinsic reward by praising their teachers for their regular contributions, asking for suggestions whenever and wherever possible and necessary, acknowledging and celebrating their achievements and contributions, ensuring quality-based promotion, providing positive feedback to their teachers for their quality service and creative contributions to their day to day activities. Policymakers of these institutions should create and foster such an environment that supports and encourage quality service and CP. It is suggested that in developing HR policy, management should also create a provision that will consider issues like providing non-monetary forms of recognition to acknowledge employee achievement that will ensure the IRP for supporting quality. Such practices of IR along with extrinsic rewards could contribute to both employee satisfaction and CP that will eventually benefit the institutions.

6.2. Limitations

Despite the positive implications for management, the current study has some limitations. The most remarkable limitation arose from the use of convenience sampling which might restrict the generalizability of the findings. In addition, data collected from a few private universities of Chattogram may not represent the whole scenario of the country. The small sample size (N = 101) posed another limitation for this study. Larger sample size is needed to investigate further the relationships among the variables. Finally, it should, however, be noted that the current study used self-rated instruments to measure CP, which was short of 360-degree assessments where senior bosses, supervisors, colleagues, and peers could rate participants on the relevant issues.

6.3. Future Directions

In terms of future research directions, studies should be attempted to examine the associations among IRP, JS, and CP of employees in diverse industries and at different organizational levels longitudinally. Moreover, a study comparison between public and private universities will be helpful for a better understanding of the relationship between the studied variables. Future research would be benefited from a large sample size, using a variety of samples. Research examining the relationship among IRP, job satisfaction, and CP mediated by other factors, e.g. extrinsic reward practices and talent management practices could be investigated.

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Relationship between Professional Stress and Teaching Performance Based on the Demographic Factors: A Study on the Teachers of Some Selected Universities Located in Chittagong, Bangladesh

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Abstract

This study is accomplished with a view to exploring the relationship between university teachers' stress they face in their professional life and teaching performance on the view point of some of the demographic variables. A sample of 112 faculty members ranging from lecturer to professor rank is communicated randomly from different private and public universities located in Chittagong. A self-administered questionnaire incorporating five demographic factors ranged in a 5-point Likert scale has been framed in gathering primary data. The paper uses both the descriptive statistics and inferential statistics to portray the data pattern of the respondents followed by required computations to test the hypotheses and conclude inferences based on sample statistics. The study finally concludes some of the practical implications for the policy makers in exploring the issues in the context of service rendering institutions like education sector.

Key Words: Professional Stress, University Teachers, Demographic Factors.

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1. Introduction

Stress being a pervasive and inevitable part of life is faced by human being in all spheres, in a wide variety of situations and settings. Professional stress is a growing concern in the present economy, where people in their profession increasingly face pressure of work-load, burnout, lack of independence, job insecurity and job dissatisfaction. Now, it appears to be an international phenomenon created by organizational, bureaucratic, educational and social factors (Spyromitros and Iordanidis, 2017). Professional stress has negative effect on the health and wellbeing of work-groups, resulting employee-inefficiency and low productivity. Like many other jobs, stress in teaching has been extensively studied mainly due to its adverse effects on the individual and organizational performance.

Newman and Beehr (1979) defined job stress as "a situation wherein job-related factors interact with the worker to change his or her psychological and/or physiological condition such that the person is forced to deviate from normal functioning." Faculty stress refers to the experience by a faculty member of unpleasant, negative emotions, such as anger, anxiety, tension, frustration or depression, resulting from some aspects of work as a teacher (Kyriacou, 2001). The American Institute of Stress reported that stress is a major factor in up to 80% of all work-related injuries and 40% of workplace turnovers (Atkinson, 2004). Stress generally arises out of the perception of pressure in exploiting opportunity, imbalanced demand, scarce resources and situations which appear difficult to handle (Bashir & Ramay, 2010).

Along with the prevailing public universities, in Bangladesh, private universities are in the challenging position to cater to the growing need of the higher education due to the expansion of the enrollment and consequently, competition among the private universities established in the recent decades is becoming increasingly intense. So, university teachers now-a-days are confronted with increased workloads, quality teaching, continuous research, academic papers publication and efficiency rating from different interested groups. Recent studies have indicated that university teachers are exposed to from a moderate level to high level of professional stress which, in turn, may create depression and burnout at work. Faculty performance is negatively influenced by a number of stress facets within or outside the institution, that

impede the teachers' performance, resulting in lower individual as well as institutional productivity (Khan et al., 2012).

The present study is an attempt to explore the association between university teachers' stress they face in their professional life and teaching performance on the view point of some of the demographic variables such as, age, gender, job experience, professional types (permanent and adjunct) and university types (private and public) they are involved in.

2. Literature Review

Review of the literature indicates notable researches investigating relationships between certain stress elements and teachers' satisfaction and performance. Manthei and Gilmore (1996) conducted a study on the intermediate teachers of New Zealand and found that just over 26% of teachers felt that teaching was either very or extremely stressful job. Maddi, Bartone, and Puccetti (1987) found that stressful life (varies from low to moderate) uncontaminated by physical health and neuroticism evidently correlates with concurrent illness scores. Anxiety, depression, and anger are common psychological manifestations of stress (Billings & Moos, 1984; Sarason, 1980). Abouserie (1996) in his study performed in the UK on university academic staffs indicated conducting research and time constraints as the two major causes of stress at work, and 74.1% and 14.7% of the academic staffs had moderate to serious levels of stress, respectively. A similar survey conducted in an Australian university showed that of all the staff members who are engaged in both teaching and research had the highest psychological distress and lowest job satisfaction, indicating that high workloads may be the cause for work stress (Winefield & Jarrett, 2001). It may cause emotional exhaustion, negative feelings toward others and a reduced sense of personal accomplishment (Leventis *et al.*, 2017).

According to the Ontario College of Teachers, there are growing signs of unease in the profession (Browne, 2007). More than one thousand teachers were communicated in this survey on the topic "State of the Teaching Profession – A Phone Survey". Canadian teachers are also experiencing high levels of stress. According to the Canadian Teachers' Federation (2001), six in ten teachers surveyed found that their job was more stressful than it was in the past.

Kyriacou (2001) found that teachers experience higher levels of professional stress compared to other professional groups.

Akter and Rahman (2012) conducted a quantitative study on 211 employees working in five different private commercial banks in Chittagong, Bangladesh. They asserted that mental and physical health might be harmfully affected by the professional stress level beyond tolerance. The quantitative analysis demonstrated that task performance is significantly related with three important variables e.g., family stress, financial stress and social stress. Additionally, these varibles have a great impact on task performance separately.

De Nobile and McCormick (2005) examined the association between job stress and work satisfaction among the teachers of Catholic primary schools in New South Wales, Australia. The study explored four stress domains (information domain, personal domain, student domain, and school domain) as predictors of work satisfaction portraying negative relationship between job stress and work satisfaction. According to a study conducted by Kyriacou and Chien (2004), 26 per cent of the teachers reported that being a teacher was either very or extremely stressful. They indicated the changing education policies of the government as main source of stress. A study conducted by Ololube (2005) examined the relationship between teachers' job satisfaction level and their teaching performance in Rivers State, Nigeria. The study revealed that teacher dissatisfaction was associated with educational policies, administration, pay and fringe benefits, material rewards and advancement. Griffith, Steptoe and Cropley (1999) in the UK found in a study that high job stress felt by teachers was correlated with low social support at service and greater use of coping by disengagement and suppression of competing activities. Past researches showed strong relationships between the experience of chronic stress and the development of illness and disease (Grimshaw, 1999).

Wichert (2002) reported that older employees tend to experience less stress than their younger counterparts with respect to job security but experience more stress than younger workers when it comes to work intensification. Age dimension of employees can affect the job stress, but it tends to be specific to certain aspects of the job. For example, in a study conducted by Statistics Canada (Williams, 2002), more workers over the age of 45 felt stress as a result of having to learn computer skills, as compared to workers between the ages of

15 and 24. Young employees were significantly less likely than older employees to feel that long working hours were a source of stress.

Gender factor is a vital indicator susceptibility to job stress. Research indicates that women are more likely than men to experience the negative effects of stress. Men tend to cope by way of problem focused strategies while women naturally follow more emotion focused strategies to manage their stress. There is also evidence to suggest that women may have been socialized in a way that predisposes them to ineffective coping, for example, women get sick as a way of coping with stress more often than men do (Korabik, McDonald, & Rosin, 1993). Finally, when it comes to how men and women react to stress over the long term, it has been found that men tend to show physical deterioration as a response to stressful situations, whereas women generally exhibit psychological symptoms (Wichert, 2002). Largely due to these kinds of factors, women are significantly more likely to report burnout, stress related illnesses, or a desire to leave their jobs (International Labor Organization, 2001).

Chaplain (1995) conducted a research on demographical factors impacting work stress in the UK education sector and found significant differences between men and women, and faculty members of different ages and length of service experience. Male teachers reported more stress than their female counterparts in relation to professional tasks and pupil behavior. The study stated that just over one-third of all faculty members were satisfied with the teaching profession. Specifically they were found most satisfied with professional performance and least satisfied with teaching resources. Job stress and job satisfaction were found to be negatively correlated, indicating high level of job stress occurred due to low level of job satisfaction. In the study of Victor, Felix and Anbarasi (2013), women teachers are affected by stress at the age of 33. It covers the maximum age group of 37 to 48 years. The reasons behind it are mainly family condition, societal attitude, service administration and the government policies.

However, the existing literature is limited in the area of factors creating teachers' professional stress and performance indicators. Despite the importance of this factor, only a limited number of relevant researches have been done in the recent past (Foulidi *et al.*, 2017; Leventis *et al.*, 2017) yet

without addressing this specific issue. In the context of Bangladesh, no large-scale researches or articles concerning the demographic variables impacting teaching performance are found and the authors of this paper have found a research gap which necessitates the conduct of the study.

In the context of South Asia, a number of studies conducted on the professional stress issue are frontrunners in investigating levels of stress, depression and anxiety in the Indian workforce. In a study, Ravichandran and Rajendran (2007) explored no significant difference in the professional stress of part time working women in India and abroad but significant difference was found in the men working in India and abroad. Many other likely studies validated as professional stress decreases with the age level of workers but this piece of information was not statistically supported in the study of Pratibha P. Kane (2009), since both working women and men in India had higher scores of stress in the age group 20- 40 years, as compared to those working abroad.

In Pakistan, Chaudhry A. Qayyum (2012) conducted a study on the university teachers with a view to exploring relationship between professional stress and job satisfaction based on gender, age, and cadre, job experience of university teachers, job nature, and ownership of university. The Pearson correlation shows no significant relationship between job satisfaction and overall professional stress; inverse relationship in the teachers of private universities; no relationship in the context of teachers of public universities; no relationship in case of both male and female faculty members of universities.

An Indian study of Suganya, S. & Rajkumar A. Dunstan (2016) paid attention to stress level of the teachers working in the government higher secondary institutions based on diverse economic and socio cultural situations. The findings state that teachers possessing higher stress have less job satisfaction and more frequency of absenteeism.

The authors of this paper believe the study is unique in the context of Bangladesh in investigating stress – performance association based on distinctive demographic dimensions the teachers of tertiary level education sector possess and is expected to contribute to the dearth of research on this topic in the country.

3. Rationale / Significance of the Study

Hans Selye, known as father of stress commented that stress is an unavoidable consequence of life, and therefore, an unavoidable consequence of organizations. Too much stress is unpleasant and can be a major factor in morbidity and mortality (Benson, 1975; Lynch, 1975). Diseases such as coronary heart disease, stroke, and perhaps even cancer tend to occur more often in people who are habitually stressed than those who are not (Jenkins, 1976; Levy, 1983; Maier & Laudenslager, 1985). The Confederation of British Industry reported stress as the second highest cause of absenteeism among employees in the UK, and the European Foundation for the Improvement of Living and Working Conditions reported that stress affects a third of the European working population (Giga, Cooper, & Faragher, 2003). Employees' individual characteristics that generating burnout include the tendency to place too high expectations on oneself, as well as excessive compulsiveness, perfectionism, and inflated self-confidence (Hutman, Jaffe, Segal, Kemp, & Dumke, 2005). An extreme example of what can happen by stress is reffered as "Karoshi". This is a entirely a Japanese phenomenon, literally translated as "death from overwork". Karoshi refers to death caused by accidents of working long hours, extreme job stress, and cardiovascular disease. Many of the workers who are victims of Karoshi worked for up to twelve hours a day, six or seven days a week. It has been estimated that stress related mental health problems are costing Canadian businesses $33 billion annually in lost production (Conner, 2005), and related mental disability is now accounting for an estimated 30% – 40% of the disability claims being recorded by Canada's major insurers and employers. The consequences of stress are decrease in employees' efficiency, increase in absenteeism, and turnover **(**Ali, Raheem, Nawaz, & Imamuddin, 2014).

The teachers can be treated as front-line players observing greater responsibilities in the entire value-chain of education service providing institutions in any country of the world. Academician and professional researchers of Bangladesh have not yet taken an extensive empirical study on simultaneous assessment of teaching performance on the view point of faculties' demographic characteristics. This raises a concern to conduct a comprehensive research for examining the association between professional

stresses and teaching performance in regards to some specific dimensions of university faculties. The present study is an initiative to cover this gap in the literature. The rationale of the research lies in the implications of stress-performance relationship found in this study to be considered in forming HRM policies to improve teaching performance particularly in enhancing quality education in the tertiary level of education sector.

The paper is expected to provide a new perspective into the area of literature concerning professional stress and teaching performance with respect to individual demographics as predictors of professional depression.

4. Objectives of the Study

The current study has been carried out with a view to accomplishing following objectives:

a) To find out the relationship between university teachers' stress and teaching performance on the view point of some of the demographic variables;

b) To test whether the relationships found between the variables (teachers' job stress and teaching performance) are significant or not;

c) To put forward some recommendations for mitigating stress level in teaching profession indicating implications for the policy makers to ensure quality teaching service.

5. Research Methods

The present paper is designed through consulting with professional experts for guidance and reviewing extensively the available literature. The study was carried out in the 2018-2019 academic year. In Bangladesh, most of the private universities are geographically scattered in Dhaka, the capital city and in Chittagong, the main port city of the country. Hence, the universities irrespective of ownership (private and public) located in the Chittagong city (for authors' convenience) constitute the sample frame for the study. All the university teachers in this region are to be considered as population for the study. Thus, the sampling applied here can be treated as stratified random approach. A sample size of 112 faculty members ranging from lecturer to professor rank is communicated randomly at their convenient time. A self-administered questionnaire incorporating five demographic factors ranged in a

5-point Likert scale has been framed in gathering primary data. The frequency distribution of sample faculty members is shown in the tabular form following a brief explanation. The paper uses both the descriptive statistics and inferential statistics to portray the data pattern of the respondents followed by required computations to test the hypothesis and conclude inferences based on sample statistics. In the scale applied here, professional stress (Cronbach's alpha=0.73) and teaching performance (Cronbach's alpha=0.79) appear to be sufficient for the reliability of study instrument and Statistical Package for Social Sciences (SPSS Version 15.0) is used for necessary computations. Relationships between variables are estimated using Pearson correlation coefficient as statistical tool through cross tabulation.

Table - 1: Population and Sample Size of the Study

Universities		Total Number of Teachers	Teacher Student Ratio	No. of respondents (Sample size) in this study
Public	University of Chittagong	1303	1:22	18
	Chittagong University of Engineering & Technology	250	1:16	06
				24
Private	BGC Trust University Bangladesh, Chittagong	121	1:30	32
	Chittagong Independent University	79	1:18	05
	International Islamic University Chittagong	392	1:25	16

	Premier University, Chittagong	336	1:23	12
	University of Science and Technology Chittagong	273	1:11	06
	East Delta University	73	1:22	04
	Southern University, Chittagong	190	1:20	07
	Port City International University	177	1:27	04
	University of Creative Technology Chittagong	28	1:6	02
				88
Total		**3,222**		**112**

Source: Bangladesh Education Statistics, 2018 (New), BANBEIS, Educational data base, Website: data.banbeis.gov.bd

6. Hypotheses Formulation for the Research

For accomplishing the objectives of the study stated above, the following fifteen hypotheses in relation to the respondents' demographic dimensions are formulated:

$H_0$1: There is no significant relationship between professional stress and teaching performance of the university teachers.

$H_0$2: There is no significant relationship between professional stress and teaching performance in the context of male university teachers.

$H_0$3: There is no significant relationship between professional stress and teaching performance in the context of female university teachers.

$H_0$4:: There is no significant relationship between professional stress and teaching performance among the university teachers having up to 5 years of job experience.

$H_0$5: There is no significant relationship between professional stress and teaching performance among the university teachers having service tenure of 6 to 10 years.

$H_0$6: There is no significant relationship between professional stress and teaching performance in the university teachers having service tenure of 11 to 15 years.

$H_0$7: There is no significant relationship between professional stress and teaching performance in the university teachers having more than 15 years of experience.

$H_0$8: There is no significant association between professional stress and teaching performance in the university teachers of below 35 years old.

$H_0$9: There is no significant association between professional stress and teaching performance in the university teachers belonging to age group 35 - 44 years.

$H_0$10: There is no significant association between professional stress and teaching performance in the university teachers belonging to age group 45 - 54 years.

$H_0$11: There is no significant association between professional stress and teaching performance in the university teachers belonging to age group 55 years and above.

$H_0$12: There is no significant association between professional stress and teaching performance in respect of adjunct faculties.

$H_0$13: There is no significant association between professional stress and teaching performance in respect of permanent faculties.

$H_0$14: There is no significant association between professional stress and teaching performance in respect of public university faculty members.

$H_0$15: There is no significant association between professional stress and teaching performance in respect of private university faculty members.

7. Data Analysis and Findings

7.1 Sampled Faculties' Demographic Profile

The demographic profile of the faculties is gathered to examine the relationship between the variables identified for the study. The following table states the demographic profile of the university faculty members. The demographical data of the respondents were collected through five dimensions relating to faculty members' profile namely: gender (sex identity), length of service (job experience), age ranges, professional type (permanent and adjunct), and ownership forms of universities (public and private).

Table - 2: Demographic Profile of the Sample Respondents

01	Age ranges:	No. of respondents
	Below 35 years	29
	35 - 44 years	35
	45 - 54 years	25
	55 years & above	23
02	Professional / service type:	
	Adjunct	35
	Permanent	77
03	Service tenure (in years):	
	00-05	31
	06-10	41
	11-15	22
	16 & above	18

04	Ownership types of Universities: Private Public	 88 24
05	Gender: Male Female	 78 34

Source: Authors' own study, 2019

The table shows that the age of the majority of the respondents falls in the range between 35 years to 44 years followed by below 35 years age group. Majority of the faculties in this study are male belonging to the privately owned universities. Major portion of the respondents possess 6 to 10 years of teaching experience. Job nature of most of the faculties is permanent.

7.2 Inferential Analysis on Faculties' Stress-Performance Relationship

The findings of this research support the literature review in a number of key areas. The information collected through questionnaire is processed through a software package to find the relationship between the variables and to test the significance for acceptance of the formulated hypotheses. The inferential analyses were done on the view point of each of the faculty demographic variables along with finding out the relationship between professional stress and teaching performance and the results are portrayed below sequentially.

7.2.1 Overall Professional Stress and Teaching Performance

H_{01}: There is no significant relationship between professional stress and teaching performance of the university teachers.

In order to test the hypothesis H_{01}, as there is no significant relationship between professional stress and teaching performance of the university teachers, the following table is generated. Based on given statistics, the H_{01} cannot be accepted. Thus, the findings show a significant relationship between professional stress and teaching performance of the respondents of the study.

In the study findings, the coefficient of correlation (value of r) is equal to -0.206 which is found significant (p - value is .07 < 0.1). The correlation indicates a negative relationship between the professional stress and teaching performance of the university teachers at 10% level of significance.

Table-3: Correlations between professional stress and teaching performance of the university teachers

		Overall Teaching Performance
Overall Professional Stress	Pearson Correlation	-0.206
	Sig. (2-tailed)	0.07**
	N	112

Source: Authors' own study, 2019

* Significant at 95% confidence level

** Significant at 90% confidence level

7.2.2 Faculties' Gender Dimensions

H_{02}: There is no significant relationship between professional stress and teaching performance in the context of male university teachers.

