Ministry of Education
Department of Higher Education
Yangon University of Economics

Yangon University of Economics
Research Journal

Vol. 6, No. 1

November, 2019

Ministry of Education
Department of Higher Education
Yangon University of Economics

Yangon University of Economics
Research Journal

Vol. 6, No. 1

November, 2019

Yangon University of Economics Research Journal

Vol.6, No.1

Published by Yangon University of Economics

Printed by,

" Gonthiri" Printing House

About the Journal

The Research Journal of Yangon University of Economics has come out by the guidelines of the Minister for the Ministry of Education in Myanmar. The Journal aims at the advancement of research in all areas of Economics. It also has the aim of providing a scholastics platform to professinals, researchers, and academicians associated with the field of Economics. It is expected that the journal can provide implications for teaching and learning public policy, business policy and individual decision making.

The articles in this journal are contributed by researchers from all academic departments of our university. We fully appreciated the contributions of the researchers. We also admire their great efforts to contribute in this journal though gradually increasing numbers of the students enrolled in Yangon University of Economics make them occupied with teaching.

Yangon University of Economics has always been trying to promote the quality of education. This journal is a proof of such endeavour.

Editorial Board

The Impact of Exchange Rate on the Trade Balance of Myanmar

ABSTRACT

This analytical paper investigates how the exchange rates influence the trade balance of Myanmar. The major objectives of this paper are to analyze the different impacts between currency depreciation and appreciation on the trade balance of Myanmar and what are the other factors that influence the trade balance of the country. In this study, the Switching Regression Model was used to estimate the appreciation and depreciation of currency reaction to the trade balance of the country. The study using time series data from 1988 to 2015 and estimating trade balance as a function of the exchange rate. In Myanmar, the official exchange rate has been fixed at the rate varying in the range between slightly below 6 kyats and 8 kyats to the USD for the past three decades, while the black market exchange rate was varying around over 100 times the official rate before adopting managed floating rate system therefore under this exchange rate regime, reference rate is determined between Central Bank of Myanmar and authorized dealer banks. The result which analyzed by switching regression model find out the market exchange of currency depreciation did not significant effect on the trade balance of Myanmar, this means currency depreciation does not improve the trade balance. If the currency appreciation, the trade balance may reduce.

Key words: trade balance, exchange rate, depreciation, appreciation, Switching Regression Model, Myanmar

1. Introduction

The exchange rate is one of the critical indicators of the country, because it has a powerful influence on a country's activity of foreign trade development. Therefore, it is no need to be doubt that the changing of the exchange rate has a permanent effect on trade balance. In the globalization world, international trade becomes more important in every economy. And there are various problems that all the multinational enterprises must face. The economy can affect by the changes in exchange rate, either positively or negatively.

When consider about the changing of exchange rate, it can be divided tow condition, one is currency depreciation and another one is currency appreciation. Currency depreciation may have enormous impacts on the trade balance but the impact may alter, perhaps due to disparate level of the country's economic development. One of the conspicuous impacts describe that real depreciation induce to increases the trade balance in the long run. Depreciation may improve the trade balance in to two different ways of channels.

Firstly, the quantity of export will increase. In the case of currency depreciation of the currency, the price of domestic goods is cheaper than foreign goods when compare these two prices, therefore the country export is become more competitiveness. Secondly, on the other hand, the quantity of imports will decreases, because when compare domestic and foreign price the import for the country is more expensive as a result of currency depreciation. But the export and import may not be reactive at beginning period of the depreciation. Therefore, in the short run the value of export is decrease and the trade balance may deteriorate and after some period time, in the long run, it may be improved.

In Myanmar, the multiple exchange rate regimes which involved the official exchange rate that operated in public sectors and the market exchange rate that operated in private sectors trade of the country was activate for a long time. At that time, in the country there has been an enormous use of informal exchange rate by the private sector agent produced various kinds of distortions in the country in several years over decades.

To solve that problem Myanmar government reformed the unification of that multiple exchange to be benefit from more effective and productive allocation of resources. Until 2012 Myanmar adopt the fixed exchange rate system with official rate 6 Kyats per Dollar and after 2012 the government derestrict the financial system and adopted the manage floating exchange rate system. After this the Myanmar currency depreciates by the time. There is the reason why the author wants to study on the different impacts between appreciation and depreciation on the trade balance.

The military government of Myanmar, from 1988 to 2011, regulated various administrative controls on foreign trade and foreign exchange rate system, which forced to appear peculiarly dual exchange rate regime: an official exchange rate in the public

sector like SEEs and an unofficial market exchange rate in the private sector of the country. In 1977, the official exchange rate was fixed at 8.50847 kyat per special drawing right (SDR) of the International Monetary Fund (IMF), and thus had been fixed for more than 30 years. (Kubo, 2012) In contrast, the parallel market rate has depreciated inveterate in the past as a result of unstable and poor macroeconomic performance.

In 2006, the market exchange rate which conducted in public sector agents has appreciated sharply against the US dollar. In nominal terms, the exchange rate of the kyat per US dollar appreciated to 850 kyat in 2011 that is serious difference from official rate of 5.39 at that year. So it can be seen that the informal market exchange rate is more than over 140 times when compare official exchange rate. According to Gelb (1988), who analyze the impact of oil price shocks on six oil-exporting developing countries, the most severe real appreciation between 1973 and 1984 was in Nigeria; the appreciation of that country of over 11 years was 187 per cent. When make the comparison of that country result show that the official exchange rate appreciation experienced in Myanmar has been inordinately high. Most of the empirical studies on exchange rates have expressed that inappropriate and unstable exchange rates deteriorate growth in trade balance.

The first feature was administrative controls on the foreign exchange rate and therefore the trade sector separated the foreign exchange market into the public and private sector. Different exchange rates were activated in different separated sectors and these conditions lead to inefficient allocation of resources the economy. The other feature of the pre-reform condition, there was no formal institution for exporters and importers to convert currencies in the private sector, that condition led these two groups to interact in a parallel market, where exchange rates expose high volatility. It means the black market was arisen in that decades to convert currencies with depreciate exchange rate than official exchange rate.

Myanmar has had no appropriate monetary policy framework because it lacks the necessary instruments and institutions. According to the suggestion from IMF, the Central Bank of Myanmar (CBM) was created the process of an interbank money market. More essentially, the CBM prevail as a department within the Ministry of Finance and Revenue and deficiency the operational autonomy necessary to manage

monetary policy in a modern market economy. The new government, Thein Sein, was received advice from the IMF on the implementation of a new Central Bank Law. Three essential functions of the CBM will be launch (1) an efficient payment system, (2) effectively supervise and regulate the banking system, and (3) manage the country's foreign exchange reserves.

An appropriate foreign exchange rate regime is essential for trade and investment. In Myanmar, the decades-long multiple exchange rate was finally unified in April 2012. In that year, April 2012, the exchange rate unification conducted by the Central Bank of Myanmar (CBM) operate an "auction" each morning among 17 of Myanmar's banks to determine the reference rate for the Myanmar kyat (MMK) against the US dollar. Once set, other banks and money changers are allowed to exchange the kyat within a band of increase or decrease 0.8 percent above or below the reference rate. Consistent with the rationale of a managed float, the CBM maintains that it will not intervene in the foreign exchange market to achieve any particular rate, but only when it perceives the market for the kyat has become disorderly or divorced from (unspecified) fundamentals.

The most significant economic policy adopted by the new government was the overvalued of official exchange rate in effect since 1977 moved to a managed float on April, 2012. In the performing of the reform period the IMF support crucial technical advice in implementation of this movement, which was preceded in 2011 by giving license to seventeen private banks to open "money changer counters" for retail transactions.

When overviewing the exchange rate history of Myanmar, it can be seen the exchange rate of Myanmar face mostly depreciation. According the theory the country that depreciation in exchange rate may improve the country trade balance. The exchange rate and trade balance of Myanmar can be shown by the figure as follow.

Table 1 Exchange Rate and Trade Balance of Myanmar

Year	Exchange Rate	Market exchange rate	Export*	Import*	Trade balance*
2001	6.39	616.07	2358.02	2849.27	-491.25
2002	6.39	921.14	3014.72	2323.84	690.88
2003	6.39	966.57	2458.39	2069.72	388.67
2004	6.39	988.57	2355.48	2173.93	181.55
2005	6.39	1060.27	3776.45	1908.13	1868.32
2006	6.39	1270.38	4539.12	2538.21	2000.91
2007	5.74	1272.17	6252.69	3246.61	3006.08
2008	5.48	1045.00	6882.19	4256.23	2625.96
2009	5.45	1063.60	6661.54	4347.62	2313.92
2010	5.54	973.40	8661.08	4759.66	3901.42
2011	5.39	980.00	9238.04	9018.97	219.07
2012	851.58	859.66	8876.91	9181.4	-304.49
2013	966.75	967	11232.8	12042.5	-809.7
2014	997.83	1003.08	11204	13759.5	-2555.5
2015	1,025.00	1036.01	12523.7	16633.2	-4109.5

Source: Central Statistical Organization (CSO) Myanmar, DCCA.* million in US dollar, **Kyat per US dollar

Table 1 shows the exchange rate and trade balance from 2000 to 2014, in Myanmar. In the early time the official exchange rate of Myanmar has been only round about between 5 Kyats and 7 Kyats per dollar. After 2012 the new government of

Myanmar adopted manages floating exchange rate system, therefore the exchange rate become consistence rate compare with the market rate.

This research aims to study how the real exchange rate effects trade balance (how the currency appreciation and depreciation will affect the trade balance) of Myanmar. There are many studies which analyzes the long run relationship and short run relationship between real exchange balance and trade balance. But there was no studies which examine the effect of currency appreciation and depreciation on the trade balance of the country by using Switching Regression Model. Therefore, this stud try to find out the effect of exchange rate on trade balance by using Switching Regression Model and can also provide the sustainable economy of Myanmar by conducting the appropriate exchange rate regime policy.

1.1 Purpose of the Study

The objective of this paper is to study the impact of exchange rate on trade balance in Myanmar. The main objectives of this paper is

- to study the different impacts between appreciation and depreciation on the trade balance.

1.2 Advantage of the Study

The study will investigate:

- whether the depreciation of exchange rate has a favorable impact on trade balance or not in Myanmar.
- how exchange rate effects on Myanmar trade balance and
- how the country experience under fixed and manage float exchange rate in the country.

1.3 Scope of the Study

This research paper studies the period of 1990-2014 of the annual reports of Myanmar. Most of the data used in this research are secondary data. The variables used in this research are trade balance, exports, imports, and exchange rate. Based on the availability of data and regarding the methodology section, yearly data from 1985 to

2014 are collected. In order to increase robustness of the study, data are collected from IMF and WTO.

2. Review of Empirical Literature

2.1 Understanding of Foreign Exchange Market in Myanmar before 2011

In 1988, after abolished of the socialist economic system, the market oriented economic system was adopted in the country. In Myanmar, the multiple exchange rate system was took place the last several years because of the fixed exchange rate system of government policy was not activated in the private sectors. Foreign exchange transaction was controlled by the government, under that controlled the exchange rate regime of the country was separated in to two regimes: official rate and market rate. Among these two kinds of exchange rate, the official exchange rate which determine by government was activated only on the public sectors like state economic enterprises. The state economic enterprises were obligated to hand over all of that the official rate. On the other hand, the import of state economic enterprises were managed by the foreign exchange budget of the central government, therefore permission from the Ministry of Finance and Revenue was required for expenditure on foreign trade.

