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A Comparative Study of Smartphone Controlled Robot Car

Md.Tahzib-Ul-Islam,Md. Asadujjaman Tuhin, Mithun Chondro Barmon

Abstract : Now-a-days the world is optimizing and is becoming more precise by switching from the world of personal computers to laptops to android phones. Human is moving and is accepting compact technologies so that, the gap between personages and the machines is being reduced to ease the standard of living. The purpose of this project is to design and implement a robot car. The robot car will be able to move in four directions (left, right, forward, backward) and will detect the distance of the obstacle from the robot on the android app. The main intent of this project is to design and bring about a robot prototype by using 4WD Robot Chassis kit, Arduino Nano, LM298 H bridge Module, Bluetooth Module HC-06, 2 x 18650 Li Ion Battery, android apps etc. We also include wireless camera & dark sensor into this system. The robot will have several characteristics like continuous display of distance from the obstacle on the app, easy handling of a robot with the help of an app rather than any remote controller.

Keywords: Android OS, Robotics, Sensor, Wireless Technology.

Introduction

The branch of technology that deals with the design, construction, operation, and application of robots. Roboticians develop man-made mechanical devices that can move by themselves, whose motion must be modeled, planned, sensed, actuated and controlled, and whose motion behavior can be influenced by “programming”. Robots are called “intelligent” if they succeed in moving in safe interaction with an unstructured environment, while autonomously achieving their specified tasks.

Literature Review

Rahul Kumar, Ushapreethi, Pravin, Kubade, Hrushikesh, Kulkarni. Dept. of Organization: Software Engineering. VIT University, Vellore-632014. Tamil Nadu, India. info@vit.ac.in. Android Phone controlled Bluetooth Robot. A wireless camera is mounted on the robot vehicle for spying and surveillance purpose even in night time by using infrared lighting. The purpose of this work is to design and implement an Android Controlled Bluetooth Robot which is used for Surveillance, home automation, wheelchairs, military and hostages Rescue applications^{1,2}.

Premangshu Chanda, Pallab Kanti Mukherjee, Subrata Modak, Asoke Nath. Department of Computer Science. St. Xavier's College (Autonomous), West Bengal, India. principal@sxccal.edu. Gesture Controlled Robot using Arduino and Android. This paper deals with the design and implementation of a wireless gesture controlled Robot using Arduino ATMEGA32 processor and an Android operated application to control the gestures via Bluetooth with minimal, and cheap hardware requirements. The built device is cheap, and is easy to carry from one place to another. The addition of some additional sensors or camera will make it more productive^{3,4}.

1. Md. Tahzib-Ul-Islam, Asst. Prof, Dept. of CSE, Dhaka International University, Dhaka, Bangladesh.
Correspondence to: tazim.csedu@gmail.com

2. Md. Asadujjaman Tuhin, Dept. of CSE, Dhaka International University, Dhaka, Bangladesh.

3. Mithun Chondro Barmon, Dept. of CSE, Dhaka International University, Dhaka, Bangladesh.

JigneshPatoliya, Haard Mehta, Hitesh Patel.Department of Electronics and Communication Engineering,Gujarat,India.jigneshpatoliya@charusat.ac.in,haardmehta@yahoo.com,hiteshpatel.ec@charu sat.ac.in Arduino Controlled War Field Spy Robot usingNight Vision Wireless Camera and AndroidApplication. The main objective behind developing this robot is for the surveillance of human activities in the war field or borderregions in order to reduce infiltrations from the enemy side⁵.

Gaurav Bhardwaj.Department of Computer Science.B K Birla Institute of Engineering & Technology,Rajasthan,India. placements@bkbiet.ac.in, training@bkbiet.ac.in Automatic Intelligence Robot Car. It has ability to sense the environment and decide the navigation path without any human input.In future we can use it as a modern vehicle because it reduce the traffic on the road at very large extent as well as it also maintains the security stability^{6,7}.

Leandro C. Fernandes, Jefferson R. Souza, Patrick. Y. Shinzato, Gustavo Pessin, Caio C. T. Mendes, Fernando S.Mobile Robotics Laboratory (LRM).University of Sao Paulo (USP) .São Carlos,Brazil.denis@icmc.usp.brIntelligent Robotic Car for Autonomous Navigation: Platform and System Architecture⁸.This paper presents the platform and system architecture of an intelligent vehicle, presenting the control system modules allowing the vehicle to navigate autonomously. Our research group has been developed works on autonomous navigation and driver assistance systems^{9,10}.

Robotic Car

A robotic car (also known as a driverless car, auto, self-driving car and Unmanned Ground Vehicle is a vehicle that is capable of sensing its environment and navigating without human input.

Mechanism of Robot Car

Parts:

- 4WD Robot Chassis kit
- Arduino Nano
- LM298 H bridge Module
- Bluetooth Module HC-06
- 2 x 18650 Li Ion Battery
- 2x 18650 Battery Holder
- Mini Bread Board
- 0.5sqmm Wires
- Male-Female Jumper Wires
- Male-Male Jumper Wires
- Duct Tape or any other tape
- Wireless Camera

Circuit and Working :

Figure 1, shows circuit diagram of the Android phone-controlled robot. The circuit is built around an Arduino NANO board, ultrasonic sensor HC-SR04, Bluetooth module, motor driver, and a few common components.

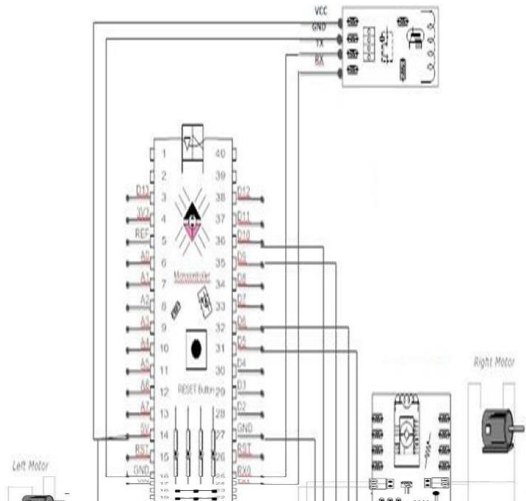


Figure 1: Circuit of the Android phone-controlled robot

Procedure :

Step 1: Prepare the Motors Terminal

Cut 4 pieces of red and black wires with length approximately 5 to 6 inch. We were using 0.5sqmm wires. Strip out the insulation from the wires at each end Solder the wires to the motor terminal.

Step 2: Mount the Motor

In **figure 2**, attach the two acrylic fasteners to each motor using two long bolts and two nuts. Note that the wires on each motor are pointing toward the center of the chassis. Join the two red wires and black wires of the motor on each side of the chassis. So after joining, we have two terminals on left side and two terminals on right side.

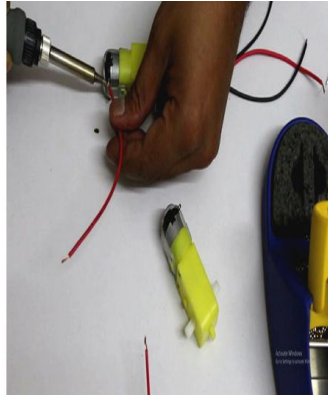


Figure 2: Mount the Motor

Step 3: Install the Top Roof

In **figure 3**, after mounting the 4 motors on the bottom floor, we have to mount the top roof.



Figure 3: Install the Top Roof

Step 4: H Bridge (LM 298 Module)

The term H bridge is derived from the typical graphical representation of such a circuit. In **figure 4**, it is a circuit which can drive a DC motor in forward and reverse direction.

Figure 4: H Bridge

Working :

See the above picture for understanding the working of the H Bridge. It consists of 4 electronics switches S1, S2, S3 and S4 (Transistors/MOSFETs/IGBTs). When the switches S1 and S4 are closed (and S2 and S3 are open) a positive voltage will be applied across the motor. So it rotates in the forward direction. Similarly when S2 and S3 are closed and S1 and S4 are opened a reverse voltage is applied across the motor, so rotates in reverse direction. The following **figure 5** shows after the final implementation.

Pin Description :

Out 1: DC motor 1 "+" or stepper motor A+

Out 2: DC motor 1 "-" or stepper motor A-

Out 3: DC motor 2 "+" or stepper motor B+

Out 4: Motor B lead out

12v: 12V input but you can use 7 to 35V

GND: Ground

5v: 5V output if 12V jumper in place, ideal for powering your Arduino (etc)

EnA: Enables PWM signal for Motor A (Please see the "Arduino Sketch Considerations" section)

IN1: Enable Motor A

IN2: Enable Motor A

IN3: Enable Motor B

IN4: Enable Motor B

Step 5: Motors Connection:

Out1 -> Left Side Motor Red Wire (+)

Out2 -> Left Side Motor Black Wire (-)

Out3 -> Right Side Motor Red Wire (+)

Out4 -> Right Side Motor Black Wire (-)

LM298 -> Arduino

IN1 -> D5

IN2 -> D6

IN2 -> D9

IN2 -> D10

Bluetooth Module -> Arduino

Rx -> Tx

Tx -> Rx

GND -> GND

Vcc -> 3.3V

Power

12V -> Connect Battery Red Wire

GND -> Connect Battery Black wire and Arduino GND pin

5V -> Connect to Arduino 5V pin

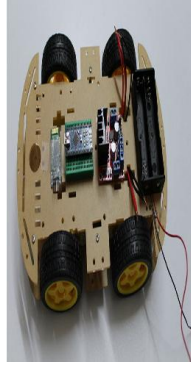


Figure 5: Electrical Wiring

Step 6: Application Instructions

The application is generated through android studio. Just after getting started, app asks to enable the Bluetooth unless and until the Bluetooth module HC-06 is not connected. In figure 6 shows the app will not be able to move the robot. Console page consist of 5 buttons named as LEFT, RIGHT, FORWARD, BACKWARD And STOP. On pressing these buttons one can move the robot in the specified direction, for example on pressing Right the app will send an R output to the controller which will then process the signal and give the input to motor driver. While pressing the stop button the robot will stop its movements. There is a display field where the distance from the Ultrasonic sensor is continuously displayed in centimeters. Lastly, an OK button is provided so once the robot stops and there are no further directions to be given user can click the button which will disconnect paired Bluetooth module.

Figure 6: Android App

Step 7: Move to proper directions

Figure 7 shows the different motions of the robot car's movement using the android app via mobile.

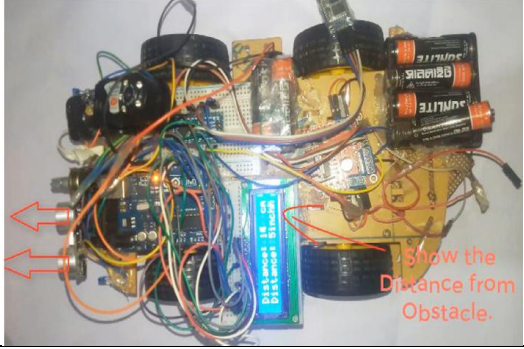




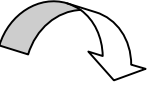
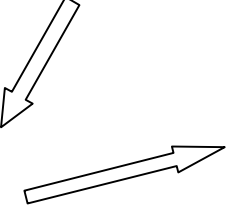
<p>Show the distance for Obstacle,</p> 	<p>Working Dark sensor</p> 
<p>Enter the "Forward" Button,</p> 	<p>Enter the "Backward" Button,</p> 
<p>Enter the "Left" Button,</p> 	<p>Enter the "Right" Button,</p> 
<p>Enter the "Stop" Button,</p>	<p>The Wireless Camera Working Process,</p> 

Figure 7: Different movement of Car

Future Enhancement :

Range of connectivity can be increased by using Wi-Fi. As of now we are using Bluetooth module which can be replaced by Wi-Fi module. And can extend range by installing routers on short distances. Additional features can be added like to handle robot by voice commands, this is achieved by adding speech recognition module. Movements and features of robot can be increased, by rotating it, and providing it diagonal movements. More type of information and data can be transferred, head count in a room can be established, face recognition can be made, and by removing user id and password, login can be performed by checking finger prints. We can also include a headset with a full-color display and a mission control center. With few additions and modifications, this robot can be used in army for detecting and disposing hidden land mines. The robot can be used for surveillance. In future we can interface sensors to this robot so that it can monitor some parameters and we can improve the efficiency using internet of things technology.

Conclusion :

The operating system of smart phone is android which can develop effective remote control program. At the same time, this program uses blue-tooth connection to communicate with robot. The surveillance is always has been a quite sensitive task. And it includes so many risks. So it's better to use robot for this job instead of people. And if you are able to control the robots with efficiency and accuracy then you can guarantee yourself with good results and success. This system is a good step for secure surveillance using robots. Today we find most robots working for people in industries, factories, warehouses, and laboratories. Robots are useful in many ways. For instance, it boosts economy because businesses need to be efficient to keep up with the industry competition. Therefore, having robots helps business owners to be competitive, because robots can do jobs better and faster than humans can, e.g. robot can build, assemble a car. Finally, as the technology improves, there will be new ways to use robots which will bring new hopes and new potentials.

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Key Factors Associated to Earnings Management Practices in Bangladesh: A Study on Listed Companies in Dhaka Stock Exchange

Fakhrul Islam*

Abstract: Earnings management is a policy used by the management of a company to deliberately manipulate the company's earnings so that the figures match a pre-determined target. This paper explores the key factors associated to earnings management practice in Bangladesh: a study on listed companies in Dhaka Stock Exchange. In this paper it has been tried to formulate hypothesis and test hypothesis to check the validity of the 6 main factors extracted out of 20 factors which significantly affect earnings management practices in Bangladesh. To conduct this research, 100 respondents were chosen haphazardly from the listed companies of Dhaka Stock Exchange. The respondents were the accountants of the distinctive organizations or people charged with managing the accounts and finance functions of those organizations. Data was gathered from the respondents through questionnaire which contained 21 questions. Every single inquiry was an announcement taken after by a five-point Likert scale going from 'strongly agree' through 'neither agree nor disagree' to 'strongly disagree'. The analysis has been carried by using different statistical tools such as descriptive statistics, reliability statistics, and multinomial regression analysis. From model fitting information under multinomial regression analysis it is seen earnings management practices in Bangladesh are significantly affected by the six key independent variables such as a) maintenance of favorable stock prices, b) high investors' desire as far as high gainfulness, c) poor financial performance of an organization that adversely influences its reputation in people in general, d) management motivating forces in view of organization performance, e) deliberate ownership of the organization's shares by management with intention to sell them to increase their wealth, f) projection of maintainability in the organization.

Key words: Earnings management, management motivating forces, Factors affecting earnings management.

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Introduction

Earnings management is the endeavor to smooth the way of income over time by utilizing different accounting techniques to move income from one period to another. Earnings management has raised a heated debate over the most recent two decades over financial reporting systems. It might be noted here that earnings management by companies is not an ongoing advancement subject. There was deep rooted agency conflict between owners and managers have perhaps been one of the primary creators of earnings management. Managers in a company are regularly under worry to report a better than actual performance to the owners. They are further boosted to treat in earnings manipulation due to their remuneration being fixing to the organizations' performance.¹ Currently, management has habitually dedicated to manipulate earnings to meet or beat market estimates and analyst expectations. Organizations that meet or beat market expectations generally get rewarded through valuation premiums reflected in their stock prices, which in the long run converts into a lower cost of capital.² On the contrary, companies that report earnings lower than the market estimate generally observe a fall in their stock prices. Aside from the effect on share prices, other incentives that create earnings management practices include managerial compensation, credit ratings, equity placements, and potential merger and acquisitions.³ Earnings management involves the adjustment of financial statements to mislead stakeholders about the organization's underlying financial performance, or to manipulate contractual outcomes that depend on reported accounting numbers.⁴ Earnings manipulation is the act of intentionally influencing the process of financial reporting to attain some personal gain.⁵ The intentional manipulation of financial information by managers to appear at a desired level of earnings or profits is called earnings management.⁶ The study aims to investigate the key motivational factors for earnings management practice in public listed companies in Bangladesh. To conduct this research, 100 respondents were selected randomly from the listed companies of Dhaka Stock Exchange. The respondents were the accountants of the different companies or persons charged with overseeing the accounts and finance function of those companies. Information was collected from the respondents through questionnaire which contained 21 questions.

Earnings Management: Theoretical Framework

Before jumping into what earnings management is, it is imperative to have a strong comprehension of what we mean when we refer to earnings. Earnings are the profits of an organization. Financial specialists and experts look to income to decide the appeal of a specific stock. Organizations with poor income prospects will normally have bring down share prices than those with great prospects. Keep in mind that an organization's capacity to produce earnings in the future plays a very significant role in determining a stock's price. Diverse academicians, researchers, experts have used different meanings and names for earnings management. Earnings Management may be called income smoothing, financial statement management, creative accounting, financial statement manipulation, window dressing, and fraudulent financial reporting. Earnings management refers to a technique utilized by the management of an organization to intentionally control the organization's income with the goal that the figures match a pre-determined target. This practice is carried out with the end goal of income smoothing. Accordingly, instead of having years of exceptionally good or bad earnings, organizations will attempt to keep the figures moderately stable by including and removing cash from reserve accounts. Earnings management is the application of accounting techniques to generate financial reports that represent an overly positive view of a company's business activities and financial position. Different accounting rules and principles require company management to make judgments. Earnings management takes advantage of how accounting different accounting rules are applied and creates financial statements that inflate earnings, revenue or total assets.⁶ Earnings manipulation is not about falsifying figures. If a company has Tk. 50 million in profit but lies and says it has Tk. 100 million, that's simple fraud. Earnings management is more about 'moving money around', so a company's profit figures look better in one reporting period, or from one period to the next. One common application of earnings management is "income smoothing" shifting earnings from one period to another so that profits look steady and consistent rather than volatile. Say a company expects to have Tk. 60 million in profit one year and Tk. 40 million the next. It might try to shift revenue and expenses around so that its books show a profit of Tk. 50 million each year. The overall figure is still correct, but the business's profits look far more consistent than they really are.⁶

Literature Review

Fraudulent reporting was first revealed after the United State of America extraordinary economic crash in 1929, at that point after Savings and Loans financial outrages in the 1980s and not long after the dot-com bubble of the mid 1990s to 2000s. Earnings management is an idea that has been quite popular among researchers and academicians to explore. Healy and Wahlen (1999) define earnings management as the circumstances when management mistreatments the opportunity of judgment, either to mislead stakeholders about firm fundamentals or to influence contractual outcomes.⁴ Accounting standards are constructed to fit different accounting environments, and the element of judgment is therefore necessary.⁴ However, this requires users to make accounting decisions based on privately held information, which potentially creates discretionary reporting situations and agency problems.⁷ Burgstahler *et al.* (2006) further explain that management, consequently, either can generate earnings as less or more informative dependent on the usage of privately held information.⁷ Leuz *et al.* (2003) differ that organizations have motivating forces to mislead stakeholders by misrepresent firm performance, thereby mask true performance through income manipulation because of contentions amongst firms and their stakeholders.⁸ Similarly, Schipper (1989) possesses a view of accounting numbers as information and relates earnings management to “disclosure management”, emphasizing that managers get involved financial reporting to obtain private gain.⁵ Schipper (1989) further argues that earnings management can happen everywhere in external reporting and undertake all shapes.⁵ Dechow and Skinner (2000) emphasize that capital market incentives for earnings management is the most accurate center of attention since stock market prices and their relation to earnings has become increasingly important.⁹ In turn, person in charges have motivations to manage income to both keep up and enhance stock value valuation, which is supported in the review by Healy and Wahlen (1999).⁴ Leuz *et al.* (2003) link how incentives to control earning can be associated with institutional factors, how the level of earnings management can vary across clusters and find that investor protection rights was a key determinant for income manipulation.⁸ Additionally, Dechow *et al.* (2010) indicate that when firms contain targets to meet or beat, set by them or by outside parties, they also have incentives to manage earnings.¹⁰ Politico-contractual theory shows several clarifications to earnings management.¹¹ Healy (1985) finds a positive connection between income management and

boosting benefit when the reward is between the upper and lower constrain.¹² Healy (1985) indicates likewise that earnings management descending happens when profit accomplished are not as much as the lower bound as or higher than the upper bound.¹² Be that as it may, Gaver *et al.* (1995) contend that directors oversee income upward when it is beneath as far as possible and they pick profit administration descending when profit surpass the upper bound.¹³ Yermack (1997) finds that directors' impact their pay contracts to incorporate more choices.¹⁴ Steady with this contention, Bergstresser and Philippon (2006) demonstrate a positive connection between's income management and pay technique in view of offers and alternatives.¹⁵ In the most indebted companies, managers try to avoid the violation of debt clauses by choosing accounting methods that increase earnings of the current year to the detriment of future years in order to avoid additional costs such as refund obligation, renegotiation costs etc. Then, Watts and Zimmerman (1986) find that managers are motivated to manipulate accounting information when they are close to the limits set by the contract.¹¹ Political costs consider that big firms choose accounting methods that allow postponing earnings disclosure to future periods. Indeed, the larger the firm, the greater the probability of being subjected to the pressure of the most influential. This encourages managers to choose accounting methods that lessen profit so as to diminish political costs decided based on accounting figures.¹⁶ Jones (1991) studied the relationship between accounting manipulation and firm size in U.S. He shows that in order to receive reimbursement, American managers apply accounting methods that reduce earnings to show that the company has suffered losses resulting from unfair competition.¹⁷ DeGeorge *et al.* (1999) find that managers oversee profit with a specific end goal to influence share prices. Weak performance can motivate managers to handle earnings with the intention of making this weakness less visible. Managers also manage earnings in order to achieve results consistently growing. Indeed, fluctuating earnings adversely affect the value of securities.¹⁸ For example, DeAngelo *et al.* (1996) demonstrate that stock prices decay when the organization accomplishes interrupted on expanding of profit. Thus, they show income that equivalent or surpass those of earlier years.¹⁹ Non-compliance with experts' desires causes issues for the organization which may incorporate its criminalization.²⁰ Along these lines, Cheng and Warfield (2005) find that when the organization receives a system of equity-based compensation, managers are propelled to distribute income at or over experts' forecasts.²¹ Hirshleifer, (1993) shows the preservation of reputation is also a motivation to earnings management.²² Peasnell *et al.* (2005) find earnings

management depends on managerial ownership.²³ Sarkar *et al.* (2008) locate a negative connection between earnings management and the existence of institutional investors holding shares in the firm.²⁴ Defond and Jiambalvo (1991) demonstrate a close connection between audit quality and diminishing mistakes in financial statements.²⁵ A survey was conducted on 100 accountants of the different companies or persons charged with overseeing the accounts and finance function of those companies and found that 20 motivational factors which affect earnings management. By applying factor analysis using SPSS 6 key factors are identified which are the main motivational factors for earnings management.⁶

Objectives of the study

The broad objective of the report is to examine whether selected six key factors significantly affect the earnings management in listed companies in Bangladesh.

Specifically,

- To examine how earnings management is practiced by the listed companies of Dhaka Stock Exchange,
- To formulate and test hypothesis to prove the validity of the 6 factors extracted out of 20 factors which are the main motivational factors for earnings management.⁶
- To formulate a regression model that represent independent variables significantly affect dependent variable.
- To give suggestions to minimize earnings manipulation practices by concentrating on the key motivational factors for earnings management.

Formulation of Hypothesis

H₀: Independent Variables do not provide sufficient evidence for Earnings Management Practice.

H₁: Independent Variables provide sufficient evidence for Earnings Management Practice.

Research methodology

In order to achieve the above objectives the following research methodology has been adopted.

Sample size: Total respondents were 100

Collection of Data

The study was exploratory in nature and endeavored to choose the key factors that provoked to earnings management practice in Bangladesh. Fundamentally primary data were utilized for this study. In month duration the targeted population filled the questionnaires and researcher collected those questionnaires within the referenced timeframe. To conduct this research, 100 respondents were chosen haphazardly from the listed companies of Dhaka Stock Exchange. The respondents were the accountants of the distinctive organizations or people charged with managing the accounts and finance functions of those organizations. Data was gathered from the respondents through questionnaire which contained 21 questions. Every single inquiry was an announcement took after by a five-point Likert scale going from 'strongly agree' through 'neither agree nor disagree' to 'strongly disagree'.

Tools for Analysis

For achieving the above mentioned objectives and for analyzing & presenting the information various financial and statistical tools have been used. The analysis has been carried by using statistical tools such as descriptive statistics, reliability statistics, and multinomial regression analysis. Multinomial regression analysis has been selected because it has no intrinsic ordering compare to ordinal regression analysis. In case of ordinal regression analysis, it has an intrinsic ordering.

Regression Model

$$Y = \alpha + b_1x_1 + b_2x_2 + b_3x_3 + b_4x_4 + b_5x_5 + b_6x_6 + \varepsilon$$

Where,

Dependent Variable:

Y = Earnings Management

Independent Variables:

x_1 = Maintenance of favorable stock prices.

x_2 = High investors' desire as far as high gainfulness.

x_3 = Poor financial performance.

x_4 = Management motivating forces in view of organization performance.

x_5 = Deliberate ownership of the organization's shares by management.

x_6 = Projection of maintainability in the organization.

Analysis and Findings

For the purpose of this research, a convenient sampling technique has been employed to select haphazardly 100 respondents from the listed companies of Dhaka Stock Exchange. The respondents were the accountants of the distinctive organizations or people charged with managing the accounts and finance functions of those organizations. Data was gathered from the respondents through questionnaire which contained 21 questions.

Table 1: Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation	Variance
Maintenance_Favorable_Stock_Prices	100	1.00	5.00	4.0200	.98453	.969
High_Investors_Desire	100	1.00	5.00	3.8500	1.22578	1.503
Poor_Financial_Performance	100	1.00	5.00	4.0100	1.12362	1.263
Management_Motivating_Forces	100	1.00	5.00	3.7200	1.34900	1.820
Deliberate_Ownership_Shares	100	1.00	5.00	3.8200	1.24219	1.543
Projection_of_Maintainability	100	1.00	5.00	3.7100	1.27363	1.622
Earnings_Management	100	1.00	5.00	3.4000	1.34089	1.798
Valid N (listwise)	100					

It can be seen that from the descriptive statistics, the mean result of the 6 predictor variables and one dependent variable are all close to the value 4, with low standard deviation indicating respondents believe that these 6 factors significantly affect the Earnings Management Practices in Bangladesh.

Reliability Statistics

The most common form of data reliability measure is cronbach's alpha. A reliability coefficient of 0.70 or higher is viewed as satisfactory in most sociology examine circumstances.

Table 2: Reliability Statistics

Cronbach's Alpha	N of Items
.789	7

From the table 2 it is seen the result of cronbach's alpha reliability test is 0.789 which indicates high reliability in the research data.

Table 3: Case Processing Summary

		N	Marginal Percentage
Earnings_Management	strongly disagree	11	11.0%
	disagree	21	21.0%
	neither disagree nor agree	8	8.0%
	agree	37	37.0%
	strongly agree	23	23.0%
Valid		100	100.0%
Missing		0	
Total		100	
Subpopulation		80 ^a	
a. The dependent variable has only one value observed in 72 (90.0%) subpopulations.			

From the table number 3, it is seen that out of 100 respondents 23 respondents strongly believe that the predictor variables significantly affect the Earnings Management and 37 respondents believe that the predictor variables significantly affect the Earnings Management Practices in Bangladesh while 8 respondents are neutral. A few respondents are not agreeing with the case that independent variables affect dependent variable. Subpopulation indicates the number of subpopulations contained in the data. A subpopulation of the data consists of one combination of the predictor variables specified for the model.

Table 4: Model Fitting Information

Model	Model Fitting Criteria	Likelihood Ratio Tests		
	-2 Log Likelihood	Chi-Square	df	Sig.
Intercept Only	268.709			
Final	221.514	47.194	24	.003

It is seen that from the table number 4 ‘Sig.’ column that $p = .003 < 0.1$, which means that the full model statistically significantly predicts the dependent variable better than the intercept-only model alone. So, we reject the null hypothesis and accept the alternative hypothesis. As a result, it is said that predictor variables significantly affect earnings management practices in Bangladesh.

Table 5: Goodness-of-Fit

	Chi-Square	df	Sig.
Pearson	291.512	292	.497
Deviance	203.579	292	1.000

A statistically significant result (i.e., $p < .1$) indicates that the model does not fit the data well. From the table number 5, it is seen that the p -value is .497 from the ‘Sig.’ column and is, therefore, not statistically significant. Based on this measure, the model fits the data well. The other row of the table i.e. ‘Deviance’ row presents the Deviance chi-square statistic. These two measures of goodness-of-fit might not always give the same result.

Table 6: Pseudo R-Square

Cox and Snell	.376
Nagelkerke	.397
McFadden	.160

In multinomial logistic regression the Pseudo R-Square measures that are similar to R^2 in ordinary least-squares linear regression, which is the proportion of variance that can be explained by the model. In multinomial logistic regression, however, these are pseudo R^2 measures and there is more than one, although none are easily interpretable. The model with the largest pseudo R-square statistic is best according to the measures.

Table 7: Likelihood Ratio Tests

Effect	Model Fitting Criteria	Likelihood Ratio Tests		
	-2 Log Likelihood of Reduced Model	Chi-Square	df	Sig.
Intercept	229.600	8.086	4	.088
Maintenance_Favorable_Stock_Prices	234.511	12.997	4	.011

High_Investors_Desire	228.323	6.808	4	.146
Poor_Financial_Performance	226.942	5.428	4	.246
Management_Motivating_Forces	230.317	8.803	4	.066
Deliberate_Ownership_Shares	225.569	4.055	4	.399
Projection_of_Maintainability	232.592	11.078	4	.026
The chi-square statistic is the difference in -2 log-likelihoods between the final model and a reduced model. The reduced model is formed by omitting an effect from the final model. The null hypothesis is that all parameters of that effect are 0.				

Table number 7 shows which of the independent variables are statistically significant. It is seen that maintenance of favorable stock prices, management motivating forces and projection of maintainability in the organization drives profit manipulation are statistically significant individually. Other predictor variables are not statistically significant because the value of P is greater than 0.1.

Suggestions

Following steps should be adopted to minimize the unethical earnings management practices to increase the credibility of the financial statements:

- Implication of high accounting regulation in Bangladesh that facilitates a high quality financial reporting standard which decreases earnings management.
- Adoption of IAS and IFRS by companies will decrease earnings management practices.
- Earnings management practices will reduce if investors' protection environment of Bangladesh becomes stronger.
- Cross-listing on a well-developed capital market that is demanding in terms of information quality and transparency will decrease earnings management.
- If auditors are of higher quality then auditors constraining aggressive earnings management and resulting in more credible earnings announcements.
- The enforcement role of legal systems is especially important when considering the accounting quality following the adoption of IFRS that prevent earnings management.
- Bangladesh Securities and Exchange Commission should have strict enforcement power so that companies are enforced to adopt IFRS.
- Accounting practices should be kept separate from the political economy of regulation.

- Each company should abide by corporate governance issued by Bangladesh Securities and Exchange Commission.

Conclusion

In conclusion, the research findings suggest that earnings management happens because of the key factors such as maintaining favorable stock prices, high investors' desire as far as high gainfulness, poor financial performance of an organization that adversely influences its reputation in people in general, management motivating forces in view of organization performance, deliberate ownership of the organization's shares by management with intention to sell them to increase their wealth, and projection of maintainability in the organization. There are other factors such as posting or releasing provisions, avoidance of heavy taxation, to safeguard management reputation through financial performance, related party transactions, avoidance of pressure from workers asking for higher wages, weak internal controls systems of the company, subjective judgment of management on adjustments of accounts receivable, inventory valuation, and dividend policy, improper revenue recognition, firm sizes, proprietorship structure, the extent of the governing body, percentages of largest stockholder ownership, numbers of main stockholders, equity-debt ratios, indebtedness and leverage, gross incomes to sale ratio, net income to sales, current ratio, to meet the statutory and regulatory requirements, political costs, and poor accounting systems persuades earnings management. It is very difficult to conduct research on this type of inestimable factors and to formulate a model to predict dependent variable. Results obtained through conducting this research are found satisfactory and independent variables significantly affect earnings management practices in Bangladesh. For the future research, it might be interesting to carry out a research to examine the quality of auditors and earnings management practices in Bangladesh.

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Addendix A: Questionnaire

(All answers will be dealt with strictly confidential and will be utilized for statistical purposes only)

Key Factors Associated to Earnings Management Practices in Bangladesh: A Study on Listed Companies in Dhaka Stock Exchange.

The aim of this questionnaire is to identify key factors associated to earnings management practices in Bangladesh.

Please indicate your views by ticking the appropriate responses below:					
	Strongly Agree (5)	Agree (4)	Neither (3)	Disagree (2)	Strongly Disagree (1)
1. Maintenance of favorable stock prices persuades earnings management.					
2. High investors' desire as far as high gainfulness persuades organization to manipulate financial performance.					
3. Poor financial performance of an organization that adversely influences its reputation in people in general induces management to manipulate financial performance.					
4. Management motivating forces in view of organization performance convince directors to control money related execution.					
5. Deliberate ownership of the organization's shares by management with intention to sell them to increase their wealth encourages management to manipulate performance.					
6. Projection of maintainability in the organization drives profit manipulation.					
7. Avoidance of pressure from workers asking for higher wages leads earnings management.					
8. Posting or releasing provisions leads earning management.					
9. Avoidance of heavy taxation leads earning management.					
10. To safeguard management reputation through financial performance persuades earnings management.					
11. Related party transactions lead earnings management.					
12. Weak internal controls systems of the company induce management to manipulate financial performance.					
13. Subjective judgment of Management on adjustments of accounts receivable, inventory valuation, and dividend policy etc induces management to manipulate financial performance.					
14. Improper revenue recognition leads					

earning management.					
15. Amortization of goodwill persuades earning management.					
16. Firm sizes, Proprietorship Structure, The extent of the governing body, Percentages of largest stockholder ownership, and Numbers of main stockholders induce management to manipulate earning.					
17. Equity-debt ratios, Indebtedness and Leverage persuade earning management.					
18. Gross incomes to sale ratio, net income to sales, and Current ratio have impact on earning management.					
19. To meet the statutory and regulatory requirements, Political costs leads earnings management.					
20. Poor accounting systems, that is difficult to understand thereby persuades earnings management.					
21. Earnings Management (Dependent Variable)					

(Use separate page if more space is needed)

Dyeing Effect on Chitosan Treated Jute Fibre

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Abstract

Jute fibre is an agricultural renewable cellulosic raw material having properties of dry strength, moderate moisture resistance, easy dyeability and good thermal and sound insulation properties with drawbacks of its stiffness, low elasticity, susceptible towards various environmental factors and poor colour fastness. Chitosan is obtained from chitin through chemical processes, viz. deproteinization, demineralization and deacetylation. This paper presents the modification of jute fibre with chitosan to enhance dyeability as well as some other natural fibres desirable properties including proliferated tensile strength, reduced moisture absorption ability and increased swelling resistance. The optimum modification was established at a condition of 2 % chitosan, 2 % acetic acid, 60⁰ C temperature and 60 minutes duration which achieved 26% fibre weight gain. Modification of jute fibres were confirmed by FTIR. Scanning electron micrographs showed that modified fibres were smoother than that of the untreated fibres and XRD analysis indicated better crystallinity of chitosan treated fibres. Chitosan modified fibres persuaded improve moisture resistance, swelling resistance in different solvent and tensile strength. Dye exhaustion study showed that dye absorption capacity were increased more than 10 % in chitosan treated fibres compare to non-modified bleached fibres when dyed with Reactive Orange 14 and Reactive Brown 10. The modified fibres showed better colour fastness to sunlight, washing, acid and alkali than unmodified fibres.

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Introduction: Jute fiber is called "The Golden Fiber" for its colour and high cash value ¹. It is the second most important vegetable fibre after cotton, in terms of usage, global consumption, production and availability, obtained from the bark of the stems of the two cultivated species *Corchorus capsularis* L. (White Jute) and *Corchorus olitorius* L. (Tossa Jute or Dark Jute) of Tiliaceae family ². Jute fibre is used for the manufacture of paper pulp, technical textiles, chemical products, carpet backing, ropes, canvas, sackings, home textile, bags, handicrafts and fashion accessories, blanket, nursery pots, insulation materials, soil saver and jute based composites ³. In spite of its great impact as cash crop on global economy, it has huge drawbacks compare to other natural fibres which includes its coarseness and rigidity nature, photo-yellowing property, poor colour fastness, poor crease resistance, drape property and microbial

degradation, all are seriously limit its general use especially in textile purposes ⁴. Various approaches have been made to overcome these limitations. Among them the surface modification of fibres is considered as the best route to obtain modern textile treatments ⁵. It enables the required level of beneficial effect by the modification of fiber surface only, thus minimizing whole fiber attack, and hence the deterioration in fiber quality could be easily avoided ⁶. Various monomers, polymers and biopolymers are applied in different ways to improve surface properties of cellulosic fibre. Chitosan is the most widely used biopolymer in this regard for its biocompatibility, biodegradability, nontoxicity and antimicrobial activity ⁷⁻¹⁰. The aim of this work was to modification of jute fibre with chitosan to improve its dyeability as well as some other desirable properties. Chitosan is the deacetylated form of chitin, i.e. poly-(1,4)-2-amido-2-deoxy- β -D-glucose¹¹. Chitin and chitosan are widely distributed in animals and fungi and are the basic polysaccharides that are major component of the shells of crustacean such as crab, shrimp and crayfish ¹². Chitosan has been useful in many areas of applications, such as waste water treatment, food, paper and textile industry and in drug industry and as a hydrating agent in cosmetics ¹³. It also proven that chitosan as an auxiliary in dyeing and printing of textile materials and leathers. While treatment with chitosan, textile materials form a crosslink with chitosan, resulting positive dyesites on the fiber surface ^{15,16}. Chitosan can easily adsorb anionic dyes such as direct, acid and reactive dyes by electrostatic attraction due to its cationic nature ¹⁶. Alongside dyeability of wool fabric and dye coverage of cotton fiber were successfully increased after modified with chitosan ¹⁷⁻²⁰. Chitosan also successfully implemented in leather modification where addition of chitosan increased both the rate and uptake of some acid dyes and improved color fastness properties ²¹. We now describe the modification of jute fibre with chitosan in an attempt to improve its coloring performances. In this regard chitin was extracted from shrimp shell to produce chitosan followed by jute fiber modification by chitosan and assay of colouring performances were carried out. The study of swelling behavior, moisture absorption, tensile strength measurement and color fastness were conducted to find out the effects of chitosan treatment. To interpret of results various approaches were implemented including FTIR, SEM, XRD.