H_{03}: There is no significant relationship between professional stress and teaching performance in the context of female university teachers.

The following table is derived to find out the correlation between professional stress and teaching performance in the context of gender dimension (table - 4). The coefficient of correlation (r – value) stands for 0.046 which is found insignificant (as p value is .54 > 0.05). The correlation statistics show that there is no relationship between professional stress and teaching performance in the context of male teachers of universities. In case of opposite gender, female, the coefficient of correlation (r – value) stands for 0.064 which is found insignificant (as p value is .68 > 0.05). The correlation statistics show that there is no relationship between professional stress and teaching performance in the context of female teachers.

Table-4: Correlations between professional stress and teaching performance on the view point of teachers' gender dimension

Demographic Variables	r	Sig.
Male faculties	0.046	0.54
Female faculties	0.064	0.68

Source: Authors' own study, 2019

7.2.3 Faculties' Service Tenure Dimensions

H_{04}: There is no significant relationship between professional stress and teaching performance among the university teachers having up to 5 years of job experience.

H_{05}: There is no significant relationship between professional stress and teaching performance among the university teachers having service tenure of 6 to 10 years.

H_{06}: There is no significant relationship between professional stress and teaching performance in the university teachers having service tenure of 11 to 15 years.

H_{07}: There is no significant relationship between professional stress and teaching performance in the university teachers having more than 15 years of experience.

In order to test the hypotheses formulated regarding university faculties' length of service with a view to judging whether it has significant relationship with teaching performance, the following table is computed.

In case of the faculties having up to 5 years of job experience, the correlation coefficient value "r" is found - 0.523 and the p - value stands for 0.04 ($p = 0.04 < 0.05$). The study results state an inverse relationship between the professional stress and job performance of the junior faculty members of universities which is significant.

Regarding the faculty members having service tenure of 6 to 10 years, the coefficient value of correlation "r" is found -0.312. Here the p – value is found significant at 90% level of confidence (p – value is 0.10). A lower but negative relationship exists between job stress and teaching performance of faculty members whose length of service tenure ranges from 6-10 years at 10% level of significance.

For the length of service tenure from 11 to 15 years of university teachers, the coefficient value of correlation "r" is estimated as 0.729 which is not significantly (p - value is 0.46 > 0.05) different than zero. The result illustrates no relationship between the professional stress and teaching performance of the faculty members whose length of service tenure ranges from 11 to 15 years.

For the senior faculty members (whose service tenure is experience more than 15 years), the coefficient value of "r" is estimated at 0.331 and it is found significant (p - value is 0.03). Inference can be drawn that a positive relationship prevails between professional stress and job performance in the senior faculties at 5% level of significance.

Table-5: Correlations between professional stress and teaching performance to the view point of teachers' length of service (experience) dimension

Demographic Variables	r	Sig.
0 - 5 years	-0.523	0.04*
6 - 10 years	-0.312	0.10**
11 - 15 years	0.729	0.46
16 & above	0.331	0.03*

Source: Authors' own study, 2019

* Significant at 95% confidence level

** Significant at 90% confidence level

7.2.4 Faculties' Age Dimensions

H_{08}: There is no significant association between professional stress and teaching performance in the university teachers of below 35 years old.

H_{09}: There is no significant association between professional stress and teaching performance in the university teachers belonging to age group 35 - 44 years.

H_{10}: There is no significant association between professional stress and teaching performance in the university teachers belonging to age group 45 - 54 years.

H_{11}: There is no significant association between professional stress and teaching performance in the university teachers belonging to age group 55 years and above.

In order to test the hypotheses formulated regarding faculties' age dimensions to judge whether it has a significant relationship with teaching performance, the following table is generated. The figures in the table clearly states that all the age groups of teachers other than below 30 years show no significant correlation between professional stress and teaching performance.

With respect to the faculties of below 35 years, the value of correlation coefficient (r) is -0.526 which is significantly (p – value is .01< 0.05) different from zero. Hence, inference can be drawn that a negative association prevails between the professional stress and teaching performance in young faculties of the universities at 5% level of significance.

Table-6: Correlations between professional stress and teaching performance to the view point of teachers' age dimensions

Demographic Variables	r	Sig.
Below 35 years	-0.526	0.01*
35 - 44 years	0.036	0.71
45 - 54 years	0.196	0.49
55 years & above	0.091	0.59

Source: Authors' own study, 2019

* Significant at 95% confidence level

7.2.5 Faculties' Service Type

H_{12}: There is no significant association between professional stress and teaching performance in respect of adjunct faculties.

H_{13}: There is no significant association between professional stress and teaching performance in respect of permanent faculties.

The following table analyzes the association between job stress and job performance on the view point of two major service types like adjunct and permanent faculties.

Table-7: Association between professional stress and teaching performance on the view point of service nature of faculty members

Demographic Variables	r	Sig.
Adjunct faculties	0.262	0.43
Permanent faculties	-0.091	0.82

Source: Authors' own study, 2019

The null hypotheses (H_{12} and H_{13}) formulated in this regard cannot be rejected in case of both the types. Hence, it can be concluded that there exists an insignificant association between stress and job performance among the faculty members' types of service.

7.2.6 Ownership Types of Universities

H_{14}: There is no significant association between professional stress and teaching performance in respect of public university faculty members.

H_{15}: There is no significant association between professional stress and teaching performance in respect of private university faculty members.

Table - 8: Correlations between professional stress and teaching performance on the view point of institutions' ownership types

Demographic Variables	r	Sig.
Private	-0.525	0.01*
Public	0.088	0.62

Source: Authors' own study, 2019

* Significant at 95% confidence level

The present study finds no association between professional stress and teaching performance among the public university teachers, which leads to the acceptance of H_{14} at 5% level of significance. On the contrary, quite an opposite result is found in case of private university teachers through the rejection of H_{15} upholding significant correlation between the variables at 5% level of significance. The value of correlation coefficient (r) stands for -0.525 and p - value is found $0.01 < 0.05$. Moreover, the correlation coefficient shows an inverse relationship between the variables.

8. Limitations, Implications and Recommendations

This paper is questioned on its generalizability due to low sample size compared to the population. The sample is too small to achieve the precision. Rather, the sample size taken in the study is not methodologically justified due to lower

response rate as that would represent the total population under the study. The low response rate is another drawback. To ensure its wider acceptability, the authors of the paper recommend for further investigation and more research with broader perspective on the relevant topic.

Professional stress can never be fully eliminated. An informed educational community as well as positive school cultures that acknowledge and support educators may help alleviate teachers' job stress to some extent (Mirowsky & Ross, 2003). Stress measurement is done to alert employees with regard to adverse as well as unexpected consequences and indicates the ways to combat those by enhancing job performance (Bhuiyan, 2013). A number of researches have stated that health-risky stress can be combated through health promotion programs and sponsored preventative measures (Smith, 2005). Despite the increasing concern and acknowledgement of adverse effect of professional stress on the efficiency of individuals and organizations, the employers' attention to recognizing the stress-sources and eliminating stressful job conditions is relatively negligible. Researchers in this field have found inconsistency between the theoretical propositions and workplace implications / practices. Cooper, Dewe, and O'Driscoll (2001) stated three causes to explain this incongruence include: a) managers' perceptions about the effect of the work environment on employees' wellbeing, 2) their beliefs about who is responsible for managing individual employees' levels of strain, and 3) the costs associated with managing changes compared with those related to teaching individuals to cope more effectively. Employees can be taught about normal reactions to trauma and stress management techniques and have the opportunity to see they are not alone in their responses (Grimshaw, 1999). The decision making authority should realize that professional stress is responsible for mental and physical health problems in employees, which consequently affect the organizational productivity.

In preventing professional stress, the decision making authority should formulate strategies involving the creation of work-friendly environment in terms of employee benefits, healthy culture, peer relations, fair organizational policies, flexible structure, employees' union / relations and favorable employment conditions. Stress management can play a significant part for well physical and emotional health maintenance and to keep healthy relationships

with others. Practicing meditation is an ancient and proven method to work under stress in a sense of peace. Reserving a free time for a hobby or in something one finds enjoyment may reduce hassles and stresses of work life. Relaxation may be one of the most effective ways of dealing with stress. Regular exercises help release tension and relax minds. Finally, instrumental support may offer the resources to resolve a problem or stop it from arising in the first place (Wainwright & Calnan, 2002; Wichert, 2002).

9. Summary of Findings and Conclusion

This paper investigates the prevailing association between professional stress and faculty performance of tertiary level education sectors in Bangladesh. Faculty members presently serving in the private and public universities of the country constitute the sample frame for the study approached through questionnaire and survey responses are adapted in the study using a scale related to job stress and performance. Necessary modifications were done in the scales to ensure construct simplicity, variable identification and acceptable design to local settings.

It could be inferred from this study that there was found significant relationship between overall professional stress and teaching performance of the respondents of the study revealing negative relationship with the coefficient value of correlation of -0.206 which is found significant (p - value is .07 < 0.1) at 10% level of significance. But in the context of gender varieties, correlation statistics show no relationship between the said variables. The study results state an inverse relationship between the professional stress and teaching performance of the junior faculty members of universities as significant. For the senior faculty members (whose service tenure is more than 15 years), the coefficient value is found significant (p- value is 0.03). Inference can be drawn that a positive relationship prevails between professional stress and teaching performance in the senior faculties at 5% level of significance. A negative association prevails between the professional stress and teaching performance in young faculties of the universities at 5% level of significance. In case of private university teachers there was found negative and significant correlation between stress and performance at 5% level of significance.

Mental health has to be seen as important as physical health (Harvey, 2005). Personality differences, gender differences, age, and social support all seem to be important factors in determining stress level which requires for individuals' coping strategies with workplace stress (Wichert, 2002). Stress coping strategies include appropriate tactics and plans to be implemented for reducing professional stress. Favorable work environment, student behavior and administrative supports may ease distress in teaching profession (Chan, 2002; Mirowsky & Ross, 2003). Institutional consciousness is indispensable to helping faculties manage workload as well as student behavior concerns. Rational coping behaviors can be treated as a good alternative which facilitates the academicians strike professional stress and attain valued outcomes with students, whereas avoidance coping predicts high level of stress.

Outcome based systematization mutually set by the governing bodies (like UGC) could establish a firm ground for strategies that would get better conditions for faculty members in higher education sector. Coping and adopting strategies may differ from person to person but, in broad-spectrum, the coping strategies usually experienced by peoples of different walks of life are psychological and physical preparation, mental perseverance keeping, treatment of clinical methods, behavioral modification, spiritual involvement, active liveliness, humor, more funniness etc. Establishing and maintaining a support network both inside and outside of the university may be a good strategy in this regard. However, with workload greater than before, teachers may feel as though they do not have the time to create and maintain such support systems. A variety of strategies are proposed in the literature. For instance, Admiraal, Korthagen, & Wubbels (2000) stated that the reaction may consider administrating the stress (termed as problem-oriented coping) and lessening the emotional reaction (termed as emotion-oriented coping). Schonfeld (1990) says more research into the association among stress factors, depression, anxiety, and role of social supports and teacher stress is needed. Finally, the study herewith recommends for policy propositions such as the inevitability of staff facility with psychologists, training visits, extroversion actions, practice of networking and health counseling.

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Faculty Attributes and Student Achievement in Tertiary Education: An Empirical Study on Universities in Bangladesh

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Abstract

In the context of the overwhelming increase and diversification in higher education institutions in Bangladesh in the recent two decades, civil society has become concerned about the quality of education offered to students. This study is an attempt to assess the relationship between faculty attributes and student achievements across universities in Bangladesh. Evaluation methods tend to overemphasize mainly on the faculties' teaching performance and research works, as a yardstick of an institution's value. Based on this perspective, this paper attempts to highlight the university teachers' attributes having relationship with the effectiveness of quality teaching as well as student achievement. The sample of the study includes some conveniently chosen private universities located in Dhaka and Chittagong – the two major cities of Bangladesh with a minimum of 90 faculty members working therein. The primary data gathered via questionnaire have been analyzed through quantitative methods and that addressed the view of the effect of demographics on student achievement. Secondary information is also searched in the prevailing published literature. The paper puts forward some recommendations for further research and is expected to enrich the existing knowledge in the area of research on quality in higher education.

Key Words: Higher study, University faculties, Demographic variables, Student achievement.

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1. Introduction

University is tertiary level education providing institution presumably committed to excellent teaching and research excellence. It is a place of disseminating ideas, experiences and perspectives that sustain the depth of learning. The inherent goal is to attain personal and intellectual growth of its students in a diverse academic environment. It emphasizes on the distinct enrollment of students, appointment of faculties, and recruitment of dynamic staff required for quality education. Bangladesh has achieved a tremendous expansion in higher education basically in terms of the increased number of private universities in the last two decades. With the rising demand for higher education, the existing public universities alone could not adequately cater to this need and that consequently enhances the approval of successive establishment of private ownership in this sector.

In the recent times, the concerned stakeholders like University Grants Commission of Bangladesh, Bangladesh Accreditation Council and intellectuals become conscious about the quality of education offered to students and are more concerned than past to the development of best strategies to accelerate student academic performance. As a result, the authors of this paper feel that there requires an increase in effective focus on higher education to the viewpoints of different dimensions. From the view point of the institutions, it is also logical to measure the faculty performance for appraising and recognizing in a proper manner. A university's performance depends on students' achievement which is closely related to teachers' performance. The quality of higher education institutions depends upon the high performance and job involvement of the faculty members in rendering quality service for the purpose of improved student learning. The more the expertise, the more quality education teachers can provide (Sarwar et al., 2010). In course of time, learners' academic achievement in terms of good grade in the examinations as well as good career in practical life is being used as the teachers' excellence indicators in teaching. Teachers are assumed most influential for quality student achievement because they are ultimate stakes responsible for implementing action plan based on practice fully adjacent to the students. Now-a-days, it is not surprising to conceptualize the faculty demographics comprised of distinct dimensions/features as the major impacting factors shaping desired student

achievement. Students' academic achievement can be termed as a yardstick for quality education itself. It is the indices for testing quality education service rendered by the institutions. Quality student achievement depends on a number of faculty related variables on the extent to which faculties possess in delivering education (Nye, Konstantopoulos, & Hedges, 2004; Rockoff, 2004). The most diverse faculty demographics are the focus of the study followed by rationale and significance of the study stated in section two, literature review in section three, objectives in section four, methodology and hypothesis formulation in section five, data analysis and interpretation of findings in section six, and recommendations for future study implications in the last section.

2. Rationale / Significance of the Study

The most notable trend in contemporary higher education is that universities are offering far more attention to the quality student achievement than in the past. In literature, there remain a lot of differences in opinions on how teachers' demographics influence student achievement as several studies found very little impact in this regard (Hanushek and Rivkin, 2010). In connection to this, the common factors studied and scrutinized correlated to student achievement are faculties' academic excellence/certification, length of job experience, performance rating score and evaluation criteria etc. A notable number of research studies in the economics of education found a causal relationship between student-teacher demographic mismatch and student achievement in the primary, secondary, and post-secondary contexts (Clotfelter, Ladd, & Vigdor 2006; Egalite et al. 2015; Fairlie, Hoffman, & Oreopolous 2014). It is quite natural that students' academic achievement is influenced by teachers (e.g., Rivkin, Hanushek, & Kain 2005). However, teachers are likely to influence students' non-cognitive development, behavior, and attitudes towards education as well. Regular attendance is one objective, easily observable manifestation of non-cognitive skills (Gershenson 2015; Jackson 2013). Moreover, teachers might be a predictor of student attendance by promoting student engagement, creating a sense of community in the classroom, and directly imparting the importance of regular attendance (Kelly 2012; Ladd & Sorensen 2014). While some of these effects are potentially attributable to teachers' actively aiding race- or gender-congruent students, symbolic effects of passive representation is likely to contribute as well.

Most emerging private universities are hiring professionals from the corporate sector along with the existing renowned academicians from public universities in order to create strong institutional brands. Academicians from foreign universities are also contractually appointed and there is a growing tendency for increasing national and international enrollments. Hence, the faculty resources are becoming diverse and the authors of this paper feel an academic interest in evaluating student outcomes to the view point of those varied dimensions and faculty demographic is one of them.

Although there exists a number of relevant studies pertaining to the developed world, Bangladesh is clearly lagging behind, which had led to a research gap required to be addressed. The study findings are expected to cover the literature gap and will put up with policy implications in practice for the betterment in the area of quality education in higher education sector.

3. Literature Review

The literature suggests different theoretical models on the issue. The empirical research indicates that the demographic factors influence the degree of faculty performance as well as students' academic progress. Faculty background has been a matter of research interest in many countries. In the USA and in many developing countries, teachers' background attributes were investigated; which were found to have significant positive and negative relationship with the satisfaction level (Ingersoll, 2001; Perie et al, 1997) that consequently persuades a concern on the impact of demographic aspects. Though it is ignored in most of the past researches, the personal traits of a teacher have recently been considered as the yardstick for evaluating teaching competencies. In examining the association between faculty demographics and student achievement, it is essential to evaluate the collective faculty demographics and see their impact compared to other factors impacting student achievement (for example, size of the class, past academic record, family prior history and socioeconomic background and so on). These collective factors can be identified as faculty demographics having a significant and positive impact on student achievement (Rockoff, 2004; Nye, Konstantopoulos, & Hedges, 2004). Nye, Konstantopoulos, and Hedges (2004) studied teachers' different traits and found that these were visible in effective teachers and responsible for generating student achievement. Clotfelter, Ladd, and Vigdor (2007) searched the

association between a teacher's academic record and student achievement, and found a positive and statistically significant relationship between the two factors at the high school and college levels. Iheanacho (2002) asserted that faculties with higher academic background are more efficient and productive than those with lower academic background. In a causal model of Onuoha (1999) teachers' qualification appears to be an influencing factor for students' academic achievement both directly and indirectly. The author concluded that the lack of qualified teachers with pedagogical skills; commitment and practical orientation, seriously affects students' academic achievement.

De Nobile and McCornick (2006) stated that the faculties' distinctive personal qualities might be considered as the indicator of their job performance. In a study conducted on the Los Angeles Unified School District, Kane and Staiger (2008) assured that teachers' demographics were significant determinants having long-term impact on student achievement. Malik (2011) in his study on evaluating the level of overall job satisfaction of university faculty members found that demographic variables such as age, gender, position / rank of the job, qualification needed for the job and tenure of service have significant relationship with the overall job satisfaction of university teachers. In a study, DeVaney and Chen (2003) found demographic characteristics like age, sex identity, racial origin, and academic background as the most impacting factors for job performance as well as job satisfaction. Crossman and Harris (2006) opined in favor of the relationship between age and job contentment, although the nature and type of association was quite unclear. Research findings show that the job satisfaction of university faculty members from Uganda reported age to have a significant influence on teaching performance (Ssesanga & Garrett, 2005). Renowned Scholars like Essien (2004) and Aji (20006) found faculty demographics significant for students' academic achievement in their study. Some prior researches support that academic qualification and credibility of a teacher have a positive impact on student gains (Clotfelter, Ladd, & Vigdor, 2007). Seweje (2003); Arubayi (1999), Onuoha (1999); and Adeniji (2004) confirmed that teacher's years of service experience has direct impact on students' academic achievement. This implies that teachers with longer years of experience teach more effectively than those with fewer years of experience.