In the private sector, no importers used the official exchange rate in conducting the economic activities, which is seriously overvaluing against the U.S dollar. This is the main reason why the black foreign exchange market arose in Myanmar. According to the government regulation, in private sectors the Myanmar citizens was prohibited from holding foreign currency, instead of it they can be withdraw only the foreign exchange certificates in the form of foreign currency deposits.

According this circumstance, the market of foreign exchange was separated between the private and public sectors. There was no foreign exchange flowed from public sector to private sector, whereas the public sector could deviate private sector foreign currency deposit to its budget, this incentive the government to controls on the private sector. The segmented foreign exchange market structure expressed that the

parallel market exchange rate was influenced by the supply and demand of the private sector.

In 1997, the export first and import later was adopted and the private sector was significantly controlled by the government. Therefore, all the export and import by the private sector had been needed licenses. The government issued the import licenses and that license applicants have adequate export tax subtracted export earnings to cover the import bill. In 2002, the rigorous practice of the export first policy, if there was without foreign currency deposits the import impossible.

In the parallel market, there were two typical types of foreign exchange. The first one is the export earnings in the form of foreign currency deposits with verification of export tax payment. The other is informally held foreign exchange, in the case of illegal export revenues and informal payments.

2.2 Exchange Rate Reforms under New Government

The series of reforms on exchange rate policy was operated under the new government starting in the late of 2011. In this reform, the Central Bank allowed some private commercial banks to operate legalized foreign exchange counters. At that counters retail customers of foreign exchange could purchase and sell foreign exchange with these licensed banks. However, there were unexpressed dominate by the Central Bank of Myanmar in purchasing and selling rate and there were some notice on the foreign exchange counters. Moreover, another important case is the Central Bank placed limits on the amount of foreign exchange which a customer could sell and purchase at the counters. Above the amount of limits, a customer has to exhibit a document verifying the source of selling foreign exchange or the purposed use of buying foreign exchange. The transactions at the foreign exchange counters include kyats and cash of US dollars, the amounts of transactions are inescapably limited by the availability of cash of the counters.

In April 2012, the government has affected certain reform steps to unify the multiple exchange rates into a single rate in the country, by replacing the official fixed exchange rate with a managed float through foreign exchange auction market under supervision of the Central Bank of Myanmar. Under the foreign exchange regime, the reference rate is deliberated in the auction mechanism. The Central Bank of

Myanmar released licenses to perform international balking to a number of private banks. Consequently, the variation between the reference rate and the informal market rate has decreased significantly.

On the one hand, the CBM declaring the reference exchange rate to the public, and on the other hand the auction of foreign exchange with private commercial banks. The selling and purchasing rates at the legal foreign exchange counters have to be within a mandated band from the reference rate.

The new government has enforced a stepwise reduction of the limitations on imports since 2010. Moreover, the export first policy is abrogated in April 2012, import licenses are procurable with non-export earning US dollar lifted at the foreign exchange counters of with the informally held foreign exchange

To clarify what has changed and what has not changed after the series of policy reforms, in the case of changed, firstly, the official exchange rate in the public sector have been devalued to the central bank reference rate. Regarding in the case of unchanged, the mass of the foreign exchange transactions in the private sector are still negotiated transactions between buyers and sellers, and they are yet to be replaced with bank intermediation. Export earnings mostly persist as the assets of exporters. They are not sold to the banks; therefore, the central bank cannot absorb foreign exchange from that source. The central bank auction and the open market of the private sector are still fragmented.

Moreover, a new Foreign Exchange Management Law was passed by the parliament in August 2012. By this law, all restrictions on current payments and transfers for foreign transactions were clearly lifted. The CBM also declared a redemption plan for the foreign exchange certificates, which were generated as temporary vehicle for the accessible use of foreign currency under previous strict control mechanism.

According to these reform steps, the pressure on appreciation of exchange rate is now constrained and the market exchange rate has been stable around the reference rate. The central bank will perform additional steps to facilitate the smooth functioning of the formal foreign exchange markets, entitling private banks to extend foreign exchange operations and services at per state banks. Although the central bank is endeavoring for establishing an interbank foreign exchange market, the market is too little for the market intervention to be impressively performed.

2.3 Review of Relevant Literature

There are many studies on the impact of exchange rate on trade balance for developing countries which come to various conclusions. The major facts of the studies are summarized clearly as follow:

Summary of Literature Review

Author(s)	Topics	Variables	Using Model	Results
Pavle Petrović, Mirjana Gligorić	Exchange Rate and Trade Balance: J-curve Effect	trade balance, real exchange rate, GDP	Johansen's Cointegration Analysis, ARDL, ECM, VAR	a RER depreciation has a significant positive long run impact on the TB in Serbia and short run movements and indicate the existence of the J-curve effect.
PHAM THI TUYET TRINH	The Impact of Exchange Rate Fluction on Trade Balance in Short and Long Run: Vietnam	trade balance, real effective exchange rate, domestic output, foreign output	Autoregressive distributed lag (ADRL), Eerror correction model (ECM)	RER have positive impact on TB in the long-run, Depreciation can lead to improvement of TB improve and an appre-ciation can lead to deterioration of TB. There exists impact of RER on TB in short-run.

Summary of Literature Review (Continued)

Author(s)	Topics	Variables	Using Model	Results
Dr. Keshab R.Bhattarai, Mark K. Armah	The Effects of Exchange Rate on the Trade Balance in Ghana: Evidence from Cointegration Analysis	Real Export, Real Import, Real Exchange Rate, Real GDP, Foreign price, Domestic price, nominal exchange rate	Cointegration, Engle-Granger, Error-Correction Model(ECM), Vacor Autoregressive Model (VAR)	For improved balance of trade in Ghana, coordination between the exchange rate and demand management policies
MUHAMMAD SHAHBAZ, ABDUL JALIL, FARIDUL ISLAM	Real Exchange Rate Changes and the Trade Balance: The Evidence from Pakistan	Trade balance, ratio of real exports to real imports, realexchangerate,	Auto Regressive Distributed Lag (ARDL) approach	a long-run relationship between the series exists, and coefficient of elasticity is negative and statistically significant,which does not support for the J-relation.
IRINA TOCHITSKAYA	The Effect of Exchange Rate Changes on Belarus's TB	nominal exports, nominal imports, real domestic incomes, real foreign incomes, a REER	Unit Root Tests, ADF, ARDL, VAR	a real effective depreciation can improve the trade balance in the short run.

3. Method, Data and Model

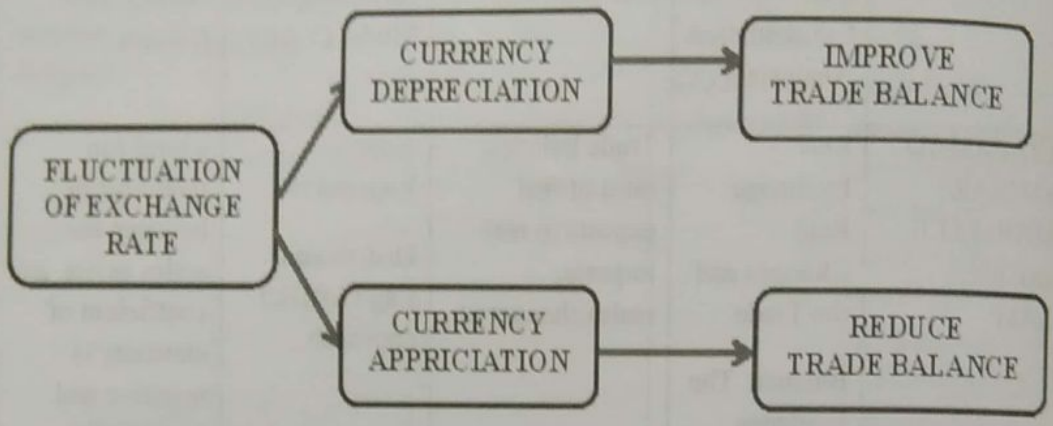
3.1 Conceptual Framework

From many analyzing model which relevant the relationship between exchange rate and trade balance of the country, this paper studies the relationship by using Switching

Regression model. Theoretical framework for the function of trade balance and exchange rate of Myanmar can be depicted as the following:

$$TB = f(MER, GEX, GIM) \quad (3.1)$$

The conceptual framework of the study: the trade balance in the equation is the explained variable for the study and which may be affected by the fluctuation in exchange rate. The conceptual framework of the study can be illustrated by the following figure.



If the currency depreciation, mean the domestic goods and services is cheaper than foreign goods and services, export is greater than import and the trade balance will improve. If in the case of currency depreciation, it may have the opposite effects on trade balance.

The other variable GDP can also be effects on trade balance by two ways. GDP can also improve and worsen trade balance. If GDP increase, means the country national income incense, therefore the country may import more. If they import more capital goods, the country can improve the productivity and can enhance the export and the trade balance will improve. But if the country import consumptions goods more the import will greater than export and the trade balance will decline.

The impact of exchange rate (market) on trade balance will be examined in two ways: exploratory data analysis and descriptive analysis. The first section deals with the data running and data analyzing by using Simple Switching Regression model to find out the relationship between currency appreciation and depreciation with trade balance. The facts that how exchange rate affected the trade balance, how currency

appreciation influences the trade balance and how currency depreciation intent the trade balance of Myanmar will be discussed based on the empirical results. In the second section, the relationship between the economic growth and foreign trade will be discussed by using descriptive statistics.

3.2 Data Collection

All the data to be used in econometric models are taken from International Monetary Fund (IMF), World Trade Organization (WTO), Central Statistical organization of Myanmar, Central Bank of Myanmar web pages, and official data from ministry of commercial for the reliability and robustness of the study. They can provide sufficient level of information and data related with trade balance and exchange rate statistics of Myanmar.

Regarding the methodology section, trade balance, market exchange rate, export and import data are required for doing Switching Regression model estimation and causality analysis among these four variables. In order to increase the soundness of this analysis, sufficient time series data on Trade Balance, Market Exchange Rate, Export and Import are needed. For this reason, annual data of Trade Balance, Market Exchange Rate, Export and Import are taken from 1986 to 2015.

3.3 Data Description

The following table presents the descriptive statistics of the data used in this study.

Descriptive Statistics of the variables

Variables	Observations	Mean	Standard Deviation	Minimum Value	Maximum Value
GTB	29	0.200388	2.383778	-5.128312	9.290939
GMER	29	0.141473	0.261223	-0.178569	1.137021
GEX	29	0.128484	0.250543	-0.590200	0.603261
GIM	29	0.142439	0.383118	-0.673459	1.392437

Source: Calculated result by author

3.4 Test Unit Root Test (ADF)

The study need to test unit root test first to know the variables are stationary or nonstationary. Before doing Switching Regression estimation, it should be tested whether variables are stationary or not, because in order to analyze the impact of currency depreciation and appreciation on trade balance, the data have to be stationary if the test result is not stationary the data need to change to stationary by taking log. For testing this, ADF unit root test can be applied as the following.