Materials and Methods

Experimental Materials: Jute (*Crochorus olitorius* L.) was collected from Rajshahi Jute Mills Ltd., Bangladesh. Approximately 30 cm length of fibers were cut out above 60 cm of the stem. Chitosan was prepared in the laboratory from dry shrimp shells which were collected from Shatkhira region of Bangladesh. Reactive dyes (Reactive Orange 14 and Reactive Brown 10) were purchased from BDH, England. All chemicals such as sodium carbonate, sodium chlorite, acetic acid, sodium acetate, sodium hydroxide, hydrochloric acid, sodium chloride used etc were of reagent grade.

Preparation of Jute Samples: Raw jute samples were initially subjected to scouring and bleaching prior to chitosan treatment and dyeing. The fibers were scoured at 70 - 75°C for 30 minutes in a solution containing 6.5 gm/L (Jet cloth washing powder, *Unilever Bangladesh*) detergent and 3.5 gm/L Na₂CO₃ ²². The fibers were then bleached with 5 gm/L NaClO₂ at 85-90°C for 90 minutes. During bleaching, the pH of the liquor was adjusted to 4.0 and buffered with 0.2 M acetic acid and 0.2 M sodium acetate ^{22,23}. After bleaching, the fibers were immersed in 0.2% sodium meta bisulfite solution for 15 minutes to neutralize chlorine and followed by water washing ²⁴.

Preparation of Chitosan: Prawn shells were well powdered by a grinder and deproteinized by 1N NaOH and demineralized by treatment with 1N HCl. Later it was deacetylated by the reaction with 40% sodium hydroxide at 100° C for four hours under constant stirring.

Modification of Jute Fibre by Chitosan Treatment: A weighed quantity of jute fibre was immersed in a bath containing 2.0 % chitosan dissolved in 2.0 % acetic acid at 60° C under slight agitation for one hour by keeping it at a material liquor ratio 1 : 50. The optimized condition was obtained after evaluating parameters (a) concentration of chitosan (0.50, 1.0, 2.0, 3.0 and 4.0 %), (b) concentration of acid (1.0, 2.0, 3.0, 4.0 and 5.0 %), (c) temperature (40° C, 50° C, 60° C, 70° C and 80° C), (d) time (30, 50, 60, 90 and 120 minutes) and (e) material liquor ratio (1:15, 1:25, 1:50, 1:75 and 1: 100). After that the fibres were dried at room temperature. Weight gain percentage was calculated according to the following formula ^{25- 28}.

$$\text{Weight gain (\%)} = \frac{A - B}{B} \times 100$$

Where,

A = The weight of the fibres after treatment.

B = The weight of the fibres before treatment.

FTIR Spectroscopy: IR spectra of bleached and chitosan treated jute fibers were recorded with infrared spectrometer (Model: FTIR-8900, Shimadzu, Japan) using the KBr pellet technique. The dried fiber samples were crushed into small particles before pelleting with KBr. The spectra were measured in the absorption band mode in the range of 4,000-400cm⁻¹.

Scanning Electron Microscope: The fibre samples were coated with gold sputtering at room temperature. Scanning electron micrographs (SEM) of the samples were taken by scanning electron microscope (JSM-5410LV). The instrument was operated at 15 kV.

X- ray Diffraction Analysis: X-ray diffraction (XRD) of both bleached and treated jute fibers were performed at room temperature with a Bruker D8 Advanced Germany X-Ray Diffractometer using CuKα₁ radiation at the operating voltage and current of 40 kV and 30 mA, respectively. The diffraction intensities were recorded between 10 and 70° (2θ angle range).

Measurement of Tensile strength: The tensile strength of bleached and chitosan treated jute fibre were measured by using a "Portable Electronic Single Yarn Strength Tester YG021J " Fanyuan Instrument (HF) Co., Ltd., China.

Measurement of swelling behavior: Swelling behavior of the treated and bleached jute fibres sample were determined by treating them with water, methanol, and carbon tetrachloride. Known initial weights of the chitosan treated samples and bleached sample were immersed in 100.0 ml of solvents at room temperature for 72 hours. The percent swelling was calculated from the increase in initial weight in the following manner ²⁹.

$$\text{Percent swelling (P}_s\text{)} = \frac{W_f - W_i}{W_i} \times 100$$

Where,

W_f = final weight of the sample taken out from the solvent

W_i = Known initial weight of the sample

Measurement of Moisture absorption: The moisture absorption study of the chitosan treated fibre and bleached fibre were measured at a constant humidity level. The chitosan treated and bleached jute fibres samples were dried at 60⁰ C in the oven until a constant weight was obtained. The percent moisture absorption was studied as a function of weight gain and was performed using the following formula ²⁹ (Singha and Thakur, 2009).

$$\% \text{ Moisture absorption} = \frac{W_f - W_i}{W_i} \times 100$$

W_f = final weight of the sample taken out from the humidity chamber

W_i = weight of the dried samples

Dyeing of Jute Fibers: Both bleached and chitosan modified fibres were dyed with 0.5% reactive dyes: Reactive Orange 14 and Reactive Brown 10 in the presence of 50% sodium chloride (NaCl) as electrolyte at 60 °C for 90 min in the fiber-liquor ratio of 1:50. Dyeing was carried out in an Oscillating dyeing machine (Model TB700, Dysin, China). For making the medium alkaline and fixing the dye on the fibre, 20% sodium carbonate solution was added after 60 min. The dye uptake of the samples were determined by sampling the dye bath before and after the dyeing process. Dye exhaustion (%E) was measured colorimetrically ²⁴ as

$$\% E = (D_o - D_e) / D_o \times 100$$

Where, D_o and D_e are the original and exhausted dye bath concentration respectively.

Color Fastness of Dyed Fibers: Dyed jute fiber samples were exposed directly under sunlight without any protection from weathering, but was protected from rain for 6 hours each day and continued for 300 hours. After every 50 hours the colour fastness of the specimen was measured by the Grey scales ³⁰. Wash fastness of dyed jute fibre was determined using 5 gm/litre soap solution ³⁰. For determining colour fastness to spottings with acid and alkali, the dyed jute fibres were combed and compressed enough to form a sheet of 10 cm x 4 cm. The specimen was spotted with two drops of sulphuric acid (50 gm/litre), acetic acid (300 gm/ litre), tartaric acid ((100 gm/litre), sodium carbonate (100 gm/litre), sodium hydroxide (50 gm/litre) and 10% ammonia solution at room temperature ³¹. The specimen was dried at room temperature and then the change in colour of the specimen was determined by the Grey scale.

Results and Discussion

Chitin to Chitosan Conversion: Chitosan synthesis starts with the removal of protein from crustacean shells followed by demineralization in order to remove carbon and various salts which is processed by deacetylation of chitin to produce chitosan. In the present study, the percentile yield of chitosan was calculated as the dry weight of chitosan obtained from the starting raw material 65.0 gram of dried powdered prawn shell and the result is presented in Table 1. This obtained yield of chitosan was lower than that of precursor chitin (Table 1). This could be due to loss of sample volume or weight after removal of acetyl groups from the polymer during deacetylation process which nearly similar to other results obtained after working with various crustaceans shells ³²⁻³⁴.

Table 1: The yield of chitin and chitosan from crude shells.

Parameter	Chitin	Chitosan
Yield %	16.91	12

Table 2: Weight gain percent of jute fibre after chitosan treatment. Here, A = Chitosan concentration, B = Acetic acid concentration, C = Temperature, D = Time, E = Material Liquor Ratio and WG = Weight Gain.

No	A (%)	WG (%)	B (%)	WG (%)	C (°C)	WG (%)	D (Min.)	WG (%)	E (%)	WG (%)
1	0.5	12	1	22	40	10	30	15	1:15	4.00
2	1	13	2	26	50	15	50	17	1:25	7.02
3	2	26	3	23	60	26	60	26	1:50	26.0
4	3	27	4	15	70	20	90	13	1:75	21.0
5	4	28	5	10	80	13	120	9	1:10	13.0

Table 3: Selected optimum modification condition of fibre modified by chitosan

Chitosan Concentration (%)	Acetic Acid Concentration (%)	Temperature (°C)	Time (Min.)	Material Liquor Ratio	Weight Gain(%)
2	2	60	60	1 : 50	26

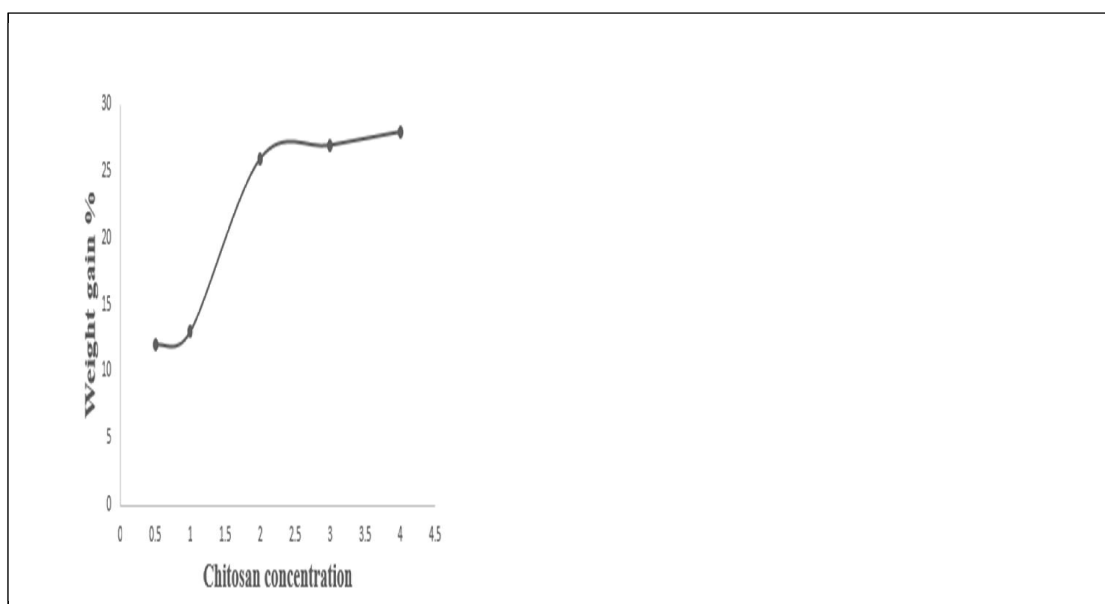


Figure 1: Effect of chitosan concentration on modification of jute fibre with chitosan.

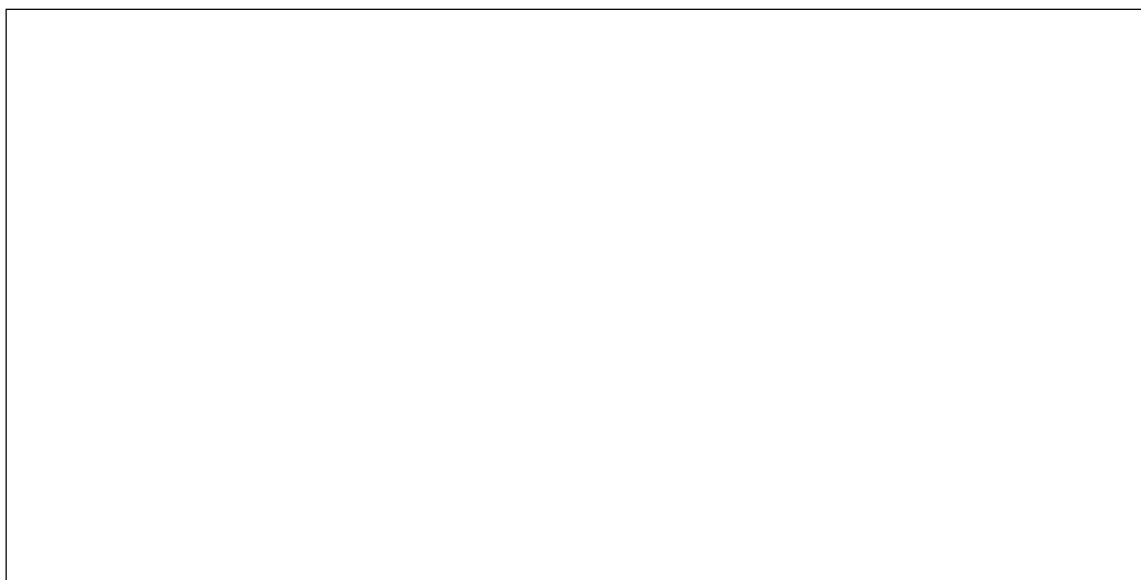


Figure 2: Effect of acetic acid concentration on modification of jute fibre with chitosan.

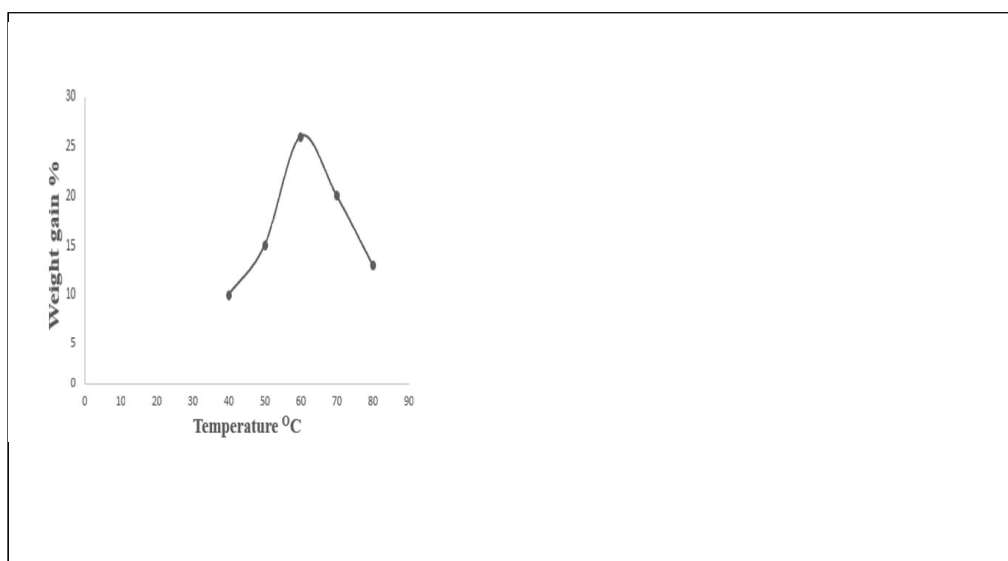


Figure 3: Effect of temperature on modification of jute fibre with chitosan.

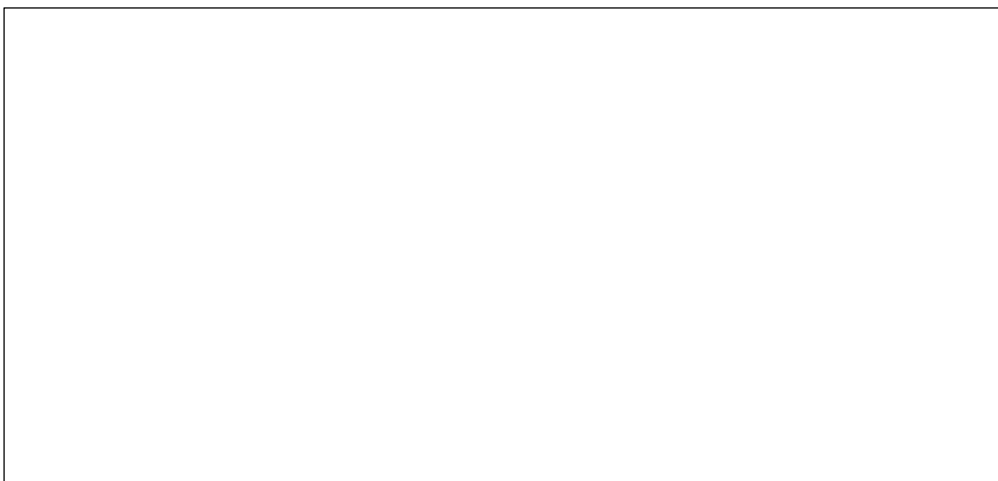


Figure 4: Effect of time on modification of jute fibre with chitosan.

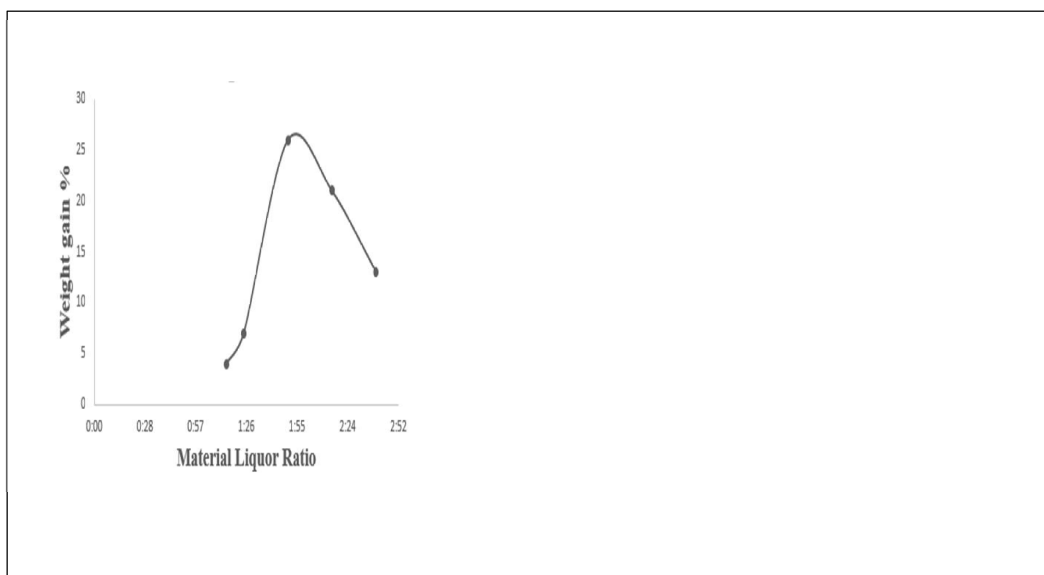


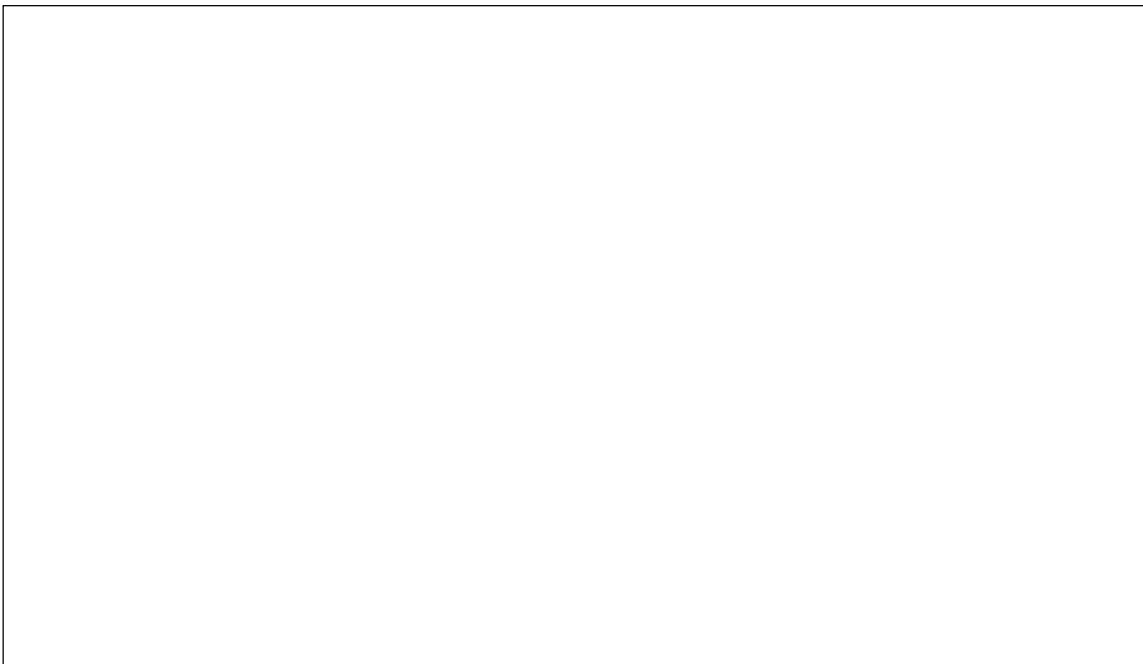
Figure 5: Effect of material liquor ratio on modification of jute fibre with chitosan.

Effect of Modification Parameters on Modification of Jute Fibre with Chitosan:

Fibre modification parameters such as concentration of chitosan, concentration of acid, temperature, time and material liquor ratio play a significant effect on modification of jute fibre. As it is depicted in Table 2 and Figure 1 was obtained from present investigation and represented the grafting yield as weight gain percentage. From the Table 2, and Figure 1, it was seen that the weight gain percentage increases considerably with the increase of chitosan concentration. This gradually increasing weight gain percentage was due to the absorption, adsorption and excess deposition of chitosan on jute fibre at higher concentration. It was found that 2.0 % chitosan concentration is sufficient to produce effective and efficient modification of jute fibre. Because when fibre was treated with more than 2.0 % of chitosan solution caused flexibility reduction due to excess deposition of chitosan and the fibre become crispy in nature. It was also found that 2.0 % acetic acid concentration was enough to bring maximum weight gain (Table 2 and Figure 2). Because at this concentration, adsorption and intermolecular hydrogen bonding between chitosan and the fibres occur easily. Maximum grafting percentage was obtained at 60°C and for 60 minutes (Table 2 and Figure 3 and figure 4). If temperature and time were further increased then grafting percentages decrease

because strength loss occurs due to rupture of normal fibres ³⁵. It was found that the modification process was reached at economical weight gain percentage at material liquor ratio 1:50 (Table 2 and Figure 5). If this ratio was increased then grafting percentage decreased due to dilution of chitosan concentration ³⁵.

Fourier- Transform Infrared (FTIR) Spectroscopy Analysis: Fourier Transform Infrared Spectroscopy (FTIR) were used to determine the chemical functionalities present in a fiber and chitosan samples. FT-IR spectrum of Jute, Chitosan and Chitosan modified fibre were depicted in Figure 6. As it was found Chitosan shows broad peak at 3454.75 cm^{-1} for stretching vibration of -OH group and a band at 1590 cm^{-1} characteristic of the free -NH_2 of glucosamine unit. The IR spectra of bleached and chitosan modified jute fibres were mostly similar as the adsorption peaks were obtained in the spectra for entire sample except the new additional peak in the modified jute fibre. Both the spectras had same absorption peaks at around $1033.38\text{-}1060.39\text{ cm}^{-1}$ (C-O stretching), 1401 cm^{-1} (-CH_2 bending) and $1637.22\text{-}1637.89$ (C=C stretching) which is nearly similar to previous report ²⁹. The IR spectra of chitosan treated jute fibre produces a broad peak characteristic of -OH stretching vibration of cellulose and chitosan at 3368.85 cm^{-1} and free NH_2 group of chitosan at 1550 cm^{-1} respectively.



**Figure 6: IR spectra of chitosan, bleached and chitosan treated jute fibre.
a. chitosan, b. Bleached jute fibre, c. chitosan treated jute fibre.**

Scanning Electron Microscopy (SEM) Analysis: The surface morphological study of unmodified and modified jute fibres treated with chitosan were carried out by SEM. Figure 7 shows the scanning electron micrograph of chitosan treated and untreated jute fiber samples. The untreated jute fibres showed the presence of large amounts of micro pores on its surface for bleaching of the jute fibre (Figure A). The surface of the chitosan treated jute fibres looks smoother surface with a reduction of protruding loose fibres than those of untreated fibres (Figure B). Chitosan treated fibre results unique smooth surface might be caused by polymer precipitation and due to possibly strong interaction between cellulose and chitosan molecules caused by intermolecular hydrogen bonding^{36,37}.

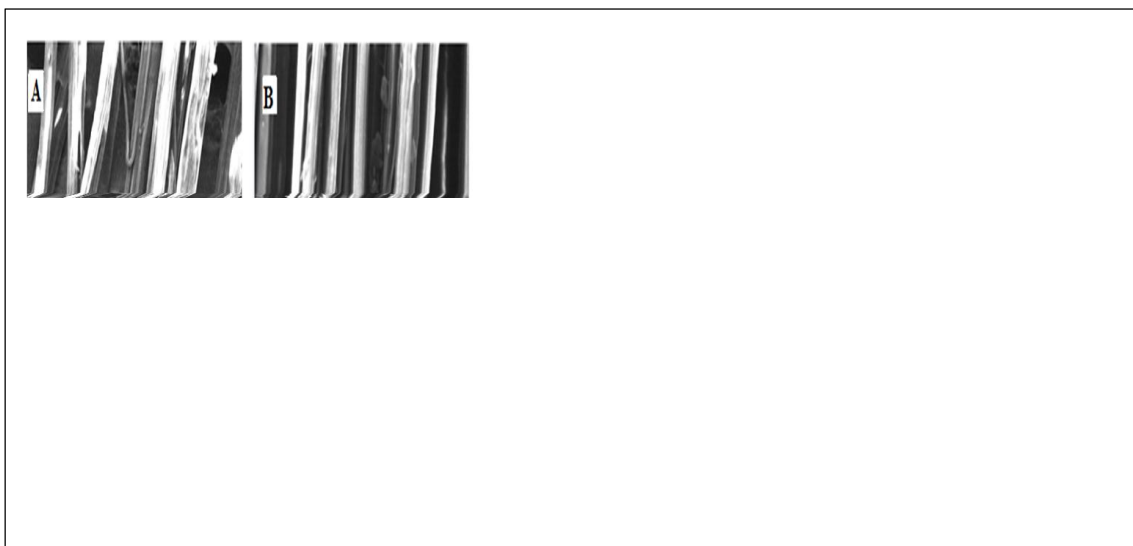


Figure 7: Scanning electron micrographs of jute fibre. A. for bleached jute fibre, B. for chitosan treated jute fibre

X-ray Diffraction (XRD) Analysis: X-ray diffraction (XRD) analysis is a definitive technique for estimating the degree of crystallinity in polymer. The XRD patterns of treated and untreated jute fibres have been given in Figure. 8. Figure 8 shows the raw jute exhibited major peaks near $2\theta=12.5^\circ$, 21.2° , and 33.2° and chitosan treated fibre at 14.5° , 22.2° and 34.1° respectively. XRD measurement suggests that the crystalline phase of the jute treated with chitosan has changed slightly which may be due to the interactions between cellulose and chitosan. Moreover, the observed peak intensities of treated jute fibre were higher than the untreated fibre due to the removal of amorphous materials like hemicellulose, lignin and some other non-cellulose materials and therefore, exhibit better crystalline phase^{38,39}.

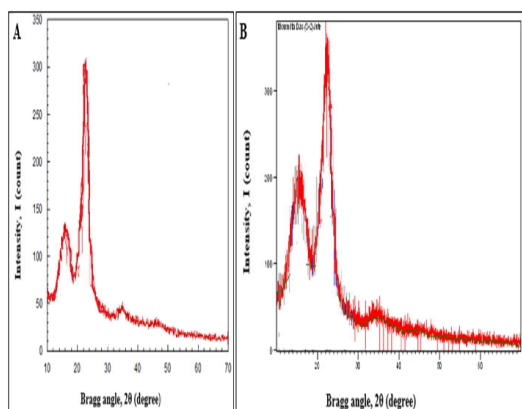


Figure 8 : XRD analysis of jute fibre. A. raw jute fibre, B. chitosan treated jute fibre.

Tensile Strength Testing: Tensile strength of the untreated and treated jute fibres were recorded in Table 3. Bleached jute fibre could bear a load of 162 kg/yarn and chitosan treated fibre could bear a load of 251 kg/yarn indicate the enhancement of tensile strength. These changes in the tensile strength was related to the increased crystallinity and the removal of hemicellulose and lignin. Evidently, the presence of the amorphous lignin and hemicellulose (as impurities) in the fibre led to the weakening condition on tensile properties of jute fibre⁴⁰.

Swelling Behavior Study: Swelling ability reflects the relationship between void structure in backbone polymer and size of solvent molecules both for protic and aprotic solvents^{41, 42}. Therefore the bleached jute fibres shows maximum swelling (Table 3) with polar solvents like water (100%) and methanol (79.5%) and least swelling with the nonpolar solvents like CCl_4 (50%). In the case of chitosan treated jute fibres, water and alcohols do not interact to the same extent (65% and 50%) as with bleached fibres due to formation of chitosan film on the fibres surface which causes change in the sorption behavior⁴³.

Moisture Content Analysis: Chitosan treatment on jute fibre has a great impact on the moisture absorption behavior. There was a decrease in percent moisture absorption when fibre modified with chitosan, bleached fibre content 16.01% moisture and after modification it content 5.613% (Table 3), which is due to the fact that treatment of jute fibre with chitosan permits formation of an approximately uniform chitosan sheath on individual fibres which blocked the sites for maximum moisture absorption and showed less affinity to moisture than the non-treated fibres¹⁹.

Table 3: Effect of chitosan treatment on Tensile Strength, Swelling behavior in different solvent and Moisture absorption percentage of jute fibre.

Fibre Type	Tensile Strength (N)	Swelling properties in different solvent			Moisture Absorption %
		H ₂ O	CH ₃ OH	CCl ₄	
Bleached Jute Fibre	162	100	79.5	50	16.01
Modified Fibre	251	65	50	30	5.613

Rate of dye exhaustion: It was observed from the Table 4 that chitosan treated fibre absorbed higher amount of dyes as compared to the untreated fibre. The results indicated that the application of chitosan to jute fibre could reduce the uses of dyes due to the increased dye exhaustion. When jute fibre was treated with chitosan, the amino groups of chitosan created additional dye sites in cellulose macromolecule of jute fibre. As a result, the treated fibre absorbed more dyestuff than the untreated fibre and this absorption has increased the exhaustion percentage of dye in the chitosan treated fibre ⁴⁴.

Table 4: Effect of various dye absorption on dyeing of bleached jute fibre and chitosan modified jute fibre. Reaction time = 90 minutes, Reaction medium: Aqueous, Fibre- liquor ratio: 1: 50.

Type of Sample	Exhaustion (%)	
	Reactive Orange 14	Reactive Brown 10
Bleached jute fibre.	40	37
Chitosan modified fibre	51	48

Color Fastness: From the Table 5, it is seen that chitosan modified fibre exhibits better light fastness than bleached fibre. This is because modification with chitosan form a protective layer on the jute fibre surface ¹⁹. This protective layer protect uv-light penetration and have less affinity towards moisture can some how protect the yellowing trends to fibre. The colour fastness of bleached and chitosan modified jute fibres have been studied at 40, 60, 80, and 100 °C temperature and the results are tabulated in the Table 6. From the Tables, it is observed that the wash fastness decreases with the increase of temperature. It seems that at higher temperature, dissolution of the dye particles from the fibre surface takes place and hence more dye is easily washed off the fibre. In that case chitosan modified dyed fibres show better result than dyed

bleached jute fibre. The ionic interaction between anionic dyes and amino ions in chitosan treated samples improve the wash fastness of dyes on cellulosic fibres ⁴⁵. The data on colour fastness to acid and alkali spottings of jute fibre dyed with reactive dyes are presented in Table 7. It is observed from the Table 7, that the colour fastness of dyed bleached jute fibres to spotting with acids, such as, acetic, tartaric, hydrochloric, sulfuric acid were excellent in all cases. But in the case of dyed chitosan modified jute fibres, when hydrochloric acid and sulfuric acid were used for spotting test, a slightly change in colour occurred. So, dyed modified jute fibres are restricted to use in presence of strong acids. Chitosan modified fibre showed better colour fastness to spotting with alkalis than bleached jute fibre. It seems that lignin and hemicelluloses present in bleached jute fibre are highly reactive with alkalis and the reactivity will depend on the strength of the alkalis. Here, NaOH and Na₂CO₃ are strong alkali than NH₄OH. So they are more effective to change in colour of jute fibre.

Table 5: Light fastness of jute fibre dyed with Reactive dyes

Exposure Period, hr	Light Fastness Grade			
	Bleached Jute Fibre		Chitosan Modified Jute Fibre	
	Reactive Orange 14	Reactive Brown 10	Reactive Orange 14	Reactive Brown 10
00	5	5	5	5
50	4-5	4-5	4-5	4-5
100	4-5	4	4-5	4
150	3-4	3-4	4	4
200	3-4	3	4	3-4
250	3	2-3	3-4	3-4
300	2-3	2	3-4	3

Table 6: Color fastness of dyed bleached and dyed modified jute fiber on washing

Washing Temperature, °C	Light Fastness Grade			
	Bleached jute fibre		Chitosan modified jute fibre	
	Reactive Orange 14	Reactive Brown 10	Reactive Orange 14	Reactive Brown 10
Unwashed	5	5	5	5
40	4-5	4	4-5	4
60	4	3-4	4	3-4
80	3-4	3	4	3-4
100	3	2	3-4	3

Table 7: Colour fastness and change in colour of jute fibre dyed with Reactive dyes to acid and alkali spottings

Chemicals	Light Fastness Grade			
	Bleached Jute Fibre		Chitosan Modified Jute Fibre	
	Reactive Orange 14	Reactive Brown 10	Reactive Orange 14	Reactive Brown 10
Unspotted	5	5	5	5
Sulfuric acid	3	3	2-3	2
Acetic acid	4	3-4	4-5	4
Tartaric acid	4	3-4	4-5	4
Ammonium hydroxide	4	3-4	4-5	4
Sodium carbonate	3-4	3	4	3-4
Sodium hydroxide	3	2	3-4	3

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Study on the Oligomer and Trimethoxysilane Monomers on the Natural-Synthetic Blended films by UV- Photo curing method

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Abstract

Chitosan, a glucosamine derivative of natural occurring chitin is a good candidate for such blend system. Chitosan which was obtained from dried prawn shell waste through the preparation of chitin and was characterized blended films of chitosan / PEG and PEG / PVP were prepared. Thin films were prepared under UV –radiation for formulation developed with two types of monomer urethane di-acrylate and trimethoxysilane(TMS) in the presence of photoinitiator Duraocure -1664. Mechanical properties like polymer loading, tensile strength (TS). Elongations at break (Eb) gel content, swelling ratio of chitosan / PEG and PEG/PVP blended films were studied. Four formulations were developed with trimethoxysilane(TMS) and oligomer (M-1200) in the presence photo initiator Darocur – 1664(2%). The films were soaked in dissimilar soaking times and irradiated under UV- radiation at different radiation intensities to the improve of the properties of chitosan blended films. The formulation containing 20% ethanol, 60%TMS and 15% oligomer (M-1200) showed the best performance at 20th UV passes for chitosan / PEG and PEG /PVP of UV radiation for 3 minutes soaking time. The blended films chitosan/ PEG performed better physico-mechanical properties rather than PEG/PVP.

KEY WORDS: Photo cured, Chitosan, Blend Initiator, swelling

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Introduction: Recently, there has been a growing interest in grafting of vinyl monomer onto blended chitosan and water soluble polyethylene glycol (PEG) for biomedical and industrial application. The chemical combinations of natural and synthetic polymers yield new materials which could have desirable properties including biodegradabilities.¹

Chitin is the second most abundant polymer in nature, it is found in arthropods, linked to proteins, pigments and being part of the cellular wall of fungi. Photo curing has been developed to an important branch of photo crosslinking of polymer. Photocrosslinkable polymers possess functional groups, which can undergo light-induced reactions to form directly a cross linked polymer. This means that light irradiation polymers carrying more than two reactive groups per chain (or of blend with a photo initiator or photo stabilizer) initiate cross linking to three-dimensional network structure. The photo initiator performs wide spread application in the case of this photo induced polymerization. Excitation of the photo initiator under UV-radiation yields reactive radicals that initiate subsequent reactions in the polymer blended and produce crosslink between two macromolecular chain^{2,3} & Chitin is linear polysaccharide composed of 2-acetamido-2-deoxy-D-glucosidic bonds. The principal derivative of chitin is chitosan, generally produced alkaline deacetylation of chitin. Its primary structure corresponds to a linear chain of beta-1,4 linked 2 - amino - 2 - deoxy -D- glucopyranose residue. Chitin & chitosan have different applications. Chitin is prepared from waste prawn shell. Bangladesh is a prawn country where prawn is the most abundant, containing high natural polymer. Polyvinyl pyrrolidone-K60 (PVP) and starch are water-soluble polymer, which produces a crosslinked polymer under radiation curing in the molten and aqueous state. But, in the solid phase at about 25°C, it is cross-linked under UV radiation treatment and chitosan / PEG and PEG / PVP blend also cross-linked under UV-radiation^{4,5}. Multifunctional vinyl unsaturated monomer was used in the treatment of the polymer film to reduce the UV-radiation intensities to obtain optimum properties or to achieve an increased cure state at the same UV-radiation intensities. In this respect aliphatic urethane diacrylate Oligomer(M-1200) was used as a monomer which makes the film character harder and more brittle. To avoid these difficulties, a mono-functional acrylic monomer (trimethoxysilane) was mixed with oligomer M-1200 at a different proportion, which leads to the softer. Polymer creates some flexibility & oligomer M1200 is more effective in producing a network than TMS.^{6,7} The present report deals with the preparation of chitin and chitosan, as well as chitosan / PEG and PEG / PVP blends. Thin films were prepared by using these blends and treated with different monomer (oligomer M-1200 and TMS) formulations, with different soaking times and cured under UV-radiation at different intensities. Films found better results as compared to that of a PEG / PVP blend through the enhanced physical and mechanical properties of the films.