Sometimes, the literature findings appear to be contradictory. The relationship between faculties' length of service / job experience and student achievement has been studied for several decades (Ehrenberg & Brewer, 1994; Hanushek, 1989), but the study findings are quite mixed with no overwhelming consistent relationship, with some results indicating increased student achievement as teachers gain experience (Clotfelter, Ladd, & Vigdor, 2007). Borman and Kimball (2005) confirmed that teaching experience had neither relationship with student achievement nor was statistically significant for student achievement. Croninger et al. (2007) asserted that academic qualifications of a teacher did have a moderate impact on student performance but could not be termed as a unique determinant. In their research in Uganda, Sseganga and Garrett (2005) asserted that sex identity had no significant impact on job performance of university faculty members. Similarly, in the study of Ward and Sloane (2000), gender appeared statistically insignificant in generating job satisfaction. Oshagbemi (2003) explained that age had no significant relationship with performance. But Mello (2006) opined that work performance heightens in proportion to age. Again, DeVaney and Chen (2003) found that older workers are more likely to be satisfied than younger workers. According to Sabharwal & Corley (2009), marital status of university teacher was found in a number of empirical findings to be significant demographic variable in affecting the faculty performance, but had inconsistent evidence. Similarly, Cetin (2006) stated that marriage positively influences the satisfaction level of academic staff members. Contrary to these studies, Oshagbemi (2003) paradoxically found marital condition to be insignificant in association to performance. Teaching performance increases as a faculty member deserves higher rank in the academic job hierarchy (Hickson & Oshagbemi, 1999). Similarly, Sabharwal and Corley (2009) found job status (i.e., Rank) as a significant variable for faculty performance. On the other hand, in an empirical study conducted for Northern Cyprus, Eyupoglu and Saner (2009) found no evidence on the increase of work performance by the job rank of academicians. Formal educational qualification and job tenure, the two main attributes of teacher quality are becoming the focus of contemporary studies. Although such, the empirical findings and reviews on the relationship between students' academic achievement and both the attributes of a teacher - education level and

job experience are in a conflict, with some concluding a positive relationship and others concluding no relationship (Goldhaber, 2004; Wenglinsky, 2002).

4. Objectives of the Study

The research investigates mainly the relationship between the university faculties' demographic characteristics and the students' academic achievement in the context of tertiary education sector in Bangladesh. The specific objectives of the study are as follows:

a. Identifying the faculties' specific demographic factors;

b. Examining the relationship between faculties' demographic factors and students' academic achievement;

c. Determining the impact of those factors on students' academic achievement.

5. Methodology

The population for the present study comprises of all faculties of the universities irrespective of private or public situated in Bangladesh approved by the University Grants Commission Bangladesh and the Government of Bangladesh which currently stands for 23,934 (According to the recent BANBEIS Bangladesh Educational Data, The total number of faculty members in all the Bangladeshi universities is 23,934. The original data source refers to every person related to teaching as teacher and do not distinguish any faculty, professor, lecturer, researcher, etc.). The multi-stage random sampling method was applied in selecting faculties as they varied as per their professional ranks. Primary and secondary sources of data are used in this study. The questionnaire was sent to about 200 faculty members of the universities, of which only 83 returned the completed questionnaire. After central editing, the authors fixed 80 usable questionnaires in rounding figure for convenient processing. The independent variables of the research are determined on the basis of the literature. The common demographic characteristics like age, race, marital status, nationality, birth order, monthly pay, number of children of staff members, coupling in workplace are carefully avoided in this study as a worthy number of publications on these pertinent variables are available in the existing

literature. Finally the following factors seem to be relevant having impact on student achievement and are considered for the conduct of the present study:

1. Faculties' formal academic qualification factors i.e., educational excellence achieved through out their student life.
2. Faculties' research work related factors i.e., research project conducted, publications in recognized national and international journals, higher study like M. Phil, Ph. D, Post Doctorate and so on.
3. Job experience factors i.e., length of service in teaching, posts occupied in different level of professorship, age factors etc.
4. Supervisory/Leading positions such as departmental chairman, dean of faculty, coordinator, provost, proctor, adjunct coordinator and so on.
5. Political affiliation inside or outside the university campus or involvement in internal teachers' association.

The questionnaire was framed with twenty questions enquiring the above five dimensions. Further, each question was rated through the use of a five-point Likert scale, which was quantified as 1 = "strongly disagree" and 5 = "strongly agree". In practice, scales of five categories are typical and had been used in the literature predominantly (Ali, 2009; Zaman, Jahan, & Mahmud, 2014). The quality student achievement was considered as the dependent variable for the study.

The statistical techniques used in the analysis of data are descriptive statistics (measures of central tendency: Mean and Standard Deviation of Faculty demographics and quality student achievement) and Correlation Matrix for faculty demographics and student achievement, Demographics' Pair-wise Relationships and multivariate analyses (ANOVA test). The analysis of variance (ANOVA) is applied to examine significant differences between the demographic factors in terms of students' academic achievement.

Based on the above discussion, the following **hypothesis** is formulated:

H_0: There is no relationship between selected faculty demographics and the student achievement

6. Analysis and Findings of the Study

6.1 Percentage Distribution of Faculty Demographics on Quality Student Achievement

The responses exactly rated by the sample faculty members are shown in the following table computing percentages of each of the dimensions to the Likert's ranges.

Table-1: Impact of Faculty Demographics on Student Achievement

Faculty Demographics impacting student performance	SA	A	NR	D	SD
1. Faculties' formal academic qualification factors i.e., educational excellencies achieved in their student life	52 (65%)	20 (25%)	4 (5%)	4 (5%)	0 (0%)
2. Faculties' research work related factors i.e., research project completed, publications in recognized national and international journals, higher study like M. Phil, Ph. D, Post Docs and so on	56 (70%)	22 (27.5%)	2 (2.5%)	0 (0%)	0 (0%)
3. Job experience factors i.e., length of service in teaching, posts occupied in different level of professorship, age factors etc.	58 (72.5%)	18 (22.5%)	4 (5%)	0 (0%)	0 (0%)
4. Supervisory / Leading positions deserved like acted as departmental chairman, dean of faculty, coordinator, provost, proctor and so on	46 (57.5%)	18 (22.5%)	6 (7.5%)	6 (7.5%)	4 (5%)
5. Political affiliation inside or outside the university campus or involved in internal teachers' association	22 (27.5%)	18 (22.5%)	31 (38.75%)	5 (6.25%)	4 (5%)

6.2 Mean Distribution of Faculty Demographics on Quality Student Achievement

Respondents' opinions are quantified through assigning numeric values as shown in the table - 2.

Table - 2: Assigning Numeric Value to the Range of Opinion

Range of Opinion	Numeric Value Assigned
Strongly agree	5
Agree	4
No response	3
Disagree	2
Strongly disagree	1

Table - 3 displays the mean and standard deviation of Faculty demographics influencing quality student achievement.

Table-3: Mean and Standard Deviation of Faculty Demographics and Quality Student Achievement

Demographic factors	N	Min	Max	Mean	SD
Formal academic qualification factors (A)	80	2.00	5.00	4.28	1.39
Research work related factors (R)	80	3.00	5.00	4.51	1.48
Job experience factors (E)	80	3.00	5.00	4.60	1.41
Leading positions held (L)	80	1.00	5.00	3.72	0.85
Political affiliation (P)	80	1.00	5.00	3.46	0.82
Total				4.11	
Student Achievement (S)	80	1.00	5.00	4.24	0.97

The findings of the current study indicate that the job experience i.e., tenure of teaching profession (E) scored the highest mean value of 4.60 with a standard deviation of 1.41 in comparison to all the facets considered in the study. The opinions of the faculties ranges from 'no response' (min = 3) to 'strongly agree' (max = 5). The academicians view that formal service length, aging, getting time based promotional or advancement facilities etc. are the most impacting factors for high level of student outcomes. Hence, time (years) spent in rendering teaching service can be an influencing variable for measuring quality learners achievement. The working experience a teacher gathers in teaching profession is a proven and effective yardstick for measuring performance. Good teaching is mastered by practice. The longer one teaches, the better the students' achievement in examination is.

In the context of research work related factors (R), the faculties expressed simultaneous agreeableness (mean value 4.51 with a standard deviation of 1.48) considering the variable as the second major influencing factor that enhances the quality student achievement.

The formal academic qualification of a faculty member (A) is found ranging up to the extent of 'strongly agree' level computing the arithmetic mean of 4.28 with a standard deviation of 1.39. The academicians think that formal academic qualification is important for constructing theoretical base and formulating in-depth knowledge foundation in the respective field / discipline which accelerate a deliberating skill in transferring subject matter to knowledge seekers. This supports the findings of Colfalter, Ladd and Vigdor (2006) and Adeniyi (2004) that formal academic qualification of a faculty member has potent level of relationship with students' academic achievement.

In the context of Supervisory / Leading positions deserved (L), the responses of the faculties diverse from 'strongly disagree' to 'strongly agree'. On an average, the respondents' expression is found at more than average level (mean value 3.72) for considering the said variable as an indicator of evaluating student achievement.

The 'political affiliation' dimension (P) computes the lowest mean value (3.46) compared to that of others ranging between 'strongly disagree' and 'strongly agree'. On average, sampled faculty teachers of the study abstained themselves

in making any opinion in favor of and against for the variable and hence, 'no responses' are made by a larger portion of the respondents.

The average value of 4.11 states that faculty respondents' agreeableness with the five demographic dimensions has impact on graduate level students' overall outcomes. The mean value of student achievement appears as 4.24 with a standard deviation of 0.97 and it can be inferred that the faculty respondents commented on behalf of the demographic issues to be the important affecting factors on quality teaching measured in terms of student achievement.

6.3 Correlation Matrix Findings

Table 4: Correlation Matrix for Faculties' Demographics and Student Achievement

Variables	Student Achievement (S)	**Faculty Demographics**				
		Formal academic qualification factors (A)	Research work related factors (R)	Job experience factors (E)	Leading positions held (L)	Political affiliation (P)
Student Achievement (S)	1					
Formal academic qualification factors (A)	0.603	1				
Research work related factors (R)	0.755	0.889	1			
Job experience factors (E)	0.812	0.523	0.891	1		
Leading positions held (L)	0.442	0.113	0.781	0.918	1	
Political affiliation (P)	0.329	0.104	0.224	0.392	0.659	1

In the Table-4, it is found that the quality student achievement (S) has high degree of positive relationship with the faculties' experience factors (E) as computed "r" appears as 0.812. Inference can be held that quality teaching learning is strongly associated with the professional length in years, timely promotional achievement i.e., career advancement opportunities, faculties' age factors etc. Knowledge transfer skill and presentation quality increase with the passage of time involved in academic profession. Despite the mixed literature findings, it is proven that number of years spent in teaching, teachers' efficiency rating scores, and regular licensure are associated with higher student achievement (Brewer and Ehrenberg 1994; Brewer and Goldhaber 2000; Anthony and Goldhaber 2007).

It is found from the table that faculties' research credibility (R) is highly correlated with the student outcomes. Faculties' research credibility includes own or joint research work, research project, publications in recognized national and international journals, higher study like M. Phil, Ph. D, Post Doctorates and so on. The relationship implies that faculties with research excellence exert more contribution to student development. This sort of creative and innovative skill provides an academician with an opportunity of offering updated knowledge required in building students' career in real life situation.

Every good teacher is a good ex-student. Teachers' formal academic qualification factors i.e., educational excellence achieved in their student life have a long run good impact on student learning. The positive value of r (= 0.603) is proven to establish the truth.

Faculties deserving supervisory or academically leading positions like departmental Chairmanship, faculty Deanship, Coordinatorship, Directorship, and Proctorship and so on are quite capable of playing significant role for higher student achievement – the present study finds. In this case the value of 'r' is 0.442 which is positive but smaller.

The lowest value of 'r' (= 0.329) is found in the relationship between student achievement and faculties' political affiliation inside or outside the university campus or involvement in internal teachers' association. The value indicates very poor relationship.

6.4 Demographics' Pair-wise Relationships

Among the five dimensions, the highest relationship is found between faculties' job experience factors (E) and the deserving academic leading positions (L) as the value of r is 0.918. The interrelationship between Research work related factors (R) and Experience i.e., tenure of service (E) is the second highest as computed r = 0.891 which is followed by the relationship between formal academic qualification (A) and Research work related factors (R) computing r = 0.889. Academic background has very low relationships with Leading positions (r = 0.113) and Political affiliation (r = 0.104). But the pair-wise inter-relationships among the independent variables are positive.

6.5 Interpretation of ANOVA Findings

Table-5: Student Achievement through Demographic Determinants - Model Summary

Model	R-value	R^2	Adjusted R^2	Standard estimate error
1	0.815[a]	0.664	0.623	0.562

a. Determinants: (Constant), Academic background, Research work, Teaching Experience, Leading position / status and Political affiliation

The model summary is showed in Table-5 above and the ANOVA findings showed in Table-6 below indicate the significant co-joint influence of the independent variables – Academic background, Research work, Teaching Experience, Leading position / status and Political affiliation on the dependent variable – Quality Student Achievement.

Here, R square = 0.664

$F_{(5, 74)} = 2.34$

& p-value is $0.000 < 0.05$

The predictor variables jointly explained 66.4% of the variance of quality student achievement, while the remaining 33.6% could be due to the effect of extraneous variables and not stated in the present study. The critical value of F is 2.34 for the degree of freedom $v_1 = 5$ and $v_2 = 74$ at 5% level of significance. But the study computed value of F is 16.49 which is quite larger than the table value. Hence, it can be inferred from study that obtained F-ratio is likely to occur by chance with a $p<.05$ finding the variance is greatly significant. Therefore, the formulated hypothesis (Ho: There is no significant impact of faculty demographic variables on student achievement) cannot be accepted.

Table-6: ANOVA Findings

Model		Sum of Squares	Degree of freedom	Mean Square	F	Critical values of F	Significance
1	**Regression**	10.286	5	2.0572	16.49	For the 5% level of significance, $\mathbf{F_{(5, 74)} = 2.34}$	0.000
	Residual	9.229	74	0.1247			
	Total	23.332	79				

7. Conclusion

This study explores the issues that are of interest to all identifying demographic dimensions responsible for effective teaching-learning for quality student achievement in the tertiary education sector. The study is expected to be fruitful for enhancing quality education. The findings of the study conclude that demographic characteristics of faculties focused in this research are positively associated with and have strong effect upon the student achievement. The differences in the responses regarding the demographic factors along with students' academic performance are also statistically significant. Faculties' teaching experience scored the highest mean value for determining quality knowledge achievement. The highest pair wise relationship is found between the faculties' job tenure factors and their supervisory positions. Experienced faculty members ascend to the higher leading positions. Still in most of the cases, seniority based career advancement policy prevails in the university

teaching job. The lowest degree of relationship is found in between student achievement and faculties' political affiliation. The findings indicate the significant co-joint influence of each of the independent variables on the dependent variable of the study.

8. Limitations and Recommendations for Future Study Implications

The generalizability of the study findings is to be taken cautiously as it is not beyond limitations. First, the research being from Bangladesh perspective is not able to portray the scenario of rest of the other countries in the world. Second, the findings of the study may be subject to response consistency effect as it is conducted through a self-administered questionnaire and the questionnaire includes those dimensions the authors feel suitable. For future research, the authors would like to recommend that the questionnaire formulation would require the test of validity and reliability incorporating more of the variables relevant to it and other developing countries should be included to enhance appropriate comparability. For analyzing the data, updated statistical approaches and tools are recommended to apply for better computation. Qualitative cases may be used for better understanding. The continuation of empirical researches to search and evaluate faculty demographics on developing students' learning is also recommended to ensure quality in tertiary level education. The main implication of this study requiring attention of the policy makers to the faculty diversity does indeed have an impact on worthwhile academic achievement of tertiary level students. This would allow the honorable faculties to further think about the personal attributes development to offer finest teaching service to their students. The authors are quite optimistic for future empirical researches in a broader perspective for the implications of the relevant aspects excluded in this study.

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Factors Affecting the Use of Alternative Delivery Channels: A Study on the Customers of Private Commercial Bank in Bangladesh

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Abstract

Alternative delivery channels (ADCs) have emerged as a new platform to offer banking services to its customers across the globe. The present study focused on constructing the new factors that affect the use of Alternative Delivery Channels (ADCs) by customers of private commercial bank in Bangladesh. A Sophisticated Statistical Techniques "Factor Analysis" (Principal Component Analysis, PCA and Confirmatory Factor Analysis, CFA) is used to construct the new factors. The results showed six new factors such as a) Riskiness, b) Convenience, c) Cost-effective, d) Easily accessible, e) Time savings and f) Transaction flexibility successfully constructed and assigned as the factors affecting the use of alternative delivery channels (ADCs) by bank customers. The study demonstrates that the chance of fraud while transferring funds under risky dimension, available banking services on holidays under convenience dimension, reasonable bank charges for issuance of debit card under cost effective dimension, available services for 24 hours a day under easily accessible dimension, instant feedback about transaction under time saving dimension and transactions are done more quickly under transaction flexibility dimension have a great influence on customer's ADC usages.

Key Words: *ADCs, Bank customers, Factor analysis, E-banking*

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1. Introduction

Banking system is important, but banking institutions are not (Gates, 2008). With the development of ICT techniques, the traditional banking system has been replaced by the electronic and automated banking system in every country (Graven, 2000). So, electronic and automated banking system is now a global phenomenon because it has reached the banking services to the unbanked people through different Alternate Delivery Channel (ADC) products and services. Electronic banking is now being used by the developed countries because of its creative, innovative, cost-effective benefits and services (Salehi, Mahdi, Mansouri & Azary 2008).

Alternate delivery channels of banking, commonly known as electronic banking (E- banking) is the waves of the future for banks. It provides enormous benefits to customers in terms of case and cost of transactions, either through internet, telephone or through other electronic delivery channels. For many customers, electronic banking means 24-hours access to cash through an Automated Teller Machine (ATM) or Direct Deposit of pay cheques into checking or savings accounts in bank. But electronic banking is now involved with various types of business transactions. E-banking is a form of banking where funds are transferred to customers or clients through an exchange of electronic signals between financial institution, rather than exchange of cash, cheque or other negotiable instruments of banks. With the expansion of global Information and Communication Technology (ICT) infrastructure and the internet, e-banking is set to play a pivotal role in the national economy. For this reason, proper software, infrastructure, and skilled manpower are important for the implementation of e-banking in the country. In Bangladesh, several banks are offering alternate delivery channels of banking services to its customer.

Now a days, alternate delivery channels of banking system is growing popularity in Bangladesh. Several private as well as local banks is going online now considering the demand and necessity of fast banking services for the customer. Internet banking not only provides banking facility round the clock but also helps a country to get attached to the international economy as well as business. At present, Bangladesh Bank (BB) has undertaken a huge project relating to modern payment automation infrastructure. Bangladesh Automated Clearing House (BACH) has started its operation that results in a gradual shift

from cash and paper-based transactions to electronic modes of payments. It has replaced the traditional system of clearing bank drafts, cheques, pay-orders, dividend with the automated system for providing best customer services. Apart from such non-cash payment instruments, various ATM cards - credit card and debit card transactions are becoming popular to the customers, especially in the urban areas (Bangladesh Bank, 2017). At present, 51 banks are operating card business in Bangladesh. Among those, interbank ATM transactions of 49 banks and POS transactions of 39 banks are being routed through National Payment Switch Bangladesh (NPSB). Other banks are also likely to join to NPSB. The number and volume of the interbank ATM and POS transactions through NPSB are growing rapidly in Bangladesh (BB, 2017).

Ali and Akter (2010) argued that a transitional period in the banking sector of Bangladesh has been passing through shifting from the traditional banking system to the online banking. This comment indicates that gradually electronic banking is gaining its importance in Bangladesh. Customer's linking is necessary for the banking sector to elevate probability, business expansion and accomplishment of business activities. Now a days, banking sector is modernizing and expanding its hand in different financial events. At the same time the banking process is becoming faster and easier to the customers. To survive in the competitive field of the banking sector, commercial banks are looking for better service opportunities to provide their customer.

Despite many benefits, provided by the banks to their customers, it remains a double-edged sword and not used by every customer, because of the increasing distance between the bank and customers, that may lead to the lack of confidence and a security concern. As a result, the quality of alternative delivery channels become an important area of attention among the researchers and bank managers due to its strong influence on the banking performance, lower costs, customer satisfaction, customer loyalty, and profitability (Seth, Deshmukh & Vrut 2004).

With the advancements of technology, including expansion of mobile phone coverage, Bangladesh Bank Governor Atiur Rahman mentioned "effective partnerships among banks and technology service providers' would make branchless banking or alternate channels of banking a great success" (BSS, 2010). This paper tries to highlight the various factors that affect the use of

Alternative Delivery Channels (ADCs) by customers of private commercial bank in Bangladesh. This research is of paramount importance for the banking industry to devise their ADCs policies and product offerings in the light of the results of this study.