Design for Unit Root Test with Dickey-Fuller

Unit Root Test	DF Unit Root Test
Null Hypothesis: H0	Time-Series is stationary.
Alternative Hypothesis: H1	Time-Series is non stationary.
Statistic test	t-Statistic
Prob. <0.1	0.00 – 0.10

Source: Author

Dickey and Fuller regression equations were considered to test whether there is a unit root as follow

$$\Delta GTB_t = \alpha + \beta_t + \theta\, GTB_{t-1} + \sum_{i=1}^{\rho} \emptyset_i\, \Delta GTB_{t-i} + \varepsilon_t \quad (3.6)$$

$$\Delta GMER_t = \alpha + \beta_t + \theta\, GMER_{t-1} + \sum_{i=1}^{\rho} \emptyset_i\, \Delta GMER_{t-i} + \varepsilon_t \quad (3.7)$$

$$\Delta GEX_t = \alpha + \beta_t + \theta\, GEX_{t-1} + \sum_{i=1}^{\rho} \emptyset_i\, \Delta GEX_{t-i} + \varepsilon_t \quad (3.8)$$

$$\Delta GIM_t = \alpha + \beta_t + \theta\, GIM_{t-1} + \sum_{i=1}^{\rho} \emptyset_i\, \Delta GIM_{t-i} + \varepsilon_t \quad (3.9)$$

From above equation α is constant (drift), β_t is deterministic term (time trend) and the parameters that are in the interest of all the equation θ is. That is, if $\theta = 0$; X_t is unit root by comparing statistics t (t-statistic), calculated with the appropriate values that are in the table.

Dickey-Fuller unit root tests results

Variable	ADF Test statistics	Critical value at 5%	Critical value at 10%	Deterministic Regressors	Lag	Results
GTB	-4.913946	-2.971853	-2.625121	intercept	6	Stationary
GMER	-4.077696	-2.971853	-2.625121	intercept	6	Stationary
GEX	-5.506281	-2.971853	-2.625121	intercept	6	Stationary
GIM	-6.783139	-2.971853	-2.625121	intercept	6	Stationary

Source: Calculation, at level

According to the tested data result, as shown in Table 4.1, all variables, GTB, GMER, GEX, GIM are stationary at level in testing with intercept. However, in testing with neither intercept nor trend, null hypothesis can be rejected for all three time-series, which means that all the variables are stationary at level in testing with either intercept or trend. The time-series data of GDP is significance at five percent critical level.

3.5 Estimation of Switching Regression Model

Switching regression model is a model that consists of two scenarios, hypothetical. In both scenarios, as follows:

Currency Appreciation 1: $TB_{1i} = \beta_1 MER_{1i} + u_{1i}, if\ \gamma' z_i \geq u_i$ (3.10)

Currency Depreciation 2: $TB_{2i} = \beta_2 MER_{2i} + u_{1i}, if\ \gamma' z_i < u_i$ (3.11)

$u_i \sim (0, \sigma_i^2), u_{1i} \sim (0, \sigma_{1i}^2)), u_{2i} \sim (0, \sigma_{2i}^2)$

where, TB_{1i} is trade balance based on the time series data at the currency appreciation.

TB_{2i} is trade balance based on the time series data at the currency depreciation.

MER_{1i} is the market exchange rate of time series data at the the currency appreciation.

MER_{2i} is the market exchange rate of time series data at the currency depreciation.

β_1 , β_2 , γ is the parameter value.

u_i , u_{1i} , and u_{2i} are the value of the variable error is random.

Assumption that the u_i have a relationship with u_{1i} and u_{2i} , this model is called the Switching regression models by switching to a group is defined within the structure of the models (regression model with endogenous Switching).

Switching Regression Model estimation results

		Coef.	Std.err	z-test	P-Value
Regime 1	GMER	-26.40294	6.023651	-4.383213	0.0000
	GEX	26.53337	3.515041	7.548524	0.0000
	GIM	2.040663	1.756246	1.161946	0.2453
	Constant	-4.512489	1.247411	-3.617483	0.0003
Regime 2	GMER	-0.782448	0.729458	-1.072644	0.2834
	GEX	-2.186205	0.916216	-2.386123	0.0170
	GIM	4.133699	0.824671	5.012546	0.0000
	Constant	0.232435	0.227835	1.020191	0.3076
Common	LOG(SIGMA)	-0.271772	0.164038	-1.656765	0.0976
Probabilities Parameters	P1-DUM	-1.905686	0.770833	-2.472242	0.0134

Source: Calculation

In table 4.2, Region 1 is described the result of currency appreciation impact on trade balance, according from those empirical result it can be seen that when market exchange increase 1 % the trade balance of the country will reduce with 26.40%. Moreover, to be explained clearly, among 29 observations the country face currency appreciation like

year of 2012, in one year we have 12 month from January to December among this 12 months currency may fluctuate month to month or day to day but in sum up of the year currency face appreciate, for that year when growth rate of market exchange increase (case of currency appreciation) 1 % the trade balance will reduce with the amount of 26.40 %. In region 1 the market exchange rate is significant. This mean that the hypothesis cannot be reject and the currency appreciation can reduce the trade balance of the country. When the export increase 1 %, the trade balance of the country increase by 26.53 % and when the import is increase 1 % the trade balance will increase by 2.04 %.

In the case of Region 2 there is described the result of currency depreciation impact on trade balance, according from those tested result it can be seen that when market exchange increase in 1 % the trade balance of the country, Myanmar, will reduce with 0.78 % instead of improve the balance of trade. Additionally, to be explained more clearly, when the country face currency depreciation like year of 2013, in one year from January to December the currency may depreciate or appreciate over the time but in sum up of the year the currency face depreciation, for that year of depreciation when growth rate of market exchange increase 1 % the growth rate of trade balance will reduce with the rate of 0.78 % instead of improve trade balance. In the region 2 the market exchange rate in not significant. This means that the hypothesis of the study can be rejected and the currency depreciation may not improve the trade balance of the country. When the exports increase 1 % the trade balance reduces by 2.19%.

4. Conclusion

The main objective of this study is to examine and find out the impact of exchange rate on trade balance of Myanmar over the period of 1986-2015 primarily with the empirical analysis and general descriptive statistics. The data set employed in this study is secondary data of trade balance (TB), Export EX) and Import (IM), these three variables are used into value in US dollar million term and market exchange rate (MER) and official exchange rate (OER) of Myanmar during the period 1986-2015 are used into kyat per dollar term respectively.

This study adopt two main methodological approaches in order to find out the appropriate answers to the research problem. Firstly, econometric methods such as Dickey-Fuller unit root test, Augmented Dickey-Fuller unit root test, and Switching Regression molel. Empirical results are mainly based on the above econometric methods. Secondly, exchange rate of Myanmar during the period of befor 2012 and after 2012 under new government 1995-2015 is analyzed by using descriptive analysis.

The results of this study is somewhat contrary to conventional belief that exchange rate has significant impact on the trade balance of Myanmar. Exchange rate does have positive impact on trade balance in the long-run, indicating that, a depreciation can lead to improvement of trade balance improve and an appreciation can lead to deterioration of trade balance. But in Myanmar after 2011 although the exchange rate is depreciate the trade balance did not improve at that year and the trade balance face deficit. Currently, depreciating real exchange rate to improve trade balance cannot take much effect.

Reference

Attah-Obeng, P., Patrick Enu, F. Osei-Gyimah, & C.D.K. Opoku. (2013). An econometric analysis of the relationship between GDP growth rate and exchange rate in Ghana. *Journal of economics and sustainable development*, 4 (9).

BHATTARAI, D. K., & MARK K. ARMAH. (2005). The effects of exchange eate on the trade balance in Ghana:. *Research Memorandum*, 448-1.

DR.G.JAYACHANDRAN. (2013). Impact of exchange rate on trade and GDP for India a study of last four decade. *International journal of marketing, financial services & management research*, 2 (9).

Fang-Yuan, L., & Shi Jun-Guo. (2013). The empirical research of the impact of GDP and exchange rate on foreign exchange. *Research journal of applied sciences, engineering and technology*, 5(6).

Gebeyehu, A. B. (2014). Journal of Poverty, Investment and Development. *Trade balance and exchange rate evidence from Ethiopia*, 2422-846X.

Genc, E. G., & Oksan Kibritci Artar. (2014). The effect of exchange of exchange rate on export and import of emerging of countries. *European Scientific Journal*, 10 (13).

Hooy, C.-W., & Ahmad Zubaidi Baharumshah. (2015). Impact of exchange rate volatility on trade . *Malaysia journal of economic studies*, 75-95.

Kubo, K. (2012). Real Exchange Rate Appreciation, Resource Boom, and Policy Reform in Myanmar. *IDE Discussion Paper, JETRO*, 358.

Kubo, K. (2013). Sources of Fluctuations in Parallel Exchange Rates and Policy Reform in Myanmar. *Institute of Developing Economies (IDE), JETRO*, 388.

Kubo, K. (2013). The Impacts of Central Bank Foreign Exchange Auctions on the Prallel Market Exchange Rate in Myanmar. *IDE-JETRO*, 234-242.

Kubo, K. (2014). Deposit Dollarization in Myanmar. *Institute of Developing Economies (IDE-JETRO)*.

Kubo, K. (2014). Foreign Exchange Market Reform in Myanmar. *Journal of Southeast Asian Economies*, 210-24.

MANKIW, N. G. (2013). *MACROECONOMICS*. New York: Worth Publishers.

OZTURK, I. (2006). Exchange rate volatility and trade. *International journal of applied econometrics and quantitative studies*, 3-1.

Petrović, P., & Mirjana Gligorić. (2009). Exchange rate and trade. *PANOECONOMICUS*, 23-41.

SHAHBAZ, M., ABDUL JALIL, & FARIDUL ISLAM. (2012). Real exchange rate changes and the trade balance: the evidence of Pakistan. *The international trade journal*, 139–153.

Than, T. M. (2015). Myanmar's Economic Reforms: Hard Choices Ahead. *social research*, 453.

Trinh, P. T. (2014). The impact of exchange rate fluctuation on trade balance in the short and long run. *Journal of Southeast Asian Economies*, 432-52.

Yuen-Ling, N., Har Wai-Mun, & Tan Geoi-Mei. (n.d.). Real exchange rate and trade balance relationship: an empirical study on Malaysia. *International journal of jusiness and janagement*, 3 (8).

Analysis of Long Run and Short Run Relationship between Myanmar's Economy and Infrastructure-Social Investment

Ms. Hnin Yu Swe

ABSTRACT

The main objective of this study is to find out the impact of infrastructure investment in Myanmar economy. The variables used in the studies are gross domestic product (GDP) is dependent variable and while Employment (EMP) and Capital stock (K), Infrastructure investment (INF) such as power, construction, transportation, communication and health and education used as proxy for infrastructure investment of Myanmar during the period 1988-1989 to 2012-2013. This study used Augmented Dickey-Fuller (ADF) unit root test, Bound Test and Cointegrating to long run estimation and ECM are used with ARDL model.
The development and keep of vital physical infrastructure is an important item for sustainable economic growth. So the investment into the infrastructure plays an important role to achieve the social objectives and that are contributing to the sustained economic growth. Then a major source of economic growth is the accumulation of capital. The results of infrastructure investment, employment, capital stock and economic growth have positive relationship in the long run and no positive significant relationship in the short run. The results conclude that for the period 1988-1989 to 2012-2013, infrastructure investment have positive relationships on economic growth of Myanmar.

Key words: ARDL model, Infrastructure investment, Employment, Capital stock, GDP

Introduction

For all nations, infrastructure development is an essential move to generate economic activities. For a nation's economic development, separately from the main resources such as physical resources and human resources, technological improvement, natural resources efficient institution, and infrastructure development are essential. Therefore, infrastructure provision may be regarded as "Hardware" of a nation's economic development. Infrastructure facilitates and integrates the economic activities. According to Asian Development Bank, infrastructure is divided into two parts as "soft" and "hard" infrastructure[1]. "Soft" infrastructure includes education and health. "Hard" infrastructure includes power, transport, telecommunication, sanitation, etc. Infrastructure is solitary of the

[1] Asian Development Bank, Economic and Research Department,2014 Myanmar Unlocking The Potential

mainstays of economic transformation. Maintainable economic growth often arises in an environment where there is an important infrastructure, and there is proof that it decreases inequality in a society (Cotonou & Benin, 2013).