Materials: Ethanoic acid (purity 99.9%) TMS (trimethoxysilane) and oligomer M-1200 (aliphatic urethane di-acrylate) received from UCN, Belgium & Photoinitiator, Darocur - 1664 were obtained from Germany.

Methods: Prawn shell from which chitosan was extracted was collected from Mongla, Bangladesh. The collected waste shell was washed with hot water and dried in an oven at 150°C for 72 hr. Dried prawn shell was ground (40-60 mesh) by using a blender.

Ground prawn shell was deprotenized with sodium hydroxide solution at the boiling temperature for 240 min. in the solid solvent ratio 1:15 (w/v) and demineralized with HCl at the boiling temperature for 240 min. in the solvent ratio 1:13 (w/v), then washed repeatedly with distilled water until the solution become alkali and acid free. Thus produced chitin is an intermediate product of chitosan. Chitosan was obtained by deacetylation of chitin with 50% NaOH where chitin : NaOH = 1 : 20 (w/v) at 100⁰c for 4hr. After this process, the solid separated from the alkali layer was extensively worked with distilled water to remove traces of alkali. The resultant solid was dried in vacuum oven at 50⁰c for 24hr. Chitosan was extracted in this way from prawn shell waste. The Chitosan solution (2gm) was prepared in a 2% ethinic acid aqueous solution. The Chitosan / PEG blend, containing PEG and Chitosan in the film from named X1, X2 and X3 were prepared by mixing an aqueous solution of PEG with a Chitosan solution in different ratio. PolyvinylpyrrolidoneK60(PVP) blend containing PEG and PVP in the film form named X4, X5 and X6 were prepared by mixing an aqueous solution of PEG and PVP in different ratio, which are given in the table-1. The films were prepared by a casting method on silicon cloth and mechanical properties of the films were investigated. Tensile properties (TS and Eb) of the film were measured by Universal Testing Mechanic (INSTRON, model 1011, UK). The load capacity was 500N, efficiency within +1%, the cross-head speed 2mm/min. and gauge length 20mm., four formulations named M1 to M4 were developed with two monomers, Oligomer M-1200 and TMS with ethanol in the presence of the photo initiator, Darocur-1664 (2%). Their compositions are given in table -2. These films were soaked in monomer formulations for different soaking times and irradiated under UV-radiation, using UV manicure (IST technique; Germany). The intensity of the lamp was 2kw at 9.5amp current and the wave length was 254-313nm with a conveyor speed of 4mm/min. The efficiency of the machine was within 1%. The films were washed with acetone in case of separation of homopolymers from the blends which may be the convenient method for the separation of homopolymers. After 24hrs the cured films were then subjected to various characterization tests. Polymer Loading (PL) of the monomer formulation with the film was determined on the basis of weight gained by the film after the entire treatment process.

Table-1: Different blending composition (w/w)

Composition				Properties	
Films	Chitosan	PEG	PVP	TS MPa	Eb%
X1	1.25	0.40		1.40	10.10
X2	1.75	1.4		1.82	15.22
X3 (=A)	2.25	2.4		2.56	20.21
X4	2.75	2.80		1.50	12.12
X5		0.5	0.27	1.43	16.23
X6		0.85	0.69	1.92	19.32
X7 (=B)		1.40	1.0	2.46	22.33
X8		1.75	1.22	2.01	20.32

RESULTS AND DISCUSSIONS

Data presented in this report are of average values of at least five samples and the results obtained are within the accuracy of +1%.

Optimization of Chitosan and Polymer Ratio: The film prepared from the polymer blend X3 containing chitosan (2.25gm) and PEG (2.4gm) in the ratio 1:1 showed the best performance in case of chitosan / PEG film (Table-1) as compared to blends X1, X2 and X4. The film X1, X2 and X4 possess brittle character, even though they have almost similar properties. The film prepared from the polymer blend X7, containing PEG (1.40gm) and PVP (1gm) in the ratio 2:1 showed the best performance in case of PEG / PVP film (Table-1) as compared to X5, X6 and X8. The films X5, X6 and X8 possess brittle character as compared to X7. That is why for later investigation of the work of chitosan / PEG (1:1) and PEG / PVP (2:1) is optimized. For better understanding, X3 and X7 are named A and B, respectively.

Table-2: Composition of different monomer formulation (%) (M₁, M₂, M₃ and M₄)

Formulations	Ethanol	TMS	OligmerM1200 aliphatic urethane diacrylate	Photo initiator Darocur -1664 (%)
M ₁	20%	90%	25%	2%
M ₂	20%	70%	20%	2%
M ₃	20%	60%	15%	2%
M ₄	20%	50%	10%	2%

Characterization of chitin and chitosan by FTIR: The prepared chitin and chitosan were characterized by infrared spectrum in arrange of 400-4000cm & absorbency at 2870cm (C-H) and 1500cm (amide bond). In chitin, both N-H (1500cm) and C=O (1650cm) bonds are present. Where as in chitosom C=O bond was found to be absent.

Characterization of raw chitosan / PEG and PEG / PVP blended films: Various mechanical properties like TS, Eb were investigated. Tensile strength of the chitosan / PEG blended film was 2.56MPa and Eb was 20.21% while TS of the PEG / PVP blended film was 2.46MPa and Eb was 22.33%.

Untreated film with UV- photo cured: The results of PL values of the uncured blended films are presented in table-3 respective of the number of UV radiation doses . It is observed from the table 3 that the highest PL is found to be 6.01% and tensile strength 2.12 MPa at 20th passes of UV-radiation with the chitosan/PEG blended films. It is also observed from the figure 4 that the highest PL is found to be 4.11% & tensile strength 1.64 MPa at 20th passes of UV-radiation with the PEG/PVP blended films. The chitosan hydroxyl and amino group would be made slightly crosslink with PEG and PVP.

Table-3: Polymer loading, tensile strength and elongation at break(Eb) of the untreated chitosan/PEG blended film against UV-radiation(number of doses)doses

No of UV Passes	PL%	TS(MPa)	Eb%
4	2.12	0.83	14.23
8	3.61	1.02	13.01
12	4.25	1.61	11.20
16	5.12	1.82	10.29
20	6.01	2.12	9.86
24	5.09	1.92	12.61
28	3.25	1.46	11.82

Table-4: Polymer loading, tensile strength and elongation at break(Eb) of the untreated PEG/PVP blended film against UV-radiation(number of doses)doses.

No of UV Passes	PL%	TS(MPa)	Eb%
4	1.63	0.93	26.89
8	2.72	1.11	24.25
12	3.12	1.20	22.26
16	3.83	1.56	20.22
20	4.11	1.64	15.23
24	3.64	1.42	16.81
28	3.22	1.02	17.92

Optimization of Monomer Formulations: Monomer formulation plays an important role because it affects the polymerization rate and overall conversion, as well as the properties of the crosslinked polymerization. Multifunctional monomer possesses more cure speed than a monofunctional monomer. The hardness of the UV cured polymer becomes brittle and twisted. On the other hand, a monofunctional monomer possesses lower density which leads to softer polymer and imparts some flexibility. Only PEG or PVP film that exists in a solid phase is not capable of being crosslinked with various monomers. and chitosan are capable of producing crosslinked polymers with various monomers^{8,9} The films A and B were soaked in different formulation (M1-M4) for 3min. soaking time to optimize a definite formulation for curing of the blended films. After soaking the films were cured under UV-radiation at different intensities (4, 8, 12, 16, 20, 24 and 28 passes). After 24hrs of radiation, the samples were subjected to various physical and mechanical properties were determined.

Polymer Loading: The results of PL values of the cured blended films are presented in Figure-1 and Figure-2 respectively against the number of UV-radiation posses as a function of monomer formulation for 3min. soaking time. It is observed from both figures that the highest PL is found to be 40.42% for A at the 20 UV- posses and 28.76% for B at the 20th posses of UV-radiation with the treatment monomer formulation M3 containing 15% Oligomer M-1200 (aliphatic urethane di-acrylate) 60% TMS, 20% ethanol and 2%

photoinitiator, Darocur-1664. The percentage of PL increases with Oligomer (M-1200), a denser multifunctional monomer up to 15%, but more than 15% Oligomer (M-1200) reduce the curing of blended films. At low concentration, multifunctional vinyl monomer like aliphatic promotes a rapid free radical induced propagation reaction with the help of a photoinitiator leading a network polymer structure through curing via their double bounds. At about 15% aliphatic urethanediacrylate concentration, the amount of residual instauration increase with the consequence of a faster rate of formation of three dimensional network structures, causing restricted mobility¹⁰. The decrease of PL values of higher aliphatic urethane diacrylate concentration may be the reason that the radical recondition process dominating thus creating a photopolymer rather than monomer chitosom backbone reaction, where the hydroxyl and amino group of chitosan may react with vinyl radicals in aliphatic urethane diacrylate, in the case of blended A and PVP backbone reaction in the case of B. In most of the case, the PL value increases with initial UV-doses, attains a maximum of the 20th passes for A and 20th passes for B and then decreases. This may be due to the radiation degradation of the blended film at higher UV passes.

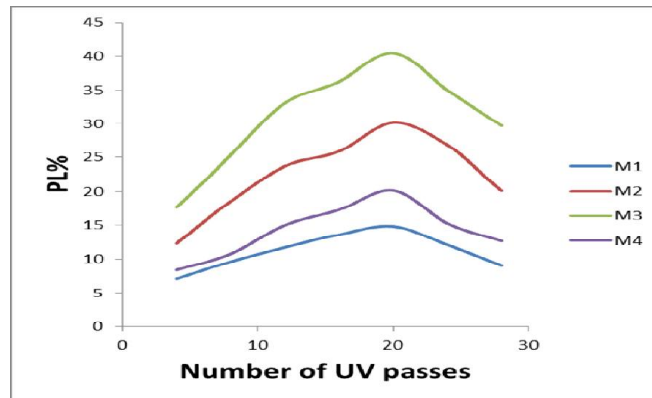


Figure-1: Polymer loading of the treated chitosan / PEG film against the number of passes (UV-doses) with respect of monomer formulation for 3min soaking time.

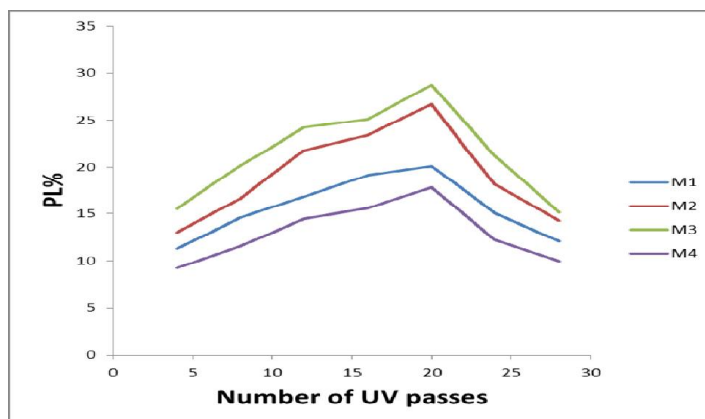


Figure-2: Polymer loading of the treated PEG / PVP film against the number of passes (UV-doses) with respect to monomer formulation for 3min soaking time.

Tensile properties: Tensile strength is very important in selecting diverse applications of polymer. The results of the TS values are shown in Figure-3 and Figure -4 for blended A and B, respectively, where TS values are plotted against a number of UV passes as function of monomer formulation for a 3min soaking time. In these figures, it is observed that the highest TS value for A was 22.78MPa at the 20th-UV passes and for B was 18.72MPa at the 20th UV passes with the monomer formulation. M3 containing 20% ethanol, 60% TMS and 15% Oligomer (M-1200) (2%) photo initiator Darocur-1664. TS values increase with the number of UV passes up to 20th passes for A and for B beyond which they decrease as the radiation passes are increased. It is obvious that after reaching the maximum, the value TS falls. This result implies that the maximum TS is achieved at particular radiation doses, further radiation demolished the TS of the blend films due to the radiation degradation of the films. The mechanism of the degradation is not clearly known, however it could be cleavage of the chain to the overdoes of the UV-radiation¹¹. With the vinyl monomer treatment, the TS value of the treated blend film increase may be due to the crosslinking of the hydroxyl and amino group in chitosom with vinyl group forming three dimensional network structures causing restricted mobility in case of A and PVP monomer crosslinked reaction in case of B. The blend films became brittle, twisted and shrinkage occurs after 15% oligomer (M-1200) concentration and the TS decreases. This may be due to the fact that the homo-polymerization reaction between the oligomer and oligomer radical is dominant and the reaction of chitosan. The reaction of PEG with Oligomer (M-1200) for A and the reaction of PVP with Oligomer (M-1200) for B is less prominent¹².

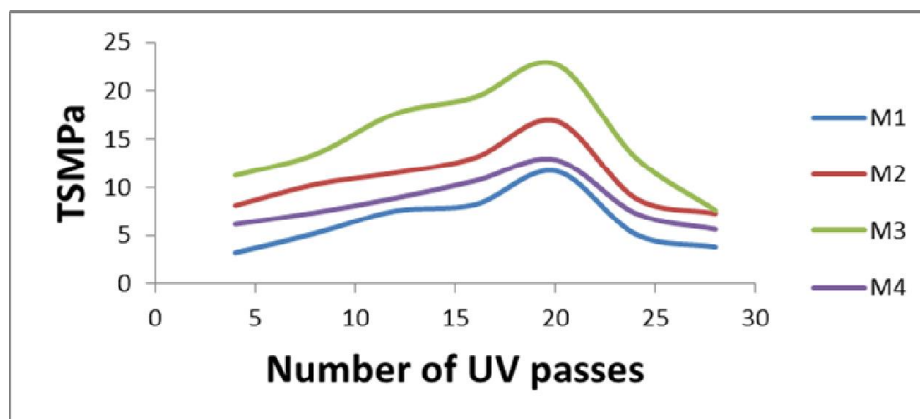


Figure-3: Tensile strength of the treated chitosan /PEG film against the number of passes (UV-doses) with respect to monomer formulation for 3min soaking time.

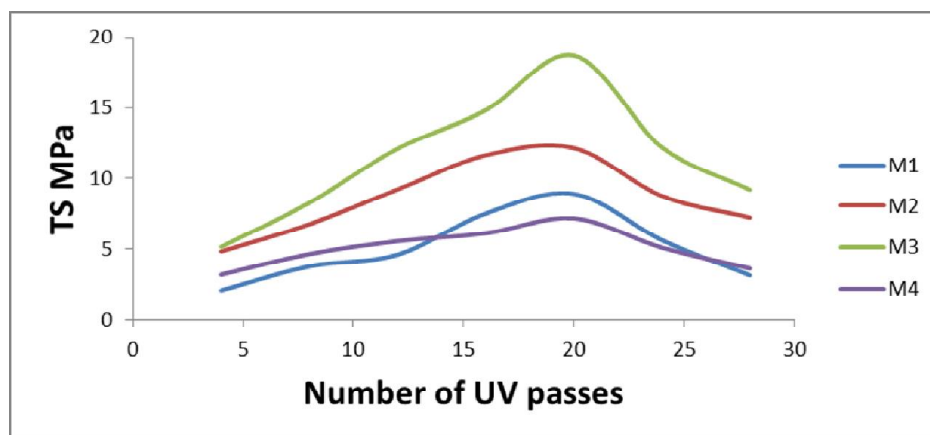


Figure.4: Tensile strength of the related PEG / PVP film against number of passes (UV-doses) with respect of monomer formula for 3min soaking time.

Elongation at Break: Flexibility and elasticity of the blend films are essential parameters that are very actively considered during the application of the polymer. These two phenomena are related to the elongation at break of the blended film. The results of Eb are plotted in Figure -5 for A and figure-6 for B against the number of passes as a function of monomer of composition for 3min soaking time. The maximum Eb for A was 15.027 at the 20th passes and for B was 9.23 at the 20th passes observed with the monomer formulation M1 containing 90% TMS. This is due to the fact that the low density nonfunctional monomer like TMS, results in the film become flexible and softer¹³. While the formulation M3 containing 15% oligomer (M-1200), 60% TMS, the Eb is not maximum and the value of Eb for A was 30.25% at the 20th pass and for B was 19.49% at the 20th passes. There is a rise in elongation at the initial stage of UV radiation like the TS value. The Eb value increases with the number of passes and reaches a maximum after that, it decreases due to the radiation degradation of the film, oligomer M-1200 (aliphatic urethane diacrylate) gives the highest TS up to a certain limit, and after

this, produces a brittle film that cracks easily during stretching. On the other hand, TMS increases high elasticity and creates some flexibility. Therefore, it is clear that TS and Eb are very much dependent on the nature of the formulation, where the monomer is mono functional or multifunctional. The combination of oligomer M-1200 and TMS at the ratio of 15 and 60 (M3), yield suitable conditions for better crosslink phenomenon at chitosan film with the highest TS and moderate Eb¹⁴

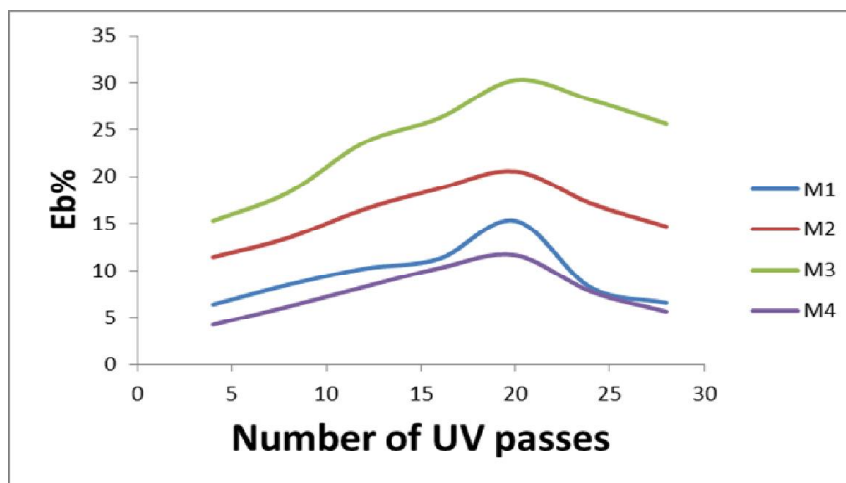


Figure-5: Elongation at break of the treated chitosan / PEG film against the number of passes (UV-doses) with respect to monomer formulation for 3min soaking time.

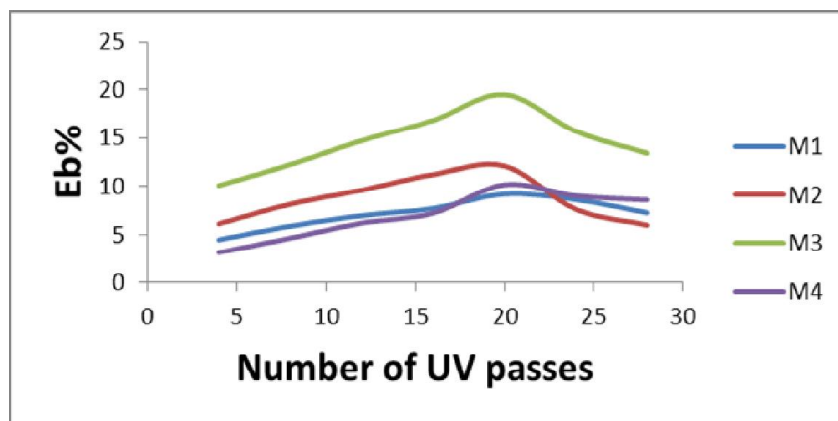


Figure-6: Elongation at break of the treated PEG / PVP film against the number of passes (UV-doses) with respect to monomer formulation for 3min soaking time.

Optimization of soaking time: On having the highest TS and PL at M4 formulation, the blended films (A and B) were soaked in M3 for different soaking times (1, 2, 3 and 4) and then irradiated under UV radiation with a different number of passes (4, 8, 12, 16, 20, 24 and 28). After 24hrs of UV radiation, PL, TS and Eb were investigated.

Polymer Loading: The results are graphically represented in figure-7 and Figure-8. Where PL values are plotted against a number of UV radiation passes as a function of soaking time for optimized monomer formulation M3. It is observed from these figures that the PL value increase with soaking time until it reaches 3min, and gives maximum value of 32.10% at the 20th UV passes for A and 27.16% at the 20th passes for B and above 3 min soaking time the PL value decreases with increasing the soaking time. For both cases, soaking increases the cross-section areas of the film, at the same time the film surface becomes lustrous. As a result, the monomer can easily diffuse in the blended films and may reach with hydroxyl and amino groups of chitosan and oxygen radical of TMS in low swelling times¹⁵. In a higher soaking time, the film becomes twisted, shrinkage occurs and it looks pale. The PL value increases with initial UV radiation doses, attains the maximum value 32.10% for A and 27.16% for B. Then PL value decreases as the radiation doses increases. This may be caused by the radiation degradation at higher UV doses¹⁶

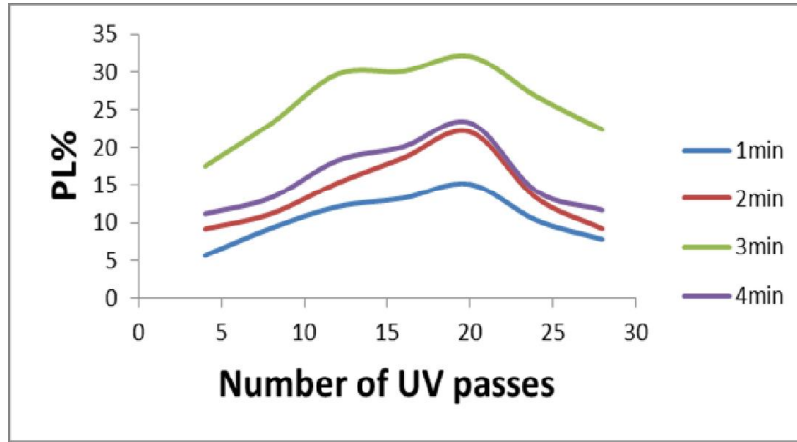


Figure 7: Polymer loading after the treated chitosan / PEG films against UV radiation (number of passes) with respect to the soaking time for M3 formulation.

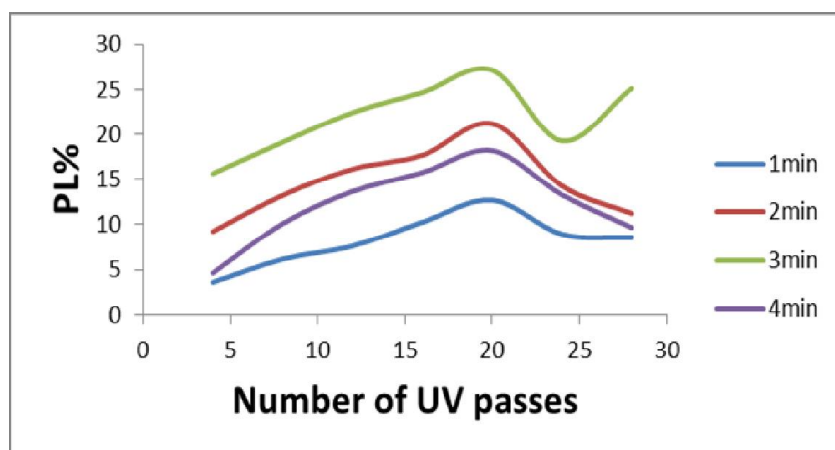


Figure-8: Polymer loading of the treated PEG / PVP film against UV radiation (number of passes) with respect to soaking time for M3 formulation.

Tensile Strength: The results of the TS values are presented in figure-9 and Figure-10, where TS are plotted against a number of UV passes as a function of soaking time for the M3 formulation. The highest TS value 23.11MPa for A at the 20th passes of UV radiation and 17.65MPa for B at the 20th passes. The TS value increases with an increase in soaking time. This may be due to the increased swelling, and leads to an increased diffusion of the monomer into the reaction sites and the amount of curing increase hence, the TS value increased. After attaining the maximum, the TS value decrease with an increase in soaking time¹⁷. The TS value also increases with the increase of passes up to the 20th passes for A and for B, beyond which they decrease as the radiation passes were increased.

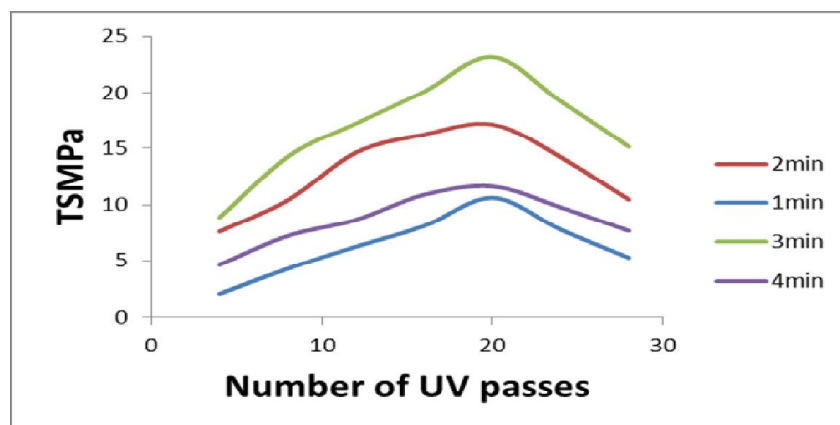


Figure-9: Tensile strength of the treated chitosan /PEG film against UV radiation (number of passes) with respect to soaking time for M3 formulation.

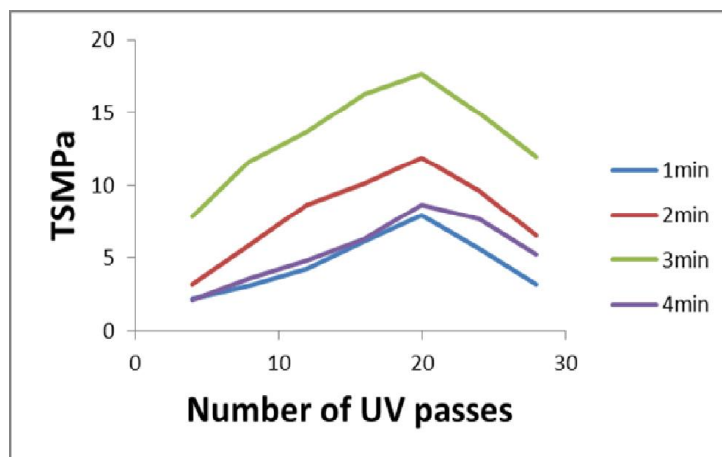


Figure-10: Tensile strength of the treated PEG / PVP film against UV radiation (number of passes) with respect to soaking time for M3 formulation.

Elongation to Break: The Eb values are plotted in figure-11 for A and figure-12 for B, against the number of passes as a function of soaking time. For formulation M3, Eb increases with the increase in soaking time and it reaches maximum 31.22% for A and 18.12% for B of UV radiation, respectively for 3min soaking time, the inherent character of the film appears to be superior as compared to other soaking times. So optimization is established for 3min soaking time and monomer formulation M3, containing 15% oligomer (M-1200), 60% TMS and photoinitiator Darocur-1664(2%), comparing the physico-mechanical properties of chitosan / PEG (A) and PEG / PVP (B).

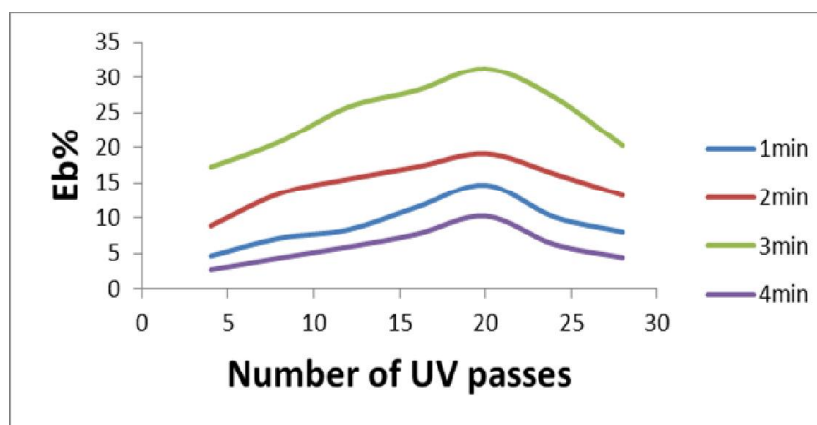


Figure-11: Elongation at break of the treated chitosan / PEG film against UV radiation (number of passes) with respect to soaking time for M3 formulation.

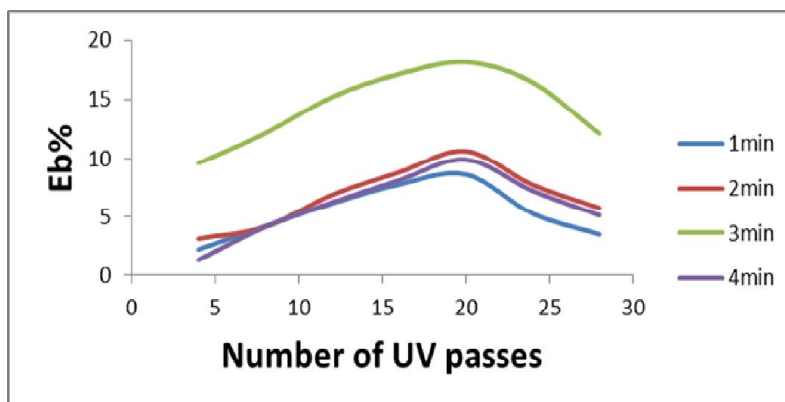


Figure-12: Elongation at break of the treated PEG / PVP film against UV radiation (number of passes) with respect to soaking time for M3 formulation.

Gel Content: The gel content is a representation of cross-linking density in the cured film as a whole. Optimized monomer treated (M3) chitosan / PEG and PEG / PVP film was determined through hot benzene and the result of gel content of the UV cured films are represented in figure-13 for A and in figure-14 for B against the UV radiation intensities (number of passes). The gel content an index of cross- linking density present in the entire film area increases as the radiation doses is increased. The maximum gel content is obtained at different doses depending on the nature of the formulation^{18,19}. The gel value increases with an increase in UV radiation and attains a maximum of 3min soaking time and at 20th UV passes for A and 20th passes for B. After the maximum, the gel value decreases. This may be due to the fact that, with higher radiation doses the cross-linking of the chitosan / PEG and PEG / PVP film degraded. This highest value (91.25%) for A and (65.62%) for B of gel content were also higher than that of other of monomer formulation. This was obtained by the formulations M3 containing 15% oligimerM-1200, 20% ethanol and 60% TMS photoinitiator Darocur-1664 (2%) at 20th UV radiation for A and B as well as at 3min soaking time. Taking the highest values, gel contents of various monomer formulations are shown in the figure-13 for A and figure-14 for B.

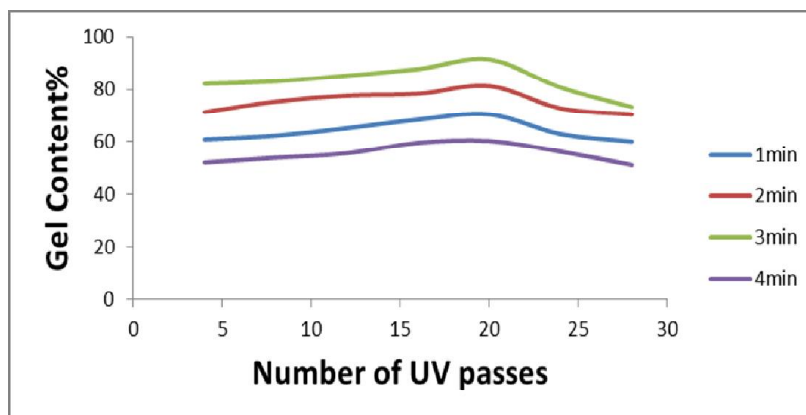


Figure -13: Gel content of optimized monomer soaked (M3) cured chitosan / PEG film of different monomer soaking time against number of UV passes.

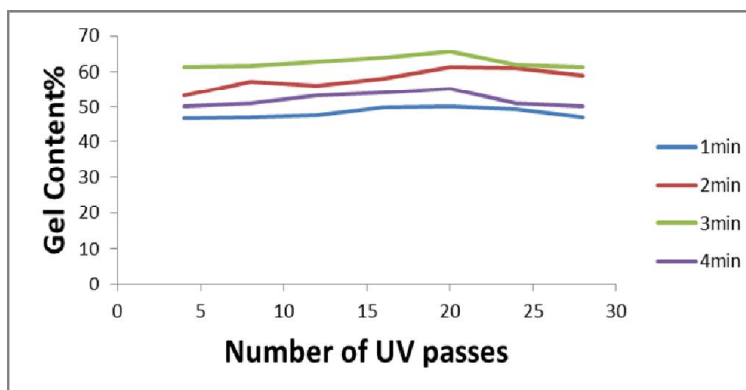


Figure-14: Gel content of optimized monomer soaked (M3) cured PEG / PVP film of different monomer soaking time against number of UV passes.

Comparative studies blended films chitosan / PEG and PEG /PVP: Having established the optimum monomer composition and soaking time for attaining the highest PL and TS value for both blended films, it is observed that chitosan / PEG blended film shows better physico-mechanical performance than that of the PEG / PVP film. The above mentioned physical and mechanical properties are summarized and represented in table -5 where the highest value of each property is plotted against corresponding blended films.

Table-5:Comparative study of physico mechanical properties of chitosan/PEG and PEG/PVP of optimized monomer formulation (M3) for 3 minutes soaking times

Properties	Polymer loading%	Tensile strength MPa	Elongation at break%	Gel content%
chitosan/PEG	32.10	23.11	31.22	91.25
PEG/PVP	27.16	17.65	18.12	65.62

Swelling Ratio: Swelling ratio is dependent on the texture of the film. If the chitosan / PEG and PEG / PVP film have higher cross-linking or gel it will show less swelling affinity. This is reflected in the results of swelling ratio shown in figure-15 for A and figure-16 for B. The high swelling ratio indicates that the system may need radiation doses for high cross- linking with the number of passes under the UV-lamps, indicating maximum gel formation at higher doses (20th passes for UV-radiation for A as well as 20th passes UV-radiation for B) then increases swelling ratio. The chitosan / PEG and PEG / PVP film soaked in the formulations M3 possesses the minimum swelling ratio.

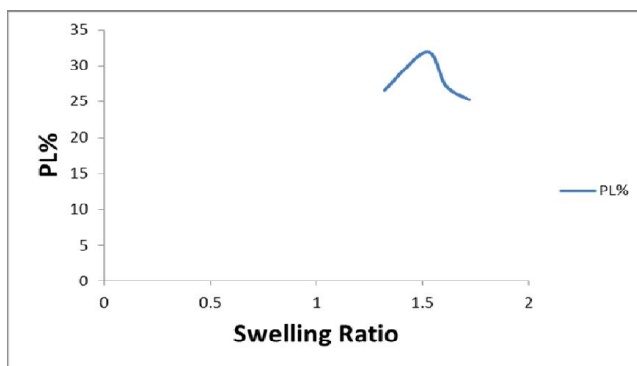


Figure -15: Swelling ratio of the cured chitosan / PEG film against polymer loading.

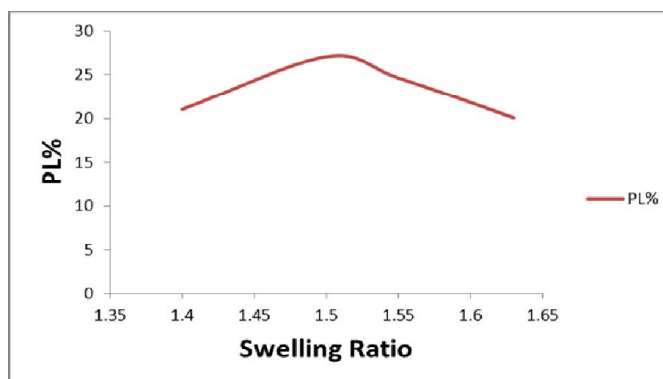
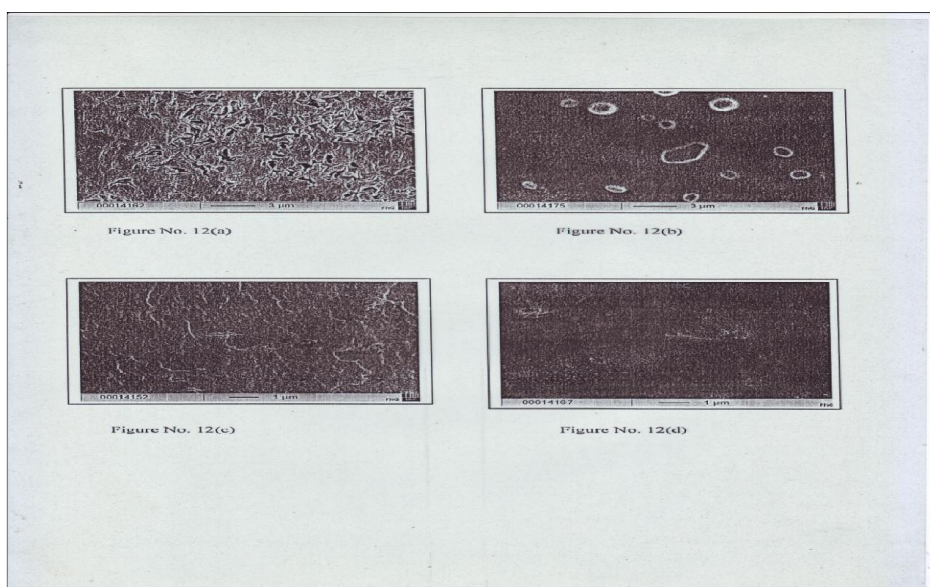


Figure: - 16. Swelling ratio of the cured PEG / PVP film against polymer loading.