This is a primary study that fundamentally contributes to the business research and measures the knowledge about customers regarding alternative delivery channels in Bangladesh. In addition, this study substantiates that low knowledge about alternative delivery channels may lead to confusing customers at the time of taking banking service. The effect of various factors can influence the customers for choosing the service from alternative delivery channels, that can also positively or negatively influence the banking sectors; and this would be a supplementary addition.

2. Literature Review

Alternative Delivery Channel (ADC) means channels that acts as intermediaries between banks and customers and leads to expand movement and execution of banking services. These channels may be media, tools or any application through which customer can perform their banking operations. From the point of view of Bank these Alternative Delivery channels will help bank to reach wild range of customer across the country.

As the world economy is growing faster and banking sector is making mark in each and every day, Digital banking or alternate channels of banking is very important and effective to be a part of it. Bangladesh just started its journey in internet banking and banks are coming forward to make it a success. Online banking is clearly a huge benefit for the customers and the system saves a lot of time and things get done so easily. A developing country like Bangladesh can make the best out of Internet Banking and banks are trying to perfectly execute this valuable system.

Alternate Delivery channels cover a wide range of avenues including ATM debit/Visa cards, credit cards, SMS/mobile banking, phone banking and internet banking (Singh, 2014). All over the globe, each of the alternate delivery channels is studied to evaluate its adoption rate among the bank customers. A brief description of the products and services is given below:

1. Automated Teller Machine (ATM): An ATM machine is a cash machine, cash point, cash line is a computerized telecommunications device that enables the clients of a financial institution to perform financial transaction without a cashier, human clerk or bank teller. It is stated by Kashyap and Sharma (2012) that in the context of urban areas of India, the widely used direct banking channel is ATM. According to Mwatsika (2014), the context of Malawi retail banking, the ATM banking is considered to be the second most popular access channel to avail banking services. 2. Debit Card: An electronic card issued by a bank which allows bank clients access to their account to withdraw cash or pay for goods and services. 3. Credit Card: A credit card is a system of payment named after the small plastic card issued to users of the system. Some people adopted usage of credit cards because of the factor of utility (Siddiqui and Anjum, 2013). 4. Point of sale (POS): POS is an abbreviation for point of sale (or point-of-sale or point of service). This can mean a retail shop, a checkout counter in a shop, or a variable location where a transaction occurs in this type of environment. 5. Phone Banking: Telephone banking is a service provided by a bank or other financial institution that enables customers to perform financial transaction over the telephone, without visiting a Bank branch or automated teller machine. 6. Corporate Automated Clearing House: The Automated Clearing House (ACH) is an electronic network for financial transactions. ACH processes a large volume of both credit and debit transactions which are originated in batches. 7. Online banking: Online banking allows customers of a financial institution to conduct financial transactions on a secure website operated by the institution. 8. SMS banking: SMS banking is a type of mobile banking, a technology- oriented service offering from banks to its customers, permitting them to operate selected banking services over their mobile phones using SMS messaging.

Numerous factors, including competitive cost, customer service, and demographic considerations are motivating banks to evaluate their technology and assess their electronic commerce and Internet banking strategies. Many researchers expect rapid growth in customers using online banking products and services. Studies show that competitive pressure is the chief driving force behind increasing use of alternate channels of banking technology, ranking ahead of cost reduction and revenue enhancement, adding more to it. Banks see that alternate channels of banking is a way to keep existing customers and

attract new ones to the bank. Banks can deliver banking services on the Internet as transaction costs are far lower than the traditional brick-and-mortar branches. Banks have significant reasons to develop the technologies that will help them deliver banking products and services by the most cost-effective channels depicted by the increased level of participation by both the local and foreign banks currently in Bangladesh.

The term of riskiness is very important factors for considering alternate delivery channels of banking. In the context of Kenya, Ndumba and Muturi (2014) found that customers had fear that their money or information could be delivered to inaccurate account number, therefore, security persist as hurdle in the acceptance of mobile banking. Similarly, short-messaging service (SMS) banking is also one of the derivatives of multiple delivery channels, namely mobile banking. A large number of banks in Pakistan are providing their customers with SMS alerts for each transaction against some service charges. Greater the perceived security, higher will be the customer's intention to use SMS banking (Amin and Ramayah, 2010). Mazhar et al. (2014) emphasizes that the effect of perceived usefulness and security is quite considerable on internet and mobile banking usage. It was brought into light that "the feeling of safety in usage" of ATM services is one of the factors that has emerged as a source of obstruction in the propagation of this alternative delivery channel (Mwatsika, 2014).

The customer of a bank is convenient or not is also a dependable variable for choosing alternate delivery channels. The factor of convenience was indirectly highlighted in the research conducted at Taiwan and Singapore by Wu et al. (2006) that makes an argument by using alternative channels customers can easily make a transaction anywhere-anytime. Abbam et al. (2015) studied about the customer choice of Banks in Ghana and they identified that the most important factors influencing customer choice of a bank are location of the bank, extension of working hours by the bank, availability of ATM facility, provision of efficient services, the bank being a private one and introduction of customers to the bank by friends and relatives.

Cost effectiveness has a great influence on customers' alternate delivery channels. Salhieh et al. (2011) explored the assessment of Jordan's banking sectors' readiness for providing electronic banking services. The findings of the

study showed that both bank managers and customers have positive attitude towards using various alternative delivery services because electronic banking system saves time and reduces the cost.

In addition to knowledge, easily accessible of alternate delivery channels have a motivating role on the customers of a bank. Verma (2014) stated that the Indian banking industry has witnessed a shift in trend from cash economy to plastic card economy. Khraim et al. Shaikh (2016) explores and identifies several alternative delivery channels such as automated teller machines (ATMs), the Internet, the telephone, Point of Sale (POS), and convenient mobile delivery of financial and non-financial services to consumers. Perera (2018) identified several factors which influenced the customers to adopt the internet banking System like a relative advantage, perceived ease of use, perceived usefulness, demographic factors, perceived security, compatibility, Service quality, Complexity, Trialability and Social influence.

Several previous studies have shown that, customers are very satisfied with the use of alternate delivery channels because of time savings. A lot of time savings benefit is offered by banks to a wide customer base through alternate delivery channels. As per findings of Mazhar et al. (2014), if an individual recognizes alternate delivery channels as being more cost efficient, time saving and user-friendly, then his likeliness of adopting mobile banking or internet banking.

Lastly, Transaction flexibility also plays an important role for using alternate delivery channels of banking organization. Electronic banking systems allow business parties or individual to pay directly or to debit accounts via telecommunication systems. Kabir and Poddar (2015) conducted a study based on E- Banking and Customer Satisfaction in Bangladesh and they found that Six factors are determined which accelerate customer satisfaction, but among those four factors are considered effective influence. These are Reliability, Easiness, Charges, Assurance, Visibility and Responsiveness of customer.

Various studies regarding internet banking and ADC products of the U.S.A., Japan, Europe, Romania, Turkey, Malaysia and Saudi Arabia banking institutions, were conducted by Pyun et al. (2002), Gurau (2002), Polatoglu and Ekin (2001), Balachandher et al. (2000) and Jasimuddin (2004). Mia et al. (2007) found that internet banking is also expanding and developing rapidly in

Thailand, Malaysia, Singapore, and Philippines. Studies regarding diffusion, and usage of internet banking and ADC products and services in Zimbabwe, China, Tunisia, Nigeria, and in Iran, were conducted by Thulani et al. (2009), Guangying (2009), Dhekra (2009), Adesina and Ayo (2010), Maiyaki and Mokhtar (2010), and Salehi and Alipour (2010).

By analyzing the literature review, the researchers have drawn the attention to fulfil the knowledge gap of customers for using ADCs in Bangladesh. The specific six factors such as a) Riskiness, b) Convenience, c) Cost-effective, d) Easily accessible, e) Time savings and f) Transaction flexibility were identified from the literature review. How much these factors have influenced the use of ADCs of bank customers in Bangladesh, is the major objectives of this research, which had not been studied yet in Bangladesh, specifically based on six factors.

3. Research Objectives

In this study, the authors took interest to pursue the factors relating to the use of alternative delivery channels (ADCs) by private bank customers in Bangladesh. The objectives of the study are:

a. To identify users and non-users of private commercial bank's ADCs in Bangladesh.

b. To find out preference of private commercial bank's customers regarding ADCs usages.

c. To explore the factors that influence the use of alternative delivery channels (ADCs) by private bank customers in Bangladesh.

d. To generate and confirm the dimensions of alternative delivery channels (ADCs) in Bangladesh.

4. Research Methods

The research method section is divided into seven sub-sections, viz. sample design, data collections, survey instrument, reliability of the scale, mode of data analysis, identifications of factors that influence customers' ADCs usage in commercial banks of Bangladesh, and demographic characteristics of the respondents.

4.1. Sample Design

The sample for this study is the customers of the different private commercial banks, listed on both Dhaka Stock Exchange (DSE) and Chittagong Stock Exchange (CSE) and have branches in Chattogram city in Bangladesh. In Bangladesh, 62 scheduled commercial banks are currently operated, out of which 29 commercial banks are listed on both DSE and CSE in which 6 are Islamic commercial banks and 23 are conventional private commercial banks (Source: websites of DSE and CSE). The researchers have selected customers who have accounts with and take services from ADCs of 10 private commercial banks purposively out of 29 listed private commercial banks to collect data for the study where 8 are private commercial banks and the remaining 2 are Islamic commercial banks (See Appendix A: Table-1). 300 customers were selected as samples from different branches of the sample banks in Chattogram (30 from each of the sample banks).

4.2. Data Collection

In the study, both primary and secondary data were used to conduct the research where articles and textbooks have been reviewed to find out related variables and existing models on the evaluation of factors that influence customers' ADCs usage. Here, a printed survey questionnaire was prepared based on various literatures (Adeniran and Junaido, 2014; Singh, 2014; Verma, 2014; Mazhar et al., 2014; Amin and Ramayah, 2010; Xue et al., 2007; Khraim et al., 2011; Kumbhar, 2011) to collect primary data where such data were collected by direct personal visit to the respondents. A total number of 300 questionnaires were distributed to 300 sampled bank customers who stayed in Chattogram cities, had account with and enjoyed services of ADCs from that sampled private commercial banks. Due to some limitations, such as customers' reluctance to answer questions, workload, etc., all questionnaires from all the selected customers of the sample banks were not possible to collect. Finally, a total of 200 questionnaires (67%) were found with usable responses (See Appendix-A: Table-1).

4.3. Survey Instrument

Questionnaire survey method were administered among the respondents by providing a 26-item questionnaire developed by the researchers to gather primary data where 6 questions were about demographic characteristics of respondents and the remaining 20 questions were 5-point Likert scale (5 = Strongly Agree…, 1 = Strongly Disagree) to identify factors that influences customers' ADCs usage. Further, under Confirmatory Factor Analysis 4 items were deleted due to low have low squared multiple correlation less than 0.20 and considered remaining 16 items valid from those 20 items to develop factors that influenced customers' ADCs usage of private commercial banks in Bangladesh.

4.4. Reliability and Validity

Reliability is formed with an overall Cronbach's alpha that shows the strong or weak consistency of a set of items (variables) that are considered as a hypothesis to measure the study concept. In this study, reliability test is used to verify the internal consistencies of predetermined items/variables (Cooper & Schindelr, 2001; Hair, Anderson, Tatham, & Black, 2003; Malhothra, 2002) regarding the factors to factors that influences customers' ADCs usage of private commercial banks. It is quite important to say that its value varies from 0 to 1, but values more than 0.6 is required to be reliable (Cronbach, 1951; Malthothra, 2002). Cronbach's alpha is used in the current study to measure the reliability of the scale.

Further, to determine construct validity Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA) and Pearson's correlation matrix are performed. Under EFA, Principal Component Analysis (PCA) with orthogonal varimax rotation is performed to extract factors in the study. For factor analysis, the SPSS (Statistical Package for Social Science) and AMOS graphics, 23.00 versions are used in the study.

4.5. Mode of Data Analysis

A sophisticated method of statistics – Factor Analysis by varimax rotation method is used in this present study to obtain interpretable dimensions. Here, researchers have followed the initial factor matrices to varimax rotation

procedures to provide orthogonal common factors (Kaiser, 1958) from 20 items in the study. Finally, factors regarding the customers' ADCs usage are made on the basis of factors scores. After that, the first order confirmatory factor analysis (CFA) is performed in the overall dataset through the maximum likelihood (ML) estimate to evaluate the validity of a theoretical construct (Byrne & Gavin, 1996). The constraints employed are riskiness, convenience, cost effectiveness, easily accessible, time savings and transaction flexibility. Afterwards, CFA results are evaluated whether the un-dimensionality and reliability of each contract are confirmed. The model fit indicators evaluated are CMIN / DF, RMSEA, SRMR, GFI, AGFI, CFI, PCLOSE and HOELTER.

To discuss the model fit of SEM, the study considers the criteria of the various model fit indices a follows:

Table-2: Criteria of Model Fit Indices

Model Fit Indices	Description	Criteria	Source
CMIN/DF	Relative Chi-square value	< 3	Hu & Bentler, 1999.
GFI	Goodness-of-Fit	≥ 0.90 (Depend on the sample size) ≥ 0.80 (Marginal)	Mulaik et al., 1989; Chandra et al., 2018.
AGFI	Adjusted Goodness-of-Fit	≥ 0.90 (Depend on the sample size) ≥ 0.80 (Marginal)	Mulaik et al., 1989; Chandra et al., 2018.
CFI	*Comparative Fit Index*	≥ 0.90 (Very Good Fit) ≥ 0.80 (Satisfactory) ≥ 0.75 (Fair Fitting Model)	Konovsky & Pugh, 1994; Du Plessis, 2010; Moolla & Bisschoff, 2013.
RMSEA	*Root Mean Square Error of Approximation*	< 0.08 (Good fit) 0.08-0.10 (Mediocre Fit)	MacCallum et al., 1996.

SRMR	Standardized Root Mean Square Residual	< 0.05 (Well Fit Model) < 0.08 (Deemed acceptable)	Byrne, 1998; Diamantopoulos & Siguaw, 2000; Hu & Bentler, 1999.
HOELTER	Hoelter'sindex	Critical Sample Size > 75 at *p* value 0.05 and 0.01	Arbuckle, 2012; Newsom, 2005.

Source: Author's contribution based on literature review

4.6. Identifications of Factors that Influence Customers' ADCs Usage in Commercial Banks of Bangladesh

The factors influencing customers' ADCs usage in commercial banks of Bangladesh based on various literatures (Adeniran & Junaido, 2014; Singh, 2014; Verma, 2014; Mazhar et al., 2014; Amin & Ramayah, 2010; Xue et al., 2007; Khraim et al., 2011; Kumbhar, 2011) have been presented in the following table:

Table-3: List of Factors Affecting the Use of Alternative Delivery Channels (ADCs) by Bank Customers

S.N	List of Factors Affecting the Use of Alternative Delivery Channels (ADCs) by Bank Customers	Notification
1.	Easier to do banking	X1
2.	Available banking services on holidays	X2
3.	Convenient way to manage finances	X3
4.	Transactions are done more quickly	X4
5.	Comfortable to use debit card or credit card instead of carrying cash	X5
6.	Payment for goods and services can be made easily	X6

7.	Payment of electricity and telephone or recharges of cell phone become easy	X7
8.	Time saving by conducting transaction using ADCs	X8
9.	Instant feedback about transaction	X9
10.	Access banking account from anywhere	X10
11.	Available services for 24 hours a day	X11
12.	Enables to accomplish banking activities more quickly	X12
13.	Less transaction cost	X13
14.	Reasonable bank charges for issuance of debit card	X14
15.	Save travel expenses	X15
16.	Accessibility of information concerning banking transactions by others	X16
17.	Riskiness as payment may go to some incorrect account	X17
18.	Information related to banking transactions can be hacked or tampered	X18
19.	Chance of fraud while transferring funds	X19
20.	Chance of data loss	X20

Source: Review of literatures of the study

4.7. Demographic Characteristics of the Respondents

Selection variables in this category are gender, age, educational qualification and family monthly income. The following Table-shows demographic characteristics of the respondents.

Table-4: Demographic Characteristics of the Respondents

Gender	**Frequency**	**Percentage**		
Female	52	26		
Male	148	74		
Total (*N*)	**200**	**100**		
Age	**Female**	**Male**	**Total**	**Percentage**
18-24 Years	13	65	78	39
25-32 Years	17	46	63	31.5
33-40 Years	17	30	47	23.5
> 40 Years	5	7	12	6
Total	**52**	**148**	**200**	**100**
Educational Qualification	**Female**	**Male**	**Total**	**Percentage**
S.S.C.	10	40	50	25
H.S.C.	22	49	71	35.5

Graduate	16	39	55	27.5
Post Graduate	4	20	24	12
Total	**52**	**148**	**200**	**100**
Family Monthly Income	**Female**	**Male**	**Total**	**Percentage**
Less than BDT 20000	15	54	69	34.5
BDT 20001 - BDT 40000	20	55	75	37.5
BDT 40001 - BDT 60000	10	24	34	17
BDT 60001- BDT 80000	4	11	15	7.5
> BDT 80000	3	4	7	3.5
Total	**52**	**148**	**200**	**100**

Source: Contribution of authors

From the of Table-4, it is found that out of total sample 74 percent are male and the remaining 26 percent are female respondents. From the table, it is found that 39 percent of the respondent is in the age group 18-24 years, where 65 respondents are male and 13 respondents are female out of 78 respondents. The second highest age group lies within 25-32 years which is about 31.5 percent where 46 respondents are male and 17 respondents are female out of 63 respondents. Besides, 23.5 percent of the respondent is in the age group 33-40 years and the remaining 6 percent of the respondent is in the age group > 40 years where 30 respondents are male and 17 respondents are female out of 47 respondents and 7 respondents are male and 5 respondents are female out of 12 respondents respectively.

The study also considers educational qualifications of the respondents as formal education is always considered an important capital of individual in building his or her occupational career (Lipset & Bendix, 1989). In this context, Table-4 portrays that 35.5 percent of the respondents are HSC where 49 respondents are male and 22 respondents are female out of 71 respondents. The graduate respondents are in second highest position which is about 27.5 percent where 39 respondents are male and 16 respondents are female out of 55 respondents. Besides, 25 percent of the respondents SSC and the remaining 12 percent of the respondents are post graduate where 40 respondents are male and 10 respondents are female out of 50 respondents under SSC education and 20 respondents are male and 4 respondents are female out of 24 respondents under post graduate education respectively.

Further the study also considers family monthly income of the respondents. Table-4 shows that 37.5 percent of the respondents is within the range of BDT 20001 - BDT 40000 family income level where 55 respondents are male and 20 respondents are female out of 75 respondents. The second highest position belongs to less than BDT 20000 income level, which is about 34.5 percent where 54 respondents are male and 15 respondents are female out of 59 respondents. Besides, 17 percent of the respondent lies within BDT 40001 - BDT 60000 income level where 24 respondents are male and 10 respondents are female out of 34 respondents. 7.5 percent of the respondent is in BDT 60001- BDT 80000 income level where 11 respondents are male and 4 respondents are female out of 15 respondents and the remaining 3.5 percent of the respondent is in > BDT 80000 family income level where 4 respondents are male and 3 respondents are female out of 7 respondents respectively.

5. Data Analysis and Findings

The data analysis and findings of the study are addressed in five parts, viz., users and non-users of ADCs, preference to use ADCs by respondents, appropriateness of data for factor analysis, factor analysis (PCA and CFA), and correlation matrix.

5.1. Users and Non-users of ADCs

The following Table-shows users and non-users of ADCs.