A main foundation of economic growth is the capital accumulation. Infrastructure is the one form of capital. Infrastructure plays a vital role in attaining the main development targets of developing countries, such as industrialization, urbanization, export promotion, equitable income distribution, and sustainable economic development. Furthermore, the availability of an efficient infrastructure network can stimulate new investment in other sectors. On the other hand, either a shortage or an over-expansion of infrastructure in certain areas can raise costs and create incentives to refrain from investing. However, good infrastructure can reduce the production costs and can raise productivity but it has to expand fast enough to accommodate growth.

Infrastructure means the vital facilities and systems portion a country, city, or area, including the services and facilities obligatory for its economy to function. Infrastructure has different definitions in different dictionaries and usages. There are many types of infrastructure. The fundamental services and facilities are crucial for a country or institution. The foundation of development is the form of physical structures. For the function of organization or society, fundamental systems and services are needed. For the supporting of day- to- day economic actions, need the facilities and in a services. Economic development is based on the basic foundations. The basic public workings in a country include transportation, sanitation, schools, roads, hospitals, stations, and communication systems in a community but infrastructure is classified to the usefulness of the accordance with them. Stations, roads, dams, transportation, bridges, canals, and irrigations, etc., are called physical infrastructure. On the other hand, universities, libraries, schools, hospitals and recreation centres are called infrastructure of human capital, and infrastructure of public utilities includes power, sanitation, communication, water distribution, and solid waste collection.

According to the World Development Report (1994), similar to the ADB, infrastructure is divided into two parts[2]. They are called economic infrastructure and social infrastructure. Social infrastructure includes hospitals, libraries, recreation centres, universities, and parks. Economic infrastructure also includes public works such as roads, dams and canal work for irrigation and drainage, and public utilities such as sanitation,

[2] World Bank, World Development Report,1994: Infrastructure for Development

power, telecommunication, ports, airports, water supply, etc. This investigation is shown with the framework of this definition. The word economic development used in this study refers to an increase in GDP, more employment opportunities saved and protected environment, admission to better health and education, and reduction in inequality. Economic growth is the necessary condition for effective poverty alleviation as it can advance the standard of living of the population and promote infrastructure development. Firstly, economic growth increases the average income of households. The improvement of social and physical infrastructure through increase in state investment for education, health care and infrastructure development can lead to an indirect effect (not connected to income) on poverty reduction.

There are two positive outcomes of infrastructure on economic growth. First of all, the productivity of physical and human capital should be increased by the availability of infrastructure. For example, improving health and education sectors make easy access to both better and information and can get more capable factor combination for production. Secondly, infrastructure also serves as a direct factor input, e.g., roads are used as a necessary input in commodity market for trading from one place to another. Nevertheless, in the short run, an increase in the public capital stock in infrastructure may have an adverse effect on economic activity to the extent that it displaces (or crowds out) private investment. Furthermore, high quality infrastructure leads to incentives for new investment by decreasing costs of production. The adequate infrastructure supports determine one country's success and the other country is failure in diversifying production growth, poverty elimination, or improving environmental conditions. Good infrastructure can raise productivity and can lower production costs but it has to expand fast enough to accommodate growth. The precise linkages between infrastructure and development are still open to debate. Nonetheless, infrastructure capacity grows step by step with economic output. That is a 1 % increase in the stock of infrastructure is associated with a 1 % increase in gross domestic product (GDP) across all countries. And as countries develop, infrastructure must adapt to support changing patterns of demand as the shares of power, roads, and telecommunications in the total stock of infrastructure increase relative to those of such basic services as water and irrigation.

In Myanmar, small infrastructure investment prolonged over some decades has led to a weakening of capital stock and basic infrastructure. Public infrastructure of Myanmar investments are needed in human asset and social development particularly in health and education infrastructure and transport and communication infrastructure. Human capital

development should be considered part of the basis for the country's long-term growth. Infrastructure investment is an essential mechanism employed by the governments of developing countries over the past forty years to affect economic development (Krueger 1992). The government in most developing countries does not have the necessary organizations to instrument many fiscal policies to enable economic growth and affect income distribution; infrastructure policy is often seen as an effective method to achieve those ends (van de Walle and Nead, 1995; Israel, 1992; Broadway and Marchand, 1995). This one is widely recognized that an adequate source of infrastructure facilities is an essential component for production and growth. Infrastructure is a modest vital service that has to be put in place to support development. Socio-economic development can be facilitated and enhanced by social and economic infrastructures. If these services and facilities are not in habitation, development willpower be very difficult and actually can be likened to a very rare commodity that can only be safe at a very great price and cost. In addition, the availability of an effective infrastructure system can encourage new investment in more sectors.

On the other hand, the absence of infrastructure or over-expansion in certain areas can increase costs and make disincentives to invest. The key message of the WB Report (1994) stayed that infrastructure can provide the main benefit in economic growth, poverty alleviation, and environmental sustainability-but only when it affords services that respond to active demand and does so efficiently.

Before 1988, Myanmar's economy needed infrastructure, and infrastructure development plans were far behind schedule owing to insurgency and uncertain conditions. Meanwhile in 1989, Myanmar government invested in various sectors in order to establish Myanmar as a peaceful, modern, and developed nation. The administration of Myanmar trusts that the geographical and communication aspects show an important role in the development of physical and economic relationships between regions. So, the government has distributed furthermost of its budget for infrastructure progress.

Myanmar has recognized the prominence of infrastructure and has made substantial progress in developing transportation, communication, and energy infrastructure even though the heavy capital investments are needed to develop since the economy of the opened up in 1989. The development of infrastructure was carried out by the national economic growth to achieve a balanced and equal growth between regions and to achieve the

solidarity of the national races. Highways known as Union Highways and National Highways have been the rivers; Ayeyarwaddy, Chindwin, and Thanlwin are implementation tasks. They are also careful as part of the boundary area development to the gap between the regions to build more confidence and accepting among the nationalities (Kyu, 2008).

According to the WBR (2013), the growth of real GDP in Myanmar is estimated at 6.5 % in 2012-2013 from 5.9 % in 2011-2012. But this event was caused by the gas production, construction, services, as well as foreign direct investment and export of commodities. According to an ADB report (2014), transport infrastructure of Myanmar gaps behind most of its peers in the state. Similarly, the power sector has the lowest rate in Myanmar compared with Southeast Asian. Needs for infrastructure investment of Myanmar is estimated to be around US $ 22 billion for the 2010-2020 period or roughly US $ 1.9 billion per year. Investment is a major driver of economic growth. However, Myanmar's education and health structure has suffered from long underinvestment. The investment of public was less than 1% of GDP before 2011. This situation is very low compared with ASEAN countries. However, education and health reform was started in early 2012. Therefore, the government of Myanmar started to upgrade the health and education sectors. Health outlay upturned to 1.5% of GDP in 2012 from 0.2% in 2011, while the spending of education raised to 1.6% of GDP in 2012 from compared with 0.8% in 2011.

As the government of Myanmar has built the amount of infrastructures which form the necessary foundation for the economic development of nation, there is a need for analysing the special effects of bulk investment in infrastructure provision, examining the strengths and weaknesses of these investments, and expressing appropriate policies and reforms to achieve of international standards. The objective of the study is to determine the relative importance of infrastructure in enabling Myanmar to reach its potential output level. Additionally, this study examines whether the infrastructure can be substituted for capital and labour in the production process.

Method of Study

The research method used Time series data and ARDL Model to test the analysis of Long Run and Short Run relationship between Myanmar's Economy and Infrastructure-Social Investment in this paper. And the variables, which GDP, employment, capital stock and infrastructure investment are collected from Central Statistical Organization (CSO), Asian Development Bank ((ADB), World Bank and Financial, Economic and Social

Condition published by Ministry of National Planning. This paper analyses the period of 1988-1989 to 2012-2013 of Myanmar.

Table1 Infrastructure Investment in Myanmar (1988-1989 to 2012-2013)

(in current prices) (Kyats in Millions)

Year	GDP (Kyats)	Real GDP (Kyats)	INF stock (Kyats)	EMP (person)	K stock (Kyats)
1988-1989	76242.7	47141	132801.3	16036	386354.6
1989-1990	124666.3	48883.1	135975.6	15221	377565.3
1990-1991	151941.4	50259	147011.63	15737	383601.8
1991-1992	186902.4	49933.3	144928.13	16007	387576.1
1992-1993	249394.7	54756.6	154101	16469	392437.3
1993-1994	360320.7	58063.9	159971.6	16820	396371.3
1994-1995	472773.7	62406.1	168527.9	17230	405659.9
1995-1996	604729.1	66741.6	174260.6	17587	428148.8
1996-1997	791930.0	71042	178101.6	17964	453365.8
1997-1998	1119509.0	75123	182456.1	18359	471219.8
1998-1999	1609776.0	79460	194539.9	19069	499998
1999-2000	2190320.0	88157	203361.1	19425	528325.5
2000-2001	2552732.5	100274.8	217935	19781	569116
2001-2002	35484722	111650	220439.5	20137	610372.4
2002-2003	5625254.7	125076.5	231085.4	20493	628162.6
2003-2004	7716616.2	142387.7	234661.1	21522	646844.9
2004-2005	9078928.5	216758.47	237342.8	25829	657932
2005-2006	12286765.4	283150.86	246474.4	26132	663063.4
2006-2007	16852757.8	325915.37	253597	26435	679281.9
2007-2008	23331693.2	371973.94	259152.6	26720	713812.8
2008-2009	29233288.0	37694.11	263486	27054	759416.7
2009-2010	339056656	384784.44	269500.9	27373	823498.4
2010-2011	39776764.9	430391.31	274252.7	27740	915780.5
2011-2012	46307887.7	463078.88	278006.6	28163	929256.1
2012-2013	51259260.0	464915.51	280972.2	28571	944787.7

Source: Ministry of National Planning and Economic Development, Myanmar

Note- Infrastructure = power+ transportation +communication +construction +health+ education

Finding

The economy of Myanmar had been growing at rationally enviable rates even before then On average, it grew at 5.1 percent between 2005/06 and 2009/10 and could have been higher if not for the devastation caused by cyclone Nargis in 2008 when growth slowed down to 3.6 percent. However, since the transition started, the economy has grown at an average of 6.7 percent. Reforms so far and reengagement with the international community have stimulated growth, and most economic and some social indicators have generally improved. In 2013, the economy grew an estimated 7.5% from 5.3% in 2010, led by increased gas production and exports, services, construction, and foreign direct investment (FDI) (Department, 2014). Myanmar's real growth rate is 4.5 percent in 2005-2006. In 2006-2007, Myanmar's real growth rate grows up 7.0 percent and 5.5 percent in 2007-2008. However, 2008-2009 economic growth rates fall to 3.6 percent because Myanmar suffered the massive destruction caused by hurricane Nargis. And then, Myanmar's annual real GDP growth rates grow up 5.1, 5.3, 5.9, and 7.3 percent in the fiscal year 2010 to 2013[3]. However, continued strong real GDP growth is caused by construction, gas production and services as well as foreign direct investment and exports of commodities.

Figure 1 shows some propositions for the relationship between GDP and infrastructure stock, employment, and Myanmar capital stock. Now, it can be seen that both GDP and infrastructure investment has nearly the same trend. In fact, still from 2007-2008, both GDP and infrastructure investment showed a slow growth trend. Nevertheless, FY 2008-2009 GDP fell and infrastructure investment showed a moderate growth trend.