Scanning Electron Microscope (SEM):



Some holes and cracks are found in the non grafted films fig (a). But grafted film is more homogenous fig(b) for chitosan/PEG. Cross section of grafted films fig (d) is more homogenous than non grafted films fig (c) for PEG/PVP.

Conclusion: Natural polymer ,chitin was extracted from prawn shell waste. Chitosan was obtained from the extracted chitin. The UV- cured films of different oligomers and TMS possess different characteristic , which are described in the respective section. The properties are influenced by the presence of additive TMS. Besides, PEG and PVP is water soluble synthetic polymers. Chitosan / PEG and PEG / PVP blended films were prepared with these polymers. Four formulations were prepared with oligomerM-1200, TMS, ethanol and the photo initiator Darocur-1664. When these formulations were applied on chitosan/PEG and PEG/PVP blended films treated under UV- radiation, there is clear reflection of the characteristic properties of oligomer and TMS. Monomer soaking of these blended films was performed in various soaking times. The monomer treated blended films were cured under UV-radiation at different radiation intensities. Various mechanical properties like TS (MPa) and Eb (%) and PL (%) of these blended films were studied. It was observed from the above discussion that the chitosan / PEG blended films showed better physico-mechanical properties as compared to that of the PEG / PVP films. Chitosan, PEG and PVP were used as additives in this respect. But as an additive in the blends, chitosan performed better as it showed a higher percentage of strength.

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Prospects and Challenges of Women Legal Profession in Bangladesh: Social Perspectives

Tahmina Khan¹, Jamsedur Rahman²

Abstract: This study was an examination of the differences in the career prospects and work experiences of female legal professional in the private sector in Bangladesh. The literature derived from South Asian studies, particularly India, Bangladesh, British research on women in the legal profession and other professions. The study suggested differences between men and women in terms of their promotional prospects, with more men than women being promoted to senior positions in organizations. These were intriguing findings and made as wondered if these differences would be replicated in a country with a different legal, cultural, political, social and economic situation. Bangladesh is a multicultural and multi-traditional country with distinct cultural groupings, so it is interested in examining whether cultural groupings influence male and female lawyers' professional anticipation. The study investigated that gender emerged as the overall stronger influential factor than cultural groupings in explaining differences between male and female lawyer's career prospects in the Bangladeshi legal profession.

Keyword: Legal Profession, Culture, Social economic, Challenges, Wayout

Introduction

The study investigates the experiences and prospects of female profession in Bangladesh. Women are being deprived of the opportunity to have a career in law profession. Family, society has a stereotypical view that women don't have liability to excel in law sector. Women's leadership is more important to participate within the justice sector. In this perspective, the study aims to discover whether female lawyers in Bangladesh have the same opportunities as male lawyers to develop their careers, whether the door to their careers is 'wide open' or if female lawyers face substantial barriers to their careers suggesting they have only 'a foot in the door'. It is essential to explore the experiences and prospects of Bangladeshi female lawyers and law profession utilizing both quantitative and qualitative means.

Objectives of the Study

The main objective of the study is to find out the prospects and challenges of women in legal profession in Bangladesh. There are also some other objectives of this study.

They are-

- To concept based background of the women legal profession in Bangladesh.
- To analyze the present social situation of legal profession of the women in Bangladesh.
- To challenge of the crossing legal profession rights of women in Bangladesh.
- To suggest on improvement of the social and professional rights on women of Bangladesh.

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Rationale of the Study

The study is not only an important prerequisite for dynamic Social order but also a systematic and objective analysis of information that is discovered. At first, the national machinery involved in promoting legal profession of women's issues in Bangladesh examined as it plays an important role in this area. In fact, it was upon the urgings of the Minister for Women and Children Affairs under department of women affairs that the government agreed to an amendment to Article 8 (2) in the Constitution which now guarantees gender equality for all women in Bangladesh. The areas of improvement for women in light of the constitutional change and current issues affecting women, such as education, family and work, and also areas of the law which still discriminate against women in Bangladesh.¹

Methodology

The methodology of this study is based on the cross sectional of the opinion from questionnaire survey of women lawyers, advocate, advisor of organization, legal practitioner, social worker, student of law and personal correspondence and diary as well as law legislation observational study. For this purpose, an easily understandable questionnaire was prepared. A total sample size of 78 was placed. Qualitative and quantitative both data collected from KII checklist, FGD guidelines, oral interview and observation, official publications such as the ministry of law, statistical departments of the government, NGO, Bureau and semi-official sources include women and gender studies department of Dhaka University. Descriptive analyze via SPSS and Excel with statistical tables are prepared chronologically on the basis of survey questionnaire. Summary findings were explained in detail.

Study Area

The sample data are collected clustered from different parts of Dhaka city and also from woman profession in different location. Cluster sampling procedure was followed to select the sample. Number of total sample is 78 (seventy-eight). Samples were taken from 4 (four) Thanas. These thanas were Uttara, Banani, Mohammadpur and Ramna of Dhaka city.

Figure -1 shows the selected study area of Dhaka City.

Dhaka city is located in central Bangladesh at 23°42'N 90°22'E, on the eastern side of the Buriganga River. The city lies on the lower reaches of the Ganges Delta and covers a total area of 306.38 square kilometers (118.29 sq mi). Dhaka District is bounded by the districts of Gazipur, Tangail, Munshiganj, Rajbari, Narayanganj, Manikganj.²

Figure-1: Selected Study area of Dhaka city³

Literature Review

Women legal profession is social issues affecting in Bangladesh. The study begins by examining the national machinery involved in promoting women's issues in Bangladesh. The study examines areas of improvement for women in light of the constitutional change and discuss current issues affecting women, such as education, family and work, and also areas of the law which still discriminate against women in Bangladesh.

Social Improvement in women's lives and Discrimination: Article 8(2) of the Constitution was amended to include the word 'gender' in 2001 as a move to promote equality between women and men in Bangladesh by removing laws or policies which discriminate against women. The other laws and suggestions regarding the equal rights of opportunities of women are originated. These laws will eradicate discrimination in the society regarding women's profession.⁴

Women Work and Family Responsibility its conflict verse Family Work: Another proposed situation centered explanation for the legal profession is the rigid work practice of long working hours without the offer of more flexible work arrangements for women. However, in an increasingly competitive labor force, women are working long hours alongside their male counterparts in an effort to show their worth to organizations. For example, interviewed employees in a Fortune 500 company and noted that both men and women were putting in more hours at work, which subsequently created greater stress for their family lives. In the previous section, It was discussed the literature on the difficulty faced by the women with work practices because of their family responsibilities. This difficulty may lead to women experiencing greater work-family conflict. The interface between work and family life can either create conflict or integration for the persons involved instead proposed 'an expansion approach' where participation in multiple roles can expand rather than deplete resources and create energy, thereby enhancing overall well being. Some roles may be performed without any net energy loss at all.⁵

Women Social Network and Negative Stereotyping of Women's work Skill: Working long hours in the office is generally perceived as a sign of commitment to the organization. In the case of women lawyers, negative stereotyping of women as being less committed to their work also plagues their career prospects. It has argued that men hold the monopoly on cultural, economic and social capital in the legal profession. Lawyers in New York found that women with children were considered to be 'unstable professionals'. Their commitment to work was frequently questioned. The Equal Opportunities Commission report 'The cycle of inequality also showed that women solicitors' careers are negatively impacted by having children as their commitment levels are always questioned by their employers. This argued that women with family responsibilities have more difficulty in finding time for networking or 'practice development' compared to their male counterparts with fewer family responsibilities.⁶⁻⁷

Gender Imbalance, Career Entry, and Hiring: In the labor force as a whole, women largely work in different and less rewarding occupations, jobs, and work settings than men do. Women are somewhat more likely than men to be found in less remunerative and prestigious practice settings. The American Bar Foundation's series of Lawyer Statistical Reports analyze data on virtually the entire Bangladesh population of lawyers. In several surveys, women reported taking first jobs in government, public interest, or other nonfarm settings more frequently than did men. There is also some gender imbalance across substantive practice areas, but it has decreased as women's representation in the profession has grown.⁸

The Gender Gap in Earnings and Challenge: Some studies of lawyers' earnings generally report that women earn substantially less than men. Women's earnings are, on average, 52% to 64% of men's earnings, and the magnitude of that gap declines yet remains resiliently significant when law school status, academic distinction, labor supply, practice setting, specialization, hours worked, family situation, and measures of social capital. Using a 1993 national survey of college graduates compared the relative economic rewards to women of four professional degrees: law, medicine, MBAs, and social science/psychology. Dr. Sunder conducted a survey of nearly 1600 lawyers in a 15-year (1975–1990) bar admission cohort in Ontario, Canada, to examine earnings across careers. The results reveal a persistent gap between the earnings of men and women.⁹

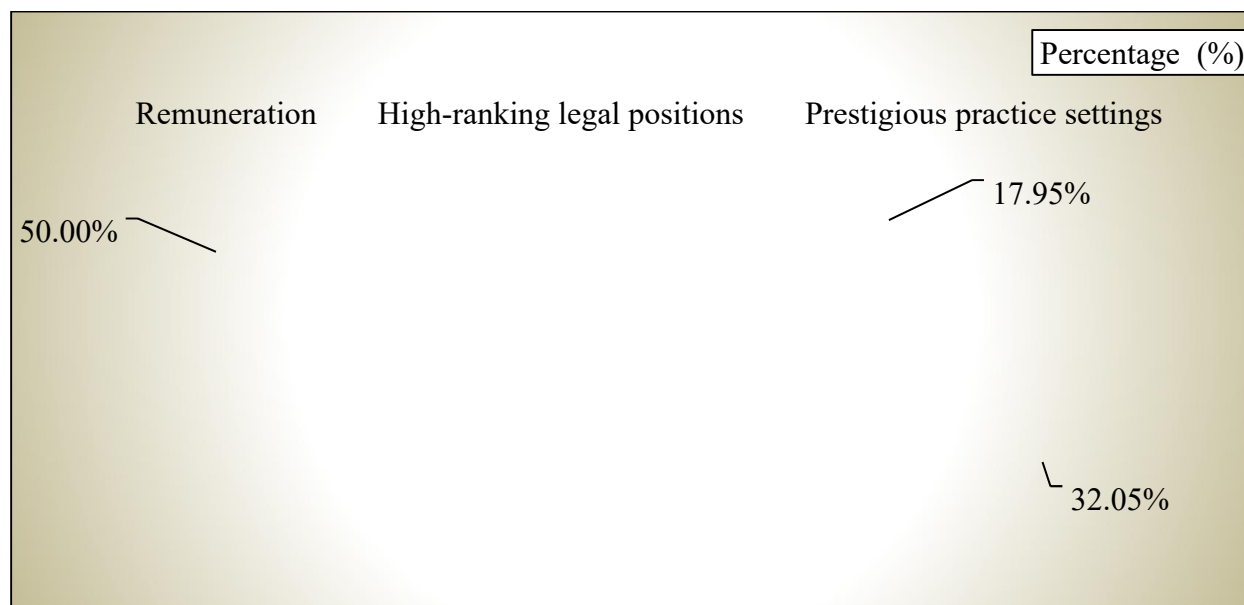
Social Perceptions, Attitudes, and Quits: Research on gendered professional identity formation in law has explored the gendered nature of lawyer work regimes, the sexualization of women's professional roles, and the process by which women internalize the normative culture of law and manage impressions to demonstrate legitimate professional identity. It claims that standards for professional performance are based on male models and that women are held to a higher standard of performance than men. Research also reveals that, in firms that do not restrict women's access to senior positions, women associates were better able to establish constructive developmental relationships, identifying with women partners as a source of validation and support.¹⁰

Feminization of the Profession its Impact: Challenge Way-out: There are raised some questions that women have successfully entered all legal specialties, practice settings, and higher echelons of status and influence in their profession. The Number of women taking admission at top law schools have undoubtedly increased tremendously over the past few years. Unfortunately, this level of achievement for women has not carried over to the workplace once these students begin practicing law. The progress women have made in the legal profession in the last three decades is creditable, yet there is still a long way to go. One of the most dramatic changes in the legal profession in recent years has been the influx of women. In many countries women now constitute close to half of all law students, although it will be the turn of the century before this representation is fully mirrored among practitioners. The influx of women into the legal profession has prompted speculations among both academics, political and social activists that women would bring about change in the nature of substantive law and how law is practiced. The study shows that the issues of gender equality in law and legal professions still continue to present a challenge today all over the world.¹¹

Social Structure of the women Profession: Feminist Consciousness in Decision Making: The studies show that women will structure and practice law differently and this aspect remains unanswerable. As a result of widespread occupational segregation, women still occupy lower positions in the power hierarchy and particular fields and jobs on the horizontal axis and demonstrates that the gap may be narrowing between women and men in private practice. But studies of women in large firms they occupy entry-level positions; they have not made much progress vertically. If feminism's purpose is to advance humanism, then the feminization of the legal profession should help to redeem it from the flaws of domination (both by and of clients) If it does not, then women will find themselves transformed by the male professional world working long hours, estranged from their families, and perhaps exploiting another class of women to perform traditional female. Men are more likely to enter and stay in private practice and be a partner, in compare to women who have missed paid work to do childcare. This shows an insignificantly negative effect for being a woman. This effect is disproportionately borne by women who do childcare who suffer a disadvantage similar to that of men who do childcare.¹²⁻¹³

Analysis and Discussion

The number of respondents was 78. The survey has illustrated that about 3.33% of respondents were male, about 93.33% were female and 3.34% were LGBTQ, 13.33% think that women generally face physical strains in the legal profession, 16.67% think that women generally face mental strains in the legal profession, 53.33% think that women generally face financial strains in the legal profession and 16.67% face others problems. 53.33% women face discrimination in workplace in their professions.



Source: Field Survey, 2018

Figure-2: Sorts of discriminations legal women professionals

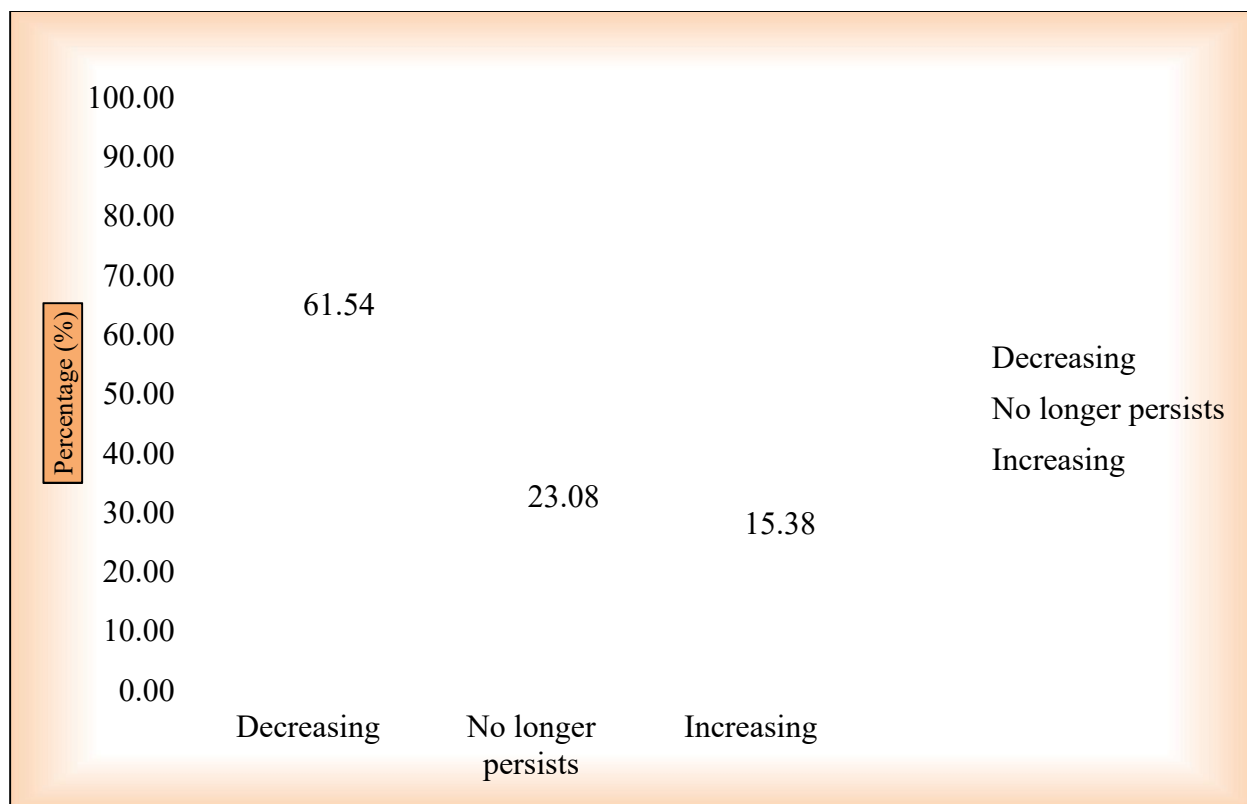
Figure-2 shows that the respondents were asked about sorts of discrimination. They revealed that 50.00% respondents faced prestigious practice as sorts of discrimination in professions, 32.05% respondents face high-ranking legal positions as sort of discrimination and 17.95% respondents face remuneration sorts of discriminations legal women professionals.

Table-1: Problems face in practicing legal

Type	Frequency	Percentage (%)
Sexist behavior	3	3.85
Harassment	12	15.38
Demeaning comments	19	24.36
Negative courtroom environment	44	56.41
Total	78	100.00

Source: Field Survey, 2018

Table-1 shows that there are many problems those women have to face in their profession. In legal profession, most of the women face negative courtroom environment, they also face demeaning comments, harassment and sexist behavior in percentage of 56.41%, 24.36%, 15.58% and 3.85% respectively.



Source: Field Survey, 2018

Figure-3: Present nature of gender imbalance in substantive legal practice areas

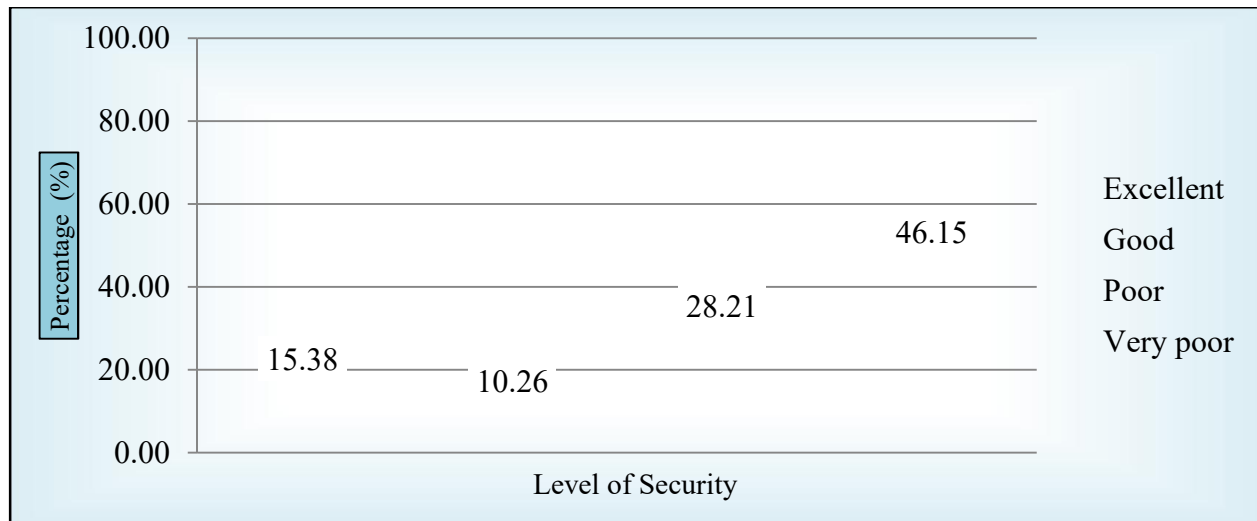
Figure-3 shows that gender imbalance seen everywhere in the legal practice. But now a days this situation is changed. The data revealed information that nature of imbalance in substantive legal practice area was decreasing day by day according to 61.54%. On the other hand 23.08% respondents opinioned about no longer persist and 15.38% respondents opinioned about increasing.

Table-2: General people's attitude towards women's participation in the legal profession

Type	Frequency	Percentage
Positive	21	26.92
Neutral	39	50.00
Negative	18	23.08
Total	78	100.00

Source: Field Survey, 2018

Table-2 presents that the attitude is important for any sorts of profession. In legal profession, women were not seen through good eye in the past. But time has been changed. But this was not changed radically. People attitudes are most of the time neutral about women's participation in the legal profession. According to data, 26.92% respondents think positive, 50.00% think neutral and rest 23.08% think negative. The above figure will show the results.



Source: Field Survey, 2018

Figure-4: Level of security provided by the Government to women legal professionals

Figure-4 shows that Security is important to encourage women to come in legal profession. Security should be maintained strictly. The respondents were asked about the security provided

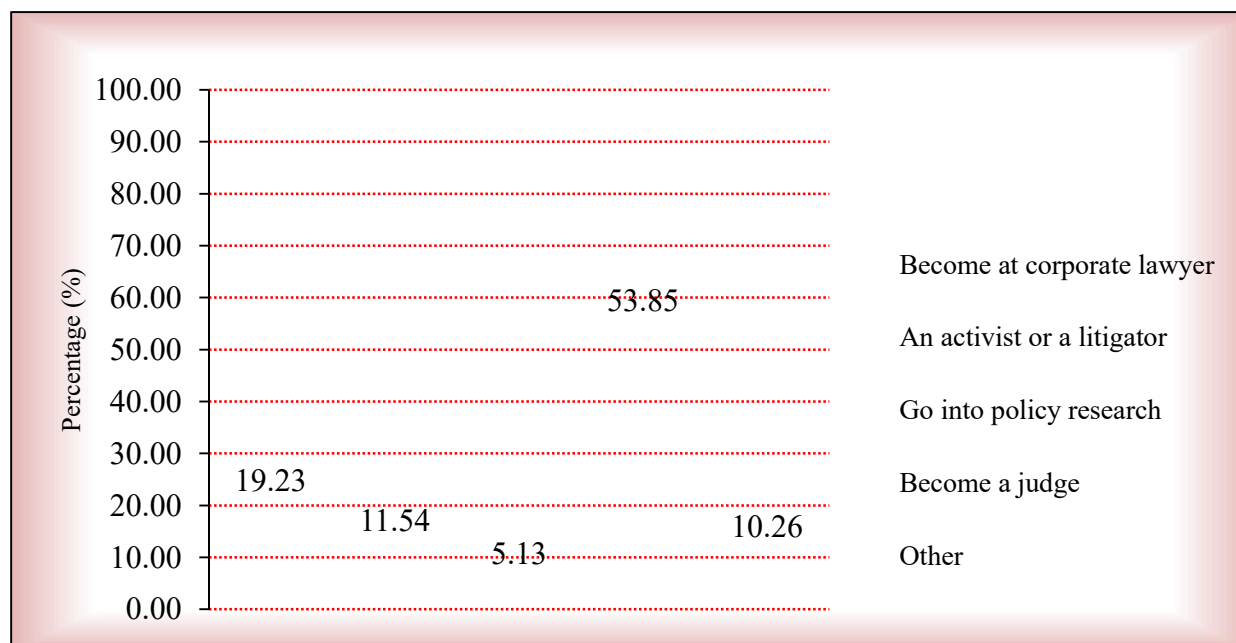
by government. The data show that 46.15% said very poor, 28.21% said poor, 1026% said good and 15.38% said excellent about level of security provided by the Government to women legal professionals.

Table-3: Women have a bright future in the profession

Type	Frequency	Percentage (%)
Yes	37	47.44
No	28	35.90
Not Sure	13	16.67
Total	78	100.00

Source: Field Survey, 2018

Table-3 indicates that legal profession is one of the prestigious professions in the world. But it is matter of great regret that there are less number of women come in this profession due to many reasons. The respondents were asked about the bright future of legal in the profession. The data showed that 47.44% said yes, 35.90% said no and 16.67% said not sure that Women have a bright future in the legal profession.



Source: Field Survey, 2018

Figure-5: Career prospects do you think women have a legal profession

Figure-5 shows that there are many opportunities to use self in legal profession, Women have the opportunities to switch in different professions. The respondents were asked about their

career prospects of women in legal profession. The results were found that 19.23% want to be a corporate lawyer, 11.54% want to be an activist or a litigator, 5.13% want to go into policy research, 53.85% wanted be judges and 10.26% wanted to be others.

Discussion

The overall discussion finds out some certain facts about women legal professionals in Bangladesh. The first thing to note is that the number of women in legal profession is increasing sharply, which shows a welcome change in the mind-set of the society. However, this increase is only quantitative, not qualitative. The fact that most women professionals are not getting enough cases, and consequently have low earnings, is a disturbing fact. Secondly, marriage and family-raising seem to be big hurdles for women legal practitioners. Although a number of women join the legal profession as a career of first choice, most of them opt out immediately or soon after marriage. It is really shocking that very few women are able to continue after the age of forty. This discouraged women to come in legal profession. Finally, gender discrimination experienced at the workplace by the women legal practitioners is a serious issue. It is important to note here that, keeping the sensitivities of women, no separate question on sexual harassment was asked in the questionnaire, and gender discrimination was supposed to be inclusive of sexual harassment. This makes it clear that even the profession of law, whose aim is to provide justice to everyone, is not free from discrimination and harassment, often of a sexual nature, meted out to its own women fraternity. This fact itself is a grim reminder of the sense of insecurity and suspicion towards men, being felt by women, even in the profession of law which is associated with considerable power and prestige.

Women opinion in Legal Profession: The first professions of women, influenced in their career were journalism, academics and medicine. The later years saw the influence of feminism on professions which were largely dominated by men, for example surgery, civil services, law, management, entrepreneurship, and politics. The constitution of Bangladesh ensured the equal rights of women in profession. According to a report by the *Daily Star* about women in legal profession, over 250 women on an average are coming into the law profession in Bangladesh each year mainly getting attractions to handsome earnings and scope for providing legal support to the oppressed people in the society. There are over 41,000 lawyers in Bangladesh. Of them, around 5,000 are female practicing in different courts, including the Appellate Division and the High Court Division of the Supreme Court. More than 400 women lawyers are practicing in the High Court and the Appellate Division but far less in the apex court, said sources at the Supreme Court Bar Association.¹⁴ Most of the women lawyers are now working for the interest of the people particularly for the helpless and oppressed women and children. Women lawyers find a charm in law profession since they can directly contribute to their family as well as the society by earning money. Women are now conscious of the challenges and profits of the legal business and so, they choose to study law discipline.¹⁵⁻¹⁶

Findings

There are several findings of this study. Nowadays many women enter into legal profession every year. It is increasing day by day. The results suggest that there have been overall improvements in the economic standing of female lawyers. Women lawyers and judges can make an impact on legal matters affecting women's interests. The constraints that women face in and outside the home also affect in their professional career. There is also evidence of a persistent 'glass ceiling' in the earnings distribution for women. Women would inhabit the role of lawyer differently than men if they could overcome men's domination of the profession. Women's role as lawyers, judges and partners of law firms will refuse to capitulate to a 'macho' ethic of law and will try to incorporate their own integration of psycho-social health and family balance into their roles.

Recommendations

The study was prospects and challenges of women in legal profession in Bangladesh: social perspectives. After above discussion, there are some recommendations included here. They are given below:

- Women must continue to educate themselves and the public as to the benefits of a gender balanced judiciary.
- Law schools could be enlisted to teach law students about the realities of the legal profession in addition to teaching them how to "think like a lawyer" in substantive law courses and how to act like an ethical lawyer in Professional Responsibility courses.
- There must continue to make gender balance within judiciary an issue that cannot be overlooked without political consequence.
- Women have offered much to the legal profession so far in the little over a century that they have been admitted to the practice. They should be offered with an increased presence at all levels of the practice, with equal pay and opportunities, and with a voice which can be heard in leadership positions in the profession.
- Although men and women must take the lead in fighting the barriers that block the path to judicial appointments, women must draw upon their best resource themselves.

Conclusion

A shocking condition for women in the legal profession would be devastating for the future of the whole country. The main barrier to establishing the constitutional promises can be adduced to the absence an adequate environment which could foster the circumstantial growth of the women's right to work. Another way, implementation of laws is similarly prerequisite. Laws fail to manifest any fruition if not implemented. The sexual harassment prevention and complaint committee to be established in every institution, as mentioned in the guidelines, need to be formed in the Bar Associations very promptly. Most importantly it must function actively, regularly and impartially. The findings of the study make clear that many women lawyers in Bangladesh are not treated equally with men. Disparate treatment of men and women is found in the courtroom, in salary levels, in opportunities for advancement, and in the day-to-day interchange among colleagues. Most women perceive gender bias; most men do not. Significant numbers of women report overt discrimination, including physical and verbal sexual harassment. More subtle forms of discrimination in terms of attitudes and perceptions about women lawyers are also prevalent. Moreover, women continue to bear most of the family responsibilities.

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Uses and Problems of Credit Card in Private Commercial Banks of Bangladesh: Bank Employees and Bank Clients View

Rashel Sheikh*

ABSTRACT

Credit card is now a common e-commerce tool for most of the private commercial banks of Bangladesh. This study focused on usage and problems of credit card both for bank clients and for bank employees. 446 respondents of 18 commercial banks were selected as sample using stratified sampling technique. Five-point Likert scale was used preparing the interview schedule. Collected data and frequency was analyzed through mean, coefficient of variance and chi-square test. APA (6th Ed.) was used for overall formatting of the study. Findings of the study show that most of the bank clients and bank employees don't use credit card. Most users use credit card not more than five times per month. There are no any respondents who use it more than ten times per month. Users of credit card face different kind of problems. Most of the bank client agree and strongly agree that their bank take high annual charge on their credit card although bank employees disagree with the statement. Most of the respondents agree with the statement that their credit card has limited accessibility. Most of the respondents are neutral about the statement that credit limit of credit card is not satisfactory. High interest rate on unpaid credit loan is another major problem of credit card.

Keywords: Users, Perception, Credit card, PCBs

INTRODUCTION

There are more than fifty eight private commercial banks operating in this country (Bangladesh Bank). To sustain in the market more or less all private commercial banks have already introduced credit card. Credit card generally means a plastic card issued by scheduled commercial banks assigned to a cardholder, with a credit limit, that can be used to purchase goods and services on credit or obtain cash advances.

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Credit cards allow cardholders to pay for purchases made over a period of time, and to carry a balance from one billing cycle to the next. Credit card purchases normally become payable after a free credit period. During which no interest or finance charge is imposed. Interest is charged on the unpaid balance after the payment is due. The use of credit card is increasing day by day. There are less than 1 million issued credit cards in the country, according to data from the Bangladesh Bank (Rahman, 2017). City bank issues the total number of its credit cards to more than 192,000 at the end of November. Long-time market leader Standard Chartered Bank has around 150,000 active credit cards, according to data from the Bangladesh Bank (Rahman, 2015). Therefore need of credit card is huge. This article is helpful for all commercial banks of Bangladesh as because this article showed the opinion of all users of credit card.

OBJECTIVES OF THE STUDY

The main objective of the study is to find out the uses and problems of credit card faced by the private commercial banks of Bangladesh. For achieving the main goal some specific objectives are set out as follows:

- (i) To measure the number of credit card users in Bangladesh.
- (ii) To measure the frequency of usage of credit card in Bangladesh.
- (iii) To find the major problems of credit card in Bangladesh.

LITERATURE REVIEW

Few articles have been found regarding the credit card uses and problems in Bangladesh. Sheikh, Hossain & Islam (2014) focused on the different factors that affect the customer's preference in selecting credit cards in Bangladesh. They found that the most important influencing factors are interest rate, discount and reward, maximum credit limit, loan payment system and loan processing system to the users of credit card.

Thomas (1992) in his article, pointed out that major changes that occurred in the U.K. in the distribution of the costs associated with credit-card operations, including the introduction of annual fees to cardholders, the lowering of merchant service charges, and the increasing proportion of cardholders paying off their monthly balances completely. He described those changes and compares briefly the resulting fee and cost structure with that in the USA.

Islam, Karim, & Alam (2015) studied the rising trend in the use of credit cards in Bangladesh and its implication on over-indebtedness and its difficulties in personal finance. As credit card enables an individual to purchase certain products and services without having money in the account, it actually accelerates consumers to spend more and fall in deep debts. The study found that majority of the participants face financial difficulties with credit card debt and the accumulating debt is seriously affecting the budgeting and personal finance and decreased saving and or no saving at all. Thereby they were bound to modify their saving. From the above review of literature related to credit card, it is observed there is no studies that separately discuss the usages and problems of both bank clients and bank employee. Researchers are trying to cover those gaps.

METHODOLOGY OF THE STUDY

A structured interview schedule was prepared based on group discussion and objectives of the study. The interview schedule was organized into two sections: demographic and analytical. Demographic data includes sex, age, educational level, occupation, and income level. Analytical part includes data relating to ATM booth.

Sampling Technique: Stratified random sampling was used through the study. There were 03 stratum in this study. 14 conventional commercial banks, 03 Islamic commercial banks and 01 foreign commercial bank were used as sample from total 48 commercial banks of Bangladesh (Bangladesh Bank, 2016). Total 450 (18×25) interview schedules were distributed; 15 for bank client and 10 for bank employees for each bank. 446 schedules were collected and analyzed as 4 interview schedules were missed by the bank clients.

Collection and Analysis of Data: This research is mainly based on primary data. All samples were collected through the students of Hamdard University Bangladesh. Before collection of information, they were given a lesson about interview schedule. Interview schedules are collected between the periods of August 2015 to October 2016. Collected data are analyzed using five point Likert scale. Data has been analyzed using SPSS. Mean, C.V. and chi-square test have been used in this study to analyze the data.

ANALYSIS AND FINDINGS OF THE STUDY

Analyzing Demographic Data

From Table 1, it is found that 88 percent of our respondent is males and only 12 percent is female. This is because males are mostly engaged in banking sectors in Bangladesh. We also found that most credit card users are aged between 20 to 30 years. They possess about 49 percent of the total respondents. Second highest users are between the ages of 30 to 40. Below 20 years and above 50 years of age users are very few.

Table 1: *Demographic Data of the Respondents*

Variables	Attributes	Frequency		Total	(%)
		Client	Employee		
Sex	Male	223	170	393	88
	Female	43	10	53	12
Age Group	Below 20 years	8	0	8	1.8
	20-30	145	72	217	48.6
	30-40	78	98	176	39.5
	40-50	27	10	37	8.3
	50 years and above	8	0	8	1.8
Education Level	SSC or below	23	0	23	5.2
	HSC	52	0	52	11.7
	Honors or graduation	53	10	63	14
	Masters	133	170	303	68
	M. Phil or Ph. D	5	0	5	1.1
Per Month Income	Below BDT 15,000	65	14	79	17.7
	BDT 15,001 - 30,000	57	33	90	20.1
	BDT 30,001 –45,000	98	50	148	33.2
	BDT 45,001 –60,000	34	47	81	18.2
	Above BDT 60,000	12	36	48	10.8

Source: Field survey data from August 2015 to October 2016

Table 1 also describes the education level of the respondents; it is seen that most respondents have completed their master's program. 68 percent of the respondents have completed master's program. Next highest respondents have completed their graduation program; it possesses 14 percent of the total respondents. Below secondary education level are only about 5 percent of the total respondents and only 1 percent respondents have completed or continuing M Phil or PhD program. Bank employees are more educated than bank clients, comparatively. Basing on per month income, highest number of respondents are earning between BDT 30,000 to BDT 45,000 per month. It possesses about 33 percent of the total respondents. Respondents earning more than BDT 60,000 possess about 11 percent of the total population.

ANALYSIS OF THE USES OF CREDIT CARD

Frequency of using credit card is shown in Table 2. It is seen that only 19 percent of the respondents use credit card. 81 percent respondents do not use credit card. Coefficient of variance is 42.67 for bank client and 45.15 for bank employees. Mean value is 1.85 for the bank client and 1.76 for the bank employees.

Table 2: *Measurement of the Number of users of credit card*

S. N.	Opinion Categories	No. of Respondents		Total	%
		<u>Bank Client</u>	<u>Bank Employee</u>		
1	Use	41	44	85	19
2	Don't Use	225	136	361	81
	Total	266	180	<u>446</u>	100
	Mean	1.85	1.76		
	C.V	42.67	46.15		

Sources: Calculated from field survey

Assessment of Opinion of the Respondents about Usage of Credit Card in a Month

There are five categories of users of credit card in this study; 1 equals unusual user who use 0-5 times per month, 2 equals usual users who use credit card 6–10 times per month, 3 equals regular users who use credit card 11–15 times per month, 4 equals frequent user who use credit card 16 – 20 times per month and 5 equals very frequent user who use credit card more than 20 times per month.