Table-5: Frequency Distribution for ADCs Usage

Frequency Distribution for ADCs Usage	**Users**			**Non-users**			**Total (*N*)**
ADCs	**Female**	**Male**	**Total**	**Female**	**Male**	**Total**	
ATM/Debit Card	50 (25.64%)	145 (74.36%)	195 (97.5%)	2 (40%)	3 (60%)	5 (2.5%)	200
Credit Card	6 (42.86%)	8 (57.14%)	14 (7%)	46 (24.73%)	140 (75.27%)	186 (93%)	200
Internet Banking	15 (22.06%)	53 (77.94%)	68 (34%)	37 (28.03%)	95 (71.97%)	132 (66%)	200
Mobile Banking	32 (32.99%)	65 (67.01%)	97 (48.5%)	20 (19.42%)	83 (80.58%)	103 (51.5%)	200
SMS Banking	37 (24.67%)	113 (75.33%)	150 (75%)	15 (30%)	35 (70%)	50 (25%)	200

Source: Contribution of authors

Table-5 portrays that majority of the respondents use ATM/Debit card. 97.5% i.e., 195 out of 200 respondents uses ATM/Debit card where 74.36% i.e., 145 respondents are male and the remaining 25.64% i.e., 50 respondents are female. The second highest types of ADCs used by respondents is SMS banking which is 75% of 200 respondents where 75.33% i.e., 115 respondents are male and the remaining 24.67% i.e., 37 respondents are female. The next mostly used ADCs types by respondents is mobile banking which is 48.5% i.e., 97 out of 200 respondents uses mobile banking where 67.01% i.e., 65 respondents are male

and the remaining 32.99% i.e., 32 respondents are female.34% i.e., 68 out of 200 respondents uses internet banking where 77.94% i.e., 53 respondents are male and the remaining 22.06% i.e., 15 respondents are female. Besides, the study finds that the respondents use less credit card which is 7% i.e., 14 out of 200 respondents use credit card where 57.14% i.e., 8 respondents are male and the remaining 42.86% i.e., 6 respondents are female.

5.2. Preference to Use ADCs by Respondents

The following Table-shows preference to use ADCs by respondents.

Table-6: Frequency Distribution of customer's preference to use ADCs

Frequency Distribution of Customer's Preference to Use ADCs	**Yes**			**No**			**Total (*N*)**
Preferred ADCs	**Female**	**Male**	**Total**	**Female**	**Male**	**Total**	
ATM/Debit Card	40 (23.67%)	129 (76.33%)	169 (84.5%)	12 (38.71%)	19 (61.29%)	31 (15.5%)	200
Credit Card	1 (20%)	4 (80%)	5 (2.5%)	51 (26.15%)	144 (73.85%)	195 (97.5%)	200
Internet Banking	1 (16.67%)	5 (83.33%)	6 (3%)	51 (26.29%)	143 (73.71%)	194 (97%)	200
Mobile Banking	10 (50%)	10 (50%)	20 (10%)	42 (23.33%)	138 (76.67%)	180 (90%)	200
SMS Banking	7 (35%)	13 (65%)	20 (10%)	45 (25%)	135 (75%)	180 (90%)	200

Source: Contribution of authors

Table-6 portrays that majority of the respondents prefer to use ATM/Debit card. 84.5% i.e., 169 out of 200 respondents prefer to use ATM/Debit card where 76.33% i.e., 129 respondents are male and the remaining 23.67% i.e., 40 respondents are female. The respondents have same preference regarding mobile banking and SMS banking which are 10% but considering gender, male and female respondents equally prefer to use mobile banking whereas 65% of 20 respondents i.e., 13 male respondents and the remaining 35% of 20 respondents i.e., 7 female respondents prefer to use SMS banking. 3% i.e., 6 out of 200 respondents prefer to use internet banking where 83.33% i.e., 5 respondents are male and the remaining 16.67% i.e., 1 respondent is female. Besides, the study finds that the respondents have lowest preference to use credit card which is 2.5% i.e., 5 out of 200 respondents prefer to use credit card where 80% i.e., 4 respondents are male and the remaining 20% i.e., 1 respondent is female.

5.3. Appropriateness of Data for Factor Analysis

Kaiser-Meyer-Olkin (KMO) is a useful method to show the appropriateness of data for factor analysis. This method is a measure of sampling adequacy. The KMO statistics varies between 0 to 1. Kasier (1974) recommends that values greater than 0.5 are acceptable. Again, Bartlett's test of sphericity (Barlett, 1950) is another statistical test applied in the study for verifying its appropriateness. This test should be significant i.e., having a significance value less than 0.5.

Table-7: KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.707
Bartlett's Test of Sphericity	Approx. Chi-Square	1130.235
	Df	190
	Sig.	.000

Source: Contribution of authors

In this study, the value of KMO is .707 which is greater than .5, thereby indicating that the sample taken to process the factor analysis is acceptable. Besides, the significance value is also less than 0.50. So, according to Bartlett's Test of Sphericity, the data is appropriate for the factor analysis.

5.4. Factor Analysis

After examining the reliability of the scale and testing appropriateness of data, we next carry out factor analysis to simplify diverse relationship that exists among set of observed variables. For this, the study employs principal component analysis (PCA) followed by the varimax rotation. After that, Confirmatory Factor Analysis (CFA) is employed based on PCA results of the study to construct validity.

5.4.1. Result of Principal Component Analysis

The study used PCA for factor extraction and orthogonal method for factor rotation. It is necessary to mention here that factor loading greater than 0.3 is considered significant, 0.4 is considered more important and 0.5 or greater is considered very significant (Hair, Anderson, Tatham, & Black, 2003). For parsimony, only those factors with loadings above 0.5 are considered significant (Hair et al., 2003; Pal & Bagi, 1987; Hair et al., 1998; Pal, 1986). Again, in the study, most of the factors that influences customers' ADCs usage explains about 60 percent of the variance associated with most of the variables, the factors fit data quit-well.

To find out determinants that influence customers' ADCs usage of commercial banks in Bangladesh, twenty reasons are taken into consideration. A principal component factor analysis with varimax rotation is performed for these twenty items/reasons indicating factors that influence customers' ADCs usage. Here, six factor results i.e., riskiness, convenience, cost effectiveness, easily accessible, time savings and transaction flexibility are emerged from the output with eigenvalues greater than 1 (Appendix B: Table-8). These six factor results are generated after grouping the items/reasons with a factor loading of higher than 0.45 under a factor. The total variance is 61.795% which indicates that the six-factor solution explain 61.795% of the total variance where the remaining variance is explained by other items. The six dimensions that influence customers' ADCs usage are named accordingly and discussed as follows:

The result of Cronbach's alpha coefficients of the six dimensions are 0.829 (Riskiness), 0.605 (Convenience), 0.690 (Cost Effectiveness), 0.649 (Easily Accessible), 0.612 (Time Savings) and 0.602 (Transaction Flexibility).

Riskiness

This factor is represented by four variables of riskiness (F1) with factor loading ranging from 0.858 to 0.745. They are Chance of fraud while transferring funds, Information related to banking transactions can be hacked or tampered, Chance of data loss, and Riskiness as payment may go to some incorrect account. This component accounted for 14.173% variation with eigenvalues 3.612 (Appendix B: Table-8). Jalal et al. (2011) indicate that all the elements for the three identified factors such as perceived usefulness (PU), perceived ease of use (PEOU), security and privacy (PC) are important with respect to the users' adoption of e-banking services.

Convenience

This factor is represented by four variables of convenience (F2) with factor loading ranging from 0.773 to 0.470. They are Available banking services on holidays, Easier to do banking, Convenient way to manage finances, and Accessibility of information concerning banking transactions by others. This component accounted for 10.635% variation with eigenvalues 2.672 (Appendix B: Table-8). Kashyap and Sharma (2012) argued that in this electronic era there exist no need to count days to get account balance statement at the end of the month; also with the proliferation of ADCs, a bank customer does not need to wait for his turn to avail service of a bank personnel because now the bank is available at your door step in form of internet banking, mobile banking etc.

Cost-effectiveness

This factor is represented by three variables of cost-effectiveness (F3) with factor loading ranging from 0.906 to 0.478. They are Reasonable bank charges for issuance of debit card, Less transaction cost, and Save travel expenses. This component accounted for 9.705% variation with eigenvalues 1.991 (Appendix B: Table-8). The Nigerian authors Adeniran and Junaido (2014) found out in their research that cost of using ATM, simplicity in handling the machine and

safety of the entered information and monetary value, all play vital role in attracting banking clientage towards this means of service.

Easily Accessible

This factor is represented by three variables of easily accessible (F4) with factor loading ranging from 0.757to 0.693. They are Available services for 24 hours a day, Access banking account from anywhere and enables to accomplish banking activities more quickly. This component accounted for 9.688% variation with eigenvalues 1.611 (Appendix B: Table-8). Alternative delivery channels of banking enable the customer to have direct link with the bank via mobile anywhere and everywhere (Mazhar et al, 2014).

Time Savings

This factor is represented by three variables of time savings (F5) with factor loading ranging from 0.750to 0.633. They are Payment of electricity and telephone or recharges of cell phone become easy, Time saving by conducting transaction using ADCs, and Instant feedback about transaction. This component accounted for 9.332% variation with eigenvalues 1.407 (Appendix B: Table-8). Wisdom (2012) also provided further evidence to the fact that use electronic banking products saves time, makes banking services more convenient and quickens service delivery among others.

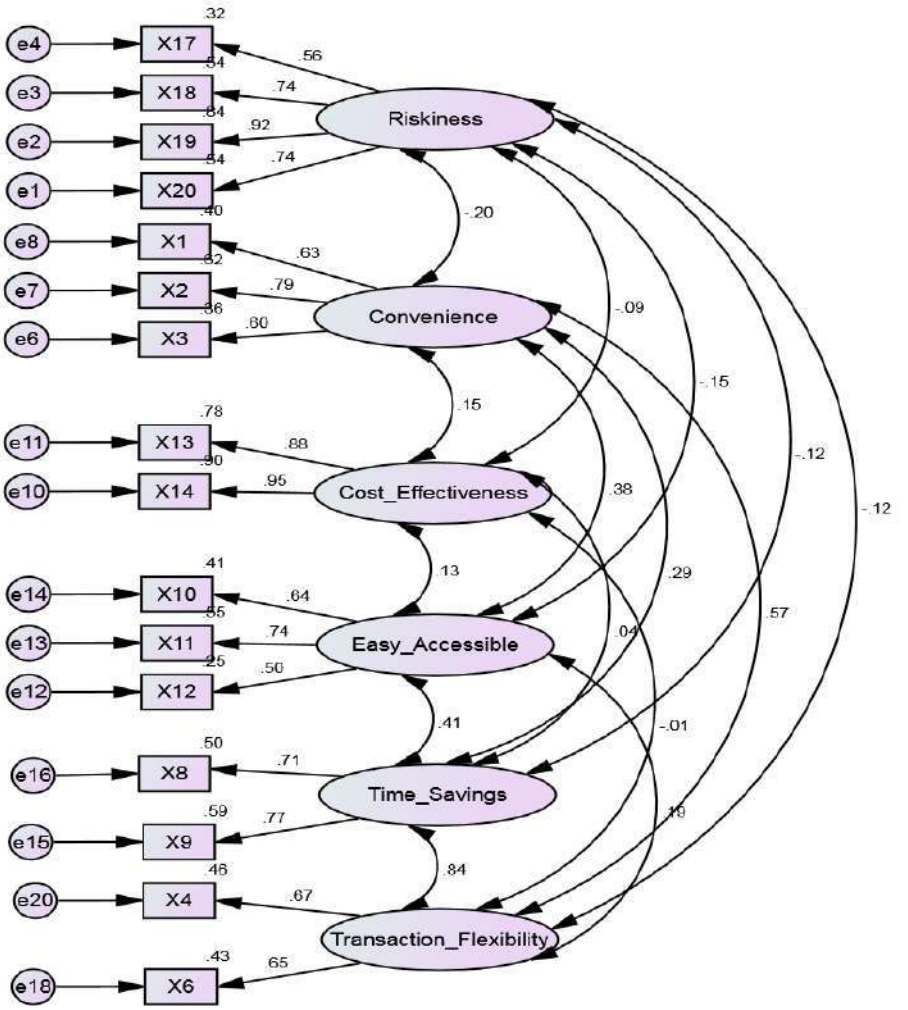
Transaction Flexibility

This factor is represented by three variables of transaction flexibility (F6) with factor loading ranging from 0.749 to 0.522. They are Comfortable to use debit card or credit card instead of carrying cash, Transactions are done more quickly and Payment for goods and services can be made easily. This component accounted for 8.262% variation with eigenvalues 1.066 (Appendix B: Table-8). Bony and Kabir (2012) evaluate about the Practice of e-banking in commercial bank of Bangladesh and they conclude that, e-banking can up surging in banking sector and make our country with more state of art facilities.

5.4.2. Confirmatory Factor Analysis

The study considers the dimensions resulted from Principal Component Analysis to perform Confirmatory Factor Analysis. The following figure-1 shows the relationship between each latent variable of customers' ADCs usage.

Figure-1: Path Diagram



Source: Contribution of authors

The results of CFA showed by Figure-1 and Table-9 explained that the six latent variables are those six factors determined by EFA. From Table-8, the main dimension of riskiness is chance of fraud while transferring funds (0.919), while the main dimension of convenience is available banking services on holidays

(0.787). Furthermore, the main dimension of cost effectiveness is reasonable bank charges for issuance of debit card (0.95), the main dimension of easily accessible is available services for 24 hours a day (0.742) and the main dimension of time savings is instant feedback about transaction (0.765). Finally, the main dimension of transaction flexibility is transactions are done more quickly (0.675). All significant dimensions affect each variable with alpha 1% (Table-9). Under CFA, 16 items under six factors are considered and 4 items are i.e., X5 (Comfortable to use debit card or credit card instead of carrying cash), X7 (Payment of electricity and telephone or recharges of cell phone become easy), X15 (Save travel expenses), and X16 (Accessibility of information concerning banking transactions by others) have been removed from factors Transaction Flexibility, Time Savings, Cost Effectiveness, and Convenience respectively due to have low squared multiple correlation below 0.20 indicating the variance in the items are not much responsible for by the factors (Johnson & Stevens, 2001).

Table-9: Regression Weight

Path	Unstandardized Estimate	Standardized Estimate	S.E.	C.R.	P
X20 <--- Riskiness	1	0.735	CP		
X19 <--- Riskiness	1.204	0.919	0.107	11.234	***
X18 <--- Riskiness	0.925	0.738	0.092	10.055	***
X17 <--- Riskiness	0.702	0.563	0.092	7.605	***
X3 <--- Convenience	1	0.604			
X2 <--- Convenience	1.359	0.787	0.201	6.769	***
X1 <--- Convenience	1.108	0.632	0.172	6.428	***
X14 <--- Cost Effectiveness	1.02	0.95	0.252	4.041	***

X13 <--- Cost Effectiveness	1	0.884	CP		
X12 <--- Easy Accessible	1	0.5	CP		
X11 <--- Easy Accessible	1.376	0.742	0.264	5.207	***
X10 <--- Easy Accessible	1.173	0.639	0.225	5.216	***
X9 <--- Time Savings	1	0.765	CP		
X8 <--- Time Savings	0.936	0.708	0.122	7.671	***
X6 <--- Transaction Flexibility	1	0.652	CP		
X4 <---Transaction Flexibility	0.994	0.675	0.141	7.072	***

Source: Contribution of authors

Notes: **, **, *** Significant at alpha 10 %, 5 %, and 1 % respectively, S.E: Standard Error, C.R: Critical Ratio, CP: Constant Parameter*

The model fit result of the study reports results of the model fit indices like chi-square = 154.816, degree of freedom (df) = 89, p = 0.00, CMIN/DF = 1.740, CFI=0.938, GFI=0.916, AGFI=0.871, RMSEA = 0.061, SRMR = 0.0554, Hoelter's N returns value at 5% significant level = 144 and Hoelter's N returns value at 1% significant level = 159 are found in the model. Based on overall indices, this sample has an acceptable fit to the model as CMIN/DF, CFI, GFI, RMSEA, and SRMR lie in the acceptable ranges (Table-9).

5.5. Correlation

To examine convergent and divergent validity and the relationship between the six latent variables based on CFA, Pearson's correlations are calculated (Sharif et al., 2011). From Table-10, it is revealed that convenience and easily accessible dimensions are significantly related with all dimensions where riskiness is negatively related and other latent variables are positively related. Time savings has positive significant relation with convenience, easily accessible, transaction flexibility and negative significant relation with

riskiness. Additionally, riskiness dimension is negatively correlated with all dimensions and has significant relation with convenience, easily accessible, time saving dimension and transaction flexibility dimension in the study (Table-10).

Table-10: Correlations

	Riskiness	Convenience	Cost Effectiveness	Easily Accessible	Time Savings	Transaction Flexibility
Riskiness	1					
Convenience	-.235***	1				
Cost Effectiveness	-.096	.178**	1			
Easily Accessible	-.181***	.463***	.160**	1		
Time Savings	-.137*	.395***	.045	.490***	1	
Transaction Flexibility	-.143**	.647***	-.010	.296***	.893***	1

Source: Authors computation

Notes: **, **, *** Significant at alpha 10 %, 5 %, and 1 % respectively*

6. Implications of Findings

The present study found that customers use and prefer to use ATM/Debit card more than other alternative delivery channels of banks but less use and less prefer to use credit card. The reasons behind more using ATM/Debit card may be its easy accessibility, availability and less using credit card may be high interest charges against credit card, usages of credit card as debit card against loan, banks conservativeness due to ticket size and recovery uncertainty, credit card with dual currency (taka and USD) cards (Mamun Rashid, 2021). Thus, Bank should follow rules and regulations about compliance of ICT enforced by Bangladesh Bank and charge a reasonable price to increase ADCs usages. To find out the reasons behind ADCs usages, the study revealed six factors i.e., a)

Riskiness, b) Convenience, c) Cost-effective, d) Easily Accessible, e) Time Savings and f) Transaction Flexibility. In this regard, to minimize ADCs riskiness, bank can impose govt. policy in case of transferring funds through ADCs, limit the client's transaction amount, centralize the operations and form effective risk management committee by skilled and experience human resources (Amin, 2018). Moreover, as Convenience, Cost-effective, Easily Accessible, Time Savings and Transaction Flexibility influence customer to use ADCs of bank and increase bank transaction volume (Sathye 1999; Pikkarainen et al., 2004), bank should focus on these quality to attract not only urban customers but also rural customers to increase customers' satisfaction and ultimately increase banks' profit.

7. Conclusion and Recommendation

Alternative Delivery Channels (ADCs) have emerged as a new platform to offer banking services to its customers in the competitive world. Through ADC products and services, the banking services have reached to the unbanked people. Additionally, ADCs usage has a great influence on the banking performance, lower costs, customer satisfaction, customer loyalty and profitability. The present study tries to investigate the various factors that affecting the use of ADCs by private commercial bank customers in Bangladesh. In the study, secondary literature review and primary data collection method were used to conduct the research. Initially, the study found that customers differ in their preferences to use direct banking channels. Most of bank customers i.e., 97.5% of the respondents in the study had already used and 84.5% of the respondents had preferred to use ATM/Debit card due to availability of Taka in the ATM booth but less used i.e., 7% and less preferred i.e., 2.5% to use Credit card due to high interest rate payment. Thus, maintaining reasonable interest rate, improving network services, solving of the problem promptly, bank can make their ADCs users fully satisfied.

Further, the study performed Principal Component Analysis (PCA) with orthogonal varimax rotation under Exploratory Factor Analysis considering 20 items and then based on Principal Component Analysis results the study performed Confirmatory Factor Analysis only with 16 items having high squared multiple correlation more than 0.20 and found six new factors affecting

the use of alternative delivery channels (ADCs) by private commercial bank customers; which are a) Riskiness, b) Convenience, c) Cost-effective, d) Easily Accessible, e) Time Savings and f) Transaction Flexibility. The result reveals that these six factors of ADCs usages explain 61.795% of total variance. The study demonstrates that the chance of fraud while transferring funds under riskiness dimension, available banking services on holidays under convenience dimension, reasonable bank charges for issuance of debit card under cost effectiveness dimension, available services for 24 hours a day under easily accessible dimension, instant feedback about transaction under time savings dimension and transactions are done more quickly under transaction flexibility dimension have a great influence on customer's ADC usages. Thus, banks should focus on their security system to avoid risk and insecurity as network failure, information hacked, fund transfer by fraudulent, money laundering and terrorist financing are involved in automated banking system, providing banking services quickly and ensuring their availability for 24 hours a day even for holidays, making quick responses for bank transactions, and charging reasonable price for debit card issuance in order to keep trust of customers on them. It is argued by Kashyap and Sharma (2012) that the lack of knowledge is a major hindrance in the way of ADCs adoption because a customer who does not understand how to use technology is implied to shy away him from the usage of internet banking.