Cyclone Nargis is believed to be the worst recorded natural disaster in Myanmar's history. Cyclone Nargis blew heavily in 2008-2009, and because of Cyclone Nargis there were lots of damages such as building, housing, and business. As a result, real GDP fell. In this figure, it can be discussed that to some extent, there is a connection between infrastructure investment and the economic growth of Myanmar.

This study examines the relationship between infrastructure investment and economic growth of Myanmar. Consequently, in order to investigate the dynamic relationship between infrastructure investment and economic growth of Myanmar during the period 1988-1989 to 2012-2013, the study of method used for estimation is based on Autoregressive Distributed Lag (ARDL) Model. The entire methodology portion consists of ADF unit root

[3] World Bank, 2004, Myanmar Ending Poverty and boosting shared prosperity in a time of transition

tests, ECM estimation, and bound test in association with ARDL model. The case of Myanmar, most of the studies have been prepared only in descriptive statistics and qualitative analysis. This paper can be said to be the first to study the relationship between infrastructure investment and economic growth with numerical analysis. Descriptive analysis of the infrastructure investment of Myanmar is also done as part of the empirical investigation.

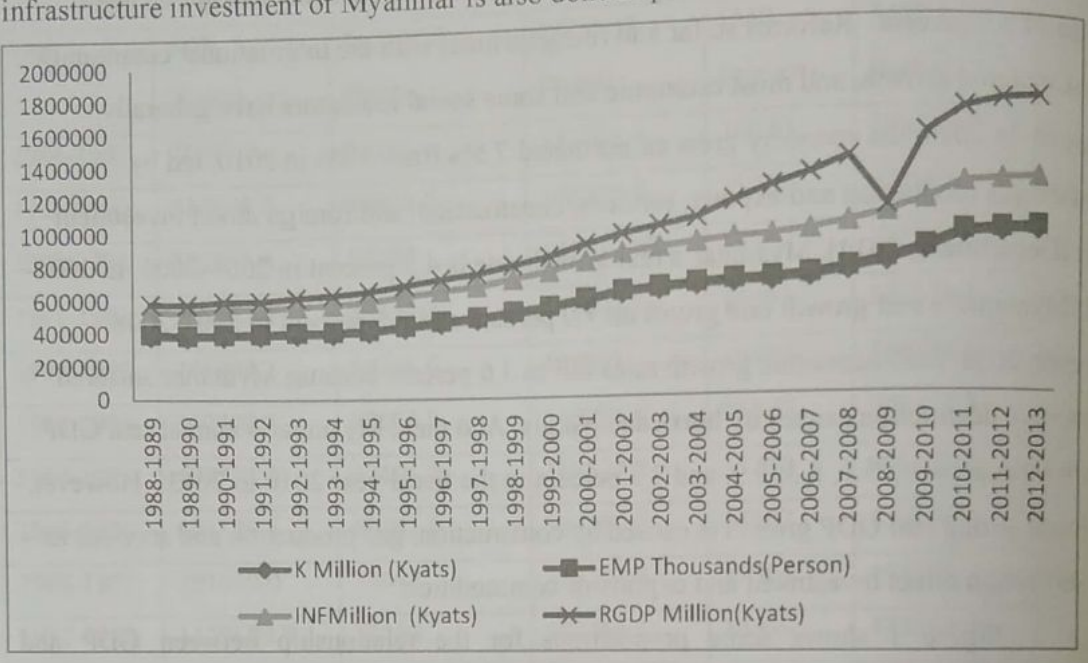


Figure 1 RGDP, infrastructure Stock, employment and capital stock during 1988-1989 to 2012-2013

In this research, three methods such as ADF unit root test, Bound test and Cointegration and long run estimation, ECM are used. The results are as follow:

Table 2 Augmented Dickey-Fuller unit root tests results

Variables	ADF Test statistics	5% Critical value	10% Critical value	Deterministic Regressors	Lags	Results
lnGDP	-4.380527 (0.0030)	-3.020686	-2.650413	Intercept	5	Stationary
lnINF	-5.927624 (0.0001)	-2.998064	-2.638752	Intercept	5	Stationary
lnEMP	-4.777279 (0.0010)	-2.998064	-2.638752	Intercept	5	Stationary
lnK	-2.981671 (0.0517)	-2.998064	-2.638752	Intercept	5	Stationary

Source: Calculation ( ) = P-Value

According to ADF unit root test all independent variables, i.e. INF, EMP and K in Table 4.1 are of I(1) and dependent variable of GDP is also stationary at first different I(1) in testing with intercept. Therefore, by testing with intercept, null hypothesis cannot be rejected for all time-series that is they are stationary. And so, the appropriate technique to cointegratiion is the ARDL approach to cointegration by using Bound test.

Table 3 ARDL Approach to Cointegration: Results of F-Test

Variables	F-Test	Lag Length	The number of k
$\Delta lnGDP\{F_{GDP}(lnGDP\backslash lnINF, lnEMP, lnK)\}$	31.62044	4	3

Source: Calculation (3.65-4.66, 3.15-4.08, 2.79-3.67 and 2.37-3.2 are the lower and upper critical values for bounds testing ARDL for 1%, 2.5%, 5% and 10% significance levels, respectively.)

In table 3 shows the calculated F-statistics. The value of F- statistics was tested to know the existence of a LR relationship among variables of Myanmar economy and Infrastructure-economic investment. From table 4.4 mentioned the cointegration among the economic growth; INF, EMP and K in Model 1 exist when economic growth is the dependent variable because it is at 4 lag length F-value that is higher than the lower bound and upper bound value. The null hypothesis of no cointrgration among economic growth, INF, EMP and K is also rejected and that there is indeed a cointegration relationship among the variables in the model.

Table 4 Results of the LR coefficients using ARDL (4, 4, 4, 4) (Dependent Variable is LNGDP from 1988-1989 to 2012-2013

Regressor	Coefficient	T-Ratio (Prob.)	ARDL Model
LNINF	0.037257	0.03905(0.97)	ARDL(4,4,4,4)
LNEMP	0.418018	0.385421(0.76)	ARDL(4,4,4,4)
LNK	1.773549	2.100864(0.28)	ARDL(4,4,4,4)
Constant	-16.240010	-5.358060(0.11)	ARDL(4,4,4,4)

Source: Calculation

From Table 4, the coefficient of infrastructure stock, employment and capital stock are positive and statistically significant, indicating that infrastructure investment, employment and capital stock enhance economic growth in the LR. If an increase in infrastructure investment about 1 percent , GDP will increase on average, about 3 percent at 5% significant level in LR. This is consistent with the findings of Peter Perkins, Johannfedderje and Johnliz(2005), James Heintz, Robert Pollin, Heidi Garrett-Peltier (2009), Wolassa L. Kumo(2012) and Sakineh Sojoodi, Fakhri Mohseni Zonuzi and Nasim Mehin Aslani Nia(2012).

Conclusion

The main objective of this study is to examine and find out the relationship between infrastructure investment and economic growth of Myanmar over the period of 1988-1989 to 2012-2013 mainly with the empirical analysis and general descriptive statistics. The data set engaged in this study is secondary data of annual Gross Domestic Product (GDP), infrastructure investment (INF), employment (EMP) and capital stock (K) of Myanmar during the period 1988-1989 to 2012-2013.

This study accepts two main methodological approaches in order to find out the appropriate answers to the research problem. Firstly, econometric methods such as Augmented Dickey-Fuller unit root test, Bound test and cointegratiion to LR estimation within the framework of (ARDL) model. Empirical results remain principally based on the above econometric methods. Secondly,

The results of this study are the same to conventional acceptance that infrastructure investment has significant impact on the economic growth of Myanmar. The empirical results of this study shows that there is significant positive relationship between infrastructure investment and economic growth meaning that infrastructure investment can be generated a significant effect to enhance economic growth. The same results ha Robert Pollin, Heidi Garrett-Peltier (2009), Sakineh Sojoodi, Fakhri Mohseni Zonuzi and Nasim Mehin Aslani (2012). Therefore, we have to accept the first hypothesis that infrastructure investment had an impact of economic growth of Myanmar the period of1988-1989 to 2012-2013.

The results from this research are that during periods of economic growth, investment through public infrastructure motivates economic growth by growing national income. So, the government of Myanmar had raised infrastructure investment in order to not only decrease unemployment problem but also to encourage regional development using

fiscal policies and domestic resources. Moreover, most of industry zone cannot reach expected investment from both foreign and domestic owing to insufficient infrastructure investment. If better transportation and communication, employment can easily be access to find jobs through information, education and more appropriate job opportunities and thus promoting then if increase labour production. Furthermore, better transportation and communication enable entrance to markets, improving and also the agriculture sector and modernization of trade.

Suggestion for Future Study

This study examines the relationship between infrastructure investment and economic growth of Myanmar in general. Data set used for the practical analysis is the real GDP and infrastructure investment, employment, and capital stock. Infrastructure investment includes health and education such as social infrastructure and power, construction, and transport and communication such as economic infrastructure investment. However, as basic infrastructure plays a vital role in Myanmar's infrastructure investment sector, future researchers may study by dividing the economic and social infrastructure into two and study the impact of both investments on the economic growth of Myanmar.

Additionally, the rest of basic infrastructure investment could also be put into the model so that the whole investment sector of Myanmar can be covered in one research.

ACKNOWLEDGEMENTS

I would like to express my heartfelt gratitude to all those who gave me the possibility to my study and this research.

First of all, I would like to express my sincere appreciation to the Faculty of Economics, Chiang Mai University for providing with opportunity to undertake this study. My heartfelt appreciation must be given to Asst. Prof. Dr. Chukiat Chaiboonsri, my kind and helpful advisor, for his valuable guidance, constructive comments and encouragement which was very important input to conduct this study. Without his continuous and consistent guidance, this thesis could not be completed in proper way.

It is a great pleasure to express my high and special gratitude to my co-advisor, Assoc. Prof. Dr. Prasert Chaitip and Assoc. Prof. Dr Kanchana Chokethaworn who had provided the

guidance for thesis. In addition, I would also like to thankful the head of Prof. Dr. Thida Kyu who has been a support of education in Yangon University of Economics.

And then, I would like to thank Bangkok Bank Limited that supported to attend Master of Economics (International Program) joint by Chiang Mai University and Yangon University of Economics.

Moreover, I am also very thankful to my lovely parent, my grandmother, my aunt, my elder sister and my younger brothers who has been a source of courage, inspiration, and financial and material support. In the course of my thesis writing and the whole learning process, my thanks go to friends.

REFERENCES

Afzal, M., Ahmad, M. S., Begum, I., & Quddus*, M. (2010). " Relationship Between School Education and Economic Growth in Pakistan". *Pakistan Econimic and Social Review*, volume 48, No.1, pp 39-60.

Alemnew, T. (2015). *"Public Infrastructure Investment, Private Investment and Economic Growth in Ethiopia: Co-Integrated VAR Approach"*. Ethiopia.

Andree, A. (2015). *" Highway Infrastructure and Economic Growth "*.

Andreev, A. (2015). *" Highway Infrastructure and Economic Growth "*.

Chaibboonsri, C. (2011). *" Selected Topics In Quantitative"*. Thailand.

Chude, N. P., & Daniel Izuchukwu, C. (2013). "Impact of Government Experditure on Economic Growth in Nigeria",1977-2012. *International Journal of Business and Management Review*, Vol, 1, No.4, pp.64-71.

Cotonou, & Benin. (2013). *" Infrastructure Development and Rural Transformation"*. Africa: Palais des Congres, Cotonou, Republish of Benin.