Table 3: *Measuring the Frequency of Usage of Credit card in a Month*

Sl. No.	Types of Users	No. of Respondents		Total	%
		<u>Bank Client</u>	<u>Bank Employee</u>		
1	Unusual	33	33	66	77.6
2	Usual	8	11	19	22.4
3	Regular	0	0	0	0
4	Frequent	0	0	0	0
5	Very Frequent	0	0	0	0
	Total	41	44	<u>85</u>	100
	Mean	1.2	1.25		
	C.V	33.16	34.64		

Sources: Calculated from field survey

Table 3 gives a description about the usage of credit card by the respondents. It is seen that most of the respondents use credit card 1 to 5 times per month; as because 77.6 percent of the respondents use credit card not more than 5 times per month. It can be said that most of the users are unusual users. Remaining 22.4 percent of the respondents use credit card between 6 to 10

times per month. There is no regular user, no frequent user and no very frequent user of credit card. C.V. for bank client is 33.16 percent and for the bank employee is 34.64 percent.

PROBLEMS OF USING CREDIT CARD

There are different problems faced by the credit card users. They have different attitudes toward credit card. Among various problems, major problems are- high annual charges, limited accessibility of credit card, limited credit limit, high interest rate on unpaid credit loan, etc. Only 41 respondents out of the bank client and only 44 respondents out of the bank employee use credit card in this study. 36 bank client and 39 bank employee face problem with their credit card. That is 88.2 (75/85) percent of the respondents have problem with credit card.

Assessment of Opinion of the Respondents about Annual Charge of Credit Card

One of the major problems is the high annual charge on credit card. From Table 4, it is seen that most of the respondents (40%) are neither agree nor disagree with the statement. 57.3 percent of the respondents agree and strongly agree that their bank take high annual charge on their credit card. 18.7 percent of the respondents disagree and strongly disagree with the statement. Mean value of the bank client is 4.06 and for the bank employee is 3.1. Coefficient of variance is 17.38 percent for bank client and 31.64 percent for bank employee.

Table 4 : *Assessment of Opinion of the Respondents that annual charge of credit card is high*

Opinion Categories	No. of Respondents		Total	%
	<u>Bank Client</u>	<u>Bank Employee</u>		
1	0	0	0	0
2	2	12	14	18.7
3	2	16	18	24
4	24	6	30	40
5	8	5	13	17.3
Total	36	39	<u>75</u>	100
Mean	4.06	3.1		
C.V	17.38	31.64		
No. of Res. (1+2)	2	12	14	18.7
No. of Res. (4+5)	32	11	43	57.3

χ^2 (Chi-square) – Test

Calculated Value: 29.42	Table Value: 5.99	Degree of freedom: 2
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Sources: Calculated from field survey, 1= Strongly Disagree, 2=Disagree, 3= neither Agree nor Disagree, 4=Agree, 5= Strongly Agree.

In order to calculate χ^2 from Table 4, 1st and 2nd row is merged with 3rd row. New degree of freedom becomes (3 - 1) (2 - 1) = 2. The table value of χ^2 for degree of freedom, at 5% level of

significance is 5.99 and the calculated value is 29.42. The calculated value of χ^2 is much greater than the table value. Therefore, it can be said that there is a significant difference between the opinions of the respondents about the high annual charge of credit card.

Assessment of Opinion of the Respondents about Accessibility of Credit Card

Another problem by the respondents about credit card is that the card has limited accessibility. Most of the respondents (40%) are agree with the statement that their credit card has limited accessibility according to Table 5. 48% of the respondents agree and strongly agree with the statement that their credit card has limited accessibility.

Table 5: *Assessment of Opinion of the Respondents about Accessibility of credit card*

Opinion Categories	No. of Respondents		Total	%
	<u>Bank Client</u>	<u>Bank Employee</u>		
1	0	1	1	1.3
2	5	7	12	16
3	13	13	26	34.7
4	14	16	30	40
5	4	2	6	8
Total	36	39	<u>75</u>	100
Mean	3.47	3.28		
C.V	24.93	27.55		
No. of Res. (1+2)	5	8	13	17.3
No. of Res. (4+5)	18	18	36	48

χ^2 (Chi-square) – Test

Calculated Value: 0.57	Table Value: 5.99	Degree of freedom: 2
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Sources: Calculated from field survey, Note: 1=Strongly Disagree, 2=Disagree, 3= neither Agree nor Disagree, 4=Agree, 5=Strongly Agree.

On the other hand, only 17.3 percent of the respondents disagree and strongly disagree with the statement. Mean value of the bank client is 3.47 and 3.28 for bank employee. C.V. for bank client is 24.93 percent and for the bank employee is 27.55 percent; that is opinion of the bank client is more uniform than bank employees.

In order to calculate χ^2 from Table 5, 1st row is merged with 2nd row 5th row is merged with 4th row and new degree of freedom becomes (3 - 1) (2 - 1) = 2. The table value of χ^2 for 2 degree of freedom, at 5% level of significance is 5.99 and the calculated value is 0.57. The calculated value of χ^2 is much less than the table value. Therefore, it can be said that there is no significant difference between the opinions of the respondents about the limited accessibility of credit card.

Assessment of Opinion of the Respondents about Credit Limit of a Credit Card

Another problem with credit card is credit limit. That is how much amount of money can be taken as credit loan from the bank against a credit card. Table 6 describe that most of the respondents (37.3%) are neutral about the statement that credit limit of credit card is not satisfactory.

Table 6: *Assessment of opinion that credit limit of credit card is not satisfactory*

Opinion Categories	No. of Respondents		Total	%
	<u>Bank Client</u>	<u>Bank Employee</u>		
1	2	1	3	4
2	6	6	12	16
3	8	20	28	37.3
4	16	9	25	33.3
5	4	3	7	9.4
Total	36	39	75	100
Mean	3.39	3.18		
C.V	31.32	27.47		
No. of Res. (1+2)	8	7	15	20
No. of Res. (4+5)	20	12	32	42.7

χ^2 (Chi-square) – Test

Calculated Value: 7.1	Table Value: 5.99	Degree of freedom: 2
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Sources: Calculated from field survey, 1= Strongly Disagree, 2=Disagree, 3= neither Agree nor Disagree, 4=Agree, 5= Strongly Agree.

42.7% of the respondents agree and strongly agree with the statement that the credit limit is not satisfactory. 20% of the respondents disagree and strongly disagree with the statement. Mean value is 3.39 for the bank client and 3.18 for the bank employee. Coefficient of variance among the opinion categories is also different between the bank clients and bank employees. C. V. is 31.32 percent for the bank client and 27.47 percent for the bank employee.

Table 6, 1st row is merged with 2nd row and 5th row is merged with 4th row and new degree of freedom becomes $(3 - 1) (2 - 1) = 2$. The table value of χ^2 for 2 degree of freedom, at 5% level of significance is 5.99 and the calculated value is 7.1. The calculated value of χ^2 is greater than the table value. Therefore, it can be said that there is a significant difference between the opinions of the respondents about unsatisfactory credit limit of credit card.

Assessment of Opinion of the Respondents about Interest Rate on Credit Loan

Another major cause of dissatisfaction among almost all of the respondents is that credit card charges high interest rate on unpaid amount of loan. Any credit card outstanding balance could carry an annual interest as high as 36 percent. The average interest rate for credit cards in the country is nearly 30 percent (Rahman, 2017).

Table 7 dictates most of the respondents (46.7%) are agree with the statement that interest rate is high on unpaid credit loan. 86.7% of the respondents agree and strongly agree with the statement. Only 4% of the respondents disagree and strongly disagree with the statement. Mean value is 4.17 for the bank client and 4.28 for the bank employee. Coefficient of variance is 20 percent for the bank client and 16.68 percent for the bank employee; that is opinions of the bank employees are more uniform than bank clients.

Table 7: Assessment of opinion that interest rate is high on unpaid credit loan				
Opinion Categories	No. of Respondents		Total	%
	Bank Client	Bank Employee		
1	0	0	0	0
2	2	1	3	4
3	4	3	7	9.3
4	16	19	35	46.7
5	14	16	30	40
Total	36	39	75	100
Mean	4.17	4.28		
C.V.	20	16.68		
No. of Res. (1+2)	2	1	3	4
No. of Res. (4+5)	30	35	65	86.7
χ^2 (Chi-square) – Test				
Calculated Value: 0.67		Table Value: 5.99	Degree of freedom: 2	

Sources: Calculated from field survey, 1= Strongly Disagree, 2=Disagree, 3= neither Agree nor Disagree, 4=Agree, 5= Strongly Agree

In order to calculate χ^2 from Table 7, 1st and 2nd row is merged with 3rd row and new degree of freedom becomes (3 - 1) (2 - 1) = 2. The table value of χ^2 for 2 degree of freedom, at 5% level of significance is 5.99 and the calculated value is 0.67. The calculated value of χ^2 is much less than the table value. Therefore, it can be said that there is no significant difference between the opinions of the respondents about high interest rate on unpaid loan of credit card.

Other Problems of Credit Card

According to the primary data collected through the interview schedule, most of the bank clients face problems like- credit card increase cost, knowledge about credit card is very poor; they don't need credit card, and poor income level. On the other hand, most of the bank employees face problems like- credit card is unnecessary, credit card increase cost and it is burdensome. They have less interest in using credit card. Other problems faced by the both respondents as- credit card provides poor customer services, government charges 15% VAT of the interest of credit loan etc.

FINDINGS OF THE STUDY

- Credit card is not widely used in Bangladesh. Only 19 percent of the respondents use credit card according to primary data of the study. About 78 percent of credit card users use only credit card 0-5 times per month and remaining 22 percent of them use 6–10 times per month. There is no user of credit card who use more than 10 times per month.
- There are many problems with credit cards. The main problem is high interest rate on unpaid amount of the credit card. About 87 percent of the respondents agree/strongly agree that credit card issuing bank charges high on unpaid amount of credit card. However only 9 percent of the respondents are neutral and only 4 percent of the respondents disagree/strongly disagree with the problem.
- Another problem is that annual charge of credit card is high. About 57 percent of the respondents agree/strongly agree, 24 percent of the respondents are neutral and 19 percent of the respondents disagree/strongly disagree with the problem. There is a significant difference between the opinions of the respondents about the high annual charge of credit card.
- Another problem is that credit card has limited accessibility. About 48 percent of the respondents agree/strongly agree, 35 percent of the respondents are neutral and 17 percent of the respondents disagree/strongly disagree with the problem.
- Another problem is that credit limit is not satisfactory. About 43 percent of the respondents agree/strongly agree, 37 percent of the respondents are neutral and 20 percent of the respondents disagree/strongly disagree with the problem.

CONCLUSION

Bangladesh is still a low income country, where credit card is seen as a credit facility by banks and consumers alike, and not as a lifestyle transaction vehicle. This makes a huge difference in understanding and appreciating the value of credit card. As others e-commerce tools, it takes a remarkable position in Bangladesh. Credit cards are used limitedly in this country. There are no any respondents who use it more than ten times per month. Using credit card there are different problems faced by the respondents. Most of the bank client agree and strongly agree that their bank take high annual charge on their credit card although bank employees disagree with the statement. Most of the respondents agree with the statement that their credit card has limited accessibility. Most of the respondents are neutral about the statement that credit limit of credit card is not satisfactory. Interest rate is high on unpaid credit loan is another major problem of credit card. Credit card is not used by most of the respondents because they think that it will increase their cost or they don't really need it.

RECOMMENDATIONS

The following suggestions and recommendations are made on the basis of findings of the study:

- Still today credit card is not popular in Bangladesh. All commercial bank should have a strong campaign for credit card and to make it well known to everyone.
- The bank clients have not clear idea about credit card. Many of the clients try to avoid credit card as they fear it will increase cost.
- Bank should reduce the annual charge on credit card, should reduce the processing fee and other charges on credit card to make credit card more popular to all.
- Government should also support credit card and can reduce VAT of the processing fee of credit card.

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APPENDIX

An Interview Schedule on

Uses and Problems of Credit Card in Private Commercial Banks of Bangladesh: Bank
Employees and Bank Clients View

1. Your sex: ☐ Male ☐ Female
2. Your age –
☐ ≤ 20 ☐ 21 - 30 ☐ 31 - 40 ☐ 41 – 50 ☐ > 50
3. Your highest degree in education that you have already completed / studying –
☐ SSC or Below ☐ HSC ☐ Honors ☐ Masters ☐ M. Phil. /Ph. D.
4. Your income level (Per month in Tk.) –
☐ ≤ 15,000 ☐ 15,001- 30,000 ☐ 30,001- 45,000 ☐ 45,001- 60,000 ☐ > 60,000
5. Do you use *Credit Card*? Yes / No.
If yes, how many times do you use it in a month?
☐ 1-05 times ☐ 06-10 times ☐ 11-15 times ☐ 16-20 times ☐ More than 20
- (i) Do you have any problems with your *Credit Card*? Yes / No. If yes, which ones are?
 - Validity period is not satisfactory-
☐ Strongly Agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly disagree
 - Annual charge is high-
☐ Strongly Agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly disagree
 - Your card has limited accessibility-
☐ Strongly Agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly disagree
 - Credit limit of your credit card is not satisfactory-
☐ Strongly Agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly disagree
 - Other problems about your credit card (if any)-

Students' Perception and Attitude towards using YouTube as Learning Material in English Lessons: A Study at Tertiary Level in Bangladesh

Mst. Farhana Ferdouse*

Abstract

The purpose of the study is to explore the use of YouTube by surveying students' perceptions towards using YouTube in English lessons. The study is descriptive and employed mixed method. The study consisted of fifty students studying in different private universities in Dhaka city. The study employed survey questionnaire and interviews to collect data about students' perception of using YouTube videos in English language learning. The results of this study revealed that students are highly interested to use YouTube in practicing English skills. The findings of the study also indicate that students have positive attitudes towards the use of YouTube videos to facilitate the acquisition of English language learning. However, this paper included a number of recommendations according to the study findings. It also recommended some future research, particularly to explore more accurate information about students' attitudes towards the use of YouTube and the negative concerns that pupils may have while learning new languages by using YouTube.

Key Words: YouTube, students' perception and attitude, learning materials, English learners of tertiary level in Bangladesh

Introduction

YouTube has become one of the most-popular websites in the world. Among all technological tools, the YouTube videos have provided a lot of opportunities to enhance the quality of teaching and learning English in Bangladesh. It has provided countless opportunities and effective means to learners to make language learning and practice more meaningful and independent.¹ pointed out in his research, YouTube presents an infinite resource for language learning because it provides learners with various language sources such as songs, music videos, movie trailers, talk shows, lectures, debates, and parodies. Furthermore, YouTube could be considered as a valuable online resource to help meet the learners' needs in learning language for real world and their interests in discovering the world. However, there is an interaction between teaching through media and the level of students' attitude in teaching second language.

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Attitudes may play a very crucial role in language learning as they would appear to influence students' success or failure in their learning. Using YouTube video in learning associated with indicators of attitude, especially cognitive and affective aspects. Videos are effective teaching tools, with positive outcomes in both academic and affective learning. The affective one refers to the feeling and emotion. Memory is, in turn, strongly influenced by emotion; with the result that educational video has a powerful ability to relay experience and influence cognitive learning². He states that YouTube videos combine visual context with spoken language, and provide students with better understanding to keep the events in the memory for long time. Using YouTube video in the classroom attract student's attention to be in the situation. It is regarded as a source of interactive language learning. Therefore YouTube video is more effective than Textbook for learning English to the students having positive attitude because the students having positive attitude have a greater chance to involve them actively in teaching and learning process. Therefore, this study intended to investigate the Bangladeshi tertiary level's students' attitude and perception towards using YouTube as learning resources in their English language classes. The researcher, through this study, aimed to shed lights on the perceptions and willingness of students towards using YouTube videos in English language learning. The study also revealed that students' positive attitude towards using YouTube videos facilitate their motivation to learn English language in effective manner. To elicit responses from the students, five Bangladeshi private universities had been chosen. The methodology of the research was being conducted through the questionnaires and interviews. The findings revealed positive perceptions of the students towards the usages of technologies despite having several obstacles faced by both the teachers and students while implementing those in the classroom.

Purpose of the Study

Technology-enhanced language learning reflected a growing and evolving area of interest in foreign language education and second language acquisition. While text-based resources have remained the standard for centuries, currently, with the development of technology, the usage of YouTube videos in teaching and learning has become a trend. YouTube is to a certain extent a new phenomenon, scholars and researchers in second language acquisition are increasingly concerned about its effectiveness in English language learning. Surprisingly enough, despite the importance of using YouTube in engaging students in English learning process, little research has been conducted to investigate the perceptions of Bangladeshi undergraduate in using YouTube in practicing English lessons.³ stated that a study on the perception of the usage of YouTube in ESL classroom for undergraduate students is a relatively new field of study and not much literature has been published. Hence, this study mainly is intended to fill in the gap. By using both quantitative and qualitative methods to obtain students' perceptions of the effectiveness of YouTube videos as a learning tool, this study adds to the knowledge base of the existing literature. Further, qualitative analyses provide more detailed explanations and insight into student perceptions, which is needed when establishing guidelines for future implementation. Finally, the purpose of the study is to explore the use of YouTube in English lessons by surveying students' perceptions and attitude towards using YouTube. In particular, it seeks to look at the students' opinions about using YouTube as learning materials with regard to making their English lessons more interesting and motivating⁴.

Research Objectives

This study has been conducted to achieve the following objectives. The first objective of this research is to investigate perception of the students of tertiary level in Bangladesh in using YouTube videos to learn English. The second objective for this study is to investigate how students' positive attitude towards using YouTube videos improves motivation in their Language learning process.

Research Questions

This research has been done to answer the following questions:

- How do the students of tertiary level in Bangladesh perceive YouTube videos in their English language learning?
- How does the students' positive attitude towards using YouTube videos develop students' English learning process?

Significance of the Study

This study will be significant in English Language Teaching (ELT), specifically for English educators (teachers and lecturers), which will assist them in using YouTube videos as an effective teaching and learning materials in English language classes. The collected data on students' perception and attitude towards learning English using YouTube videos will definitely help the teachers to use videos in effective manner. The teachers of tertiary level in Bangladesh are still lagging behind in implementing YouTube videos fruitfully as they never evaluated students' attitude and perception about using YouTube as their learning materials. Using YouTube in language learning is a new phenomenon, and before the implementation of it in the classroom, student's attitude must be assessed. Hence, the researcher believes that this study will work as a pathfinder for the teachers and the syllabus designers as it dealt with the learners' perception what is significantly important to determine how and why YouTube should be used in English language lessons at tertiary level in Bangladesh. The results of this study will also be significant to ESL learners which will help in providing better understanding on the usage of YouTube in English language learning process. The findings will also "contribute to the effective use of YouTube for language learning purposes"¹ in Bangladeshi Context.

Theoretical Framework

The theoretical framework for this study was built upon the model which focused on technology and learners' attitude. The model is Technology Acceptance Model (TAM), which was first introduced by Davis in 1986. TAM is specifically tailored for modeling user acceptance of information systems. TAM is specifically designed for the purpose of explaining technology usage behavior. In TAM, a user's behavioral intention to use an information system reflects the user acceptance of the system⁵. TAM hypothesizes that two particular beliefs; perceived usefulness and perceived ease of use, are of primary relevance for computer acceptance behaviors. External variables refer to influences that ESL learners receive in using YouTube in their language learning. These influences include those from teachers, social, and within themselves. Perceived usefulness is identified as the user's belief that his or her performance will be increased by using a specific application system. This

means that when students perceive that language learning through YouTube videos can help improve their language performance, they are more likely to use YouTube videos in their learning process. On the other hand, perceived ease of use (EOU) refers to “the degree to which the user expects the target system to be free of effort”⁶. EOU refers to students’ perception about the degree of effort needed to use YouTube in language learning. These two factors play important roles in understanding a person’s attitude towards information technology and perceived ease of use has its significant effect on usage intention. Based on TAM, it is believed that usefulness and ease of use (EOU) have a significant impact on a user’s attitude towards the usage of the system⁷. Motivation and confidence are specific elements that make up willingness, while knowledge and skills make up ability. So, the researcher tried to structure her study using these theoretical frameworks to assess students’ perception and attitude to learn English using YouTube.

Limitations of the Study

The limitations of the research were following:

- The researcher could have collected the perception of the teachers also to make her study more informative and fruitful.
- For getting more accurate results, the number of participants could be increased. However, this was not possible due to the shortage of time.
- The researcher had covered only some of the universities of Dhaka. However, covering the universities from other districts could make the research more authentic and interesting.
- The results of findings could have a contrastive view if the researcher could collect responses also from the public universities of Bangladesh.

Literature Review

Many researchers have tried to shed light on the attitude and perception of the students in using YouTube as a learning tool in teaching and learning English language. A lot of studies related to perception and the use of videos or YouTube videos in learning process had been done by various researchers. A large-scale survey by⁸ revealed that students liked learning language through videos. According to Plato and Triandis⁹, attitude has three components, they are (1) cognitive, (2) affective, and (3) readiness for action. The cognitive component is concerned with thoughts and beliefs. The affective component concerns feeling towards the attitude object, the feeling may concern love or hate of the language, or an anxiety about learning a minority language¹⁰ remarks that the scenes, movements, feelings, and gestures presented in YouTube video segments offer significant visual impetus for language learning. Some scholars state that the incorporation of YouTube in language learning could reduce the level of stress; students may feel when learning a new language as they could view it as entertaining rather than educational activity¹¹ states that “positive attitudes let learner have positive orientation toward learning English”. As such, attitudes and perception play a very crucial role in language learning as they would appear to influence students’ success or failure in their learning. Cox (2011) cited¹² that YouTube videos combines visual context with spoken language, and provide students with better understanding to keep the events in

the memory for long time. Using videos in language learning is one of the most useful tools of cognitive processing and memory¹³. This can be testified by the fact that students can remember “almost 80% of an interesting video after one hour, but can remember only about 25% of lecture content after the same time lapse”¹³. Therefore, YouTube videos can be used as teaching materials. Using YouTube video in the classroom attracts student’s attention to be in the situation. Therefore, it has been established through the previous researches that YouTube video is more effective than Textbook for learning English. Moreover, it is also proven that students having positive attitude towards YouTube learn effectively. Therefore, it could be assumed that lots of researches have been done on the effective use of YouTube in English learning. But there is a paucity of research about the attitude and the perception of the students in integrating YouTube in learning English at tertiary level in Bangladesh. So, through this study the researcher tried to investigate and elucidate the attitude and perception of the students to discover and invent new guidelines for the teachers and the students as well.

Methodology

Research Design

The study compiled the information by using survey questionnaire and interview to examine and figure out students’ attitude and perception towards using YouTube videos in English language learning. There were 15 questions in the survey questionnaire where 13 questions were close ended and 2 questions were open ended.

Methods of data collection

For collecting data the researcher had used both the qualitative and quantitative method. Because using mixed method allows the researcher to get results that are more accurate rather than adopting only one research method. The research was conducted in five private universities. Fifty students participated in this research. The study used the results of the survey questionnaire and interview to answer the research questions. The study utilized the questionnaire and interview to assess the students’ perceptions of using YouTube videos in learning English. Finally, qualitative data are naturalistic and uncontrolled that were used as to take the responses of the students participants in the form of the interview.

Sampling and Participants

As the purpose of the study is to find out the students’ perception regarding the use of YouTube in their overall learning experience, the researcher selected five universities. All the participants in this research were undergraduate students. All the students were from the Department of English from different semesters.

Interview questions

The interview questions were set for the students since it follows the open-ended questions. Open-ended questions are needed to identify a huge number of possible answers that might be restricted to provide pre-prepared response categories found in quantitative research. There were six interview questions for the students’ interview.

Data analysis

This part of the research will provide the detailed analysis and discussion of the data that were collected through the survey. The responses to the questions from the students and teachers are being analyzed through the graphical representations using pie charts and bar charts along with tables. After that, the overall findings are discussed in relation to the central research questions.

Figure 1 represents the results of question no.1 (Do you have a computer or smart phone with internet access?). For this question, 96% participants respond 'yes' and only 4% respond 'no'. Thus, the majority of respondents have computer or smart phone with internet access.

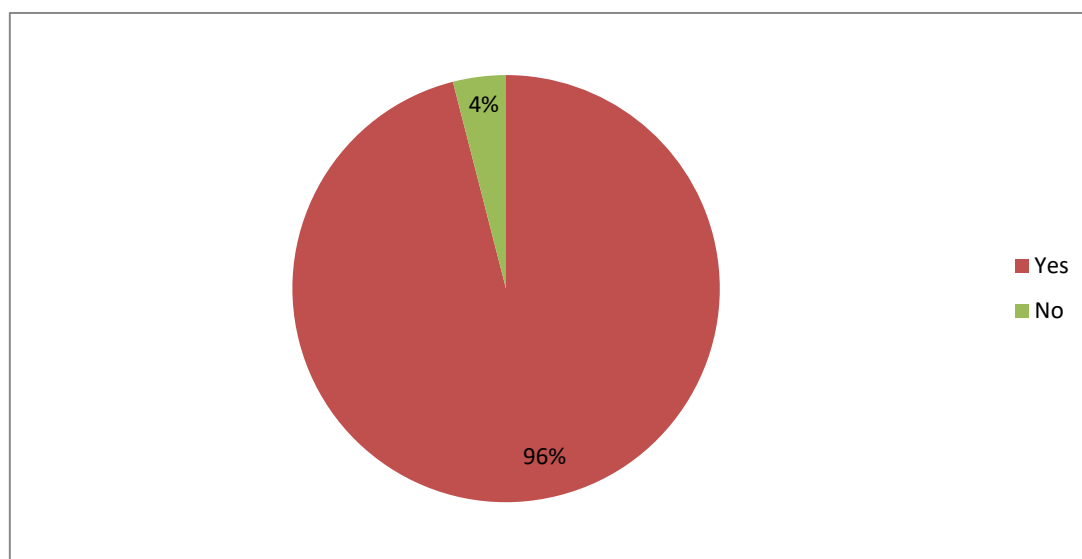


Figure 1 represents the data about students' usage of technology with internet access

For question no. 2 (Have you ever used YouTube?) 100% participants respond 'Yes'

Figure 2 represents question no.3 (Generally why do you watch YouTube?). The researcher has given 4 options such as 'to view others' videos for pleasure / fun', 'to upload videos for sharing with friends and others', 'for learning or academic purpose; and others. 30% participants use You tube for fun or pleasure, 8% participants use it for uploading videos , 14% participant use for academic/learning purposes and 10% students have other reasons . Some participants give mix answers. 4% participants use you tube both for fun and sharing videos. 24% use both for fun and academic purpose. 8% use both for sharing videos and learning purpose and 2% use for pleasure, sharing videos and for learning. Thus the highest number of participant use you tube for pleasure or fun and the second highest reason for using you tube is learning or academic purpose.

Reason	Percentage
A	30%
B	8%
C	14%
D	10%
A+B	4%
A+C	24%
B+C	8%
A+B+C	2%

Figure 2 represents the data about the reason behind students' usage of YouTube

Figure 3 represents question no.4 (the time you spend on watching YouTube per week). The researcher has given 4 options such as 'less than 1 hour', '2-5 hours', '6-10 hours; and more than 10 hours. 14% participants watch you tube less than 1 hour, 38% participants watch it for 2-5 hours, 34% participant use for 6-1o hours and 14% students watch YouTube more than 10 hours.

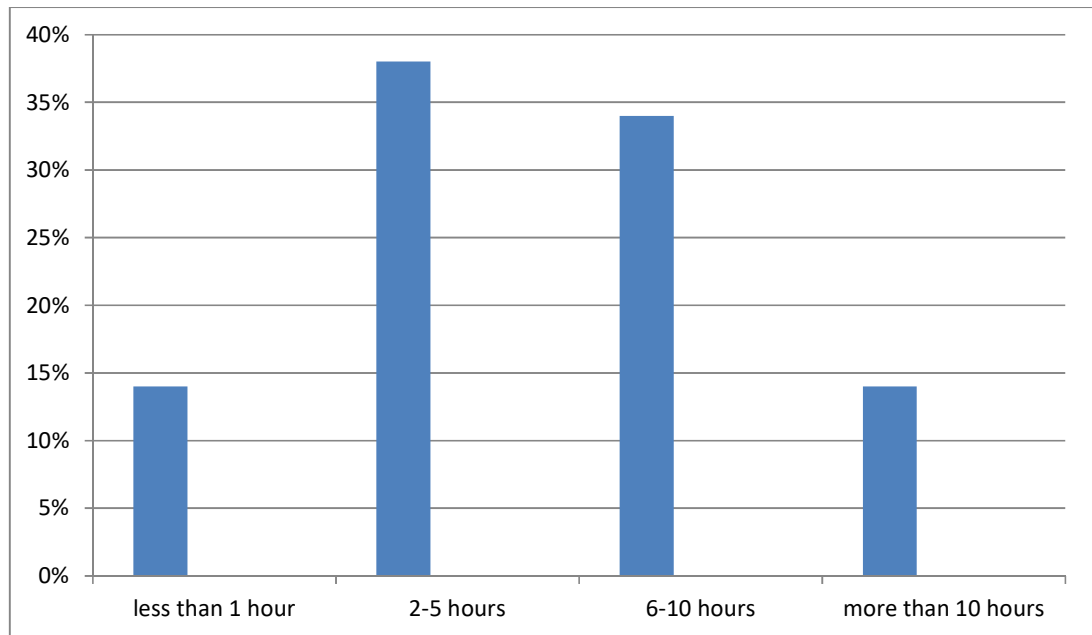


Figure 3 represents the data about the duration of the students' YouTube usage

Figure 4 shows question no.5 (do you watch videos on YouTube for learning English?). Here 2 options are given – Yes and No. 90% participants say yes and only 10% respond no.

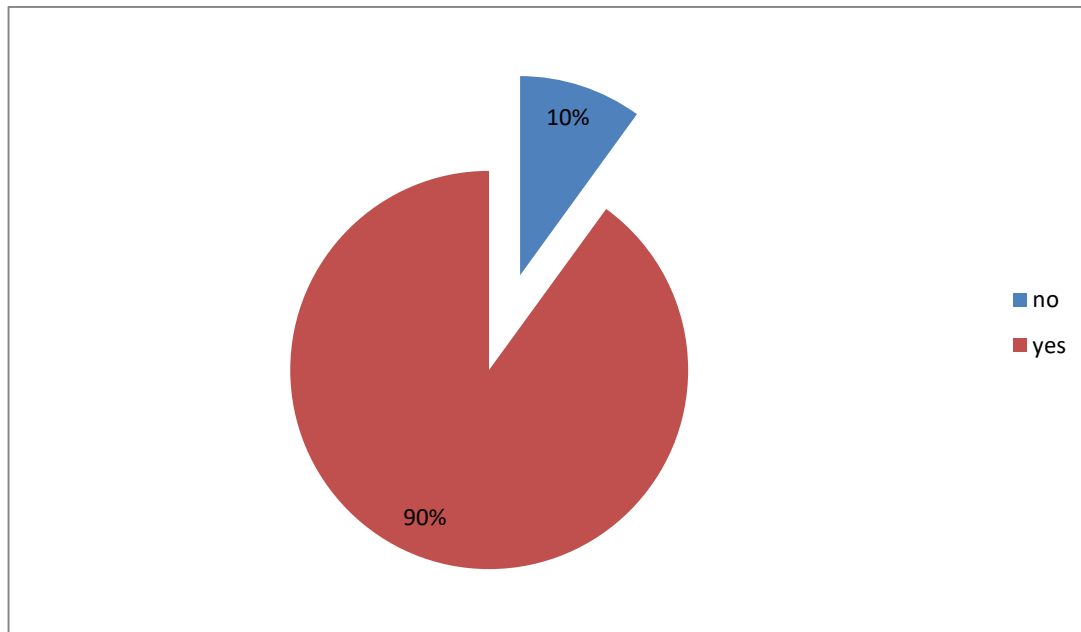


Figure 4 represents the data about the students' usage of YouTube for English learning purposes

Figure 5 represents the result of question no 6 (how often you have done YouTube related educational activity?). Four options are given such as 'Everyday' 'only at weekend' 'rarely' 'others'. 40% participants respond everyday, 28% respond only at weekend and 32% respond rarely.

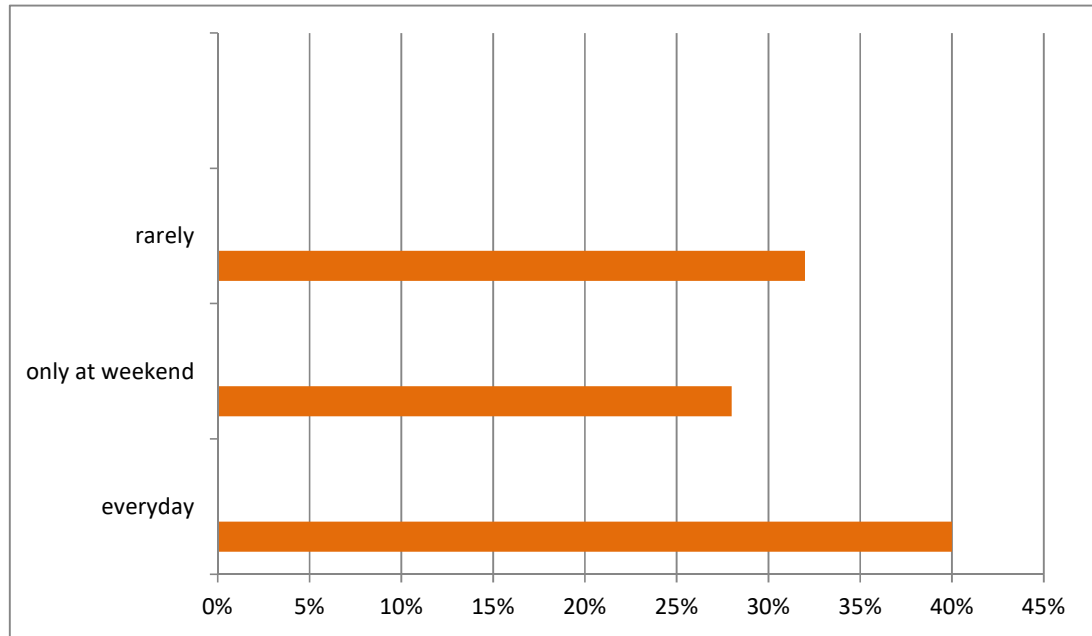


Figure 5: represents the data about the duration of students' engagement in educational activities using YouTube for English learning purposes

Figure 6 shows the result of question no. 7 (do you enjoy practicing English using YouTube?). The researcher has given 3 options such as 'yes' 'no' 'confused'. 72% participants enjoy practicing English using YouTube, 16% participants say no and 12% participants respond confused.

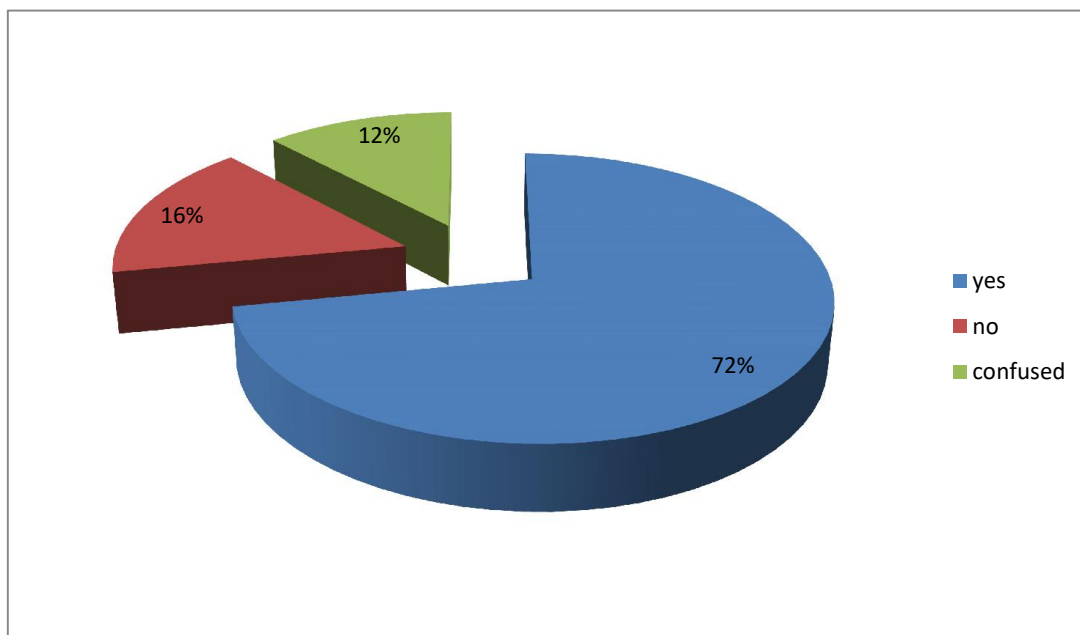


Figure. 6 represents the data about student' attitude towards using YouTube for English learning purposes

Figure 7 represents question no.8 (do you think you tube is beneficial for learning English?). Among two options 92% participants respond yes and 8% respond no.