One of the most important limitations is to use convenience samples that might limit the generalize ability of the findings.

A complete mathematical model to generate the dimensions of bank customer's ADCs usages can be used in the future research where other factors such as profitability from ADCs usages, managerial efficiency factors, social and economic factors can be considered. For proper adoption of ADC, social consciousness is required to understand the ADCs significance. In light of consciousness, legal force contribution is imperative to ensure the infrastructure security and the social security of banking. ADC is contemporary technological advanced system of banking that can assist business environment for economic services digitalization in Bangladesh.

To analyze the study, the following suggestions may be identified:

a) Bank should follow rules and regulations about compliance of ICT enforced by Bangladesh Bank.

b) Banks should focus on their security system to avoid risk and insecurity of customers.

c) By improving network service, providing receipt after transactions, and solving of problems promptly, banks can make their debit card users fully satisfied.

d) Banks have to face some challenges like, lack of customer confidence, security concerns, system failures, cases of transaction errors and network failures. All these challenges must have to fulfill by the banks for achieving competitive advantage.

e) Banking organizations should take necessary steps for delivering knowledge about the use of alternative banking channels to customers.

f) The workforce of banking organization should be properly trained regarding ICT knowledge.

g) Alternative banking channels have impact on the profitability of banks. And agency banking has a positive effect on the financial performance of commercial banks whereby it enhances the financial performance of commercial banks.

Amin (2018) investigates about the alternative delivery channels of Islami Bank Bangladesh Limited: Usage, Challenges, and Prospects of it. According to the study, diffusion rate of ADC products as Online Banking, ATM Card, SMS Banking, Internet-Banking, Mobile-Cash, Electronic Fund Transfer, and Real Time Gross Settlement of IBBL is on growing. The findings also show that huge risk and insecurity because of network failure, money laundering, and terrorist financing involved in automated banking system. The concluding remarks show that compliance of ICT rules and regulations, not depending on single switch to transact data, introducing chip card instead of magnetic stripe, adopting EMV and encryption techniques, skilled IT committee, availability of internet bandwidth will help the banks to confront these risks and challenges successfully. So, banking institutions in Bangladesh have huge opportunity to

introduce alternative delivery channels though some foreign and private commercial banks, like Islami Bank Bangladesh Limited (IBBL) have already introduced some ADC products.

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Appendix-A: List of Sample Commercial Banks and the Respondents from Each Who Have Responded to the Questionnaire

Sample Commercial Banks	No. of Respondents
Al-Arafah Islami Bank Limited	17
Islami Bank Bangladesh Limited	24
City Bank Limited	21
Standard Bank Limited	19
Eastern Bank Limited	19
Trust Bank Limited	20
AB Bank Limited	21
Southeast Bank Limited	18
Prime Bank Limited	20
United Commercial Bank Limited	21

Source: Data have been compiled by the researchers.

Appendix-B: Table-8: Principal Component Analysis with Rotated Component Matrix and Commonalities

Dimensions	Variables	Components						Communality	Cronbach's Alpha
		1	2	3	4	5	6		
Riskiness	X19	.858						.770	0.829
	X18	.841						.715	
	X20	.757						.624	
	X17	.745						.646	
Convenience	X2		.773					.668	0.605
	X1		.718					.597	
	X3		.590					.622	
	X16		.470					.389	
Cost-effectiveness	X14			.906				.828	0.690
	X13			.877				.805	
	X15			.478				.476	
Easily Accessible	X11				.757			.623	0.649
	X10				.734			.603	
	X12				.693			.571	
	X7					.750		.611	

Time Savings	X8					.667		.572	0.612
	X9					.633		.505	
Transaction Flexibility	X5						.749	.594	0.602
	X4						.565	.532	
	X6						.522	.609	
Eigenvalues		3.612	2.672	1.991	1.611	1.407	1.066	12.359	
% of Variance Explained		14.173	10.635	9.705	9.688	9.332	8.262	61.795	

Source: Contribution of authors

PLS-SEM Based Analysis of Customer Satisfaction of Mobile Banking in Bangladesh: A Study on Users' Perspective

Golam Shahria *
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Abstract

In the present world of information technology and competitive business environment, the cell phone based mobile banking service is considered as one of the most value added multidimensional business events in the banking industry. Because of the fastest growing number of mobile banking users in Bangladesh, the banking companies have enormous opportunities to capture market share by properly adopted the critical aspect of customer satisfaction. This paper focuses on general users of mobile banking. The objectives of this study are to identify most influencing factors and determine how strongly these factors influence customer satisfaction and retaining in mobile banking. It is a quantitative research through self-administered questionnaire as primary data collection instrument. The hypotheses have been developed by reviewing existing literature and published articles as secondary data. 455 usable questionnaires were returned out of 550 questionnaires and these collected data were analyzed by Partial Least Square Structural Equation Model (PLS-SEM) with the use of Smart_PLS (V 327) to validate the model and test the hypothesis. The findings of the research exposed that convenience; expense and responsiveness have significant influence while security and relative advantage have insignificant influence on satisfaction. In spite of having some limitation, the research provides some practical implication for banks with better strategic perception to design mobile banking services to crop higher customer satisfaction.

Key Words: Convenience, Expense, Loyalty, Relative advantage, Responsiveness, Satisfaction, Security.

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Introduction

The development and adoption of information technology in financial sector have given banking services a new dimension in the 21st century. The banking industry has unsurprisingly changed itself for the provision of quick and quality customer services to the customer in the form of modern technology based banking facilities such as online banking, ATM service, mobile banking etc. Mobile banking is one of the most suitable banking services which create the opportunity to bring the people under the shade of banking services that were away from banking services before. Because of mobile banking, previously unbanked rural population can now enjoy various banking facilities like utility bill payment, fund transfer, shopping, cash withdrawal etc. Mobile banking makes banking available to everyone, everywhere, and every time irrespective of branch location and office hour. Simply mobile banking means leading banking transactions via a mobile device such as cell phone. Broadly, it is a multi-platform co-operation between mobile operators and banking industry that integrate mobile communication and electronic money to facilitate bank related various activities through a mobile phone. This mobile banking service is gaining popularity not only in developed countries but also in developing countries like Bangladesh with the rapid improvement of technology and increasing use of mobile phone.

Upward popularity of mobile banking creates a great opportunity for banking industry to enlarge their business, but it passes the challenges for marketers to satisfy and retain customers as well. Therefore, the critical understanding of customer satisfaction in mobile banking is now the demand of time. And also critical evaluation of factors that affect customer satisfaction in mobile banking and confirm retention is important for banking industry to take marketing strategies that will ensure present satisfaction and encourage new dimension for future customer satisfaction in mobile banking in Bangladesh.

Literature Review

With the incredible growth in mobile usage, mobile banking has become very familiar and popular to the customer for relaxed and tension-free banking activities. At the same time, bankers are also concerned to add new features and maintain current value added services in mobile banking. Therefore mobile banking is now a significant issue of research and already there exists many research studies regarding different aspects of mobile banking with special focus on customer satisfaction. Singh (2012) quantified mobile banking as an evolutionary step in banking sector of India where banks work together with mobile operators to offer latest banking service in variety of business field. Younus Z. and Zaman D. S. U. (2021) found that the adoption of mobile financial services had positive impact on the economic indicators in Pakistan. Glavee G. R. et al (2017) provided comprehensive insights which include the deciding factors affecting an individual's intention to adopt mobile banking services in Pakistan. Kahandawa & Wijayanayake (2014) said that the mobile banking creates a new platform in commercial transactions and this platform enables Sri Lankan business trading with minimum time and effort. Rapid transaction and easy access of mobile banking make banking activities convenient for Nepalese people (Shrestha, 2013). Yousuf and Wahab (2017) found the speed of mobile banking as the most significant advantage in Malaysian business sector.

Farah, M.F., Hasni, M.J.S. and Abbas, A.K. (2018) showed that most of the predictors of intention, including perceived value, performance expectancy, habit, social influence, effort expectancy, perceived risk and trust has significant influence on adoption of mobile banking in Pakistan. Laforet & Li, (2005) discovered that Chinese people were unwilling to use mobile banking in the initial stage due to security concern in spite of having various benefits. Achieng & Ingari (2015) showed in their study that cost is also a concerning issue along with security for Kenyan people to use of mobile banking.

Mattila (2003) said in the study that security and trustworthiness were most important factors but complexity, compatibility and relative advantage also had significant influence on the people of Finland for the adoption of mobile banking service. Author analyze the relation of five factors (complexity, reliability, relative advantage, compatibly and accessibility) with customers

attitude towards mobile banking and finally find out that relative advantage was the most significant predictors of adoption of mobile banking. Aldiabat K. et. al. (2019) stated that supportive access factor of mobile banking is associated with the user satisfaction related to mobile banking in Jordan. Glavee G. R. et al (2017) found that perceived behavioral control (PBC) has significantly stronger effect on mobile banking adoption intention. Bhatt (2016) found time effectiveness, convenience, safety; responsiveness and simplicity had significant influence on customer's adoption and satisfaction in mobile banking in India. Younus Z. and Zaman D. S. U. (2021) indicated that the perceived trust, convenience and perceived risk had a significant influence on the adoption of mobile banking services but perceived cost and reliability were said to have insignificant influence on its adoption.

Shaikh S. et al (2018) stated that cost efficiency, easiness and security have significant impact on customer E-Satisfaction. But, cost efficiency and security are in negative or inversely in relation although easiness factor is in positive relation. Ravichandran & Madana (2016) used the SPSS V21 and argued that usefulness, perceived risk, and compatibly significantly influence people but social influence and literature have little impact on customer satisfaction in mobile banking in Sri Lanka. Almost same result reveals in a research carried out by Cheah et al (2011) in Malaysia in 2011 and they found out that significant factors influenced mobile banking adoption. They used Technology Acceptance Model (TAM) and found usefulness, relative advantage, ease of use and innovativeness had positive influence but risk had negative influence and social norms had no role in this case. The traditional TAM model suggests security, facilitating condition and performance expectancy can satisfy a customer in mobile banking in Thailand (Boonsiritomachai & Pitachyadejanant, 2017). Leiva et al (2017) identified that adopting an extended TAM, Structural equation Model (SEM) analysis reveals usefulness, trust, easiness and relative advantage as main influencing factor in Spain for mobile banking adoption.

Mobile banking in Bangladesh is now very popular and is also gaining more popularity day by day like other countries. The following table shows an increasing trend on users of both mobile phone and mobile banking.

Table-1: Use of mobile phone and mobile banking

	Nov, 19	Oct, 19	Sep, 19	Aug, 19	July, 19
The total number of Mobile Phone subscribers (in millions)	164.832	164.170	163.415	162.583	162.117
No. of registered clients in mobile banking (in millions)	78.594	77.3.95	75.978	73.585	73.091
No. of daily average transaction	7,680,771	7,330,541	7,078,839	6,587,757	7,335,807
Average daily transaction (in crore BDT)	1,263.96	1,218.15	1,181.11	1,145.57	1,208.95

Source: Bangladesh Bank and Bangladesh Telecommunication Regulatory Commission (BTRC)

There are some research conducted on mobile banking and most of the researches are about implementation, prospect and challenges of mobile banking in Bangladesh. Bhuiyan M.S.R. and Rahman M.M. (2013) showed that tremendous potential for mobile banking in Bangladesh and reveal some of the key barriers to progress as well. Hossain M.A. and Haque M. Z. (2014) found some challenges which might hinder mobile banking implementation in Bangladesh such as technical and security standards, regulatory and supervisory issues and business and legal issues. On the other hand, Kabir (2013) find out that easy use, usefulness, trust and relative advantage positively influenced and risk negatively influenced mobile banking adoption in Bangladesh. By conducting a quantitative research only 2nd generation bank, Jannat and Ahmed (2015) identified ineffective advertisement as negatively influencing factor of mobile banking.

Although mobile banking is an emerging issue in Bangladesh, a few literature scan be found in this field. No significant research was found in existing literature about the measurement of customer satisfaction and loyalty. In addition, TAM and SPSS have been used as statistical tool at present in almost all research in this filed. The Smart PLS is now most popular and accurate tool for determining customer satisfaction at detailed factor analysis. So this study is an attempt to make up the gap of use of modern statistical tool for determining factors and enrich the present literature by measuring which factor/s strongly influence customer satisfaction and loyalty in mobile banking in Bangladesh.

Customer Satisfaction Relating to Mobile Banking

Customer satisfaction is a measurement that determines how well a company's products or services meet customer expectations. Customer satisfaction is a measure of how people feel when interacting with the brand. It can be influenced by any number of factors. Customer satisfaction is known as a result of service quality, which implies that it is identified with the nature of the items administrations gave to the client in a positive way (Yeo, Thai, & Roh, 2015).

Mobile Banking is a technique of providing facilities to a consumer to carry out banking transactions on the mobile phone through a data service-provider. On the other hand, mobile banking refers to a system that enables bank customers to access their accounts and general information on bank products and services through mobile devices. Banks need to provide services to their customers whenever they require it and wherever they are. Bank now call this facility as "Anywhere and any moment banking". Banks can provide these facilities through mobile banking.

More than 70% of the population of Bangladesh lives in rural areas where access to formal financial services is difficult. However, these are the people who are in most need of receiving funds from loved ones in distant locations, or to access financial tools to improve their economic condition. Less than 15% of Bangladeshis are connected to the formal banking system whereas over 68% have mobile phones. These phones are not merely devices for talking, but can be used for more useful and sophisticated processing tasks. In this study, Bank-led Mobile Financial Service Provider is also considered who are operating under the license and approval of the Central Bank (Bangladesh Bank) as a

subsidiary of various banks in Bangladesh such as bKash, Upay, Rocket etc. Bank-led Mobile Financial Service Provider provides safe, convenient and easy ways to make payments and money transfer services via mobile phones to both the unbanked and the banked people of Bangladesh.

Research Objectives

The following objectives have been developed for the study by reviewing the above mentioned literature:

1. To identify the factors which affect customer satisfaction of mobile banking.
2. To examine the significance of each factor in Bangladesh perspective.
3. To measure how the factors strongly influence customer satisfaction in Bangladesh.
4. To discover the relation between satisfaction and loyalty in case of mobile banking.

Research Methodology

1. Conceptual Mode and Hypothesis Development

Partial Least Square Structural Equation Model (PLS-SEM) is used for evaluating the factors affecting customer satisfaction. A conceptual model has been designed that expressed the relationship between endogenous and exogenous latent variables. There are 16 factors that have been confirmed based on existing above literature for SEM technique model and these 16 factors have been categorized into five groups namely convenience, security, relative advantage, expense and responsiveness. These five groups of factors are called exogenous latent variable. Satisfaction and loyalty are the endogenous variables each of which consists of three indicators (presented in appendix-1).

For a long duration customer satisfaction is the focal point of marketing research. *Customer satisfaction* indicates positive and happy feelings of a consumer after consuming the product or service (Kheng et al, 2010). Yussoff N. M. & Nayan S.M. (2020) said in their research that customer satisfaction is important because it shows whether the business is accepted by the market or

not. Kotler and Keller (2009) defined customer satisfaction as a person's feeling of pleasure or disappointment resulting from comparing a product's perceived performance (or outcome) in relation to his/her expectations. The customer satisfaction is treated as the necessary premise for the retention of customers. Lam & Burton (2006) identified satisfaction as the main determinants of loyalty. Yussoff N. M. & Nayan S.M. (2020) showed that customer is loyal to a particular brand because they received good products and services from the company. Customer's loyalty is measuredas a significant intangible asset for various companies (Jiang and Zhang, 2016). Customer's loyalty is viewed as a long-term asset (Kandampully et al., 2015). Actually *loyalty* is the degree to which a customer exhibits repeated purchasing behavior from the vendor (Kotler et al, 1999). So, like many other services in case of mobile banking, customer loyalty is also associated with customer satisfaction in Bangladesh.

H_1: satisfaction influence loyalty.

Chikomo K. et al (2006) stated that mobile banking is attractive because it is a convenient approach to perform remote banking. Conveyance is the extent to which mobile banking can serve user's needs. It may include ease of use, usefulness etc. (Kabir, 2013). The results indicated that access convenience, transaction convenience, benefit convenience, and post-benefit convenience have a crucial impact on m-banking adoption intention (Jebarajakirthy C. and Shankar A. 2021).

H_2: Convenience influence satisfaction

Users of mobile banking considered the amount of cost or expenses associated with this transaction. Liza F.Y. (2014) found that customers will consider adopting mobile banking for long but cost is the most critical factor. Costs of mobile banking include bank charge, transaction fee, mobile network charge etc. (Achieng & Ingari, 2015). Although mobile banking requires some transaction cost, it may reduce transportation cost. Sometimes, it is helpful to reduce total cost by providing the facility of utility bill payment, discount on shopping, discount on restaurant bill etc. Cost or expense is an important consideration for people in a developing country.

H_3: Expense influence satisfaction

Security is the vibrant issue to customer for virtual transaction. Chikomo K. et al (2006) proposed that security problems can be solved to provide secure and economic communications between the mobile application and the bank servers. The proposed solutions allow the users to bank using secure SMS and GPRS. Wodo W. et al (2021) stated that the security problem can be solved not only in technical areas, but also at the level of awareness and habits of their users. Ghosh and Barua (2014) defined security as the safety and protection of information. But in practice not only information but also monetary issue is closely related with security because of fraud and hacking (Kabir, 2013). Security will ensure assurance. So, assurance should have positive impact on satisfaction.

H_4: Security influence satisfaction

A product's degree of superiority and attractiveness to customers is called the relative advantage. Relative advantage is the degree to which the innovation is observed by users to be better than the existing idea; i.e. perceived cost and benefits (Rogers, 2003). Suleiman (2015) indicate that perceived benefits include 'direct benefits' similar education in transaction costs and transaction errors, improved data accurateness and faster proffering process. Relative advantage means comparative benefits that a user gets from mobile banking. This benefit can be expressed by social prestige, savings in time etc. (Mattila, 2003). Relative advantages have positive relation with any service quality and satisfaction.

H_5: Relative advantages influence satisfaction

Responsiveness is the customer's perception of receiving help when needed (Achieng & Ingari, 2015). Responsiveness creates close satisfying relationship. Immediate response from mobile operator and bank or agent can be an important influencing factor in customer satisfaction.

H_6: Responsiveness influence satisfaction

2. Data Collection

The quantitative research approach has been used in this study. Both primary and secondary data were collected for this research. A self-administered questionnaire has been developed from the literature for collecting primary data. The questionnaire contain twenty two questions which were measured by five point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The sources of secondary data include website, internet, different working papers and published articles. Secondary data were analyzed to find out research gap and variables for the study. Analysis of secondary data also enriches literature review.

3. Population and Sample

The population of this study is the users of mobile banking services for who are living in Chittagong of Bangladesh. The convenient sampling technique is used to select potential participants for this study. The age range of respondents is 20 to 55 years old. 550 questionnaire had been distributed to respondents. The valid respondents were 455 covering 83% of original sample. A study of mobile banking has been conducted on 400 respondents who are living in Bangkok (Tan B. et. al 2020). Another study of mobile banking is conducted in Pakistan on 250 respondents to get their ideas on mobile banking services (Younus, Z., Zaman D. S. U. 2021). Glavee-Geo R. et al (2017) a survey approach was used with a sample of 189 responses from across Pakistan. Multi-group analysis was performed in order to detect gender differences among men and women in the process of adopting m-banking.

4. Research Tool

Partial Least Square Structural Equation Model (PLS-SEM) has been used for calculating the effect of observed variables and their indicators on satisfaction and loyalty. Data analysis has been done through Smart_PLS, Version-3.2.7.

Smart_PLS is a prominent software application for PLS-SEM which was initially developed by Ringle, Wende & Will (2005). SEM consists of two sub model; one is outer model that specifies the relationship between latent variable and their manifest variables and another one is inner model which specifies the relationship between endogenous (dependent) and exogenous (independent) latent variable.