Daw Khin Mar Aye, D. W. (n.d.). *National Mid-term Review Report on the implementation of the Istanbul Plan of Action (IPoA)*. Myanmar: Central Statistical Organization,Ministry of National Planning and Economic Development.

Dawn C.Porter, D. (2009). *" Basic Econometrics "* (Fifth Edition ed.). Americas, New York: McGraw-Hill/Irwin,.

Delgado, A. d. (2013). *" Expenditure Policy in Angola: Impact on Economic Development and Inequality "*. Angolan: Catolica Lisbon,School of Business and Economics.

Department, E. a. (2014). *"MYANMAR UNLOCKING THE POTENTIAL"*. Myanmar: Asian Development Bank.

Derrick Reagle,Ph.D, D. (2001). *" Theory and Problems of Statistics and Econoetrics "*. New York: McGraw-Hill Companies,Inc.

Dougherty, C. (2011). *" Introduction to Econometrics"* (Fourth edition ed.). New York: Oxford University Press In.

Group, W. B. (2014). *"Myanmar ending poverty and boosting shared prosperity in a time of transition "*. Myanmar: World Bank Group.

Haider, S. Z., Usman, M., Amjad, Ullah, S., & Naveed, T. A. (2012). "Role of Infrastructure in Economic Growth: A case study of Pakistan". *J. Asian Dev.Stud*, Vol, 1 , Issue1.

Heintz, J., Pollin , R., & Garrett- Peltier, H. (2009). *" How Infrastructure Investments Support the U.S. Economy Employment, Productivity and Growth"*. Political Economy Research Institute.

Herman, E. (2011). " The Impact of Economic Growth Process on Employment in European Union Countries". *The Romanian Economic Journal*, no. 42.

Jacqueline Johnson, P. K. (2010). *"The Economic Impact of Public Infrastructure in Ontario"*. Canada: The Conference Board Canada.

John Luiz, P. J. (2005). " An Analysis of Economic infrastructure investment in South Africa". *South Africa Journal Of Econimics*, Vol.73:2.

Kim N.B Ninh, D. H. (2015). *"Conceptualizing public sector reform in Myanmar "*. Myanmr: The Asia Foundation.

Kumo, W. L. (2012). *" Infrastructure Investment and Economic Growth in South Africa: A Granger Causality Analysis "*. African: African Development Bank Group, Working Paper No. 160.

Kyu, T. (2008). *" The Role of Infrastructure in Economic Development of Myanmar (1988-2004)"*. Myanmar.

Nsiah, C., & Fayissa, B. (n.d.). *" Do Public-Private Infrastructure Investments Promote Long-Run Economic Growth? Evidence from African Countries"*. African Countries: Baldwin Wallace University, School of Business, Berca.

OECD. (2014). *OECD Investment Policy Reviews:*. Myanmar: OECD.

Reungsri, T. (2010). *" The Impact of Public Infrastructure Investment On Economic Growth In Thailand"*. Australia: School of Economics and Finance Faculty of Business and Law Victoria University.

S.Anwer, M., & Sampath, R. (1999). *" Investment and Economic Growth"*. Colorado: At Western Agricultural Economic Association annual meeting presented by Fargo,ND.

Sahoo, P., Dash, R. K., Greenthanjali, & Nataraj. (2010). *" Infrastructure Development and Economic Growth in China "*. China: Institute of Developing Economies ,IDE Discussion Paper No-261.

Sakineh Sojoodi, N. M. (2012). "The Role of Infrastructure in Promoting Economic". *Iranian Economic Review, Vol.16, No.32,, Vol.16, No.32*.

Siyanpeter, Eremionkhalerita, & Edith, M. (2015). "The Impact of Road Transporatation Infrastructure on Economic Growth in Nigeria". *International Journal of Management and Commerce Innovations ISSN*, Vol. 3, Issue 1, pp: (673-680).

Studies, C. F. (2008). *" Listening to Voice from Inside: Myanmar Civil Society's Response to Cyclone Nargis"*. Myanmar.

Effect of Career Orientation Types on Employability Skills of Selected Graduates of Three Universities of Economics

Dr. Soe Thu[1], Khin Khin Saw[2], & Win Thandar[3]

Abstract

This study examined the graduates' transition to employment of graduates attended at three universities of economics during Academic Years from 2010-2011 to 2015-2016. It focused to identify types of career orientation and employability skills perceived by them and to analyze how their career orientation types can affect their employability skills after their graduation.

The study used following statistical tools: Frequency and Descriptive Analysis, Tests of Kolmogorov-Smirnov, Leven, Independent Samples, Welsh, and Pearson Correlation Coefficient.

The study found that hesitation type of career orientation of graduates had highly employability skills constructed attitudes and valued their social network, friendship, general knowledge and experience through taking part in social network, sports, and art activities. Another finding was that if graduates had the higher perception of hesitation career orientation type in them, their personal and core skills of employability would be relatively higher.

Keywords: Graduates, Employment, Career Orientation Type, Employability Skill

I. INTRODUCTION

The new changes to the knowledge based economy have caused the expectations of the employers to be different and distant from those of the employees. For there to be no big gaps between the expectations of the employers and those of the employees, graduates, employers, universities with the higher education, government and non-government communities are required to collaborate and support the countries' social, economic sector and education sector by overcoming any challenges and threats.

Employability means the development of skills and adaptable workforces in which all those capable of work are encouraged to develop the skills, knowledge, technology and adaptability to enable them to enter and remain in employment throughout their working lives [1]. But some graduates do not know how to utilize

[1] Professor & Head, Department of Commerce, Yangon University of Economics

[2] Lecturer, Department of Commerce, Yangon University of Economics

[3] Lecturer, Department of Commerce, Meiktilar University of Economics

their knowledge and skills, or how to acquire the needed skills for success in their workplace. Consequently, there are expectation gaps between the employers and the employees, educators and employers need to work together to prepare students for the complexities they will encounter as they leave school and enter the work place [2].

Employability is centered on the assumed transposition of skills and competences from the educational context into the workplace. This has challenged the relatively neat fit between the types of knowledge and skills acquired through higher education and its overall utility and transferability in jobs. By placing heavy emphasis on the rather mechanistic link between skills acquired in an educational context and its deployment in the job, the skills approach tends to downplay the way in which graduates become realized as skilled, employable workers [3].

There are three elements mainly to be investigated in the transition process of graduates towards employment. They are four types of career orientations before graduation, their employability after graduation and their work identity after getting employed in order to examine whether those graduates were treated effectively and obtained the required academic knowledge and other employability skills which are basic necessities demanded by employers in labor market or not and, last but not least, the way they believed in themselves as professionals and are proud of being graduates of their university while taking their responsibility at the workplaces currently [4].

The employability of graduates has become an aim that governments around the world have, to varying extents, imposed on national higher education systems. This interest in employability reflects an acceptance of human capital theory [5]. Under human capital theory, the task of a government is to foster conditions that encourage growth in the stock of human capital, since this is seen as vital to the performance of knowledge-based economies in a globalized society. There are two important sources for knowledge growth in this society; one is the learning-by-doing that takes place in innovative workplaces and the other one is the higher education system [6].

The higher education system is subject to governmental steer in giving an emphasis to the enhancement of the employability of new graduates. Employers in the UK tended to value generic skills more highly than disciplinary-based understanding and skills. For some employers (the computer industry and social work provide two

contrasting examples, disciplinary knowledge and understanding are vital. [7] This is consistent with the views of Reich who argued that advanced economies need two sorts of high-level expertise: emphasizing discovery on the one hand, and focusing on exploiting the discoveries of others through market-related intelligence and the application of interpersonal skills on the other. Reich suggested a kind of professionals whom labor markets want to employ suited for in the knowledge-based economies, symbolic analysts, those who are imaginative and creative, have at their fingertips relevant disciplinary understanding and skills and the "soft" or generic skills that enable the disciplinary base to be deployed to optimal effect. Higher education's key contribution to national prosperity lies in development of graduates with such achievement at their disposal. This means that undergraduate programmes should be concerned with four areas in particular: (1) abstraction (theorizing and /or relating empirical data to theory, and /or using formulae, equations, models and metaphors); (2) system thinking (seeing the part in the context of the wider whole); (3) experimentation (intuitively or analytically); and (4) collaboration (involving communication and team-working skills). Actually, educational institutions are not always successful in preparing learners for the complexity inherent in the two main sorts of activity that Reich attributes to symbolic analysts' role [8].

Learners are often expected to learn what is put in front of them and to work individually and competitively, and subject matter may be compartmentalized. Plainly, the education of symbolic analysts – who are likely to be those at the leading edge of economic developments of one kind or another – requires that institutions make a particular effort to foster the achievements that Reich highlighted. Higher education is, however, not only about the education of symbolic analysts. There are other ways in which it can contribute to economic development. As well as preparing graduates and diplomats for employment-related roles of various kinds (and definitely not only that of the symbolic analyst), it has an acknowledged role in lifelong learning – for example, in further educating the middle manager so that he or she can manage more effectively, in "up skilling" the teacher or process worker, facilitating the development of active citizenship, and so on [9].

Any university is an important entity that generates the specific competencies needed for successful entry into the labor market, better employability and active citizenship for their university graduates and tested that how these competences were

related to characteristics of jobs and firms, to what extent higher education graduates possess these competences, and to what extent higher education institutions provides these competences [10].

Myanmar's economy growth has led to the appearance of new local businesses and has affected businesses of all sizes. The government opens the policies and regulations that have led to an influx of international businesses and foreign investment. Therefore, lots of new jobs for educated youths are created. Some youths may be able to get jobs in their fields of study. There may be challenges for some young people to match their studies in university with job because of the more competition for a specific job, lack the necessary skills needed and/or demand higher salaries than employers are willing to provide, etc. Under these current labor market circumstances in Myanmar, the transition of graduates of the three Universities of Economics in Myanmar to employment after their graduation was worth studying to find out their types of career motivation before graduation, perception of their employability and competencies that related to the current job and working fields and their work identity on balancing job characteristics and employability skills. To be specific and effective, it could be proved that the types of career orientation and employability skills of the graduates would be different significantly due to the difference between two groups of graduates those who were enrolled by different university entrance (matriculation examination) marks, those who attended 3-year or 4-year schooling time in their university of economics and those who learnt the courses the old or new enhanced curriculum.

II. Background, Scope and Methods

A. Background of the Study

There are 192 higher education institutions in Myanmar. Among them, there are only three Universities of Economics in Myanmar, namely Yangon University of Economics (YUEco) which was established since 1962 in Yangon Division, Monywa University of Economics (MUEco) which was opened in 1996 at Sagaing Division, and Meikhtilar University of Economics (MEUEco) which was launched in 1999 at Meikhtilar in Mandalay Division.

Annually, each university of economics admits the specific numbers of students those who apply for specific university and specialization degrees based their location in specific regions and matriculation examination marks above or on par with

the minimum university entrance marks imposed by each university of economics. The number of students admitted and enrolled in each university and the specification score of minimum university entrance marks prescribed by each university are different from each other among those three universities of economics based on their location of university, capacities of administrative and academic system of each university and the preferences of students-parents in choosing and applying for which university of economics as graduates to get early jobs as soon as possible after graduation.

B. Scope of the Study

This study only focuses the total number of graduates (2,119) offered in 2010-2011 those were outputs of number of students (2,838) those who were enrolled by each of three universities of economics in 2008-2009. In 2011-2012, total number of graduates (3,511) those were out of number of students (4,292) those who were admitted by each of three universities of economics in 2009-2010. Similarly, total number of graduates (3,467) conferred in 2012-2013 those were outputs of number of students (4,037) those who were attended by each of three universities of economics in 2010-2011.