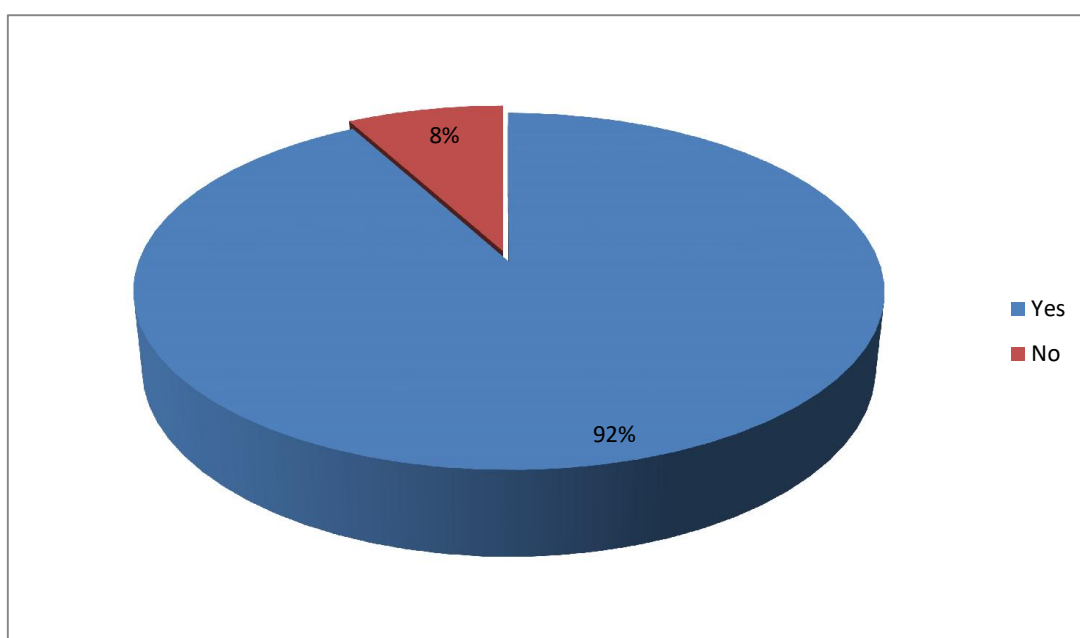


Figure. 7 represents the data about students' perception about the benefit of using YouTube for English learning purposes

Figure 8 shows the result of question no.9 (in which way YouTube is beneficial for you in learning English?). 4 options are given here.- '(a) it makes the expectations of the tasks clear in my mind' '(b) it makes me aware of what not to do in the required tasks' '(c) it gives me idea for the tasks' '(d) it is motivating in the way that my performance is not much different from the example on YouTube'. 18% participants respond option (a), 14% respond option (b), 28% participants respond option (c), 22% participants respond option (d) and 6% participants do not respond. Some participants choose more than one option.4% participants respond both option (a) and (b). 4% respond both option (a) and (c), 4 % participants choose both option (b) and option (c).

Way	Percentage
A	18%
B	14%
C	28%
D	22%
A+B	4%
A+C	4%
B+C	4%
Do not answer	6%

Table. 8 represents the data about students' perception about the benefit of using of YouTube for English learning purposes

Figure 9 represents the results of question no. 10 (what are the difficulties you face in using YouTube for learning English?). For this question 4 options are given such as '(a) I am not sure which playlist to look at' '(b) I waste my time looking at examples' '(c) I think all examples are good' '(d) others'. 6% participants respond option a, 14% respond option b , 10% participants respond option c and 12% respond option d. for this question , 58% participants do not give any response because they think You tube is beneficial for them.

Reason	Percentage
A	6%
B	14%
C	10%
D	12%
Do not respond	58%

Figure.9 represents the data about the obstacles that the students may face while using YouTube for English learning purposes

In question no. 11, the researcher wants to know among four English language skills which skill YouTube helps you much to improve? There are given 4 options- reading skill, writing skill, speaking skill, listening skill. Most of the participants choose listening skill. Here 50% participants respond listening skill, 40% participants responds speaking skill; only 4% respond reading skill and no one find you tube helpful in writing skill.

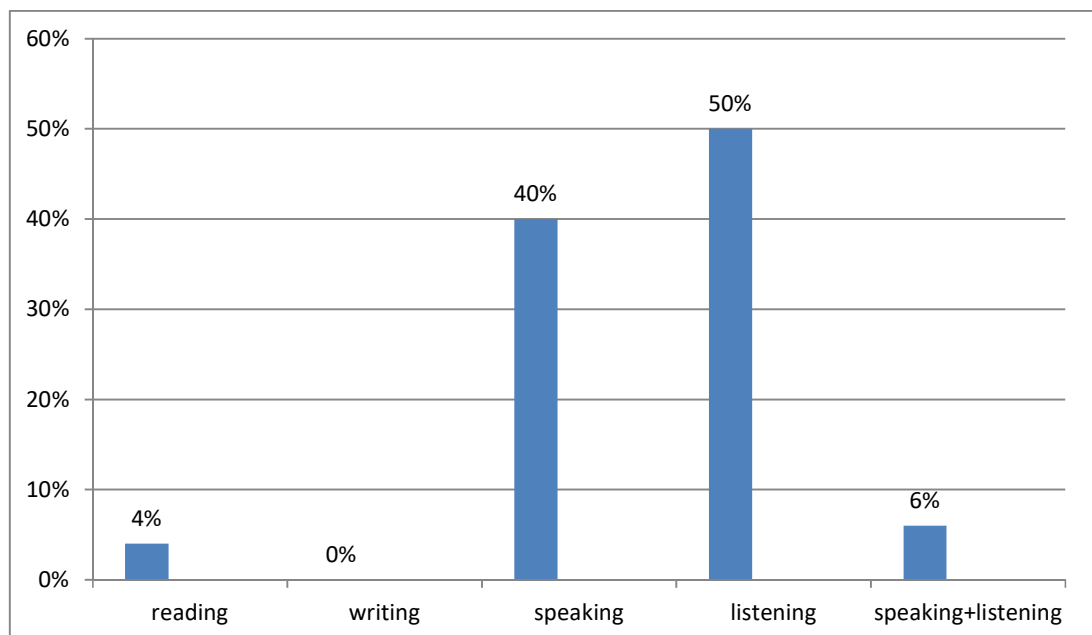


Figure. 10 represents the data about the English skill the students learn most effectively from YouTube.

Figure 11 represents question no.12 (do your English teachers use YouTube videos in teaching English?). 56% participants say 'Yes' and 44% participants say 'No'. Among 56% participants 6% participants say their teacher use YouTube regularly, 44% responded sometimes and 6% responded their teachers' use you tube rarely as learning tool in their class.

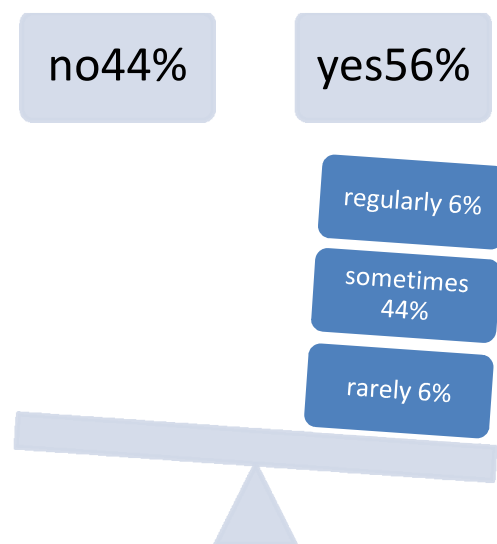


Figure no. 11 represents the data about the teachers' willingness about using YouTube for English teaching purposes

For question no.13 (do you think you tube videos can help you to learn or understand your lesson much better?) researcher gives two option-yes or no. here 96% participants responded yes and only 4% responded no.

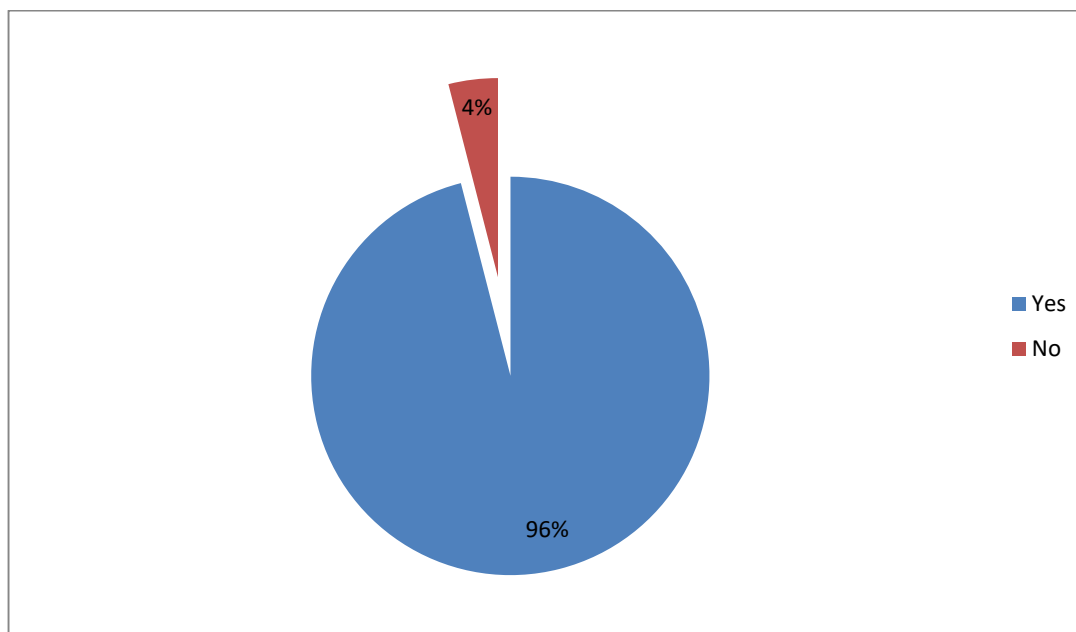


Figure 12 also represents the data about students' opinion about using YouTube in understanding their lessons in effective manner.

The 14th question is what might be the reasons of practicing English by using YouTube? Among 50 participants, 36 provided reasons for practicing English by using YouTube. Most of the participants said that You Tube is very easy and effective way of learning. They find it interesting and helpful for improving their proficiency. It is also found that they use You Tube to improve their speaking and listening skill.

By question no.15 the researcher seeks suggestion about using YouTube from the participants. Here 30 participants gave suggestions and 20 participants did not provide any suggestion. Most of the students suggested watching videos which are effective for learning English such as documentary, English movies, songs, tutorials etc. Some of them advised to follow different educational cannels. They also suggested that one should be careful about using you tube because all videos are not good for learning.

Further Discussions

From the result of this study, it can be said that the students believe YouTube as an effective tool that can help the students understand and comprehend the English language better. The results of this questionnaire show that the multimedia and internet have become a very

important part of our daily life. According to the answers of the participants of this research 96% have computer or smart phone with permanent internet access and all of them use to visit YouTube website almost every day. Majority of the participants spend 2-5 hours on watching you tube and many of them spend up to 10 hours.

Data on watching videos on YouTube for learning English shows that they consider the website useful and helpful. They enjoy practicing English on you tube and doing you tube related educational activity regularly. 92% participants find you tube as beneficial for learning more English because it gives them motivation and clear idea about their tasks and you tube helps them much to improve their listening and speaking skill.

The majority of the learners' states that You Tube is used as learning tool in their class and found it very helpful to understand their lesson much better , and You tube is not used regularly in their class but sometimes. According to the participants it will be more helpful if the teacher uses YouTube as a tool in their class regularly. Furthermore, they believe, You Tube may become a useful tool for learning foreign language in future. All these statements indicate those learners' views on using you tube as a learning tool for practicing English are highly positive. They know it, they use it, they try to take advantage of it, and they believe it is useful.

The answers to the two open ended questions of the survey show that the attitudes of the students towards the website itself are positive as well. Majority of the participants are able to find relevant reasons and give suggestion which support the view that they want to use You Tube actively and are familiar with its features.

To sum up, this research shows that the attitudes and views of English learners on you tube are positive, learners are aware of its pros and cons, they are even experienced with using it to a certain level and they also find it useful to use it as a tool for learning English inside and outside of the classroom.

Analysis of the findings collected from the interview with the students' participants

The researcher conducted an interview session with the students' participants to gather more information about their perception and attitude towards using YouTube for learning English lesson. The researcher asked the students, "How do you feel in your traditional English class? Do you feel monotonous or comfortable? Maximum participants answered that they feel bored in class since their teachers use the traditional teaching routine for every class. In

addition, they asserted that most of their teachers do not use technology to present content during their lessons. Such answers presented the students' reaction and their negative feelings about the class when their teachers followed the traditional teaching routine. In addition, it emphasizes the importance of using new methods for teaching that make the class more interesting and enjoyable. The second question was, "Do you think that by adding technology to English lessons your understanding of the lesson will be improved?" The aim of this question was to know if the technology has the ability to improve the students' understanding of the lesson. Some of the learners agreed that, by adding technology to English lessons, their understanding will be improved. For the third question, the researcher asked "Do you know how to use the YouTube website?" most participants know how to deal with YouTube and are familiar with it since they have its application in their smart phones and laptops for watching videos. The fourth question, "Do you enjoy and feel happy when you use the YouTube website?" was concentrated on the learners' feelings when they watch any kind of videos on YouTube. Some of the students expressed that they feel happy and they sometimes do not even realize how much time has passed while they are watching YouTube videos for any purpose. They like YouTube since it has audio and visual effects. The fifth question explored whether YouTube videos can improve students' performances and understanding in class. More than half of the participants described watching YouTube videos in the classrooms as a positive step for many reasons, which varied from one student to another. Maximum students were very optimistic and they believed that YouTube videos have the ability to provide a full understanding of many aspects of their lessons. Regarding the sixth question, which was "How did YouTube videos simplify the lesson of the English language?" In fact, there are a reasonable number of students who believed that it has the ability to simplify lessons since it has audio and digital effects and makes them more realistic and understandable. The audio-visual effects featured in YouTube videos can help learners to grasp the hidden meanings of some references and idioms in English language. After the completion of the interviews and survey comments that the learners provided, it became clear that the students have positive attitude to use YouTube in English lessons. In addition, this study found similar results as some past research, which found that watching authentic videos in the classroom can make the learning process more enjoyable and meaningful. Moreover, researchers have consistently found that YouTube is an effective tool that can build learners' knowledge and help them improve their English fluency. Moreover, authentic YouTube videos have the ability to improve learners' comprehension and elicit information. Additionally, it gives learners the opportunity to understand the lesson in effective and lively way. Also, YouTube videos can present the lesson more realistically and comprehensively than traditional teaching methods. Besides, students can use YouTube videos as a learning tool that aids them in developing a clearer understanding both inside and outside class. Furthermore, it assists teachers to complete their tasks more effectively and efficiently.

Few Suggestions

The downside of using you tube videos is that the information on YouTube is not assorted and can be dangerous. Teachers need to teach students media literacy to differentiate different videos and make sure they are critical enough to distinguish different videos and get videos

suitable to them. Also, since the videos are super diverse, students could be easily distracted by some videos about games, TV dramas and so on. When they log into YouTube, no one can guarantee they are watching what they are asked to instead of watching they want to, which can be a waste of time. So the students need to have strong self-discipline skills and good time management skills to get work done. Some ways to use You Tube as an English learning tool is given below:

- Find Videos with Transcripts to read:

Fortunately, many videos in foreign languages feature either subtitles or transcripts, which students can read while listening to the audio. By doing this, students will find it far easier to keep up with what's being said, and won't find themselves lost in a series of words or phrases they don't understand.

- Search for Songs in target language:

Music is an amazing way to improve listening skills and vocabularies. Unlike TV shows and movies, pretty much every popular song in existence has its own music video, which is available on YouTube.

- Good videos can facilitate learning and make learning interesting. Teachers can use videos to deepen students' understanding, or help visual learners. Videos can be used to generate students' ideas.
- Teacher can create their own channels, record class lessons and post them online so the students can watch it to enhance their understanding of knowledge they learned. It is also helpful for them who miss classes since they can check videos to catch up. If they have any questions, they can leave comments and teacher can answer their questions later.
- They can also give students links of videos for students to check as assignments.

Conclusion

To sum up, it could be said that this paper has shed some lights on the students' perception about the use of YouTube in learning English lessons. The data, collected through questionnaire and interview, support the idea that the students are having very positive attitude towards using videos in their English lessons. The study also showed that the YouTube website can be an effective method in dealing with students' difficulties and barriers in understanding English. The researcher suggested that future research in the efficient use of YouTube videos in learning English is essential, specifically to investigate learners' attitudes towards the use of YouTube and negative concerns that learners may have while learning new languages by using You Tube. At the end, the researcher hopes and believes that this study will help the future researchers to optimize the use of You Tube in learning English in effective manner.

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Appendix:

Questionnaire:

The purpose of this survey is to gather data about students' attitude and perception towards using YouTube videos in learning English. Your input is highly appreciated and will be kept confidential and used anonymously for thesis purposes.

Name of the participant:

Level of education:

Institution :

Q1. Do you have a computer or smart phone with Internet access?

A) Yes

B) No

Q2. Have you ever used YouTube?

A) Yes

B) No

(If yes answer the following questions?)

Q3. Generally, why do you watch YouTube? (May choose more than one)

A) To view others' videos for pleasure / fun

B) To upload videos for sharing with friends and others

C) For learning or academic purpose

D) Other (please specify)

Q4. The time you spend on watching YouTube per week?

A) Less than 1 hour

B) 2-5 hours

C) 6-10 hours

D) More than 10 hours

Q5. Do you watch videos on YouTube for learning English?

A) Yes

B) No

Q6. How often you have done YouTube related educational activity?

- A) Everyday
- B) Only at weekend
- C) Rarely
- D) Others

Q7. Do you enjoy practicing English on YouTube at home?

- A) Yes
- B) No
- C) Confused

Q8. Do you think YouTube is beneficial for learning English?

- A) Yes
- B) No

(if yes answer question number 9 and if no answer question number 10)

Q9. In which way YouTube is beneficial for you?

- A) It makes the expectations of the tasks clear in my mind
- B) It makes me aware of what not to do in the required tasks
- C) It gives me ideas for the tasks
- D) It is motivating in the way that my performance is not much different from the examples on YouTube

Q10. Why YouTube is not beneficial for you?

- A) I am not sure which playlist to look at
- B) I waste my time looking at examples
- C) I think all examples are good
- D) Others

Q11. YouTube helps you to improve much -----

- A) Reading skill
- B) Writing skill

C) Speaking skill

D) Listening skill

Q12. Does your English teacher use YouTube videos in teaching as a learning tool?

A) Yes

B) No

If yes how often -----

A) Regularly

B) Sometimes

C) Rarely

D) Others

Q13. Do you think YouTube videos can help you to learn or understand your lesson much better?

A) Yes

B) No

Q14. What might be the reasons for practicing English using YouTube?

(Provide 1 or 2 reasons)

Q15. Do you have any suggestion about using YouTube for learning English?

Thank you for your cooperation

The Relationship between Budget Deficits and Inflation in Bangladesh

Asma Akter^{*}

Abstract: The fiscal theory of price level concludes that persistent government deficits can cause inflation and many empirical investigations find the positive association between deficits and inflation for many countries. This study empirically examines the budget deficit and inflation relationship from the perspective of Bangladesh using annual data for the period from 1980 to 2016. The analysis uses ARDL approach and concludes that deficits have inflationary effects in the long run. Hence, fiscal policies have crucial impact on maintaining price stability and the government should take it into account while planning the modes of financing deficit budget. Rigorous analysis of the relationship between deficit financing and inflation with higher frequency data can lead to a better understanding of the dynamics.

Key Words: Inflation, Budget Deficit, and GDP

Introduction

Budget Deficit, also known as Fiscal Deficit arises when government spends more money than the income during the fiscal year. It is common among contemporary developing economies all over the world. If the deficit occurs because the government has invested more on infrastructure development or on prospective industries – then it will be beneficiary for the economy as output growth will boost up.

On the other side, Fiscal theory suggests that higher fiscal deficits create inflation. Akcay et. al¹ explain two transmission channel of this. One way is that, the government borrowing generally increases the net credit demands in the economy, driving up the interest rates and crowding out private investment. The resulting decrease in the output will cause demand pull inflation as for a

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Any views expressed in this paper are authors own and do not reflect that of Bangladesh Bank. Comments are most welcome.

given level of money supply, less amount of output is available. The other way is that, deficit can also lead to higher price level even when the private sector monetizes the deficits. This occurs when high interest rates induce the financial sector to develop new interest bearing assets that are almost as liquid as money and are risk free. Therefore, this monetization of debt could be a considerable source of inflation for many countries. As maintaining price stability is one of the prime macroeconomic goals of a country, understanding inflation dynamics is crucial.

During the first half of the fiscal year 2019 inflationary pressures remained well contained in Bangladesh (MPS, January-June 2019).² In December 2018, 12-month average and point-to-point CPI inflation stood at 5.55% and 5.35%.³ The government budget balance is almost always negative. The total deficit financing of the government during July-December, 2018 amounted to Taka 491.85 billion.⁴ In this context, this study will investigate the long run as well as short run dynamics between budget deficit and inflation. The rest of the article is structured as follows. The next section discusses literature review. Section 3 provides methodology and section 4 presents empirical analysis of the study. Section 5 gives conclusion and recommendation.

Literature Review

It has been a matter of debate among economists for a long period about what actually causes inflation. This macroeconomic debate arises mainly because of the disparity between developing and developed countries internal situations and the different conventional views about measures to control inflation (Afrin⁵). Woodford⁶ concludes in the fiscal Theory of Price Level (FTPL) that a government's decision about way to finance the deficit plays a crucial role in determining the inflation dynamics.

Sargent and Wallace⁷ clarify that, in the long run inflation is a fiscal issue considering the government budget constraint and the existence of an upper bound on the real per capita stock of interest bearing public debt held by the private sector. Together these confirm that the money supply growth is determined by the fiscal deficit. They find that the relationship between inflation and fiscal deficits is dynamic since the government can allocate seigniorage inter temporally by borrowing and the current budget deficit is not essentially correlated to current level of inflation.

The existence of a stable long run relationship between budget deficits, money growth and inflation is tested for Turkey by Akcay and et. al¹. Using the cointegrating vectors the analysis shows that a significant effect of budget deficits on inflation cannot be refuted under the Assumption of long-run monetary neutrality. Based on annual data for the period 1970-71 to 2014-15 Kaur⁸ also finds the long run cointegration between fiscal deficits and inflation for India.

Afrin⁵ critically examines the relationship between fiscal deficit and CPI inflation using annual data from 1974 to 2010 applying ARDL cointegration method for Bangladesh. Empirical analysis shows that budget deficits have long run inflationary impacts and real GDP, inflation expectations and the current floating exchange rate regime also have some impact on the inflation dynamics of Bangladesh.

Ishaq and Mohsin⁹ investigate if deficits are inflationary or not with panel data of 11 Asian countries from 1981 to 2010 using GMM. Findings reveal that deficits have positive correlation with inflation when financial markets are fragile and central bank is not fully independent.

However, using fixed effects in a panel of 94 developed and developing countries Fischer et al.¹⁰ find that the effect of changes in the budget balance is insignificant in low inflation countries or in the low inflation periods of high inflation countries.

De Haan and Zelhorst¹¹ examine the budget deficit and money growth relationship for 17 countries from Asia, Europe and Latin America, using VAR approach. Their analysis give evidence of a positive relation between government budget deficits and money growth for a few countries and for the period of severe inflation.

Methodology

Catao and Terrones¹² (2005) derived a specification of the long run relationship between deficit and inflation for household as well as for government using general equilibrium models surveyed by Ljungqvist and Sargent¹³ (2000). In the model, economy wide steady-state equilibrium imply that inflation is proportional to the product of the ratio of government budget deficit to GDP and the inverse of the narrow money to GDP. In order to consider the dynamics of inflation to changes in fiscal deficits autoregressive distributed lag structure were used. This study basically follows the conceptual specification of Catao and Terrones.

Furthermore, for time series analysis the ARDL approach is more updated and useful technique than the conventional Johansen (1998) and the Johansen and Juselius¹⁴ (1990) approach. The conventional approach estimates the long run relationship within a system of equations while the ARDL estimates use a single reduced form equation (Pesaran & Shin¹⁵ 1998). Moreover, ARDL approach is more convenient as using only stationary or non-stationary I(1) or mixture of both is possible in this approach. Software STATA is used to conduct the analysis.

Empirical Analysis

a. Data

For analyzing the relationship between inflation and fiscal deficits the study uses annual data from period 1980-2016. Data are taken from International Financial Statistics (IFS0 Database). Following Afrin² this paper defines budget deficit is the difference between government expenditure and revenue, which is scaled by broad money (M2) supply. In the study only 3 variables are used.

$$\text{Budget Deficit (BD)} = \frac{(\text{Government Expenditure} - \text{Government Revenue})}{M2}$$

$$\text{Inflation(Inf)} = \text{Percentage change in CPI index}$$

$$\text{Log of GDP(lrgdp)} = \text{Natural log (Real GDP)}$$

b. Unit Root Test

Table-1: Unit root tests for the variables

Variable	Augmented Dickey-Fuller test		Integration remarks
	In level	In first difference	
Inf	-2.374 (0.15)	-8.177*** (0.00)	I(1)
BD	-2.176 (0.50)	-3.748*** (0.00)	I(1)
lrgdp	-0.742 (0.22)	-3.820 (0.00)***	I(1)

*The null hypothesis states that the variable has a unit root.
p-values shown in the parentheses following each adjusted t-statistics.
*** denotes the significance of the statistics at 1% levels respectively.*

c. Conintegration

If the linear combination of two or more I(1) series exhibits a stationary relationship, then it is implied that those variables are cointegrated. Therefore this paper estimated Angle and Granger two steps Cointegration Test and found that variables are cointegrated. This implied that based on the data there is a long run relationship among Inflation, Budget Deficit and GDP. The result is given in Appendix.

d. Autoregressive Distributed Lag Model

Table-2: Unit root tests for the variables

Dependent Variable: Inflation Rate (Inf)		
	Coefficients	P-value
l.Inf	0.369**	0.03
BD	7.905*	0.07
lrgdp	0.075	0.94
Constant	3.076	0.70

^{*,**} denote the significance of the statistics at 10%, and 5% levels respectively.

The coefficient of the BD is positive and significant at 10 percent level which implies that in the long run fiscal theory is effective. A one unit increase in the ratio budget deficit over M2 increases inflation by 7.9 percentage points in the long run, holding the effects of all other variables constant. The coefficient of one lag of Inflation is significant at 5 percent. The diagnostic tests (see Appendix) confirm that the model passes the autocorrelation and heteroskedasticity test.

e. Error Correction Model

To find out the short run impact Error Correction Model was estimated and the result is presented in Table 3

Table-3: Unit root tests for the variables

Dependent Variable: Δ Inflation Rate (dInf)		
	Coefficients	P-value
Δ l.Inf	0.257	0.139
Δ BD	-4.657	0.526
Δ lrgdp	15.591	0.672
ECM	-0.826***	0.00

^{***} denotes the significance of the statistics at 1% level.

The speed of adjustment is negative and significant at 1 percent level. Here, the study is based on annual data and the high magnitude of error correction term implies that a large portion of any deviation from long run equilibrium inflation is adjusted within a year. The adjustment coefficient -0.83 means, almost 83 percent of the deviation of inflation rate from its long run

equilibrium level is corrected within a year, tested at 1 percent level. However, all other variables are insignificant.

Conclusion and Recommendation

The relationship between fiscal deficit and inflation for Bangladesh are empirically examined in this paper. This examination provides insights into the factors causing inflation. A long run relationship between government budget deficits and inflation is found which indicates demand management policies such as sources of government revenue collection and expenditure management are important determinants of Inflation of Bangladesh.

Therefore, the government should carefully plan the modes of financing deficit budget, keeping in mind its impact on inflation. The finding of this study also matches with Catao and Terrones¹², where they find that inflation and deficit financing has a stronger positive relationship for developing countries than developed countries. However, analysis of the relationship between deficit financing and inflation with higher frequency data is recommended for a better understanding of the dynamics.

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Appendix

ADF Unit Root Test at Level

```
. dfuller inf, lag(2)
```

Augmented Dickey-Fuller test for unit root Number of obs = 34

Test Statistic	----- Interpolated Dickey-Fuller -----			
	1% Critical Value	5% critical Value	10% critical Value	
z(t)	-2.374	-3.689	-2.975	-2.619

Mackinnon approximate p-value for z(t) = 0.1493

```
dfuller bd, trend
```

Dickey-Fuller test for unit root Number of obs = 36

Test Statistic	----- Interpolated Dickey-Fuller -----			
	1% Critical Value	5% critical value	10% critical value	
z(t)	-2.176	-4.279	-3.556	-3.214

Mackinnon approximate p-value for z(t) = 0.5031

ADF Unit Root Test at First Difference

```
. dfuller dlnf, lag(1)
```

Augmented Dickey-Fuller test for unit root Number of obs = 34

	Test Statistic	----- 1% Critical Value	Interpolated Dickey-Fuller 5% Critical Value	----- 10% Critical Value
z(t)	-8.177	-3.689	-2.975	-2.619

Mackinnon approximate p-value for z(t) = 0.0000

```
. dfuller dbd, lag(1)
```

Augmented Dickey-Fuller test for unit root Number of obs = 34

	Test Statistic	----- 1% Critical Value	Interpolated Dickey-Fuller 5% Critical Value	----- 10% Critical Value
z(t)	-3.748	-3.689	-2.975	-2.619

Mackinnon approximate p-value for z(t) = 0.0035

```
. dfuller dlrqdp, lag(1) trend
```

Augmented Dickey-Fuller test for unit root Number of obs = 34

Angle and Granger two steps Cointegration Test

```
. *The Angle and Granger two steps Cointegration Test
. *step 1: Running the OLS at level and keeping the residual
. reg inf bd lrgdp
```

Source	SS	df	MS	Number of obs	=	37
Model	151.67908	2	75.83954	F(2, 34)	=	12.62
Residual	204.373968	34	6.01099906	Prob > F	=	0.0001
				R-squared	=	0.4260
				Adj R-squared	=	0.3922
Total	356.053048	36	9.89036245	Root MSE	=	2.4517

inf	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
bd	12.92402	3.291874	3.93	0.000	6.234131 19.61392
lrgdp	.0736484	.9805393	0.08	0.941	-1.919047 2.066344
_cons	5.295695	8.25056	0.64	0.525	-11.47146 22.06285

```
. predict uhat, resid
```

```
. *Step 2:Testing the stationarity of residual
. dfuller uhat, lag(1) nocons
```

```
Augmented Dickey-Fuller test for unit root      Number of obs   =    35
```

Lag Order Selection Criteria for Long run Model

Output of Long-run Model

*Running the ARDL(1,0,0) model to test the long run relationship
reg inf L.inf bd lrgdp

Source	SS	df	MS	Number of obs	=	36
				F(3, 32)	=	9.18
Model	152.383924	3	50.7946413	Prob > F	=	0.0002
Residual	176.973442	32	5.53042007	R-squared	=	0.4627
				Adj R-squared	=	0.4123
Total	329.357366	35	9.41021046	Root MSE	=	2.3517

inf	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
inf						
L1.	.3687988	.1664574	2.22	0.034	.029736	.7078615
bd	7.90474	4.194489	1.88	0.069	-.6391541	16.44863
lrgdp	.0750365	.9422479	0.08	0.937	-1.84426	1.994333
_cons	3.075718	7.990983	0.38	0.703	-13.20138	19.35282

Auto-correlation test (LM test) for ARDL(1,0,0) model

Heteroskedasticity test for ARDL(1,0,0) model

Short run Model (Error Correction Model)

```
. reg dlnf L.dlnf dbd dlr GDP L.ehat
```

Source	SS	df	MS	Number of obs	=	35
Model	107.341099	4	26.8352748	F(4, 30)	=	5.50
Residual	146.365996	30	4.87886654	Prob > F	=	0.0019
				R-squared	=	0.4231
				Adj R-squared	=	0.3462
Total	253.707095	34	7.46197339	Root MSE	=	2.2088

dlnf	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
dlnf					
L1.	.256564	.168892	1.52	0.139	-.0883595 .6014876
dbd	-4.657305	7.263818	-0.64	0.526	-19.492 10.17739
dlr GDP	15.59114	36.46415	0.43	0.672	-58.87859 90.06088
ehat					
L1.	-.8261823	.1898236	-4.35	0.000	-1.213854 -.4385108
_cons	-1.004196	1.873923	-0.54	0.596	-4.831258 2.822865

Auto-correlation test (LM test) for Error Correction Model

Heteroskedasticity test for Error Correction Model

English Language Teaching Classes at Secondary Education in Bangladesh: An Evaluation*

Dr. Md. Kamrul Hassan*

Abstract: Bangladesh is a developing country and a potential growing economy in South-East Asia. Despite the declaration of Bangla as official language, English occupies an important position in all official correspondence in Bangladesh. Considering the importance of English competence at the national level, the Bangladesh government implements an ‘EEE’ policy or ‘English for Everyone’ (Wedell, 2008) for teaching English. English is offered as a mandatory subject for students at all levels in the national curriculum from primary to tertiary, undergraduate level in colleges and universities with a view to developing communicative competence for higher education, foreign trade and business, global communication, foreign employment, e-governance and for utilisation of modern technology in sectors such as education, agriculture, administration and business. Drawn data from classroom observation and interviews with teacher and students, this study investigates the ELT classroom activities at secondary level and demonstrates the difficulties of the ELT teachers’ classroom management skills and pedagogical practices. To the extent, this paper suggests some recommendations to improvise ELT in secondary schools.

Keywords: English Language Teaching (ELT), Pedagogy, Observation, Secondary Education, Bangladesh.

Introduction

A broad goal of English Language programmes is that of developing the communication ability to convey and interpret a message via written or spoken modalities to another person. Meanwhile the importance of English was growing rapidly in Bangladesh particularly in science and technology, to produce better work force and in order to participate in higher study (Hassan, 2011). As result, at the national level, emphasis was given to English so that students could communicate in English for various purposes, e.g. education, science, technology and foreign employment. Imam claims that, ‘Being nationally competent in English is one necessary condition if Bangladesh is to move up the

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long curve of economic growth from its low starting point' (2005:474). Despite the official introduction of Bangla, English has always had a place of prominence alongside Bangla in government administration, private offices, education and in law. Khan (2002) claims that "currently English in Bangladesh is used for interpersonal, professional, academic, commercial as well as recreational purposes like all other developing countries". Like some other South Asian countries, English language in Bangladesh is resolutely recognized as a potential tool for communication for various purposes, for example, social, cultural, economic progress, and prosperity (Banu & Sussex, 2001a). Since Bangladesh achieved its independence in 1971, English has been a compulsory subject for students at every level of schooling from primary to tertiary. After independence, the Bangladeshi government implemented the teacher-centred Grammar-Translation Method (GTM) for teaching and learning English. In describing this context, Sarwar (2008) asserts that the previously used GTM method was deductive and students were taught only to perform well in examinations. Teaching was mainly focused on grammar. In the examinations, questions were designed mainly to test students' writing skills or grammatical knowledge not listening, speaking or reading skills (2008: 2). In this context in the late 1990s, GTM was replaced with Communicative Language Teaching (CLT) in secondary English classes given the view that it would help develop students' communicative competence, improve English teaching and learning, and raise English ability at the national level (NCTB, 2002; Hamid, 2010). However, evidence suggests that classroom practice has not changed to any significant level ((EIA 2009b, p2). In other studies, findings suggest that ELT classroom practices still rely on traditional grammar-translation methods (TQI-SEP, 2007; Anwar, 2005; Hamid and Baldauf, 2008; Hamid, 2010; Hassan, 2011; Chowdhury and Phan Le Ha, 2008). The government of Bangladesh gives priority to education and has been trying to improve the English language teaching situation within its limited resources. However, the budget allocated for the education sector is usually spent on teacher salaries and school infrastructure development. Because of financial limitation schools cannot provide the needed teaching and learning aids and library facilities (Hamid, 2010). Teachers mainly use the textbook, the blackboard, chalk and duster in the classroom instruction (Hassan, 2011). The TQI study also reports that the majority of secondary schools do not have required number of teachers. There is also shortage of required furniture, classrooms, or a suitable learning and teaching environment. Furthermore, teachers are overloaded with many consecutive classes (TQI-SEP, 2007), which most likely raises barriers quality teaching. In addition, Hamid and Baldauf claim, that 'The alarming rate of failure of rural students in English is customarily attributed to English schools teachers and other school factors' (2008: 21). This seems to be a problem for the education system in general,

although rural schools are particularly affected. Hamid also claims that ‘inadequate infrastructure, limited resources and under qualified teachers result in poor quality of teaching and learning of English’ (2010:293).

English teacher education and training is one of the major concerns of implementing innovation in ELT policies; however, in several English teaching contexts, for example in South-East Asia, English teacher education and training have not been effective in fully improving ELT practices (see, for example, Nunan, 2003; Qi, 2009; Wedell, 2008). Evidence clearly suggests that Bangladesh lacks adequate capacity- resources or academic knowhow- maintain the quantity and quality of teacher education and training (Hamid, 2010). Several researchers claim that teacher qualifications, training and language skills are a major problem of teaching English in Bangladesh (Hamid & Baldauf, 2008; EIA, 2009a; Rahman, 2007).

In addition, questions arise about the usefulness of teacher training and its application in the teaching context. Furthermore, evidence suggests that in the secondary school certificate (SSC) examination, a high number of students fail in English (SEQAEP, 2010). Moreover, students’ fear of English also affects their learning and performance in examinations (Hussain, 2008; SEQAEP, 2010). This situation in which English language teaching has been deemed so important for individual and national development and yet efforts to improve teaching and learning have continually failed, influenced me to undertake this research. Many researches have been undertaken in this context; however, investigations of ELT classroom activities both from teachers’ and students’ perspectives remain largely unexplored. This study investigates the ELT classroom activities from both teachers and students perspectives to identify the problems and difficulties of teaching English at secondary education.