Data Analysis and Interpretation

PLS-SEM is analyzed and evaluated in a systematic process which consists of two stages-Outer measurement model analysis and Inner structural model analysis. The analysis of outer model involves determining indicator reliability, internal consistency, discriminant validity, and convergent validity (Petera et al, 2017).

Indicator reliability is the square value of outer loading of the items (Wong, 2013). This reliability defines the percentage of variance extracted from the indicators (Hair et al, 2017).The result of indicator reliability of 0.70 or higher is preferable **(**Hussain, 2018**)** and greater than or equal to 0.5 is acceptable (Wong, 2013) but for exploratory research 0.4 can be accepted (Hulland, 1999). The result of indicators reliability of this study is presented in the following table (table-2).

To measure Internal Consistency, Cronbach's Alpha is traditionally used but literatures suggest that using composite reliability can be the best substitute in this regard (Bagozzi & Yi, 1988; Hair et al, 2012; Wong, 2013). Composite reliability should be 0.7 or higher. If it is an exploratory research, 0.6 or higher is acceptable (Bagozzi and Yi, 1988). The result of composite reliability for internal consistency of this study is presented in the following table (table-2).

Table-2: Result Summery of Outer Measurement Model

Latent Variable	Indicators	Outer Loading	Indicator Reliability = (Loading)2	Composite Reliability	Convergent Validity=AVE
Convenience	conv-1	0.793	0.629	0.878	0.592
	conv-2	0.721	0.520		
	conv-3	0.791	0.626		
	conv-4	0.706	0.500		
	conv-5	0.828	0.685		
Expense	Exp-1	0.801	0.642	0.863	0.677
	Exp-2	0.838	0.702		
	Exp-3	0.829	0.687		
Loyalty	Loyal-1	0.705	0.510	0.767	0.523
	Loyal-2	0.703	0.500		
	Loyal-3	0.760	0.578		
Relative advantage	R-Adv-1	0.811	0.658	0.876	0.702
	R-Adv-2	0.847	0.717		
	R-Adv-3	0.855	0.731		
Responsiveness	Res-1	0.780	0.608	0.825	0.611
	Res-2	0.768	0.590		
	Res-3	0.796	0.634		
Satisfaction	Sat-1	0.790	0.624	0.845	0.645
	Sat-2	0.786	0.618		
	Sat-3	0.833	0.694		
Security	Sec-1	0.874	0.764	0.869	0.768
	Sec-2	0.878	0.770		

Average Variable Extracted (AVE) is used to check convergent validity and according to the rules of thumb, the minimum acceptable value is greater than 0.5 in order to confirm convergent validity. Table-2 presents values of AVE of this study.

The table-02 shows that, it can be seen that all the indicators have individual indicator reliability values that are much larger than the minimum acceptable level of 0.4 and close to the preferred level of 0.70. The table-02 also shows a higher level of internal consistency among all five reflective latent variables as all the values are larger than the minimum threshold level of 0.7. Again from table-02, it is found that all of the AVE values are greater than the acceptable threshold of 0.50 and so convergent validity is confirmed.

According to Fornell and Larcker (1981) criterion, the square root of AVE of each latent variable should be greater than the variables correlation with any other variables in the model to ensure discriminant validity. Another discriminant method is cross loading of the indicators outer loading. All loadings of a variable on its assigned variables must be higher than all other cross loadings of other variables. This study ensures validity in both measures (Table-3 & Appendix- 3).

Table-3: Fornell-Larcker Criterion Analysis for Checking Discriminant Validity

	Conveyance	Expense	Loyalty	Relative Advantage	Responsiveness	Satisfaction	Security
Conveyance	**0.769**						
Expense	0.685	**0.823**					
Loyalty	0.634	0.588	**0.723**				
Relative Advantage	0.583	0.549	0.559	**0.838**			
Responsiveness	0.677	0.622	0.613	0.566	**0.781**		
Satisfaction	0.824	0.746	0.695	0.710	0.777	**0.803**	
Security	0.692	0.605	0.597	0.597	0.652	0.784	**0.876**

From the above table-03, the latent variable Conveyance's AVE is found 0.592 (from table-02) hence its square root becomes 0.769. This number is larger than the correlation values in the column of Conveyance and also larger than those in the row of Conveyance. It is found that the square root value of AVE of Expense, Loyalty, Relative Advantage, Responsiveness, Satisfaction and Security are larger than the correlation values in their respective columns and also larger than those in their respective rows.

Subsequently analyzing the measurement model and confirming reliability, consistency and validity, the next step is to analyze the inner structural model which includes measurement of path coefficient, explanation of endogenous variables variance (R^2), multi-collinearity check (VIF) and Measurement of effect size (f^2).

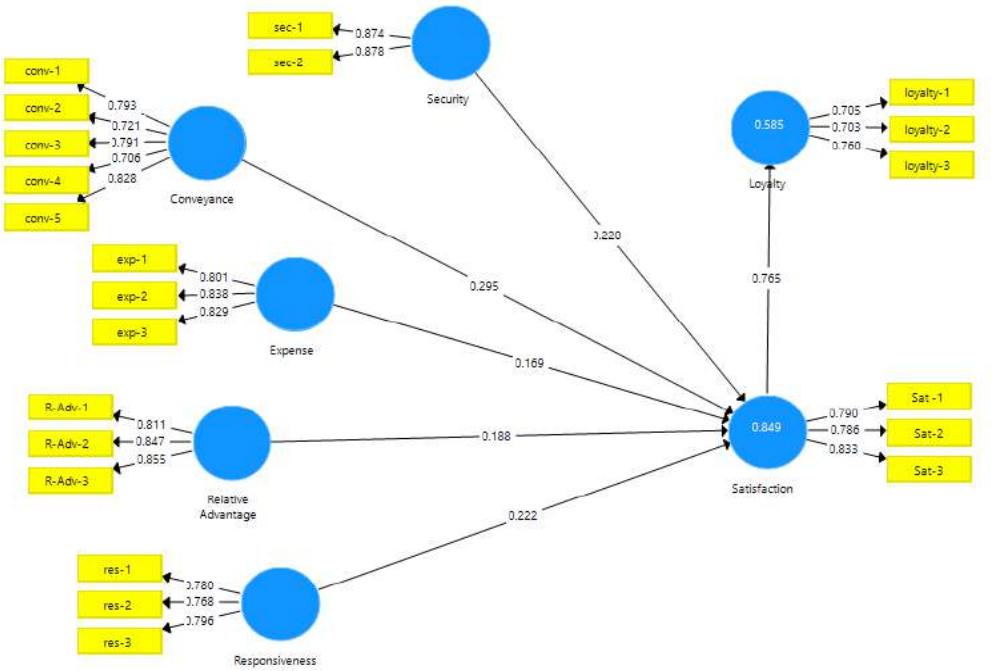
The basic criteria for evaluating the structural model in PLS-SEM are the measurement of significance of path co-efficient. The inner model suggest that convenience has the strongest effect on satisfaction (0.295) followed by responsiveness (0.222), security (0.220), relative advantage (0.188) and expense (0.169). The path coefficient of satisfaction to loyalty in this model is 0.765 and it indicates the most significant relation between them (Figure-1). The alternative way to test the significance of structural path under PLS_SEM is the bootstrap procedure using *t statistics*. As per rules of thumb, the value of t test is significant if it is higher than 1.96 at 5% level of significance for two tailed test. If *P* value is considered, it must be smaller than 0.05 at 5% level of significance (Wong, 2013). In this model the following table (table-4) confirms the significance of all hypothesized path except the relation between relative advantage and satisfaction.

Table-4: Path co efficient

Relationship	t statistics	P value
Convenience Satisfaction ⟶	3.551	0.000
Expense Satisfaction ⟶	2.061	0.040
Relative Advantage Satisfaction ⟶	1.503	0.134
Responsiveness Satisfaction ⟶	2.453	0.015
Satisfaction Loyalty ⟶	8.928	0.000
Security Satisfaction ⟶	3.034	0.003

After reviewing table-4 of the path coefficient for the inner model, all of the *T*-Statistics are larger than 1.96 except relation of relative advantage and all of the P values are smaller than 0.05 except relation of relative advantage. Therefore, all factors have significant influence on satisfaction except relative advantage and satisfaction has significant influence on loyalty.

The amount of variance in endogenous variable explained by the exogenous variables linked to it is termed as coefficient of determination (R^2). It is the measure of predictive value of the model. In this study the value of R^2 is 0.849 for customer satisfaction and 0.585 for loyalty. It means five independent variables substantially explain 84.9% variance in the satisfaction but satisfaction and responsiveness together can change only 58.5% of loyalty. According to Wong (2013), R^2=0.75 is substantial, R^2=0.50 is moderate and R^2=0.25 is weak. So, this study indicates a substantial and moderate variance of satisfaction and loyalty respectively (figure-1).



A detailed PLS_SEM analysis includes multi-collinearity assessment. As the rules of thumb, the Variance Inflation Factor (VIF) need to have a value of 5 or less in order to avoid potential collinearity problem (Hair et al, 2011). Since the VIF values of all the indicators are less than five (Apendix-2), it confirms that there is no issue of multi-collinearity problemin this model.

Effect size (f^2) is the measurement of contribution of an exogenous variable to the endogenous variables R^2 value. The effect size helps to assess the overall contribution of a research study (Hussain et al, 2018). According to Barclay (1995), the f^2 value of 0.35 indicates very strong effect, 0.15 means moderate effect and 0.02 means weak effect. Table-5 shows a moderate effect of convenience, responsiveness, security and relative advantage and weak effect of expense on customer satisfaction. In case of loyalty, satisfactions effect is very strong.

Table-5: Value of f^2

	Convenience	Expense	Loyalty	Relative Advantage	Responsiveness	Satisfaction	Security
Convenience						0.212	
Expense						0.087	
Loyalty							
Relative Advantage						0.129	
Responsiveness						0.144	
Satisfaction			0.407				
Security						0.135	

Findings and Managerial Implementation

On the basis of the above analysis and their interpretation, the following table is prepared as the result of the study.

Table-6: Results of Hypothesis

Hypothesis	Path coefficient		Support
	t test	P value	
H_1: Satisfaction influence loyalty	8.928	0.000	Yes
H_2: Convenience influence satisfaction	3.551	0.000	Yes
H_3: Expense influence satisfaction	2.061	0.040	Yes
H_4: Security influence satisfaction	3.034	0.003	Yes
H_5: Relative advantages influence satisfaction	1.503	0.134	No
H_6: Responsiveness influence satisfaction	2.453	0.015	Yes

From the study it is clear that, satisfaction has strong influence on loyalty in mobile banking in Bangladesh. There are several factors that influence the satisfaction of users of the country in the use of mobile banking. Among those factors, the most influencing factor is convenience. Although this factor does not directly influence loyalty, it has significant influence on satisfaction. General users of mobile banking usually use mobile banking for easy accessible and function; reduced physical and mental effort and continuous update etc. That is why, convenience is the main concern for them in case of satisfaction.

The second strong affecting factor is security. Now-a-days, security is a crucial pillar of mobile banking. In order to ensure more security, mobile banking providers can properly train up their agent or staff and to update security network service. Mobile banking service basically provides their service through virtually or digitally. To survive in the competitive market, banks need to give deep attention to customers demand, their requirement, their choice and have to provide prompt security service in case of any cyber-attack.

The third strongest factor is Responsiveness. Mobile banking is gaining continuous popularity because of customer care, available agents and prompt correction of error and 24/7 service. So, banking is available at every time.

Expense and relative advantage are comparatively weak factors because their relation with satisfaction is insignificant. The f^2 value shows these factors have weak effect on the variance of satisfaction. It means customer satisfaction from mobile banking is not much fluctuating for these two factors. There might be several reasons behind this.

Limitation and Future Research Direction

This research focuses only on five independent factors. But there might be many other factors that can influence customer satisfaction. Moreover, this study does not analyze demographic factors such as, gender, age, generation wise, race etc. that may have relation with mobile banking adoption and satisfaction. The study can be done on target customer such as, college students, university students etc. in future. Therefore, this phenomenon requires investigation on a wide scale.

Conclusion

Mobile banking and bank led financial service is a banking process without bank branch which provides financial services to banked and unbanked communities efficiently and at affordable cost. It provides banking and financial services, such as cash-in, cash out, merchant payment, utility payment, salary disbursement, foreign remittance, government allowance disbursement, ATM money withdrawal through mobile technology devices as per need of customer satisfaction. This study tries to identify the factors that influence satisfaction of users or customers of mobile banking service. The result reveals that convenience, security and responsiveness strongly influence customer satisfaction but expense and relative advantage are the insignificant factors in this regard. With some limitation, this study provides valuable knowledge and information to the banks, bank led financial service provider, software engineer to design their product with respect to the factors that have influence on satisfaction & loyalty and implement mobile banking service in such a way that will result in more customer satisfaction and loyalty. A densely populated country like Bangladesh is now a good market for mobile banking because of large number of smart phone users. The mobile phone access rate in this country is one of the highest in Asia after China and India. So, with proper guideline and security policy, mobile banking will be leader of e-payment system in Bangladesh as well as in the world.

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Appendix-1: Primary List of Factors

Code	Factors	Reference
Sec-1	Monetary safety	Laforet & Li, 2005, Boonsiritomachai & Pitachyadejanant, 2017; Achieng & Ingari, 2015
Sec-2	Safety of personal information	Ghosh and Barua, 2014; Achieng & Ingari, 2015; Kabir, 2013
Exp-1	Transaction fee	Achieng & Ingari, 2015
Exp-2	Transportation cost	Jannat & Ahmed, 2015
Exp-3	discount	Focus group
R-Adv-1	Time savings	Kabir, 2013
R-Adv-2	Social image	Mattila, 2003
R-Adv-3	Retrieval of account balance and history.	Kahandawa &Wijayanayake, 2014
Res-1	Customer care	Ghosh and Barua,2014
Res-2	Agent and helpline	BB & DU, 2017
Res-3	Prompt correction of error	BB & DU, 2017
Conv-1	Accessibility	Islam &Himel,2015
Conv-2	Continuous update	Boonsiritomachai & Pitachyadejanant, 2017

Conv-3	Reduce physical and mental effort	Achieng & Ingari, 2015
Conv-4	Easy function	Jannat & Ahmed,2015
Conv-5	Proper instruction	Leiva et al, 2017
Sat-1	Choice preference	Ghosh and Barua,2014
Sat-2	Pleased feelings	Islam & Himel, 2015; Kheng et al, 2010).
Sat-3	Satisfying experience	Kabir, 2013
Loyal-1	Continuity	Lam & Burton, 2006
Loyal-2	Objection	Ghosh and Barua, 2014
Loyal-3	Recommend	Wong, 2013

Apendix-2: Variance Inflation Factor (VIF)

Items	VIF
Rel-Adv-1	1.527
Rel-Adv-2	1.695
Rel-Adv-3	1.823
Sat-1	1.451
Sat-2	1.369
Sat-3	1.477
Conv-1	1.731
Conv-2	1.508
Conv-3	2.014
Conv-4	1.471
Conv-5	2.306
Exp-1	1.521
Exp-2	1.650
Exp-3	1.492
Loyalty-1	1.137
Loyalty-2	1.165
Loyalty-3	1.141
Res-1	1.334
Res-2	1.307
Res-3	1.331
Sec-1	1.403
Sec-2	1.403

Appendix-3: Cross Loading

	Convenience	Expense	Loyalty	Rel-Adv	Responsiveness	Satisfaction	Security
Rel-Adv-1	0.522	0.342	0.404	**0.811**	0.468	0.583	0.481
Rel-Adv-2	0.489	0559	0.509	**0.847**	0.466	0.622	0.478
Rel-Adv-3	0.454	0.473	0.490	**0.855**	0.488	0.579	0.543
Sat-1	0.695	0.542	0.500	0.583	0.598	**0.790**	0.597
Sat-2	0.602	0.559	0.662	0.555	0.613	**0.786**	0.518
Sat-3	0.690	0.687	0.669	0.576	0.659	**0.833**	0.761
Conv-1	**0.793**	0.571	0.562	0.496	0.638	0.733	0.637
Conv-2	**0.721**	0.519	0.555	0.568	0.519	0.591	0.451
Conv-3	**0.791**	0.476	0.430	0.414	0.492	0.627	0.525
Conv-4	**0.706**	0.455	0.413	0.352	0.419	0.552	0.482
Conv-5	**0.828**	0.601	0.467	0.405	0.509	0.644	0.546
Exp-1	0.562	**0.801**	0.456	0.488	0.542	0.568	0.486
Exp-2	0.580	**0.838**	0.458	0.435	0.488	0.603	0.481
Exp-3	0.551	**0.829**	0.532	0.437	0.508	0.664	0.524
Loyalty-1	0.448	0.395	**0.705**	0.442	0.492	0.534	0.513

Loyalty-2	0.381	0.361	**0.703**	0.397	0.275	0.495	0.352
Loyalty-3	0.531	0.505	**0.760**	0.381	0.540	0.619	0.520
Res-1	0.539	0.410	0.494	0.424	**0.780**	0.595	0.441
Res-2	0.492	0.553	0.458	0.454	**0.768**	0.587	0.516
Res-3	0.553	0.495	0.486	0.448	**0.796**	0.638	0.567
Sec-1	0.597	0.543	0.550	0.521	0.530	0.682	**0.874**
Sec-2	0.616	0.518	0.579	0.525	0.612	0.692	**0.878**

An Analysis of the Year Wise Movement of Foreign Direct Investment and Its Forecasting Trends in Bangladesh: Period 2020-2029

Mahmudul Islam *
Md. Siraz Meah **

Abstract

Foreign Direct Investment (FDI) has a great impact on the advancement of a developing country like Bangladesh. The FDI has the important role to develop the garments & weaving, telecommunication, banking and pharmaceuticals industry of Bangladesh. The study aims at analyzing the current FDI status in Bangladesh and forecasting Foreign Direct Investment (FDI) inflows in Bangladesh for the period 2020-2029 using least square method based on data covering for the period 1980-2019. In this paper, the authors used trend of FDI inflows for the last 17 year (2003-2019) in Bangladesh from various angles. This study also found that Bangladesh has got most of FDI from the UK (United Kingdom) with $ 2783 million which was 16.44 percent of total FDI inflows during the period. The Authors forecasted that the expected total volume of FDI inflows will reach US$ 6259.18 million by the year 2029. Some of the policy recommendations for attracting FDI in Bangladesh are also discussed in the paper.

Key Words: Foreign Direct Investment (FDI), Forecasting FDI, Least Square Method.

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Introduction

Foreign Direct Investment (FDI) can play a vital role for accelerating the economic development in the developing countries of the world. FDI is a part of investment in the developing countries. According to the World Trade Organization (WTO), "FDI is the investment that arises when the investor in the domestic country holds and owns assets in the host country with the willingness to control management and operations of that asset". According to the International Monetary Fund (1993), a foreign direct investor can be an individual, an incorporated or unincorporated public or private enterprise, a group of related individuals, or a group of related incorporated and/or unincorporated enterprise, which has a direct investment enterprise that is a subsidiary, associate or branch, operating in a country other than the country or countries of residence of the foreign direct investor or investors. Free market economy is changing the strategies of multinational companies (MNCs) of developed countries and the way developing countries compete for FDI. FDI encourages the transfer of new business, and knowledge and it allows the domestic country to promote its products more widely in international market. Various policymakers and economists have emphasized on the importance of a sound business environment and flow of FDI for accelerating economic growth in developing countries. In Bangladesh, FDI is recognized as a key factor for economic growth. Being one of the developing countries with scarcity of domestic investment after fulfilling its basic needs, the importance of foreign investment is increasing day by day. The flow of FDI in Bangladesh has traditionally been lower than other South Asian nations. Through this Bangladesh can achieve some socio-economic objectives including some MDG goals, Foreign direct investment (FDI) has considered a powerful weapon of her development. Moreover, in Bangladesh, FDI can emerge as a important key to build up physical capital, create employment opportunities, develop productive capacity, enhance skills of domestic labor and can help to integrate the domestic economy.

Literature Review

Kumar (2001) says that Foreign Direct Investment (FDI) has emerged as the significant source of external resources flow to developing countries from the 1990s and has become a important part of capital formation in the country.