On the other hand, the total number of students (4,485) those who were enrolled in 2011-2012 in each university of the study were attended as third year students at their respective degree specialized programs and number of graduates (4,815) those were outputs of majority of (4,485) students enrolled in 2011-2012, were graduated in 2014-2015 after attending 4-year degree programs offered in each of three universities of economics. In a similar way, there were number of graduates (3,408) in 2015-2016 those were outputs of number of students (3,061) enrolled in 2012-2013 in the each of three universities of economics in the study.

Based on the information mentioned above, the responded graduates as population in the study could be divided into two groups in which the first group involved the graduates those who graduated between 2010-2011 and 2012-2013, those who completed their learning within three-year schooling time and old curriculum system with learning design in all universities. Another study group consisted of the graduates those who completed between 2013-2014 and 2015-2016, those who were treated and trained by the new upgraded curriculum and degree

courses designed within length of schooling time four-year to get their respective degrees.

Table (1) presents these two types of graduates classified by their different university entrance minimum marks by academic year, difference between attending three years and four years schooling time length, and different treatment of old curriculum system and degree courses designed and upgrading new curriculum system and degree courses designed in each university of economics.

Table (1) Number of Graduates into Grouping Classified by Three Universities of Economics

Particulars	Graduates Offered in 2010-11 and 2012-13 (Group I)	Graduates Offered in 2013-14 and 2015-16 (Group II)	Total Number of Graduates
YUEco	6,675	5,116	11,791
MUEco	1,495	1,560	3,055
MEUEco	927	1,547	2474
Total	9,097	8,223	17,320

Source: Survey Data (2017)

C. Sampling and Sample Units of the Study

The sampling method of the study is simple random sampling. By conducting by this sampling method, the numbers of respondents of graduates from each group were selected. The number of selected respondents from Group I by each university of economics and they are graduated offered during in 2010-2011 to 2012-2013. Moreover, all selected respondents of the study from Group I were currently working at the respective field after graduation. Therefore, total sample units of working graduates from Group I were (650) out of population (9,097) graduates finished in the academic years of 2010-2011 to 2012-2013 by three universities of economics according to the following Sample Size Formula. In terms of the numbers that selected from population, the sample size n is given by $= \frac{Nx}{(N-1)E^2+x}$, where $x = Z(\frac{c}{100})^2 r\,(100-r)$N is the population size, r is the fraction of responses and Z(c/100) is critical value for the confidence level c. The margin of error (E) is given by $E = \sqrt{(N-n)x/n(N-1)}$. The required sample size is calculated by using sample size calculator in raosoft.inc to get the minimum recommended size of this study.

The number of selected respondents from Group II by each university of economics and they were graduated offered during in 2014-2015 to 2015-2016. Moreover, all selected respondents of the study from Group II were currently working at the respective field after their graduation. The total sample units of working graduates from Group II were (620) out of population (8,223) graduates finished in the academic years of 2014-2015 to 2015-2016 by three universities of economics according to the following Sample Size Formula. In terms of the numbers that selected from population, the sample size n is given by $= \frac{Nx}{(N-1)E^2+x}$; where $x = Z(\frac{c}{100})^2 r\,(100-r)$ N is the population size, r is the fraction of responses and Z(c/100) is critical value for the confidence level c. The margin of error (E) is given by $E = \sqrt{(N-n)x/n(N-1)}$. The required sample size is calculated by using sample size calculator in raosoft.inc to get the minimum recommended size of this study.

D. Research Methods of the Study

In order to fulfill the research objectives and prove the postulated research hypotheses, structured questionnaire has been designed especially for this study and contains three parts. Part (1) identified the types of career orientation of respondents and part (2) examined employability skills perceived by each respondent graduate, and part (3) analyzed the effect of career orientation types of each selected graduate on their employability skills perceived by themselves. Five point Likert-style rating ("strongly disagree =1", "disagree = 2", "Neither agree nor Disagree = 3", "Agree = 4" to 5 "strongly agree") method of questionnaires was employed for three constructs of independent variables, four types of career orientation: Orientated toward Introspection, Orientated toward Hesitation, Orientated toward Learning, and Orientated toward Instrumentalism and three dependent variables of employability skills: core, process, and personal perceived by each respondent. The Likert-Scale rating method of questionnaire design enables to ask respondents on how strongly they agree or disagree with statement or series of statement. The advantage of the Likert-Scale rating questionnaire is that it enables numerical value to be assigned to case for easy quantitative analysis. The questionnaire was pretested to check its content validity and modified accordingly by pilot test. The pilot sample has been exempted from the study sample.

As a sampling method, simple random sampling (SRS) was employed in this research. The required sample sizes are calculated by using sample size calculator in raosoft.inc to get the minimum recommended size of this study. After calculation the sample size with 5% margin of error and 95% confidence level, 650 out of 9097 graduates finished in the academic years of 2010-2011 to 2012-2013 and 620 out of population 8223 graduates finished in the academic years of 2014-2015 to 2015-2016 by three universities of economics are set up as study sample. In the process of sampling, 1270 questionnaire are distributed to each selected graduated from 2010-2011 to 2015-2016 academic years in YUEco, MUEco, and MEUEco, now all of them are working at the respective working environment.

By way of a data collection method, face-to-face interview with the respondents and self-administrate survey that are distributed by hand delivery or online are mainly use to collect the data. Therefore, combination of the data collection method is used in this research. Enough time given to sampled respondents to fill the questionnaires to reduce sampling error. The questionnaires have been collected within four month with a response rate of (100) %.

After receiving the raw data from 1270 respondents, the next step was to input the data in software to carry out the data processing. The data is processed via SPSS version 22. The purpose is to ensure the data are in the standard of quality. The process includes checking, editing, coding and transcribing. Initially, check and review each questionnaire to verify its completeness and incomplete questionnaire will be discarded. No amendment is required as there is no missing data. And then coding process is made by identifying and assigning numerical scores to make calculation and descriptive analysis. For this paper, for the gender of respondents in Section A, male has been coded as "1" while female as "2". Lastly, the data are entered and transformed into a more suitable format for data analysis.

For data analysis, the frequency distribution table and multiple composite bar char, applied for the presentation on findings. Descriptive method is applied. 5 point Likert Scales Scale is used to get average score of each source. This study used data analysis both qualitative and quantitative data analysis method. The study utilized the following statistical tools:

1. Frequency and Descriptive Analysis

2. Kolmogorov-Smirnov test -to check if the data is distributed normal
3. Leven's test -to use homogeneity (the variances in the two groups must be similar)
4. Independent Samples t Test procedure - to test if there is a difference in a measured characteristic between two population (assumption of homogeneity is met)
5. Welsh's test procedure - to test if there is a difference in a measured characteristic between two population (assumption of homogeneity is not met and skewness values are both same sign)
6. Pearson Correlation Coefficient- to describe the extent to which two variables covey and the direction can be quantified mathematically.

The secondary data used in the study were collected in the Department of Higher Education, Ministry of Education, Departments of Academic Affair of YUEco, MUEco, and MEUEco during mid in 2017.

III. Analytical Framework of the Study

The study mainly focus to examine the employability of working graduates those attended in YUEco, MUEco and MEUEco, how they perceived their employability skills whether they get required skills and knowledge through attending university or learning by doing at specific workplaces after graduation. Moreover their employability skills could be related to their types of career orientation before graduation. Based on the literature review and empirical studies of employment, employability skills and career orientation types of graduates, the working definitions of main key terms of the study were determined to investigate firstly the demographical data, employability status after the graduation and their specific roles, functions and earning by working at their firms. Afterwards, their employability level and career orientation types perceived by selected graduates were identified and then their relationship between each of employability skills learnt in university and each type of career orientation they perceived by themselves were investigated through testing the proposed three hypotheses to support the main objective of the study.

IV. Testing Hypotheses of the Study

The hypothesis was tested to prove *the higher the career orientation type before graduation perceived by selected graduates attended in YUEco, MUEco and YEUEco,*

the higher overall level of perception of their employability skills in the study." The purpose of this analysis is aim to look at the each carrier orientation and its relationship with three type of employability skills. Pearson correlation's coefficient will indicate the direction, strength and significant of the bivariate relationships among all the variables that were measured at an interval or ration level. The rule of thumb about the coefficient range and the strength of the relationship are shown as in following Table (2).

Table (2): Rules of Thumb about Pearson Correlation Coefficient

Coefficient Range	Strength of Relationship
±0.91 to ±1.00	Very Strong
±0.71 to ±0.90	High
±0.41 to ±0.70	Moderate
±0.21 to ±0.40	Small but definite relationship
±0.01 to ±0.20	Slight, almost negligible

Source: Survey Data (2017)

The resulted P value (0.00) is more than α=0.01 (1% level of significant). This means that correlation coefficient between the introspection carrier orientation and personal skill is significant at 1% level of significance.

Table (2): Analysis on Relationship between Introspection Carrier Orientation and Employability Skills

Variables	Correlation Coefficients	Strength of Relationship
Introspection Vs Personal Skill	.328**	Small but definite relationship
Introspection Vs Core Skill	.316**	Small but definite relationship
Introspection Vs Process Skill	.283**	Small but definite relationship

Note **.Correlation is significant at the 0.01 level (2-tailed)

Moreover, there is inversely and weakly but definite relationship between introspection carrier orientation and core skill. The relationship between introspection carrier orientation and core skill is a significant at 1% level because the resulted p value is 0.000 that is less than alpha value 0.01. And, there is small but definite and inverse relationship between introspection carrier orientation and process skill. The resulted P value (.000) is more than α=0.01 (1% level of significant). This means that correlation coefficient between the introspection carrier orientation and process skill is insignificant at 1% level of significance. From this analysis of relationship between introspection career orientation and employability skills of personal, core and process

skills were inversely related to each other. It could be seen that the type of the graduates who perceived themselves as introspection of career orientation during attending the university has lower perception of their personal, core and process skills required for employability. The higher the perception level of introspection career orientation of the graduates, the lower their employability skills of personal, core and process of all respondents in the study. Since all responded graduates from Group I and Group II disagreed that all of them were not the type of introspection career orientation type of students while attending university. In conclusion, all studied graduates attended and graduated in three universities of economics could not be assumed as introspection career orientation type having perception of being difficult and worried to pass the exam regularly and who originally has lower perception level on their employability skills especially in process skills such as skills in problem solving, teamwork, communication, critical thinking strategically and creativity that were required to apply in their respective workplaces currently. Table (3) presents the analysis of relationship between hesitation career orientation types and each skill of employability.

Table (3): Analysis on Relationship between Hesitation Carrier Orientation and Employability Skills

Variables	Correlation Coefficients	Strength of Relationship
Hesitation Vs Personal Skill	.828**	High
Hesitation Vs Core Skill	.816**	High
Hesitation Vs Process Skill	.683**	Moderate

**. Correlation is significant at the 0.01 level (2 tailed)

Through studying from Table (3) shown above the relationship between hesitation career orientation and three types of the skills of employability, there is positively and highly relationship between hesitation carrier orientation and personal skill. The resulted P value (0.00) is more than α=0.01 (1% level of significant). This means that correlation coefficient between the hesitation carrier orientation and personal skill is significant at 1% level of significance. Moreover, there is highly and directly direct relationship between hesitation carrier orientation and core skill. The resulted P value (0.00) is more than α=0.01 (1% level of significant). This means that correlation coefficient between the hesitation carrier orientation and core skill is significant at 1% level of significance. There is moderately and directly relationship between hesitation carrier orientation and process skill. The resulted P value (0.00) is

more than α=0.01 (1% level of significant). This means that correlation coefficient between the hesitation carrier orientation and process skill is significant at 1% level of significance.