A semi-open instrument, basically quantitative in nature was used to capture data in the ELT classes. The observation instrument was based on defined codes, which measure classroom interactions (e.g. Malamah-Thomas, 1987; Spada, 1990; TQI-SEP, 2007; EIA, 2011; Hassan, 2010). During the observation a ‘time sampling’ technique was used to record what type of activities (from the predefined list) the teacher and students were doing at a selected point. The grid in the instrument was formed by an arrangement of rows and columns. Each column represented a classroom activity. Each row represented the time at which the observation occurred. Marks were made either by ‘B’, or ‘E’ which represented the use of Bangla or English language respectively. The time duration for each class was 40 minutes. In the instrument, the time interval was two minutes and I put a mark on the

grid on every second minute. The focus of my observation was the ELT activities that teacher and students engaged in during a lesson and how they engaged in them. Apart from what I experienced during the classroom observation, my analysis was informed by what I saw around the school and what I know about Bangladesh and ELT in Bangladesh. Once I finished the observations I organised semi-structured interviews with teachers and students with the help of the head teacher and assistant head teacher since the interview is a ‘basic method of data gathering’ and is useful ‘to obtain a rich, in-depth experimental account of an event or episode in the life of the respondent’ (Fontana and Frey 2005:698). In in-depth interviews, participants have the opportunity to clarify their answers, to explain their opinions and experiences, and to cite instances (Rubin and Rubin, 2005). Group interviews were also conducted for collecting information in a group. Group interview is an opportunity for the participants to talk and discuss the issues and to share their ideas and experiences (Bloor et al. 2001). These interviews with teachers and students after each classroom observation played a vital role in informing an understanding about what I saw in the ELT classrooms and around the schools, e.g. teaching methods and techniques, the classroom situation, the school environment, students’ activities and their opinions of them, their likes and dislikes, and the teacher-student relationship. In reporting, I anonymised participants’ name to maintain confidentiality.

English use in Bangladesh

Bangladesh, a South Asian nation, is one of the most densely populated countries in the world, with a population of over 160 million in an area of 144,000 sq. kms and it is described as a homogeneous nation considering that a large number of its total population, 98% speaks Bangla (BANBEIS, 2004). Though majority of the people speaks in Bangla but in Bangladesh, given the view of current growing economy, technological advancement, and to achieve the MDGs English language is used for communication purposes in various organizations such as, in government offices, private sectors, media, publication, entertainment, and in the education sectors. Bangladesh education policy attempts to ensure equal opportunities for everyone for access to English learning. But students from particular socio-economic backgrounds are successful in English learning in Bangladesh, while others are not (Hamid, 2009; Hassan, 2003). However, the Bangladeshi government is aspirant to reach 100 percent literacy so that every citizen can enjoy equal opportunities. And English is a mandatory subject for madrasa students and it is compulsory for all students regardless of their geographic location and social background (Hamid, 2010).

Apart from this, English plays a very important role in education. Usually, a mixed-medium of education is followed in the public universities, but an elite English-medium instruction is followed in private universities since the Private University Act, 1992 started (Banu & Sussex, 2001a). Furthermore, in private universities often between one and three compulsory English courses are taught to teach all subjects in English at the undergraduate level (Hamid, 2006a; Rahman, 2005). Nevertheless, for achieving academic purposes, English is also taught to students in medical, engineering, business, sciences, social sciences and arts courses in public universities and tertiary colleges (Khan, 2002).

ELT in Secondary Education in Bangladesh:

In Bangladesh there are three divisions in secondary education, namely, mainstream, madrasa education and English-medium education (EME). Mainstream secondary education comprises of three streams: junior secondary (6th to 8th grade), secondary (9th and 10th grades) and higher secondary (11th and 12th grades). I undertook this research among the students and teachers of secondary stream. In Bangladesh, this is the largest educational phase in which 83% of the total secondary students are enrolled (CAMPE, 2006). In Bangladesh, most secondary schools offer education up to the 10th grade. At the end of this grade, students have to appear the first school-leaving examination called SSC. Eight education boards administer this examination. The Directorate of Secondary and Higher Education (DSHE) control the education administration, which is under the administration of the Ministry of Education (BANBEIS 2006). In the secondary level students are offered two English subjects: English for Today (EFT) and English Grammar and Composition, termed as first part and second part respectively. Given the view of teaching four-language skills- listening, speaking, reading and writing Bangladeshi government implemented CLT as an official methodology for secondary English teaching in the late 1990s (NCTB, 2001; Hamid, 2005; Hamid & Baldauf, 2008). As far as materials are concerned, the Bangladeshi government has a preference for locally produced textbooks for all subjects including English. Materials for teaching English were written by local experts with the help of external expertise (Hunter 2009; Farooqui, 2008).

The National Textbook Board of Bangladesh (NCTB) designs and distributes the national curriculum, syllabus and textbooks for secondary education. Moreover, the English Language Teaching Improvement Project (ELTIP) jointly funded by the Government of Bangladesh and the UK's Department for International Development (DfID) developed CLT based curriculum, materials, textbooks, and teacher training programmes throughout the country (Hamid & Baldauf, 2008). As far examination system is concerned, in an

academic year, students have to sit for three school-administered examinations, the first term, mid-term and final examination. These examinations including the SSC (Secondary School Certificate) mainly focus on testing the skills of reading, writing, vocabulary and grammar. Apart from these, in Bangladesh, institutional capability is very limited for training teachers, in particular English teachers (Hamid, 2010). As a result, over the last couple of years, several projects such as, English Language Teaching Improvement Project (ELTIP), Teaching Quality Improvement in Secondary Education Project (TQI-SEP), Secondary Education Quality and Access Enhancement Project (SEQAEP), English for Teaching, Teaching for English (ETTE) and English in Action (EiA) have been implemented with view to enhancing English teachers' pedagogic and English skills and to improve the teaching and learning of English in Bangladeshi secondary schools. However, regardless of these initiatives taken to improve the situation, teachers' and students' English performance still remains low (EIA, 2009a; Hamid and Baldauf, 2008; Nath et al., 2007).

Findings and Results from ELT Classroom Observation

In teaching learning process lesson plan plays a key role for good classroom practice. One of the potential activities of a lesson plan is to make practice of the beginning activities that influence and lead the main activities in a lesson, and are important in providing students' information, attention and motivation. In addition, this stage of a class also gives a clear idea of the teachers' pedagogic knowledge, management and preparation about classroom practice. Moreover, beginning activities are significant for a successful accomplishment of the lesson objectives. These activities include: greeting students once they entered the class, writing the lesson topic on the blackboard, reviewing the previous lesson and learning, discussing the lesson objectives, presenting the instructions of doing any activities clearly, checking whether the students have access to the appropriate book or not, and providing feedback on students' homework or assignment.

Beginning activities		Number of lessons in which this occurred	Percentage of lessons in which this occurred (n=47)
1	Acknowledges the presence of the students with greeting ("Good morning everyone)	12	26%
2	Ask students where they are up to (for teacher's own information rather than as a recap for student's benefit).	10	21%
3	Simply refers students to a page	34	72%
4	Writes the lesson topic on the black board (e.g. Unit 3, Lesson 2)	27	57%
5	Recaps the pervious lesson (in this subject)	16	34%
6	Borrows text book from a student	17	36%
7	Provides feedback to students on homework or assignment	4	9%
8	Begins teaching without explanation of what the lesson will cover	36	77%
9	Clarifies the students the objectives of the lesson	12	26%
10	Questions students about their recollections of the previous lesson	9	19%
11	Begins teaching without reference to the previous learning	35	74%
12	Checks that all students have access to the appropriate books	7	15%
13	With explanation asks students to open books at the relevant page (e.g. Turn to page 20 in your book)	6	13%

Table 1: Frequency of teachers' beginning activities in the lessons:

In the above table, it is evident that majority of the classes (74%), the teachers did not greet students with 'Good morning. Observation shows that most of the teacher (79%) were not

aware of where they have to start in the lesson, they asked students for their own information. However, it is obvious that in 72% of the classes, teachers simply asked students to open the page of the textbook without referring to previous lessons. Data also shows that in only 57% of the classes did teachers write the lesson topic on the blackboard. It is evident that in majority classes (66%) teachers did not recap the previous lesson. In 36% class, teacher borrowed textbook from students. Only in a few classes (9%) did teachers provide feedback on students' homework or assignment. Data shows that in 77% class, teachers started teaching without explaining to the students what the lesson will cover; moreover, in 74% of the classes teachers did not discuss the objectives of the lessons. In only 19% of the classes did teachers ask reflective questions to check students' learning in the previous lessons. It is obvious that in 15% of the classes teachers checked whether students had access to appropriate books. Finally, only in 13% of the classes did teachers explain the lesson before asking students to open their books to the relevant page.

In my observation schedule, middle activities are comprised of teacher activities and student activities in the lessons. Teacher activities focused on the teacher role, teaching techniques and ELT content as practised in the lessons. Similarly, student activities included the type of activities and the techniques used to do them in the class.

Teacher activities include responding, presenting, organizing, socializing, monitoring, eliciting, directing, feedback, write silently, asking open questions (OQ), asking closed questions (CQ), discussing grammar, reading out the text and other activities.

In figure1, it is evident that teachers practised grammar discussion (17%), reading out the text (16%) and writing silently (14%) most frequently. It also shows that none of teachers' practiced socializing in the class e.g. role-play and simulation activities, which mainly focus on communication practice i.e.

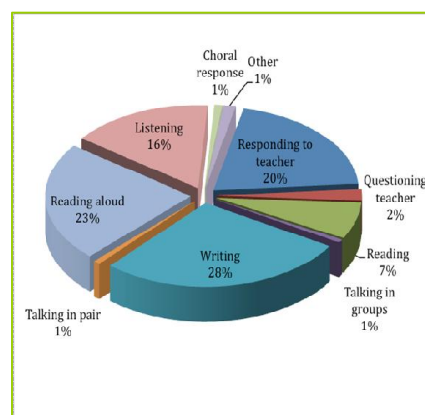


Figure 1: Teacher activities in the lessons

speaking and listening in a created situation. Moreover, it is also obvious that none of the teachers used directing techniques like gesture or mime. The teachers used a few monitoring (2%) and eliciting techniques (3%) in the classes observed. Teachers used responding (7%), presenting (8%), and organizing (5%) but not so frequently. Teachers used open (12%) and closed (11%) questioning techniques frequently in the lessons.

Student activities include responding to the teacher, questioning the teacher, talking in pairs, talking in groups, writing, reading, reading aloud, listening, choral response and other. Figure 2 shows that student' most frequent activities were writing (28%,) reading aloud (23%), responding (20%) to the teacher and listening (16%). The least practised activities were talking in pairs (1%), talking in groups (1%), choral response (1%) and questioning the teacher (2%).

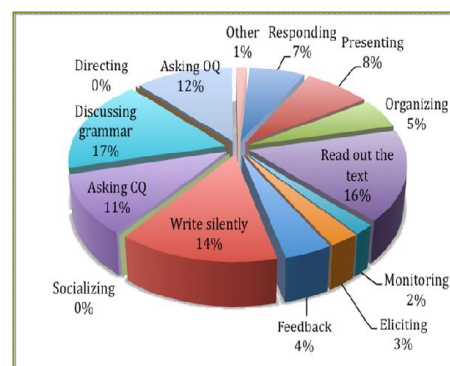


Figure 2: Student activities in the lessons

Like 'beginning activities', ending activities also have pedagogic importance. The purpose of such activities is to review what has been done in the class, to ask summary questions in order to check students' understanding and to tell the students what will follow in the next class. In addition, ending activities can involve to collecting students' class work to correct errors and to give feedback has also impact on over all learning. At the end of a lesson to set homework assignment for students and to provide feedback on it plays an important role in students' learning. How the teacher ended the lesson was also a focus of my classroom observation. Table 2: Findings for ending activities

Ending activities		Number of classes where this activity occurred	Percentage of classes where this activity occurred (n=47)
1	Recaps what the lesson has covered	11	23%
2	Provides feedback on the way students have worked during the lesson	6	13%
3	Sets homework or assignments to be completed before the next lesson.	4	9%
4	Asks summary questions to assess student's understanding of the concepts covered in the lesson	9	19%
5	Collects students' class work for marking	3	7%

6	Tell students where the lesson is leading, i.e. what will follow in the next lesson	13	28%
7	Tell students to close their books and dismisses them	29	62%
8	Stops teaching and leaves the room without doing any of the above (1-7)	4	9%

Table 2: Frequency of teachers' ending activities in the lessons:

In summary, percentage of ending activities of teachers in ELT class is evident in the above discussion. At the end of the lesson a few teachers (23%) review what the lesson has covered, provide feedback on students' activities, (13%) and set homework or assignment (9%). Data also reports that a few teachers (19%) asked summary questions to check students' understanding in the lessons. Data further shows that in only 7% of the classes teachers collected students' class work for marking. It is also evident that 28% of the class teachers talked about next lesson at the end. In 38% of the classes, teachers did not tell students to close their books and simply dismissed the class. Finally in 9% of the classes, teachers simply stopped teaching and left the classroom.

In above discussion, it is evident that ELT teachers lack pedagogic knowledge and classroom management skills. Data also suggest that ELT class seemed not encouraging, motivation, participating and interactive. These factors create problems in ELT classroom practice.

Findings and Results from Interview data

Interview data revealed the difficulties and problems teachers and students faced in the ELT classroom practices. These difficulties have been categorized under the following headings: lack of pre-service training; inadequate in-service training; lack of opportunities for input into policy making; influence of previous methods; impact of teachers' private tuition; lack of classroom management skills; lack of lesson plans, lack of financial gain and lack of prestige.

Lack of pre-service training

The teachers in this study unanimously reported that opportunities for pre-service training designed to develop teachers' pedagogic skills and teaching techniques were limited and

none of the English teachers received this training. It also appeared that lack of this training quality teaching suffers in the ELT class. The teachers reported:

I am a fresh university graduate. Unfortunately I did not get any training for teaching in this school. Now I realise teaching English is really difficult without training (Noyon).

You know, sometime we think teaching is very easy but actually it is not easy. I think without training we cannot teach what we are assumed to teach (Kader).

In adequate in-service training

In a context where in-service training is insufficient, the majority of the teachers remained untrained; additionally, the teachers reported that the training they had received did not reflect the realities of their schools and their classroom difficulties. The teacher claimed:

I think training programmes should be realistic about our problems and difficulties in the schools and in the classrooms (Alom).

Furthermore, they claimed that the training that they did receive lacked monitoring and evaluation that created problems into new pedagogic actions. The teacher asserted:

We get training but we are not provided further feedback and suggestions. Nobody listens to our school problems. We do not even have opportunities to share our experience with teachers in the schools. So we give up (Kader).

Lack of opportunities for input into policy making

Teachers reported that lack of opportunities to share and exchange their views and experiences with other colleagues, course designers and materials writers were an obstacle to implementing quality teaching. Teachers wanted to see their opinions at the policy level. But interviews with teachers revealed that their problems and limitations were not accounted for in the planning of any innovation, which perhaps undermined their confidence. Teachers are considered key role players in the implementation stage of educational change, but it appeared that they never got any opportunities, like participation in cluster meetings and workshops, to talk about their problems and difficulties. Teachers further reported that they are not called to give their opinions of the process of educational innovation. There is no consultation and their problems and difficulties have not been taken into account when a new teaching approach is adopted. They unanimously claimed it was top-down and imposed on them. The teacher reported:

We are working in the schools. It is our duty to practice and implement the new teaching approaches at the grass-root level proposed by the government. But it is a great pity that we do not have the opportunities to talk about the problems and difficulties that we face practically in school and in our personal life. I think, we know better than anybody else about the practicalities; I mean about the school, about our students, their problems, our problems and our limitations. But nobody is ready to hear us. It's kind of imposed on us (Shafiq).

Influence of previous methods

Findings reported that teachers were deeply rooted in and influenced by previous teaching methods that they experienced as teachers as well as students. Their orientation to previous methods apparently contradicts with a new pedagogy. Consequently, this confliction most likely causes problems and difficulties in the ELT classroom. The teacher reported:

I try to use various techniques to engage my students in the class, but it is not easy. I want all students' participation. According to the new method, I cannot talk more; students should talk more in the class. But sometimes I forget. My previous knowledge and experience calls me back (Alom).

Impact of teachers' private tuition

This category focuses on teachers' private tuition and its impact on the ELT classroom. Interviews with students suggested that students would not need private tuition if teachers taught well in the class. Students further claimed that teachers influenced them for private tuition directly or indirectly; in effect, teachers may be intentionally not teaching well so that students are reliant on their private tuition. The students also claimed that teachers did not treat everyone with equal care in the classroom; they may pay more attention to those students who go for private tuition. They also ignored and/or criticized those who didn't, which students felt was discriminatory behaviour. The students reported:

If our teachers teach us nicely we do not need to go for private tuition. We can learn in class. Our teachers also ask us directly or indirectly to go for private tuition. If we go to their private tuition, they behave nice in the classroom; otherwise they criticize our activities. In the private tuition, the teachers also give suggestions, which are more helpful for the examination. They do not behave well to those students who do not go to private tuition. This is a big problem for us (Group Interview).

You know, our sir behaves nicely to his private students in the class. His private students ask him questions frequently; they are free in the class and they can do whatever they want to do. He also asks them questions; he encourages them. But If I want to say something in the class, he just ignores me. It is not good and frustrating (Student).

It even appeared that in some cases students were severely beaten in class because they did not take private tuition from the teacher, or at least this is what was suggested in student interviews. Unsurprisingly, they also claimed that being beaten in class was completely discouraging and demotivating. It is clear that such negative behavior can have a strong negative influence on students' learning. In such a context where students are forced to take private tuition and beaten in class, it is impossible to ensure equal opportunities for all students to learn English skills in the ELT class.

A student reported:

I hate this behavior. He is my teacher, so I must respect him. You know, I do not go to his private tuition. This is the reason he beat me in the class. I will not attend his classes. I am feeling very bad. I am just depressed (Student).

Lack of Classroom management skills

This theme is associated with the factors that caused teachers' difficulties with classroom management. Teachers' classroom management skills focus on engaging all the students in learning process in the class, for example, to ensure all students' participation in the activities, to ensure everyone is engaged following the instructions given, to check everyone's understanding and learning in the lessons. Interview data suggest that most of the teachers only check the bright students' understanding and learning in class. The teacher reported:

It is true that we cannot ask everyone in the class. We have many problems in the class like number of students and their learning ability. I know who can answer my questions and I generally ask them (Shafiq).

However, interviews with students unanimously reported that they did not feel good when the teachers only asked the bright students.

Sir always asks only the 1st boy, 2nd boy and the 3rd boy in the class but not everyone. When we see that we are not given attention it's just frustrating. It's true that we feel bad when we cannot answer our teachers' questions (Group Interview).

Apart from this, it also appeared that students were inattentive and distracted in the class and they did not follow teachers' instructions. Interviews with teachers unanimously reported that they tried to engage the students in activities, but they could not manage the because of students' different levels of understanding. However, there is a paradox in what the teachers said: in reality, only two teachers involved few techniques to involve all the students in the class. The majority of the teachers, however, ignored the inactive students in the class. In addition, the teachers gave little effort to trying different techniques that involve students in classroom activities regardless of whether they considered them poor, weak or good students. Teachers reported:

It's true some students were talking in class. You know, it is very difficult to operate with all those students in the class. We have a big classroom. Besides, their level of understanding is different. I try different activities to involve all the students and make them participate, but it does not work (Alom).

Yes, I also noticed that some students were talking in the back. You know we have different type (ability) of students in the class. Some students are good. I try to engage my students but sometime it is difficult for me (Belal).

Teachers claimed that large class and students' different level of understanding were the constraints of class management; however, one teacher claimed that class management was difficult because of students' poor behaviour. The teacher reported:

I try different ways to engage the students in the class, but some students do not follow my instructions. They are poorly behaved in class. I cannot be rude to them. I try to be friendly in the class (Shafiq).

Lack of lesson plans

Interviews with teachers revealed that none of the teachers followed lesson plans and they claimed lack of time and overloaded classes as constraints. Teachers reported:

I do not get enough time for lesson planning. It takes time and I need to make the effort as well. I have to give time for private tuition. Besides, I am overloaded with classes, 28 in a week; it is not possible to maintain a lesson plan (Shafik).

In addition, the teacher also claimed that they lacked a clear idea about the nature of a lesson plan; however, they were particular to finish the syllabus in time. The teacher reported:

To be honest, I do not have a clear idea about the lesson plan. I teach the questions in the lessons. I ask students; they ask me. I practice reading and writing in the class. I give high importance to completing the syllabus in time (Belal).

The teachers are expected to be well prepared and equipped before entering the classroom. However, it appeared that some teachers borrowed textbooks from students and asked students to bring chalk and a duster to the class.

The teachers claimed that 'It's not good but I sometimes forget to bring this stuff' (Alom). Another teacher further reported:

I borrow a book from my students in the class; I do not see any problem with that. I sometimes ask my students to bring some chalk and a duster. I know they feel good about this (Belal).

Only one out of five of the teachers claimed that borrowing book from students in the class and asked students to bring teaching aids distracted students in the lessons. He felt that teachers should carry book and teaching aids of their own. The teacher reported:

I should have my own book and teaching aids with me. If I ask my students for chalk and duster, I think they will be distracted in the lessons. I don't like it. It is not a good practice (Kader).

Interviews with students revealed the same opinion. They unanimously reported:

Giving the book to our teachers is a problem for our own class work. We do not like it. But our teachers do it. We also do not like to go to the office room for some chalk and duster. It breaks our attention (Group Interview).

Data suggested that teachers could not maintain lesson plans because of lack of time and over-loaded class. In addition, it also revealed that teachers' lack of a clear idea about lesson plans impeded their planning. It appeared that most of the teachers asked students for book and teaching aids but students did not like this practice as they believe this takes a way their attention from studies. Findings suggest that the teachers paid only little attention to lesson plans and classroom preparation. Both teachers and students expressed that personal difficulties impeded English teaching and learning in the class.

Lack of financial gain

This category focused on teachers' low monthly payment and poor financial status. Interviews with teachers showed that they were dissatisfied with their poor salary which they thought insufficient to meet their basic family needs, e.g. food, cloths, accommodation, education and health treatment. The data show that teachers had a poor family life and, as a result, could not improve their circumstances or provide a better life for their children. This situation was the root of much frustration. Because of the need for more income, all the teachers I interviewed engaged in other jobs to maintain their family expenditure, for example private tuition, farming and working in small businesses. In many cases, this extra burden resulted to stress and poor health, according to their accounts. Teachers reported:

Our salary is very poor. This is noting in the present market. I always have to think how to manage my family expenditure within this small amount of money. It is a mental pressure. I am bound to think of alternative ways of earning. How can I offer myself completely to teaching in these circumstances? (Kader)

Not enough salary to meet my family's basic needs. I have to do private tuition. My son is studying in the university, as you know, education is very expensive. I even cannot think of a better life for my children. It's a pity for me (Shafiq).

To be honest, I have to engage with other jobs just to maintain my family expenditure. I am a teacher and I am in need. How can I explain it? This is a problem for my teaching. This is also not good for my health (Alom).

Findings suggested that teachers gained no financial status through their teaching positions, and lived in difficult situations. Teachers unanimously claimed that financial difficulties presented a big constraint to classroom preparation and practice.

Lack of prestige

This category reflects teachers' low level of social status. Interviews with teachers show that they also lack respect in society. This in turn was perceived to have a negative impact on their personal and family life. In the past, despite teachers' poor financial conditions, they at least had a position in society where they felt respected

and valued; however, during the present state of financial crisis, the teachers felt that they were undervalued in society and ignored. In addition, teachers' engagement with private tuition seemed to influence their self-respect. This lack of prestige seemed to cause complications in their teaching practice. The teachers reported:

You see, in society everything has changed, but my life is stuck. I cannot satisfy my family members' needs or fulfill their minimum requirements e.g. food, treatment, good education, cloths etc. I am not valued in society. The reason is that I am not financially well off. In the past, teachers were valued and respected people in society, even if they were poor. Now, only money matters for social value and status. I don't feel good about giving private tuition but there is no other way to survive. This is also a question of my dignity in the society (Kader).

Findings from interviews with teachers suggest that they were undervalued due to their poor financial status, which seemingly diminished their prestige and dignity in society. This status, therefore, are also inevitable resulted in dissatisfaction with their profession, which also seems to hamper teaching practice in the classroom.

Conclusion and recommendations

Drawn data from classroom observation, interviews with teachers and students, and group interviews with students this paper presents the various factors that contribute to informing pedagogical difficulties of ELT in Bangladeshi secondary classrooms. It appears that limited training opportunities to working and forthcoming teachers constitute difficulties to teaching and implementing new pedagogic activities. Interviews with teachers revealed that their problems and limitations were not accounted for in the planning of any innovation, which perhaps undermined their confidence. Data further suggests that the majority of the teachers are influenced by their previous teaching methods that obstruct applying new teaching approaches. Interview data reveals that private tuition practice creates an inequitable environment that discourages students from participating in the class and eventually creates difficulties in ELT class. Data suggest that most of the teachers lacked adequate knowledge of classroom management. This clearly shows teachers' shortage of

pedagogic skills, which is a significant constraint to quality teaching. Besides, it is obvious that environmental and personal difficulties creating problems in ELT class. Findings from interviews with teachers suggest that they are undervalued due to their poor financial status, which seemingly diminished their prestige and dignity in society. This status therefore also inevitable results in dissatisfaction with their profession, which also seems to hamper teaching practice in the ELT classroom. In Bangladesh, the importance of English has increased for many reasons, such as, developmental activities, global communications and e-governance. Moreover, English language competence is considered as human capital (Hamid and Baldauf, 2008) and assumed to be a factor of personal and national development (Erling, et al., 2012). It is evident in Khan's view, "There is a general perception that almost all jobs regard English as an asset and give preference to candidates with good command of spoken and written English" (Khan, 2002, p. 327). Keeping these views, Bangladesh education policy could attempt to ensure the following suggestions so that these could help improving ELT in secondary schools:

- I) To ensure adequate in-service and pre-service training for every teacher to develop their pedagogic and classroom management skills.
- II) To make sure of a good salary for every teacher so that they could live a good personal and social life.
- III) To take enough appropriate measures to discourage teachers for private tuition.
- IV) To take appropriate steps to include practicing teachers' suggestions and opinions in the syllabus design, materials production and assessment design.
- V) Teachers should provide with enough teaching aids and supports.

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Role of Women in Improving the Quality of Healthcare Sector in Bangladesh: Challenges and Opportunities

Mily Sultana

***Abstract:** Male and female should work together to establish a real progressive society and ensure sustainable development of Bangladesh. Without the cooperation and contribution of any of them, the progress of human civilization cannot be imagined. In every sector of society male and female have significant contribution; especially in healthcare sector, women's contribution is greatly praiseworthy. They have been playing a very significant role in bringing about changes of the undesired circumstances which the helpless patients and their relatives often face and improving the quality of health-care services in both rural and urban areas of our country. This research work tries to show the contribution of female health-professionals including doctors, nurses and other medical staffs in enhancing the quality of healthcare sector and what types of problems they are facing in professional life relating to healthcare activities which is unnoticed part of healthcare sector. This study will also help the readers understand the position of women professionals in healthcare sector and will design strategies to modify the draconian laws and proper implementation of existing laws and policies regarding health care.*

***Keywords:** Healthcare, Women, Education. Empowerment, Equity, Equality, Rights, Draconian laws, Female Professionals, Contribution, Responsibility.*

Role of Women in Improving the Quality of Healthcare Sector in Bangladesh: Challenges and Opportunities

Mily Sultana

Introduction

It is known to all that charity begins at home. In view of that practice of good deeds start from home. Always a mother or other female member of a family who starts practice of good activities including take care of kids and active participation of given that health care service to every member of the family play a vital role in social perspective. Over the decades and centuries in Bangladesh women provide the most important health care services to the community. In the rural parts of Bangladesh, where most of the health service providers are women, they are giving treatment to the patients according to the ancient and local formula. At the clinics and hospitals women are contributing to health care services by providing nursing, consulting with patients and managing the data regarding patients. But the sad reality is that they have been hardly paid for their life saving work. Researchers attempted to estimate the financial value of women's contribution to health systems in 2010 by analyzing data from 32 countries, accounting for 52% of the world's population. Women have a huge possibility to contribute in improving the quality of healthcare sector and overall progress of mankind. More particularly, female health workers, involve in providing door-to-door family planning services, have the utmost credit behind the rapid fall in fertility rate. In 2018, fertility rate for Bangladesh was 2.05 children per woman. Fertility rate of Bangladesh fell gradually from 2.13 children per woman in 2015 to 2.05 children per woman in 2018.¹

Women's contribution in healthcare sector

When women thrive, as Kofi Annan once said, all of society benefits, and succeeding generations are given a better start in life.² The estimated value of women's paid work is 2.47% of global gross domestic product (GDP), while the value of their unpaid work is 2.35% of GDP. The total is equivalent to \$3tn.³ Women carry the heaviest burden when it comes to family caretaking duties and also makes up the vast majority of frontline health workers around the world. In a sample of 123 countries, women made up 67% of employment in the health and social sectors, compared with 41% of employment across all sectors. In the US, 80% of the health workforce and 90% of registered nurses, but only 40% of executives, are women. *Elizabeth Blackwell* was the first women to receive a medical degree in the United States, as well as the first women on the UK Medical Register.⁴ The community health workers—those most likely to provide primary health care to populations most in need—are mainly women. Women have made

great strides in securing opportunities for education and employment. Health employment provides stable, remunerative careers that women (and men) can pursue while providing care to families and contributing to the physical and economic health of their communities. In fact, health systems would collapse without women.⁵

Obstacles faced by women in contributing to healthcare sector

In Bangladesh, women are facing multiplicity of problems in performing their daily activities, whether at the places of their occupation or their residences. They are obstructed by various kinds of challenges while providing their services to the common people. Particularly, women health-workers are confronted by the following challenges in providing healthcare services to the community

1. Not having proper training

In Bangladesh, there are few institutions which are providing proper training to professionals involved in healthcare service. Consequently, the women health workers are not properly trained up. That's why there are very few qualified women health workers in both public and private hospitals and clinics. As a result, they cannot give proper services to the patients and therefore, they are criticized and rebuked by both the superior authority of the concerned institutions and the relatives of the patients. This unexpected circumstance often causes many women health-workers to do more wrongs and makes them disappointed.

2. Lack of representation

Women make up the bulk of the healthcare work force but so few are in the top leadership position.⁶ The US health care industry is frequently cited as the global standard for gender diversity. According to the US Bureau of Labor Statistics, 77% of the health care workforce is female, far higher than other industries, where only 18% of CEOs are women. And the picture is worse at the biggest health care organizations. Among the 50 largest payers, providers, and pharmaceutical companies (150 companies in all), only 17 have female CEOs.⁷ Though women serves majority in the healthcare sector, they are not properly represented in this sector. It is pragmatic that if women can participate in decision making process

regarding healthcare, obviously they can provide better facilities and opportunities for women health professionals and their position in profession will be improved. It is now highly needed to create congenial environment so that women can play a significant role in healthcare sector.

3. Common tendency of blaming women

In male dominated patriarchal society, women are more blamed than male for doing any wrong. By nature none is infallible. So any human being irrespective of gender may do wrong or make any mistake. But in society, if any female employee makes any mistake, her mistake is weighed more than the mistake done by any male employee in many cases. Even in some cases, it is observed that mistake of boss of any female employee is attributed to her. Many of the female employees in health care sector also suffer this problem and consequently they cannot contribute to this sector according to the expectation of the service-seekers.

4. Insufficient safety measures and scarcity of indispensable privileges for female service providers

Many women doctors are often posted in rural areas and it creates difficulty for them to continue their jobs mostly for the reason that lack of cooperation from the authorities in ensuring safety and security required for performing their duties towards local community. Many of them do not even get proper accommodation from the government and thus have to come to their workplaces from long distances bearing a risk of their security and safety. What is more, even joining the jobs at both the rural and urban areas becomes difficult sometimes because of corruption and bureaucratic tangles and in addition, bribing higher officials at different levels has become a common scenario without which joining at any job in Bangladesh has become uncommon and exceptional. Because of such problems, many women doctors' dreams of serving the people in remote areas of the country are shattered. And as unbelievable as this might sound, many even leave this noble profession. It must ensure a women-friendly environment at the workplaces in rural areas and the administrative facilities should also be made up to the mark. Most importantly, the government needs to work on policies to mitigate the sense of insecurity female physicians have in rural settings.⁸

5. Social and Legal Obstacles

Thirty-one million girls around the world are not completing their primary education. Another 32 million cannot complete the secondary school. These 63 million girls have been removed from the potential pool of highly trained health workers. But for those who are able to continue their studies, the obstacles pile up. Families in many countries are less likely to invest in girls' education than boys'. Many young women drop out of health training schools because they can't afford it or they get married or they become pregnant. Societal norms and, in many cases, draconian policies are working against them. And female students and health workers frequently face unbridled sexual harassment and discrimination.⁹ After that there is the pay gap. Women in the health industry are routinely paid less than their male counterparts across many different roles.

6. Gender discrimination

A recent study conducted by BRAC has found that gender disparity is prevalent in the medical profession—society considers female physicians less competent than male physicians though they are equally qualified and they also face discrimination in case of promotions.¹⁰ Bangladesh secured the 47th position among 144 countries in 2017 as per the Global Gender Gap Report.¹¹ Women do more than three times much more work in healthcare than men, but they are largely unpaid. “Worldwide, most providers of health care are women,” says Professor Langer, But the health care systems to which they contribute so much are often completely unresponsive to their needs – despite the fact that they rely heavily on their paid and unpaid contributions. Women are undervalued and unsupported by the systems in which they work and this problem is exacerbated by inequitable access to healthcare experienced by too many women worldwide – particularly those in the most vulnerable groups. Right now for every work a man earns 1\$ in average ,where a woman get 54 cents for the same work at the current rate it will take 202 years until women achieve equal pay.¹²

7. Male dominated society

It has been a "natural law" to regard women as the inferior sex and for them to submit to male authority for the smooth functioning of society in its day to day progress. In the today's world it is an issue of impartiality of law irrespective of race was clearly crucial. Indeed the law which prevented women from achieving their full development as individuals must be bad law.¹³ Gender norms affect health-seeking behaviors and the use of healthcare services. Women and men often have different attitudes towards medical care including preventative care, family planning, and women may not be able to access healthcare if the services are not seen as culturally appropriate. Furthermore, women may not have the resources to pay for healthcare services and in some cases, require the permission of a male family member or male relative.

Since nurses were mostly women, this improvement of the rights of married women meant much to the nursing profession, in some European countries, married women could not work without the consent of their husbands until a few decades ago, for example in France until 1965 and in Spain until 1975. Adding up marriage bars, a practice adopted from the late 19th century to the 1970s across many countries, including Austria, Australia, Ireland, Canada and Switzerland, restricted married women from employment in many professions.¹⁴

8. Sexual Harassment

Women are often sexually harassed by the male co-workers or the outsiders. They either harassed by bodily or by orally. In a familiar case of U.S, named as **Female vs Verizon** communications INC, a female employee charged she was constantly called a "bitch" and "stupid" and was denied equipment's access to public restrooms. The court agreed to opine that this sad situation constituted a hostile work environment.¹⁵ In Bangladesh most of the female doctors need to perform their interne-duties under any professional doctor, and in that period they often get harassed by their superior male doctors either physically or orally. Sometimes nurses also are harassed by the male doctors or other medical officials. The most obvious cause for sexual harassment at the workplace is unequal power relations in society as a whole. Gender-based violence is influenced by the distribution of social, economic and legal power in society. Women are more likely to be victims of harassment because they lack power, occupy insecure positions or are socialized into suffering in silence.¹⁶

9. Lack of awareness of Women

Women in a country like Bangladesh are not much aware of their physical and mental health condition. Many of them suffer from malnutrition due to poverty and scarcity of having healthy food and fruits. They often get into marriage in an early age, which leads to them becoming a mother in an unsuitable time which is harmful for their mental and physical health. Over 650 million women have got married when they are children and about 33,000 girls are becoming child bride in every day.¹⁷ As they give birth of their children in very early age, their body structure becomes unsuitable for doing outside job and they hardly be able to acquire any work since they have to engage in doing their family works like bringing up the children and looking after other family members. So, conscious women need to take proper initiatives regarding their family lives as well as professional lives. Educated community should move forward to ensure social justice and equality. The women rights activists and other conscious citizens need to speak for the deprived class of women and they should take strong position against injustice in health care sector.

Role of local governments in improving healthcare service in rural area:

Bangladesh remains one of the countries with the highest level of malnutrition among the developing countries where children and women are most affected. It has one of the highest rates of adolescent motherhood in the world - with 28 percent of adolescents bearing at least one child. Nearly 85 percent of births take place in the home - outside a healthcare centre with medical facility or without the aid of trained healthcare professional such as doctor, midwife, or skilled birth attendant - making access to emergency care difficult, though not impossible, and life threatening to both mother and child. There are some critical challenges for the maternal and child health care system needed to be addressed immediately.

Local Governments in Bangladesh have been mandated by law to work on improving health care service. According to Local Government (City Corporation) Act, 2009 and Local Government (Municipalities) Act, 2009, city corporations and municipalities are responsible to provide primary health care to city dwellers. Local governments in rural areas such as Upazilla Parishad and Union Parishad are also mandated by their law to supervise healthcare service delivery in rural areas. As per Upazila Parishad Act 2009, Upazila Health and Family Planning Officer

must work under Upazila Chairman and he is accountable to Upazila Parishad for all kinds of health service at Upazila level. According to Union Parishad Act 2009, there is a Standing Committee on Health and Family Planning headed by UP Chairman at Union level and Councilor at ward level. The major function of the Committee is to monitor health care service rendered by the Union health sub-centers and create mass awareness among people of the rural area.¹⁸ Most of the health service providers are female in both the Upazila and Union Parishad level. So it is necessary to make sure proper training, transport facilities, accommodation, and security as well standard financial support for them.