Joong-Wan Cho (2003) studied foreign direct investment: determinants, trends in flows and promotion policies. He said that developing countries were starting to look to FDI as a source of investment when flows of official development assistance (ODA) dropped dramatically in the 1990s. Hsiao and Shen (2003) found a positive relationship between FDI and GDP in their time series analysis of the data from China. Using data on 80 countries for the period 1971–1995, Choe detects two-way causation between FDI and economic growth, but the effects are more apparent from growth to FDI.

Kafi, Uddin and Islam (2007) showed the problems and prospects of FDI in Bangladesh and they have identified some influencing factors to enhance FDI in Bangladesh. In addition Shimul et. al. (2009) investigates the link between FDI and economic growth in nineteen developing countries of South East Asian and Latin America using co-integration technique. Aitkin et. al. (1999) showed the existence of a significant cointigration between FDI and the economic growth in the USA. Alamgir (2017) reviewed in his study the current situation of FDI in Bangladesh along with its problems and remedies. He has found that the contribution of FDI of developed and developing countries including Bangladesh are not appreciable because of some uncertainties like uneven ratio in savings and investments. Sultana (2013) attempted to identify reason behind the fluctuation of FDI Inflow in Bangladesh. The study found that investors invest in power and gas sectors mostly and country wise the UK and the USA are the major investors in Bangladesh. Inflows of FDI in EPZ and Non-EPZ areas have been increased over the period of 1996-2011.

Rahman (2009) compared the FDI trend of Bangladesh with that of India. The study showed that FDI inflow in Bangladesh rose by eleven times from the time period year 1995 to 2006 while for India it increased by six times for the same period.

Billah (2012) explored FDI trend in Bangladesh that was up and down in nature. Investors from 26 different countries invested in Bangladesh. Among them Service sector's investment was highest in Bangladesh during time period of 1995-2010.

Rayhan (2009) explored that investors invest more in Gas and oil sector within time frame year 1997-2007. Akter (2013) mentioned that FDI inflow in

Bangladesh during last few decades was not consistent due to unfavorable political environment. Political unrest may hamper the faith of potential foreign investors to keep on the domestic country. If the political culture is stabilized then it can create a good business environment and more FDI can be flown into the country.

Kafi, et al. (2007) investigated on FDI inflow during 1995-2006 period of time and found the possible reasons of low FDI inflow in Bangladesh based on secondary data and importantly manufacturing sector is getting popular for investment in Bangladesh.

Rationale of the Study

The above mentioned literatures are regarding about the previous trend of FDI **(**Kafi, et al. 2007; Billah 2012), comparison between two or more countries' FDI inflows (Rahman 2009); the reasons for low and high inflows of FDI (Akter 2013) and the analysis of sector wise FDI (Sultana 2013). But there has not yet found any significant study regarding forecasting trend of FDI inflows in Bangladesh.

The main objective of this paper is to analyze the future inflows of FDI based on previous inflows of FDI over the period 2020- 2029. It can be said that the inflows of FDI are contingent on the absorptive capacity of host countries, with respect to the improvement of domestic financial system. This indicates that the projected FDI induces more capital-intensive investment in host countries and a better-developed domestic financial market is more effective in promoting economic growth (Sghaier & Abida 2013). Choe (2003); Apergis et al. (2008); Yalta, (2013), argued that there is strong relationship between FDI and economic growth. So the authors are interested in the study to absorb the advantages embodied in FDI inflows in stimulating economic growth.

Objectives of the Study

1) To analysis the year wise movements of FDI inflows for the period of 2003 to 2019.
2) To forecast the future trend of FDI for the next 10 years (2020 to 2029).
3) To provide recommendations for encouraging FDI into Bangladesh.

Data and Methodology

Data Collection: The paper is mainly based on secondary data collected from World Bank, International Monetary Fund (IMF), World Economic Outlook Database 2019, United Nations Conference on Trade and Development (UNCTAD) and Bangladesh Bank's FDI Survey Report 2019. Other data have been collected from Bangladesh Board of Investment, World Investment Report and different national and international journals, publications, books, reports and articles. The authors have utilized the BBS database for constructing the dataset. For analyzing the present position of FDI and forecasting next ten year's FDI Inflows toward Bangladesh the authors have used the time-series data covering the financial years 2003 up to 2019 and for showing impacts of FDI on GDP the authors have used the same financial year's data.

Econometric Model: The forecasting for next 10 years trend in FDI inflows i.e. 2020- 2029 has been predicted after studying the financial year 2003 to 2019. The estimation of FDI inflows in Bangladesh is approximated by using Least Square Method. This method is most widely used in practice (Gupta and Gupta 2008). The method of least square can be used either to fit a straight line trend or a parabola trend. The straight line is represented by the following equation:

$$Y = a + bx$$

Where Y = Trend line (Computed FDI) values to distinguish the actual 'Y' values,

a = intercept of 'Y' or the values of 'Y' available when 'X'=0, b = slope of the line or the amount of change in Y variable that is associated with a change of one unit in x variable, 'X' = Time series analysis represent the line.

Data Analysis and Discussion

Trend Analysis of FDI in Bangladesh: As a developing country, Bangladesh needs more FDI for its ongoing development process. Since 1972, Bangladesh is trying to be a suitable location for FDI. However, the total inflow of FDI has been increasing over the years. In 1972, annual FDI inflow was$ 0.090 million, and after 33 years, in 2005 annual FDI flow reached to $845.30 million and to $989 million in 2006 (UNCTAD-2018, Bangladesh Investment Handbook

2018-BOI). Total inflows of FDI in Bangladesh were not remarkable until 1980, a year of policy change. In 1980, government enacted the 'Foreign Investment Promotion and Protection Act, 1980' in an attempt to attract FDI. Enacting the Act government opened all sectors for FDI other than defense equipment and machinery, nuclear energy, forestry in the reserved forest area, security printing and minting, and railways. The FDI inflows since 2003 were:

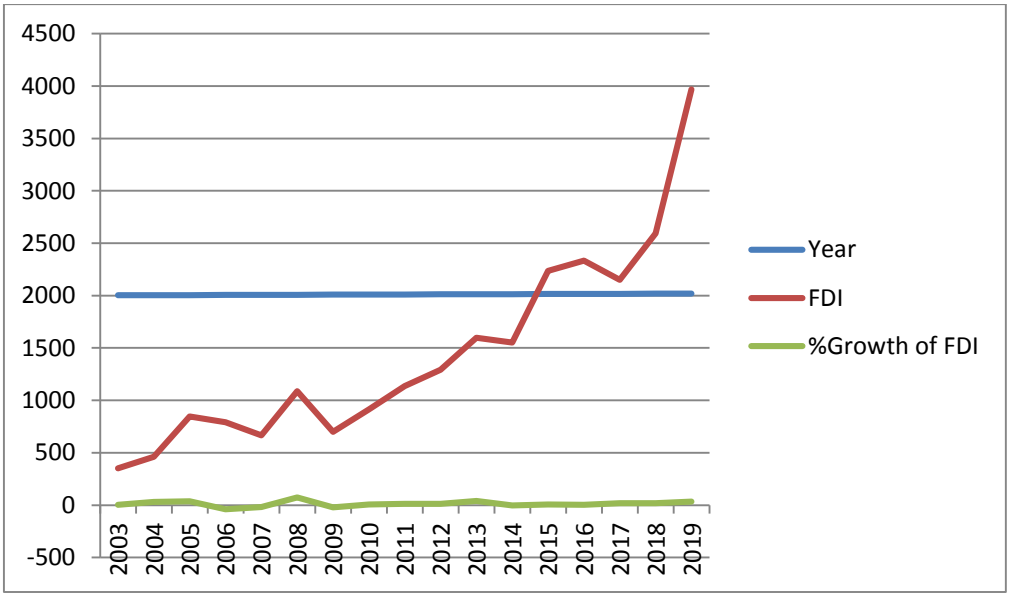
Table-1: FDI inflows from2003-2019 (US$ in millions)

Years	Foreign Direct Investment (FDI)	Annual Growth Rate (%)
2003	350.25	----
2004	460.4	0.31
2005	845.26	0.38
2006	792.48	-0.39
2007	666.36	-0.19
2008	1086.31	0.73
2009	700.16	-0.21
2010	913.32	0.07
2011	1136.4	0.13
2012	1292.6	0.11
2013	1599.2	0.40
2014	1551.3	-0.03

2015	2235.4	0.07
2016	2332.7	0.03
2017	2151.6	0.19
2018	2593.72	0.17
2019	3968.18	0.34

Source: www.Bangladesh Bank.org

Figure-1: Shows FDI inflow trend form 2003-2019 (US$ in millions)



The table and graph shows a fluctuating trend of the FDI inflows over the last 40 years. Data indicates that in 1999 there was a sudden fall in the FDI and again in 2001, 2002 and 2003 the decreasing trend continued for many reasons. It stabilized afterwards but remained below the average achieved between 1997 and 2000. Later on during next two years period it becomes alive again. From

2003 to 2019 there was a positive trend of FDI with some fluctuations in Bangladesh.

Table-2 (Details in Appendix-01) clearly shows that a major share of FDI inflows (16.44%) is contributed by U.K among top ten countries. It also indicates that the total amount of $18857.92 millions of FDI was received from 89 countries between 2003 and 2019. Among them top ten countries total contribution is $16925 million. It can be said that the top ten countries control FDI inflows in Bangladesh. Out of total FDI inflows to Bangladesh, 15.66% of the investment is made by the USA. Hence it is also a dominant source of FDI. 12.96% of the total investment is made by Singapore and is the third dominant source of FDI inflows to Bangladesh. However, Netherlands backed the fourth position by contributing 10.25%, South Korea holds fifth position among FDI source country in Bangladesh with their total investment $1540 million and Japan is in sixth position which contributed 8.37%. Hong Kong with 8.08%, Malaysia with 6.65%, Norway and Egypt both contributed with 6%.

From the table it is clearly understood that Bangladesh received the highest Foreign Direct Investment (FDI) from the United Kingdom (UK) in the past few years. Maximum amount of the UK FDI went to the banking sector in the past year, which the BB data also showed is $137.14 million followed by $42 million in textile and weaving sector (FE reporter, 2018). The data supports that Bangladesh received second highest FDI from USA. Maximum amount of the FDI coming from USA went to the Gas & Petroleum sector and followed by $ 242.04 million in power sector. Bangladesh government promoted power sector investment to help proper growth in the export-oriented economy and processed the proposal of "Prompt Power and Energy Supply (Special) Act-2010".

The third position is occupied by Singapore. About 150 companies of Singapore are operating their business in Bangladesh and over $4 billion is the trade volume of both countries (Khatun, & Ahamad, 2015). Major investments by Singapore in the last ten years went to telecommunication sector, power sector, trading sector, textile and wearing sector respectively. Basically Bangladesh telecommunication sector is largely controlled by Singapore's investor. It has also been seen that Singapore invested remarkably in computer software and IT sector of Bangladesh consistently from 2012 which is a positive sign for both countries. A team of investors based on Singapore visited Bangladesh during

July 7 to July 13 of the 2016 for obtaining first hand understanding of the business environment available here and tap the existing opportunities of their interested sectors. Bangladesh government spoke of allocating 202.343 hectare (500 acres) of land for Singapore in the Special Economic Zone (SEZ).

Bangladesh is getting a remarkable amount of FDI from South Korea so that South Korea stands 4th position among top ten countries of FDI inflow in Bangladesh. South Korea is a major investor in Bangladesh's garment sector. About 11 hundred million US dollar has been invested in garment sector of Bangladesh by South Korean's investors over last 10 years. Sector of Leather & Leather products is also preferred by South Korean investors where in every year they are doing their business in joint venture and in green field mode. But Bangladesh government should be more concerned about it because the amount of investment in this potential sector is being lessened in the current year compared to financial year 2014.

Hong Kong is also regarded as one of the consistent investors in Bangladesh and it has been investing $1131.35 million over last 15 financial year bearing 5th position of top ten counties which are investing in Bangladesh. Many Hong Kong's investor invests in Bangladesh and their top invested sector in Bangladesh is garment. Hong Kong also invests in banking sector of Bangladesh. HSBC; a Hong Kong based bank has been operating its banking services successfully since 1996 here. Bangladesh expects about $40 billion investment in power sector after 2020.

Hong Kong could be one of the key investor in power plant of Bangladesh as it has a growing trend of investment in this sector in the recent years. Though Egypt holds sixth position among top ten countries investment in Bangladesh, recently its investment is falling. This country only invests in Telecommunication sector. Orascom Telecom Holding SAE, a company organized under the laws of Egypt, invested in Banglalink of Bangladesh. Holding seventh position, Netherlands invests mostly in power sector followed by cement sector, garment sector and trading sector.

Bangladesh government considers electricity as key factor for the socio-economic development. The government has set the plan of providing electricity to all the peoples by 2021. Adequate and reliable supply of electricity

is an important pre-requisite for attracting investment. As the power sector is a capital-intensive industry, huge investments are needed in order to generate addition to the capacity. The government of Bangladesh adjusted its industrial policies to allow private investment in the power sector. In power sector many Netherland companies are investing due to facilities provided by our current government. Malaysia is one of the top ranked countries which invests in Bangladesh all in time. Bangladesh government and Malaysian government made various bilateral agreements for building up business relationship. Telecommunication sector is highly prioritized by Malaysian investors in Bangladesh. It also invests in garment, software and IT sector. Norway came to the top list because of its huge investment in IT sector. Lastly, Japan is regarded as trusted business partner from our independence. Japan invests in many sectors such as Garment, Pharmaceuticals Trading, Tobacco and Telecommunication. Bangladesh government is also very keen to maintain a good relationship with Japan as a result current government of Bangladesh are establishing a Special Economic Zone (SEC) for Japanese investors at Matarbari, Moheskhali, a upazila of Cox's bazar district.

Analysis of Forecasting Trends of FDI: Based on previous 17 years (2003-2019), the forecasting trend of next ten (2020-2029) year's FDI is shown in the following figure and table.

Figure-2: Forecast of Next Ten Year's FDI Inflows Toward Bangladesh

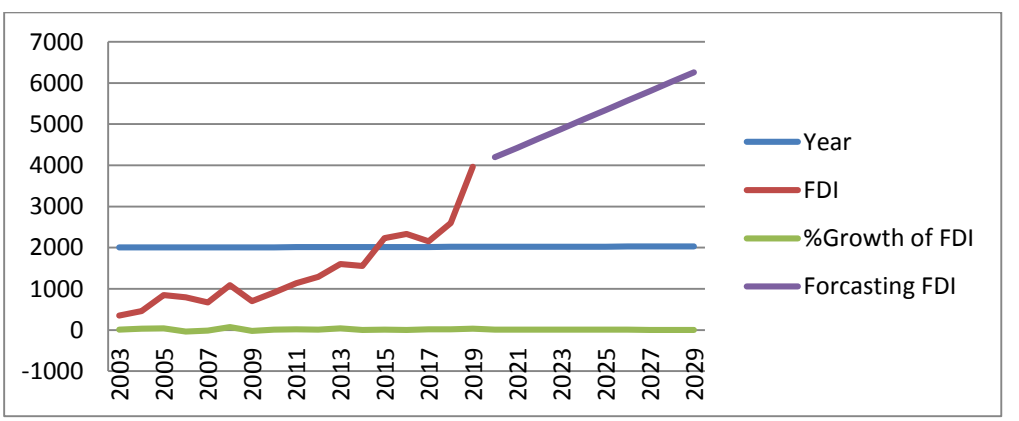


Table-3: Forecasts of FDI Inflows in the Next Ten Year (In US$ million)

Year	Forecasting FDI In Bangladesh
2020	4197.28
2021	4426.38
2022	4655.48
2023	4884.58
2024	5113.68
2025	5342.78
2026	5571.88
2027	5800.98
2028	6030.08
2029	6259.18

Source: Authors 'Own Calculation

Table-3 shows that it is possibility to increase FDI inflow in Bangladesh by observing past 17 year's FDI trend analysis.

Policies to Attract FDI in Bangladesh

As the FDI showed a great impact on GDP consequently economic so the government should focus on increasing GDP growth. The following are some of the major influencing factors that firm should choose to locate their investment in any particular developing country.

Economic Factors: Investment is driven by profit motive, and foreign investors will always prefer a country with a buoyant business sector. So Bangladesh

should try to increase the sustainable and equitable GDP growth rate, decrease the inflation rate to attract the foreign investors; and should improve the level of industrialization (Tabassum, N., & Ahmed, S., P., 2014).

Good Governance: A developing country's general structure of governance and the institutions may tend to be more complex and bureaucratic than necessary, associated with corruption. The Bangladesh government should make non-discriminatory regulations for FDI and ensure the security of investment (Tabassum, N., & Ahmed, S., P., 2014).

Infrastructural Development: The more improved is the infrastructural development of the country, the more attractive will be to foreign investors. The following infrastructure factors are significant in attracting FDI, these include: Good base of related and supporting industries (sub-contractors, suppliers, university research centre, business services and raw materials); Secured and comfortable transport facilities as well as port system; Availability and low cost of utilities such as telecommunications, energy and water; and environmental regulations and procedures. Bangladesh should ensure these infrastructural facilities to attract FDI in Bangladesh. The communication system, roads, availability of raw materials and energy are also more significant factors to the investors, so the government should provide all of the facilities (Kafi, M., A.; Uddin, M., M., & Islam, M., M., 2007).

Financial and International Integration: Financial and International Integration are also influencing factors to attract FDI in developing countries**.** Bangladesh should ensure the financial facilities and international integration, regional and international co-operation, and sound monetary system to attract foreign investment in Bangladesh. Ensuring the availability of credit is the key factor of doing business in a country. So, the government of Bangladesh should ensure the free flow of fund and regulation of collecting the funds of the foreign investors (Akter, I., S. (2013).

Political Stability: Political Stability and transparency are influential determinants for developing countries to attract foreign investment. Political factors like frequent changes of government, critical attitudes of opposition political parties, lack of transparency in the public service, incidence of corruption, and possibilities of terrorism are seriously considered by investors

in pre investment decision making. So the government should make the stable political system in the country to attract FDI (Kafi, M., A.; Uddin, M., M., & Islam, M., M., 2007).

Skilled Labor Force: One of the basic requirements of economic development of a country is its skilled labor force. Without human development it is not possible to ensure sustainable development of a country. Education, training, social services and health are the main tools for human resources development. A planned assessment of availability of human resources is necessary before formulating any policy for attracting FDI. Bangladesh has a large labor force but most of them are unskilled and uneducated. Due to huge number of labor force in the country, Bangladesh is enjoying a benefit in producing the garment product but to attract the foreign investment the country need to create skilled labor force (Rayhan, A., M., 2009).

Technological Advancement: Technological advancement plays a vital role in economic development. A well-developed technological infrastructure helps to implement government foreign investment policy. Some countries such as South Korea, Hong Kong, Singapore are succeeded to attract FDI by availability of technology. Bangladesh should improve the technological sector to enhance the production and attract the FDI (Khatun, F., & Ahamad, M., 2015).

Conclusion

FDI is not only a strategic option for a country, but also a key factor in the national economic development. Most nations try to attract foreign FDI through liberalization of investment environment, fiscal reforms and a package of incentive offers. FDI can transform a country's economic scenario within shortest possible time. It is not merely access to fund, but also to provide transfer of technical and management expertise. It is also a stabilizing factor in any economy. Bangladesh has a number of positive attributes that can successfully attract the attention of foreign investors in comparison to both developed and developing countries. The increasing availability of skilled and unskilled labor at relatively low wages and the success in maintaining reasonably stable macroeconomic environment are a few factors behind making the country an attractive destination for foreign investors. They are generally

aware that the wage rates in Bangladesh are among the lowest in Asian countries, the rate of inflation usually contains within tolerable limits, the exchange rate is reasonably stable, custom regulations are investment friendly without discrimination between foreign and domestic investors, and attractive incentive packages are available for the foreign investors. Based on the foregoing discussion and analysis, it may be stated that as Bangladesh has not yet been successful in creating a favorable environment for attracting sufficient amount of FDI. The country is lagging behind than many other developing nations in attracting FDI. Therefore, all barriers that stand in the way of industrialization and attracting FDI should be removed.

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