Legal framework relating to healthcare

The constitution of Bangladesh gives safeguards to the citizen's health right. In national context, the Constitution of Bangladesh has declared 'right to life' as a fundamental right.¹⁹ Which signifies according to *Article 18.1*) The State shall regard the raising of the level of nutrition and the improvement of public health as among its primary duties, and in particular shall adopt effective measures to prevent the consumption, except for medical purposes or for such other purposes as may be prescribed by law, of alcoholic and other intoxicating drinks and of drugs which are injurious to health.²⁰ Since it is the primary duty of the state, as prescribed by Article 18 of the Constitution, to raise the level of nutrition and improve the public health, it has enacted some other relevant laws like 1) The Medical and Dental Council Act, 1980 2) The Bangladesh Nursing Council Ordinance, 1983, 3) The Pharmacy Ordinance, 1976: 4) The Drugs Act, 1940 to raise the level of nutrition and improve the quality of the public health.²¹

According to *Article 28 (2)* of the Constitution, Women shall have equal rights with men in all spheres of the State and of public life. Again, *Article 28(4)* authorizes the State to make special provision in favour of women and children by providing- "Nothing in this article shall prevent the State from making special provision in favor of women or children or for the advancement of any backward section of citizens."²²

In addition to State laws and constitutional provisions, international instrument also provides for elimination of any kind of discrimination against women. For example, *Article 14* of The Convention on the Elimination of all Forms of

Discrimination against Women (CEDAW) provides protections for rural women and their special problems, ensuring the right of women to participate in development programs, to have access to adequate health care facilities.²³ The Committee on the Elimination of Discrimination against Women, affirming that access to health care, including reproductive health, is a basic right under the Convention on the Elimination of All Forms of Discrimination against Women, decided at its twentieth session, pursuant to article 21, to elaborate a general recommendation on article 12 of the Convention.²⁴ *Article 18* of the Convention demonstrates that women's health is an issue that is recognized as a central concern in promoting the health and well-being of women. ²⁵*Article 12 reads as follows:* States parties shall take all appropriate measures to eliminate discrimination against women in the field of health care in order to ensure, on a basis of equality of men and women, *access to health-care services*, including those related to family planning.

*Article 12 (2) provides-*States parties should take appropriate measures to ensure that health services are sensitive to the needs of women with disabilities and are respectful of their human rights and dignity.²⁶ *Article 10*, which requires States parties to ensure equal access to education, thus enabling women to access health care more readily and reducing female student drop-out rates, which are often a result of premature pregnancy;²⁷ *Article 10 (h)*, which requires that States parties provide to women and girls access to specific educational information to help ensure the health and well-being of families, including information and advice on family planning; ²⁸*Article 11*, which is concerned, in part, with the protection of women's health and safety in working conditions, including the safeguarding of the reproductive function, special protection from harmful types of work during pregnancy and with the provision of paid maternity leave;²⁹ *Article 14, paragraph 2 (b)*, which requires States parties to ensure access for rural women to adequate health-care facilities, including information, counseling and services in family planning, and (h), which obliges States parties to take all appropriate measures to ensure adequate living conditions, particularly housing, sanitation, electricity and water supply, transport and communications, all of which are critical for the prevention of disease and the promotion of good health care; ³⁰*Article 16, paragraph 2*, describes the betrothal and marriage of children, an important factor in preventing the physical and emotional harm which arise from early childbirth.³¹

The Beijing platform for action agrees at the UN summit on Women in 1995, provides a strong basis for an expanded vision of the goals. It covers 12 areas of critical concern-poverty, education, health, violence, conflict, the economy, political power, advancement of women, human rights, media, environment and “girl children”-and provides broader assessment of progress towards the third MDG of promoting equality and empowering women.³² This report takes each of the millennium Development Goals in turn. It concludes by recommending actions by government north and south to ensure that the MDGs are met for everyone, women and men, girls and boys.³³ But there is hardly legal Provisions relating to professional expansion process for the female professionals in national and international instruments.

Recommendations

In order to overcome the challenges and solve the problems which our female health service- providers are encountering in providing health care services to the service-seeking people, some appropriate measures and initiatives should be taken. Since education is the only path to ensure bright future of our nation, the current position of women in healthcare sector can be changed by ensuring moderate, effective, fruitful and outcome based education for the people of the country. Again, to remove these obstacles a series of awareness advertisements may be aired on televisions and radios as well as seminars, symposiums, lecture series and workshops may be arranged by government, NGO and academic institutions to make people more conscious about the contribution of women in health sector and encourage them to provide necessary assistance to the health service-providers. In adding together, the ministry of Women and Children Affairs and Ministry of Health and Family Welfare should take some coordinated initiatives and efforts with a view to improving the position and status of women health service-providers, so that they feel more encouraged to play better role towards improvement of the quality of health care service. The government should also make pragmatic policy suitable to present circumstances and enact proper laws to enforce such policy. It should also make necessary amendment of the laws regarding healthcare activities to make them more suitable and adaptable with the existing circumstances and implement them properly.

Since our society is patriarchal society in which only the activities and contributions of male members are appreciated by most of the people and those of women are not properly recognized, so the women rights –activists and conscious citizens of the country should make harmonized efforts to change the mindset of the common people. Through proper management of both public and private hospital, clinics and other health relating institutions, the quality of health care system can be improved and female health service-providers can play better role in this perspective. It is very urgent to stop any kind of discrimination in this sector. It is necessary to take some practical and timely initiative to develop the present condition of healthcare sector such as arrangement of proper training opportunity for all stakeholders so that their expertise may develop their own field, digitalization of this sector, implementation of academic knowledge in professional practices and increasing qualitative research work. Moreover, we need to strengthen the Bangladesh Medical and Dental Council (BMDC) and ensure the accountability of concerned regulatory body.

Conclusion

Though in Bangladesh, there are a lot of problems including large population, large scale of migration, poverty, natural disaster, climate change crises, gender discrimination, political turbulence, economic instability, crisis in health care service, the country is going to development and its government is taking different steps to improve the quality of all sectors gradually. In recent period, Bangladesh has made remarkable improvement in health service for which both the male and female service providers have contributed a lot. Particularly, women medical functionaries have a significant role in providing delivering maternal and child health services. In terms of providing primary health care they have made important contributions and consequently, most of the health indicators show steady improvement. A combination of both male and female health service-providers and their coordinated efforts have led to improved maternal and child health outcomes enabling Bangladesh to go forward towards attaining Millennium Development Goal along with about 40 percent reduction in the maternal mortality rate within less than a decade. However, we should bear in our mind that in health care sector there are a lot of problems and challenges which female service providers are facing. If we can solve these problems and overcome the challenges,

our female health service- providers will be able to play better role in improving the quality of health service.

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at: <http://www.genderequality.ie/en/GE/Pages/BeijingPlatform> , Accessed: 4th may 2019

³³ *ibid*

Designing a Single Pin Pulse Width Modulation Based Seven Segment Display Decoder

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Abstract: A design of seven segment display decoder circuit is presented which takes a pulse width modulated (PWM) signal through a single input pin. Driving a seven segment display directly requires seven precious pins controller unit. A decoder helps us to reduce the number of pins required to control a seven segment display unit. Commercially available BCD to seven segment display decoder IC needs four pins to control one single digit of seven segment display. Though there are other complicated methods available to control multiple digits of display such as multiplexing and I2C Serial methods. This design takes PWM signal of different duty cycles and convert it to corresponding binary numbers by a low pass filter and a flash analog to digital converter (ADC). A binary to seven segment display decoder circuit is attached to convert the binary numbers into required output bits. This paper represents the decoder circuit for common cathode seven segment displays only.

Key words: Seven segment display, Decoder circuit, Pulse Width Modulation, Microcontroller, Arduino.

Introduction

Seven segment display technology is one of the most commonly found technology used among digital circuits and electronic appliances like digital clocks, digital meters, microwave oven, electric stove, elevators etc.. These displays are constructed with seven segments of light emitting diodes (LEDs) and that is assembled into a structure which looks like numeral 8 which can be used to show any Hex number between “0” and “F” by illuminating combinations of these LEDs. The LEDs can be arranged in two different formations: Common Cathodes and Common Anodes. In case of Common Cathode display all the cathode connections of the LED segments are connected together to logic 0 or ground and to logic 1 or VCC for Common Anodes display which are shown in Fig 1. Each segments is lightened by applying the logic 1 or HIGH signal through a current limiting resistor. The opposite construction is done in Common Anodes displays.

Seven segment display is referred as a very popular display among electronic circuit designers because it is very easy to use and can be found anywhere at a very cheap price. Though the conventional methods of displaying data on a seven segment display are sometimes a hassle due to the shortage of microcontroller pins. Most of the existing systems engage many pins of microcontroller in order to display some data. This problem leaded us to develop a new method of controlling seven segment displays which included the designing of a brand new decoder circuit where only one pin is used as input.

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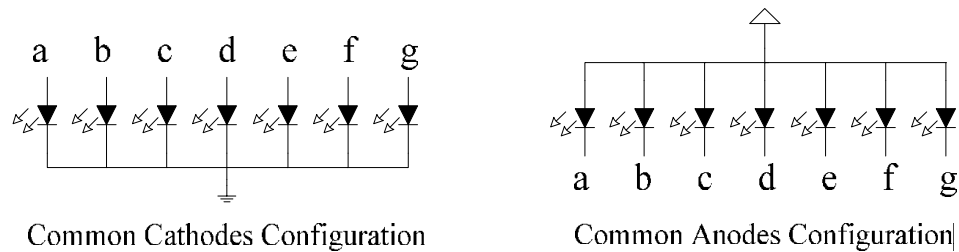


Fig 1: LEDs arrangement in Common Cathodes and Common Anodes displays.

Conventional Methods

There are several methods available of controlling seven segment displays. Some methods are used to control less number of display units to show smaller data where some methods are used for larger data. For controlling one or fewer digits of seven segment display direct and decoder methods are very common. In case of direct controlling method all LEDs are controlled directly from microcontroller by giving HIGH logic (common cathodes type) or LOW logic (common anodes type) to display pins (named by letter “a” to “g”) of each digit. This method is shown in Fig 2.

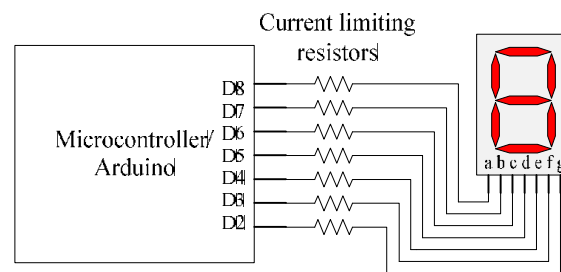


Fig 2: Direct Method of Controlling 7-Segment Display.

In BCD to seven segment display decoder method, microcontroller will produce a 4-bit binary coded decimal (BCD) signal and send it to a decoder through four pins which will be converted to corresponding HIGH or LOW signal for seven input pins of each digit of display. Hence this method occupies at least four digital pins of microcontroller which is illustrated in Fig 3.

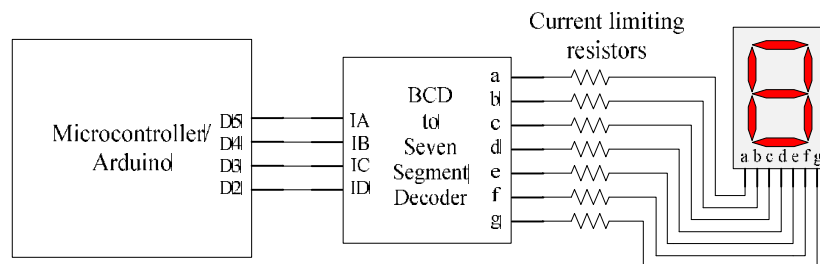


Fig 3: BCD to Seven Segment Display Decoder Method of Controlling 7-Segment Display.

Another widely used method for controlling seven segment displays at bulk is multiplexing in which several display units are connected to same seven pins of a microcontroller. But only one unit will be activated at a particular moment by another separate pin of that controller. Next unit should be activated

at the very next moment by another pin while previous unit should be deactivated. So only one digit will be lightened at a time. Since this phenomenon happened so fast, our eyes and brain cannot recognize the deactivated digits. In this method the number of microcontroller pins required is $2N+1$ where N is the number of digits. Certainly this method is useful when lots of display units are being used. Fig 4 shows the connection diagram of multiplexing method.

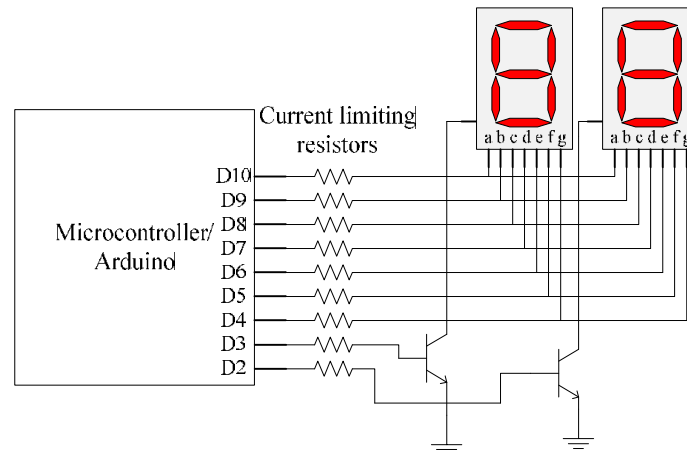


Fig 4: Multiplexing Method of Controlling 7-Segment Display Units.

Design Methodology

Since almost all the available methods and decoders require more than one microcontroller pin to control one single display unit, this paper will demonstrate a new decoder circuit which will take a PWM signal as input and deliver 7 outputs for 7 input pins of a display unit. Microcontroller will produce PWM signal of different duty cycles to display different Hexadecimal numbers. The block diagram of detailed work sequence that will take place inside the decoder circuit is illustrated in Fig 5.

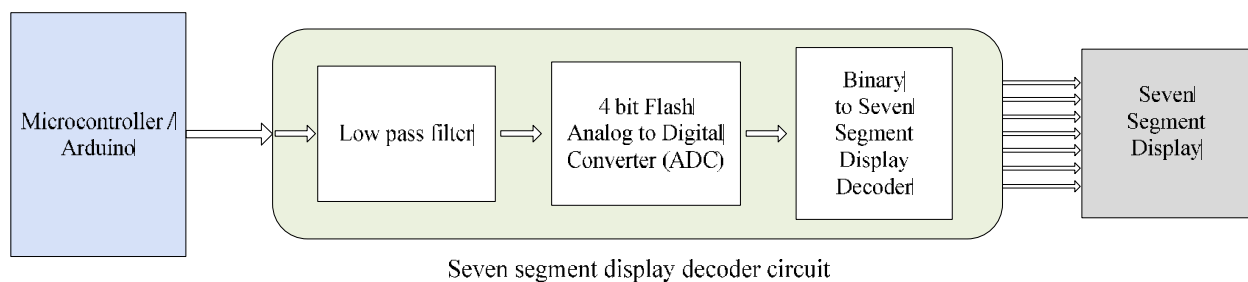


Fig 5: Block Diagram of Decoder Circuit.

At first PWM signal needs to be converted to an analog voltage by a low pass filter (LPF) since microcontroller (like Arduino) cannot produce different analog outputs. A simple R-C low pass filter will serve the purpose.

Secondly the obtained analog voltage from low pass filter is then passed to a 4 bit Flash Analog to Digital Converter (ADC). This Flash ADC contains a resistor ladder which is a series of 16 equal (first and last of these can be different if needed) resistors and connected to VCC (5V in most cases) & ground. This will create a voltage divider network which will provide different analog voltages to compare with main

signal. Second part of the Flash ADC is a series of comparators. 16 open-loop op-amp based voltage comparators are used in this design. These comparators will compare the given analog signal (obtained from LPF) to some fixed analog voltages (obtained from resistor ladder). Comparators will provide HIGH if the analog input is greater than a fixed voltage or LOW if the input is smaller than a fixed voltage. Third segment of the Flash ADC is a 16 to 4 line priority encoder. The output of the priority encoder is 4 bit binary numbers corresponding to input signal.

Lastly the 4 bit binary number will be received by a Binary to Seven Segment Display Decoder which will convert the number to a series of digital outputs which will be fed to the display unit. Conventional BCD to Seven Segment Display Decoder will show only 0 – 9 on segment display but this Binary to Seven Segment Display Decoder is designed to display 0 – F.

R-C Low Pass Filter

A low pass filter (LPF) is a signal filter which passes low frequency signals and blocks high frequency signals. In other words, low frequency signals go through much easier with less resistance and high frequency signals have a much harder time getting through. Low pass filters can be constructed using simple resistors in series with the input and a capacitor in parallel with output. This simple low pass filter is called passive R-C LPF. A simple passive R-C low pass filter which has been used in this decoder is shown in Fig 6. This low pass filter will pass low frequency signals or DC signals and blocks high frequency AC signals¹.

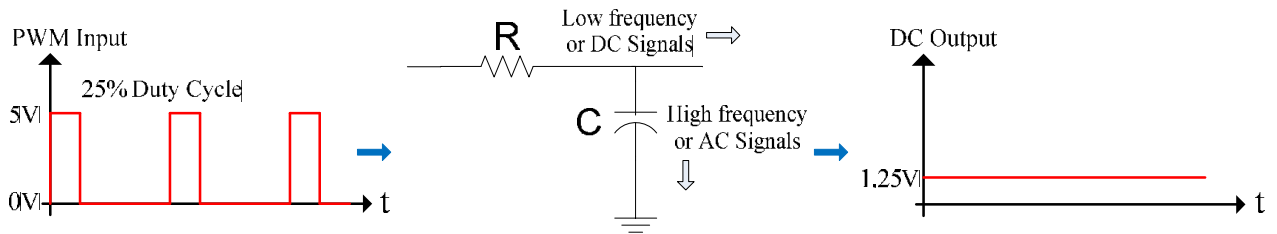


Fig 6: Passive R-C Low Pass Filter.

The values of R and C can be determined by the following equations². This will be pretty simple since most microcontrollers (like most variants of Arduino) cannot produce PWM signal whose frequency is more than 980 Hz³.

$$|V_{out}| = |V_{in}| \frac{1}{\sqrt{1 + \omega^2 R^2 C^2}}$$

Eventually the low pass filter is converting the PWM square wave signal to an analog voltage which has a value between 0V to 5V. The value of analog signal is proportional to the duty cycle of the PWM signal. For example to create a 3V signal given a digital source that can be either HIGH at 5V, or LOW at 0V, we can use PWM with a duty cycle of 60% which outputs 5V 60% of the time. If the digital signal is cycled fast enough, then the voltage seen at the output appears to be the average voltage. If the digital low is 0V (which is usually the case) then the average voltage can be calculated by taking the digital high voltage multiplied by the duty cycle, or $5V \times 0.6 = 3V$. Selecting a duty cycle of 80% would yield 4V,

20% would yield 1V, and so on⁴. Table 1 shows the corresponding analog values of different duty cycles of PWM input which are intended to be used in the decoder.

Table 1: Duty cycles of PWM to show digits from 0 to F and corresponding DC fixed voltage.

Digits	PWM duty cycle (%)	Corresponding DC Voltage(V)
0	0(approx.)	0
1	6.6	0.33
2	13.4	0.67
3	20.0	1.0
4	26.6	1.33
5	33.4	1.67
6	40.0	2.0
7	46.6	2.33
8	53.7	2.67
9	60.0	3.0
A	66.6	3.33
b	73.4	3.67
C	80.0	4.0
d	86.6	4.33
E	93.4	4.67
F	100.0(approx.)	5

Flash ADC

This particular Flash Analog to Digital Converter has 4 bit binary outputs. According to 2^n method the number of resistors and comparators are 16 each. These are open-loop CMOS op-amp based comparators which will produce digital outputs. A two-stage amplifier based comparator circuit⁵ operated in an open loop configuration is shown in Fig 7 which is used for this design. It consists of a standard two-stage differential input CMOS amplifier, without frequency compensation.

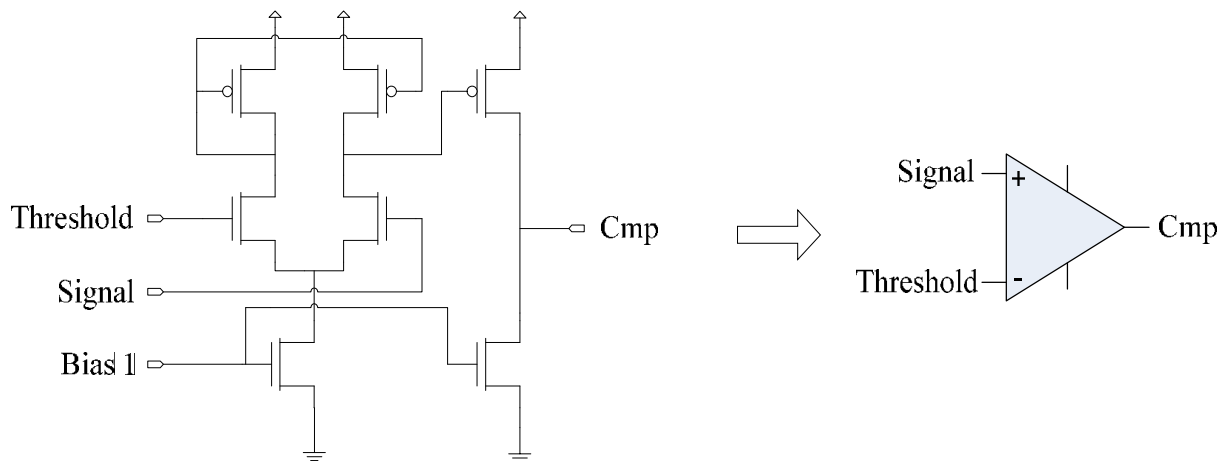


Fig 7: Comparator circuit: A CMOS two-stage amplifier operated in an open loop configuration⁵.

Each comparator produces a 1 when its analog input voltage is higher than the reference voltage applied to it. Otherwise, the comparator output is 0. These 16 bit 1s and 0s will be taken by the second stage of the flash ADC i.e. the 4 bit priority encoder. This priority encoder is designed to prioritize the most significant bit (MSB) that means highest active (HIGH) bit will be converted to corresponding 4 bit binary number. The truth table of this 4 bit priority encoder is shown in Table 2.

Table 2: Truth table for 4 bit priority encoder

Inputs																Outputs			
I ₁₅	I ₁₄	I ₁₃	I ₁₂	I ₁₁	I ₁₀	I ₉	I ₈	I ₇	I ₆	I ₅	I ₄	I ₃	I ₂	I ₁	I ₀	O ₃	O ₂	O ₁	O ₀
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	×	0	0	0	1
0	0	0	0	0	0	0	0	0	0	0	0	0	1	×	×	0	0	1	0
0	0	0	0	0	0	0	0	0	0	0	0	1	×	×	×	0	0	1	1
0	0	0	0	0	0	0	0	0	0	0	1	×	×	×	×	0	1	0	0
0	0	0	0	0	0	0	0	0	0	1	×	×	×	×	×	0	1	0	1
0	0	0	0	0	0	0	0	0	1	×	×	×	×	×	×	0	1	1	0
0	0	0	0	0	0	0	0	1	×	×	×	×	×	×	×	0	1	1	1
0	0	0	0	0	0	0	1	×	×	×	×	×	×	×	×	1	0	0	0
0	0	0	0	0	0	1	×	×	×	×	×	×	×	×	×	1	0	0	1
0	0	0	0	0	1	×	×	×	×	×	×	×	×	×	×	1	0	1	0
0	0	0	0	1	×	×	×	×	×	×	×	×	×	×	×	1	0	1	1
0	0	0	1	×	×	×	×	×	×	×	×	×	×	×	×	1	1	0	0
0	0	1	×	×	×	×	×	×	×	×	×	×	×	×	×	1	1	0	1
0	1	×	×	×	×	×	×	×	×	×	×	×	×	×	×	1	1	1	0
1	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	1	1	1	1

From the above truth table four output expressions can be derived and the circuit can be designed. These are the output expressions for our priority encoder.

$$\mathbf{O_0} = I_1 I_2 I_3 I_4 I_5 I_6 I_7 I_8 I_9 I_{10} I_{11} I_{12} I_{13} I_{14} I_{15} + I_3 I_4 I_5 I_6 I_7 I_8 I_9 I_{10} I_{11} I_{12} I_{13} I_{14} I_{15} + I_5 I_6 I_7 I_8 I_9 I_{10} I_{11} I_{12} I_{13} I_{14} I_{15} + I_7 I_8 I_9 I_{10} I_{11} I_{12} I_{13} I_{14} I_{15} + I_9 I_{10} I_{11} I_{12} I_{13} I_{14} I_{15} + I_{11} I_{12} I_{13} I_{14} I_{15} + I_{13} I_{14} I_{15} + I_{15}$$

$$\mathbf{O_1} = I_2 I_3 I_4 I_5 I_6 I_7 I_8 I_9 I_{10} I_{11} I_{12} I_{13} I_{14} I_{15} + I_3 I_4 I_5 I_6 I_7 I_8 I_9 I_{10} I_{11} I_{12} I_{13} I_{14} I_{15} + I_6 I_7 I_8 I_9 I_{10} I_{11} I_{12} I_{13} I_{14} I_{15} + I_7 I_8 I_9 I_{10} I_{11} I_{12} I_{13} I_{14} I_{15} + I_{10} I_{11} I_{12} I_{13} I_{14} I_{15} + I_{11} I_{12} I_{13} I_{14} I_{15} + I_{14} I_{15} + I_{15}$$

$$\mathbf{O_2} = I_4 I_5 I_6 I_7 I_8 I_9 I_{10} I_{11} I_{12} I_{13} I_{14} I_{15} + I_5 I_6 I_7 I_8 I_9 I_{10} I_{11} I_{12} I_{13} I_{14} I_{15} + I_6 I_7 I_8 I_9 I_{10} I_{11} I_{12} I_{13} I_{14} I_{15} + I_7 I_8 I_9 I_{10} I_{11} I_{12} I_{13} I_{14} I_{15} + I_{12} I_{13} I_{14} I_{15} + I_{13} I_{14} I_{15} + I_{14} I_{15} + I_{15}$$

$$\mathbf{O_3} = I_8 I_9 I_{10} I_{11} I_{12} I_{13} I_{14} I_{15} + I_9 I_{10} I_{11} I_{12} I_{13} I_{14} I_{15} + I_{10} I_{11} I_{12} I_{13} I_{14} I_{15} + I_{11} I_{12} I_{13} I_{14} I_{15} + I_{12} I_{13} I_{14} I_{15} + I_{13} I_{14} I_{15} + I_{14} I_{15} + I_{15}$$

The most significant input is I₁₅ and least significant input is I₀. The most significant input gets priority what happened to other input is high or low. If the I₁₄ gets HIGH logic and I₁₅ gets LOW Logic, the lower input I₁₃ to I₀ will be ignored. Similarly, these will happen for other input consequently. In this encoder, the most significant input will be the output. Fig 8 shows the 4 bit Priority Encoder circuit.

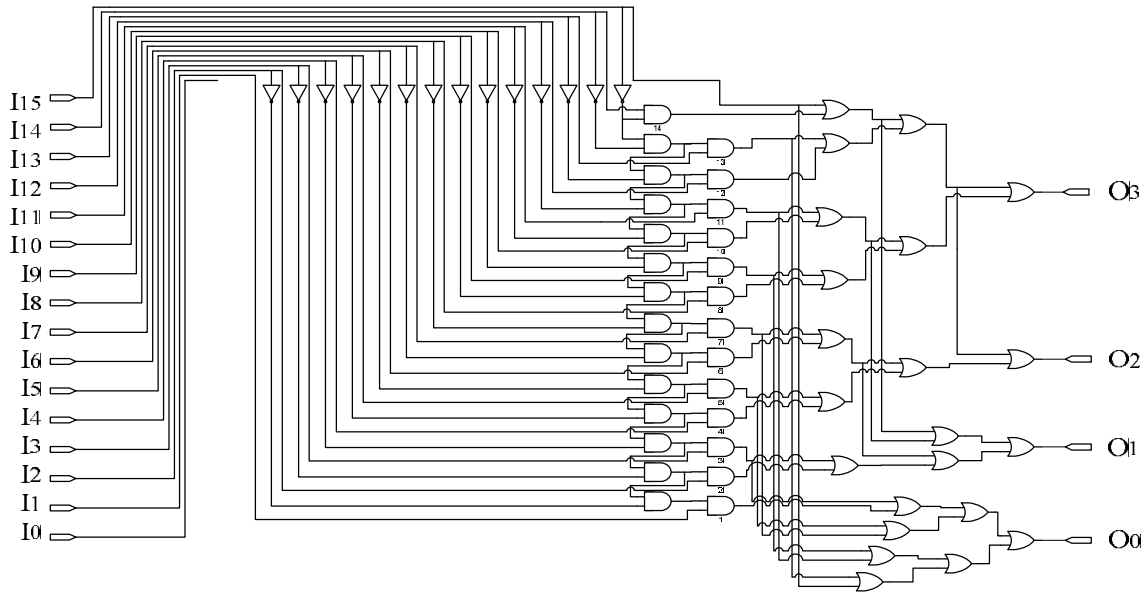


Fig 8: 4 bit Priority Encoder (MSB gets priority).

Binary to Seven Segment Display Decoder

A decoder is a combinational circuit which is used to convert a binary or binary coded decimal (BCD) number to the corresponding decimal number. The Binary to Seven Segment Display Decoder which is used in this circuit is designed to display all hexadecimal digits i.e. 0 to F. This decoder will take 4 bit binary inputs and produce seven HIGH and LOW logic outputs for turning ON and OFF seven LED segments respectively since it is designed for common cathode displays. The truth table for the Binary to Seven Segment Display Decoder is shown in Table 3. From truth table seven output expressions can be derived and the circuit can be designed which is shown in Fig 9.

Table 3: Truth table and logic expressions for the Binary to Seven Segment Display Decoder

Input				Output							Digits	Logic Expressions
A	B	C	D	a	b	c	d	e	f	g		
0	0	0	0	1	1	1	1	1	1	0	0	$a = B'D' + A'C + BC + AD' + A'BD + AB'C'$ $b = A'B' + B'D' + A'C'D' + A'CD + AC'D$ $c = A'C' + A'D + C'D + A'B + AB'$ $d = AC' + A'B'D' + B'CD + BC'D + BCD'$ $e = B'D' + CD' + AC + AB$ $f = C'D' + BD' + AB' + AC + A'BC'$ $g = B'C + CD' + AB' + AD + A'BC'$
0	0	0	1	0	1	1	0	0	0	0	1	
0	0	1	0	1	1	0	1	1	0	1	2	
0	0	1	1	1	1	1	1	0	0	1	3	
0	1	0	0	0	1	1	0	0	1	1	4	
0	1	0	1	1	0	1	1	0	1	1	5	
0	1	1	0	1	0	1	1	1	1	1	6	
0	1	1	1	1	1	1	0	0	0	0	7	
1	0	0	0	1	1	1	1	1	1	1	8	
1	0	0	1	1	1	1	1	0	1	1	9	
1	0	1	0	1	1	1	0	1	1	1	A	
1	0	1	1	0	0	1	1	1	1	1	b	
1	1	0	0	1	0	0	1	1	1	0	C	
1	1	0	1	0	1	1	1	1	0	1	d	
1	1	1	0	1	0	0	1	1	1	1	E	
1	1	1	1	1	0	0	0	1	1	1	F	

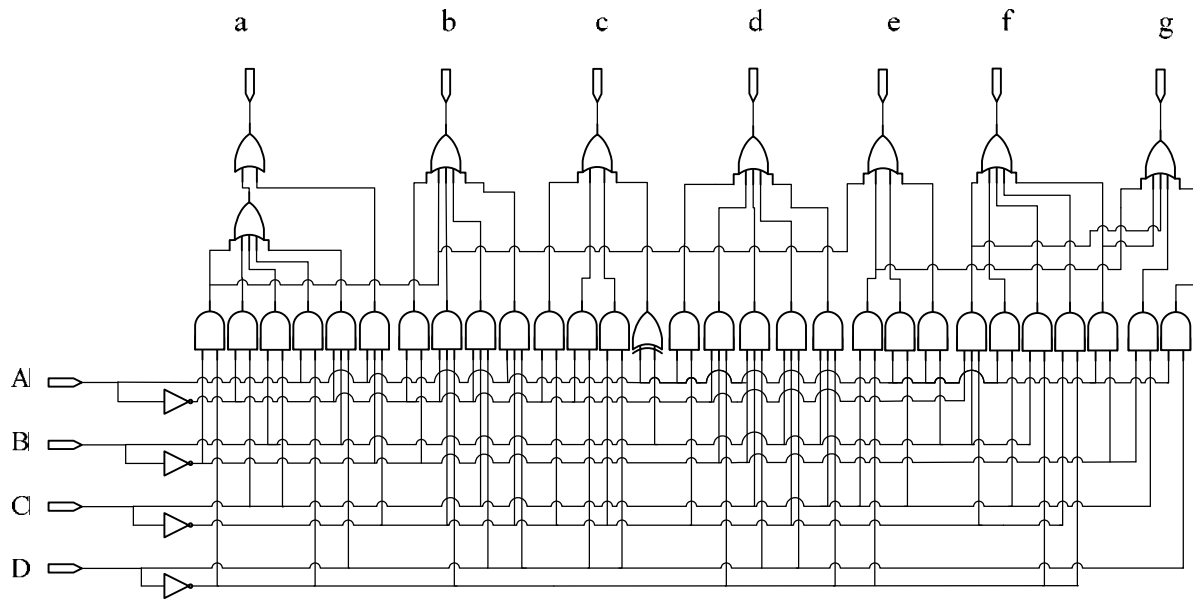


Fig 9: Binary to Seven Segment Display Decoder.

Final Circuit Assembly

Fig 10 illustrates the final circuit after assemble the low pass filter, comparators, 4bit (16 to 4 line) priority encoder and binary to display decoder.

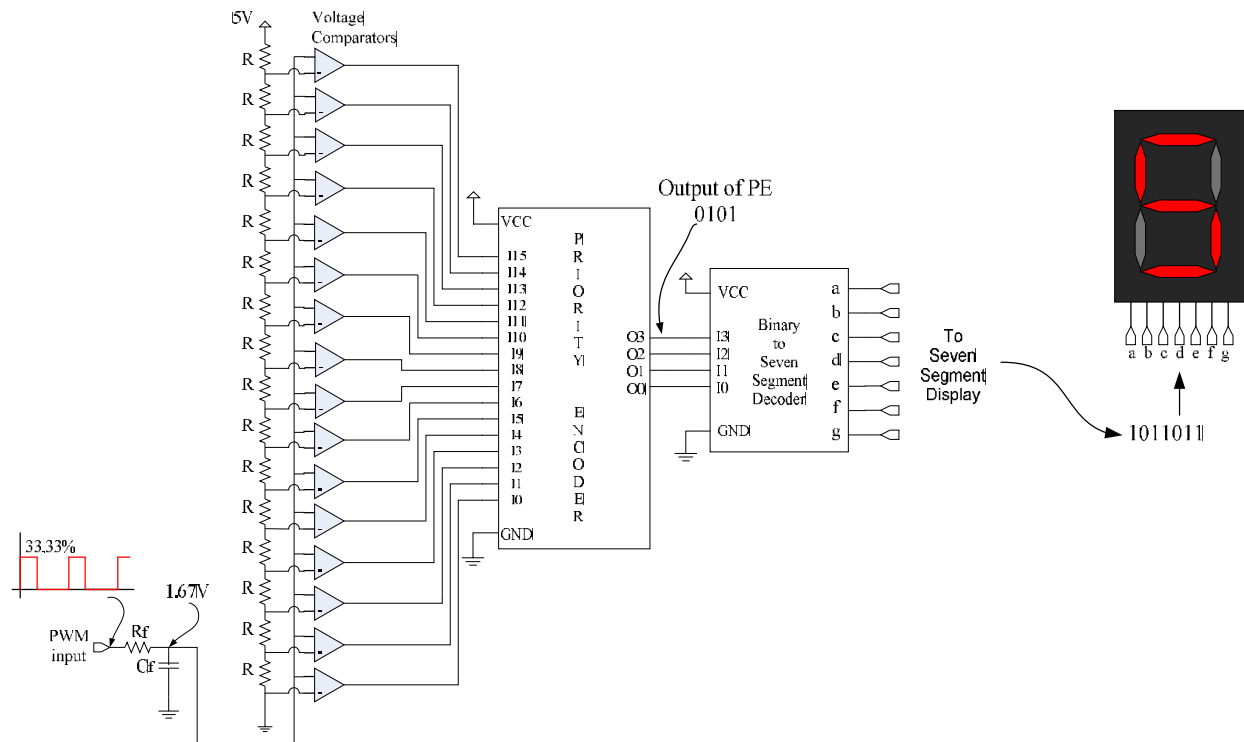


Fig 10: Single pin PWM based seven segment display decoder circuit.

Conclusion

This single pin PWM based seven segment display driving is a unique way of controlling small amount of seven segment display. Though for larger number of display units this method is not recommended since every display unit requires a driver IC of this kind which might increase the cost of adapting a display driving method from many already available. The circuit might look huge and complicated but in a small package that contains only 10 pins this circuit could be a viable option of display driving. Moreover modern microcontrollers can use the advantages of huge library support. A library can be developed for this driver circuit which will provide its user a great relief.

Future Scopes

There are many possible scopes for future study as well. One of the most challenging task was to convert PWM signal to voltage with a minimalistic circuit. Although there are many complicated and accurate circuits available for this job yet a simple RC low pass filter was used for simplicity. Flash ADC can be replaced by better analog to digital converter if needed. A possible future improvement of this paper would be the addition of a photomicrograph or mask layout of the IC of display decoder circuit.

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