It could be seen that the type of the graduates who perceived themselves as hesitation of career orientation during attending the university has high attitude and value their social network, friendship, general knowledge and experience through taking part in social network, sports, art activities and study trip and touring with friends but they have never been absent to attend to a class. Therefore it could be concluded that if the graduates had the higher the perception of hesitation career orientation type in them, the personal and core skills of all respondents would be relatively higher positively in the study. Nevertheless the relationship between hesitation career orientation type of students and their process skills were moderately related to each other because the main characteristics of process skills could be obtained normally by learning in a class and doing at workplace.

Continuously following Table (4) presents the findings through analysis on relationship between learning carrier orientation and employability. By analyzing that how the perception of learning oriented students while attending the university could be related to his employability skills of personal, core and process that required to apply them in their job currently after graduation.

Table (4): Analysis on Relationship between Learning Carrier Orientation and Employability Skills

Variables	Correlation Coefficients	Strength of Relationship
Learning Vs Personal Skill	.624**	Moderate
Learning Vs Core Skill	.827**	High
Learning Vs Process Skill	.924**	Very Strong

**. Correlation is significant at the 0.01 level (2 tailed)

According to the findings of the above Table, there is moderately and directly related to learning carrier orientation and personal skill of each graduate. The resulted P value (0.00) is more than α=0.01 (1% level of significant). This means that correlation coefficient between the learning carrier orientation and personal skill is significant at 1% level of significance. Moreover, there is highly and directly relationship between learning carrier orientation and core skill. The resulted P value (0.00) is more than α=0.01 (1% level of significant). This means that correlation

coefficient between the learning carrier orientation and core skill is significant at 1% level of significance. There is very strongly and directly relationship between learning carrier orientation and process skill. The resulted P value (0.00) is more than α=0.01 (1% level of significant). This means that correlation coefficient between the learning carrier orientation and process skill is significant at 1% level of significance.

It could be seen that the type of the graduates who perceived themselves as learning career orientation during attending the university has highly value, belief, and attitude in learning as well as education. That kind of learning oriented students were strongly confident in education and knowledge gained through from learning in a class to work and participate in knowledge based services industry.

Table (5) presents the investigation of whether the respondents having higher perception of instrumentalism carrier orientation type before the graduation had higher skills of personal, core and process of employability perceived themselves relatively.

The resulted P value (0.00) is more than α=0.01 (1% level of significant). This means that correlation coefficient between the instrumentalism carrier orientation and personal skill is significant at 1% level of significance.

Table (5): Analysis on Relationship between Instrumentalism Carrier Orientation and Employability Skills

Variables	Correlation Coefficients	Strength of Relationship
Instrumentalism Vs Personal Skill	.252**	Small but definite relationship
Instrumentalism Vs Core Skill	.407**	Moderate
Instrumentalism Vs Process Skill	.519**	Moderate

**. Correlation is significant at the 0.01 level (2 tailed)

Moreover, there is moderate and direct relationship between instrumentalism carrier orientation and core skill. The resulted P value (0.00) is more than α=0.01 (1% level of significant). This means that correlation coefficient between the instrumentalism carrier orientation and core skill is significant at 1% level of significance. There is moderate and direct relationship between instrumentalism carrier orientation and process skill. The resulted P value (0.00) is more than α=0.01 (1% level of significant). This means that correlation coefficient between the instrumentalism

carrier orientation and process skill is significant at 1% level of significance. All findings supported to prove the proposed hypothesis H4.

V. CONCLUSION

The issues and challenges occurred in the platform of graduates transition towards employment after graduation were one of the emerging socio-economical and employment issues to be resolved urgently for all stakeholders of higher education institutions, employers, employment agencies in labor markets and parents and graduates themselves in both developed and developing countries. If those responsible entities and personnel involved in concerning graduates unemployment and underemployment looked into the problem immediately in every kind of labor markets in all countries, they would know the reasons why it appears in labor market and can find out the alternative ways of solution in getting jobs in shorter waiting time for fresher graduates equipped with diversity of specific knowledge and skills acquired in attending universities through investing that platform of graduate transition to employment and, consequently, issues and challenges occurred during this period for each graduate, since the knowledge based business enterprises and organizations could be produced as a result of productivity improvement, efficient usage of resources and effective management and administrative ways led by the self-disciplined and skilled young educated human capitals of any country.

ACKNOWLEDGEMENT

This work is a two-year project of departmental research for Department of Commerce, Yangon University of Economics during the 2017-2018 academic year supported and funded by Department of Higher Education in Ministry of Education. Moreover, each and every academic and administrative department from YUEco, MUEco, and MEUEco supported through providing information required.

REFERENCES:

[1] *Paranto, S., & Kelkar, M. (1999): "Employer Satisfaction with Job Skills of Business College Graduates and Its Impact on Hiring Behavior Journal of Marketing for Higher Education" Cited in Baird, A.M. (2016): 21st Century Workforce: Employers and Students Perceptions of Satisfaction and Preparation of Skills and Competencies of Graduates needed to get hired in the Northeast. (Doctoral Dissertations, Johnson & Wales Universities)*

[2] Treasury, H.M.S. (1997): "Employment Opportunity in a Changing Labour Market." The Modernizations of Britain's Tax and Benefit System, (I).

[3] Ramli, A., Nawawi, R., & Chun, M.P.P. (2010): " Employees' Perception of Employability Skills needed in Todays Workforce among Physiotherapy Graduates", Procedia-Social and Behavioral Sciences, 7, pp. 455-463.

[4] Holmes, L., (2001): "Reconsidering Graduate Employability: The Graduate Identity Approach" , Quality in Higher Education, 7(2), 111-119.

[5] O'Regan, M. (2010): Graduate Transitions to Employment: Career Motivation, Identity and Employability:, The University of Reading.

[6] Becker , G.S. (1975): " Front Matter, Human Capital: A Theoretical and Empirical Analysis, with Special Reference to Education, Second edition , NBER, Chicago University Press, pp. 22-40.

[7] Treasury, H.M.S. (2000): "Productivity in the UK: The Evidence and the Government's Approach "

[8] Harvey, L., Moon, S., Geall, V., & Bower, R. (1997): Graduates' Work: Organizational Change and Students' Attributes." Center for Research into Quality, Birmingham B42 2TP, England, UK.

[9] Reich, R.B.(1991): " The Work of nations: London: cited in Simon and Schuster, Higher Education Quality Council (1997) ; Graduate Standards Programme: Final Report Vol. 2, HEQC.

[10] Yorke, M. (2006): "Employability in Higher Education: *What it is- what it is what it is not* (Vol.1), New York Higher Education Academy.

The Effect of Logistics Strategy on Customer Service Performance of Large Retail Businesses in Myanmar

Ei Khine Win[1]

Abstract

The purpose of this study is to identify the logistics strategy adopted in large retail businesses in Myanmar, to examine the effect of logistics strategy on customer serviceperformance of retail businesses in Myanmar.The study examines the characteristics of logistics activities of retail industry in Myanmar, therefore, a descriptive research design is adopted. The questionnaire is sent to managers of large retail businesses. Data is then collected using a questionnaire. Large retail businesses in Yangon which are members of Myanmar Retail Association in Yangon are sample units in this study. The data collected is analysed using the Statistical Package for the Social Sciences (SPSS) data analysis tool to generate descriptive data in order to describe the characteristics of these organisations. The study revealed that all the elements of process strategy are positively related to customer service performance. Market strategy is positively related to customer service performance. The analysis of the data should generate solution which will facilitate the development of guidelines for managers regarding selection and implementation of logistics strategy.

Keywords: *logistics strategy, process strategy, market strategy, channel strategy, customer service performance*

Introduction

Logistics is becoming increasingly important to businesses around the globe (Savitiskie, 2003). Logistics can be seen as one of the credential areas in which competitive advantage can be attained for businesses. Organizations focus on improving customer service performance by managing logistics activities in order to gain competitive advantage. Businesses are increasingly setting up operations in multiple locations around the global, which necessitates use of an efficient network of logistics operations to ensure smooth flow of raw materials and products from the point of production to that of consumption all over the world (Stock et al., 2000). Logistics management is considered as effective strategy for improving customer service performance.Logistics is concerned with "the art of managing material flow and information flow" (Mentzer et al., 2004).To improve customer service, logistics provides the functions of the right amount of the right products to the right place at right time with the lowest possible cost. According to Bowersox (2007), logistics is engaged in a wide range of important activities for the transfer of goods, services and related information to end user. Logistics strategy improves firm's competitiveness by strengthening supply chain relationship (Maalim 2016). Logistics strategy literature has varying views on what constitutes the typical logistics strategies. The main type of logistics strategy are process strategy, market strategy and channel strategy that are developed by Bowersox and Daugherty (1987). Process strategies was found to lead to improved transaction speeds and reduced transaction costs. A market strategy is the most important overall strategy for improving firm performance followed by integrated order processing applications. Channel strategies provide the clear internal guidelines for creating and monitoring alliances under supplier collaboration. The key of logistics strategy has the effects on increasing customer service, efficiency, effectiveness and flexibility of firm performance (Mentzer et al., 2010) The retail sector is one of the most significant economic sectors in the Myanmar economy and one of the sectors which has undergone the greatest evolution in recent years. Therefore the suitable logistic strategy can help to improve firm performance in the lowest possible costs to sell the customers from retailers in Myanmar.

[1] Lecturer , Department of Commerce, Yangon University of Economics

Rationale of the Study

Logistics is a major factors of competitiveness, profitability, and growth, within the strategic planning process (McKinnon, 2001). Organizations manage logistics activities to improve organizational performance. Myanmar logistics performance index (LPI) stills are ranked very low (i.e 129). It is the lowest among the ASEAN member countries (Taguchi, 2013). In order to have effective and efficient flow of materials and information, logistics brings together the geographical distance, sources and markets together to improve customer service (Kudo, 2010).Savitskie (2003) presented that the evaluation of logistics strategy, firm structure, and logistics information technology processes on service performance. Logistics is important to the firm's performance. In the 21st Century, information technology is increasingly used as a tool for firms to improve efficiency, reduce costs, and improve customer responsiveness.

Objectives of the Study

The main objectives of this study are to investigate the logistics strategy used by the retail businesses in Myanmar and the effect of logistics strategy on organizational performance.

For this purpose the following specific research objectives are set up;

- To identify the logistics strategy adopted in large retail businesses in Myanmar.
- To examine the effect of logistics strategy customer service performance of large retail businesses in Myanmar

Research Questions

The literature supports the importance of the research topic and demonstrates the need for additional insight regarding logistics. The study attempts to answer the following questions:

- What kind of logistics strategy is adopted in large retail businesses in Myanmar?
- How does the logistics strategy relatethe customer service performance of large retail businesses in Myanmar?

Method of the Study

This study applies both qualitative and quantitative method by using both primary and secondary data. Sample was drawn from members of Myanmar Retailer Association. Primary data and second data are used in the study. Primary data was collected through exploratory interviews with responsible persons of the companies. A questionnaire survey was conducted for obtaining primary data. In order to analyse the collected data, statistical tools was used. The retail business firms which are members of Myanmar Retailer Association was selected as study units. There are 352 members registered at Myanmar Retailer Association in Yangon at 2018. According to the legal definition of SMEs 2015, large enterprise business that has more than 60 employees in retailing industry was chosen as study units. Large retail businesses are 67 in Myanmar Retail Association. Among them 41 managers were chosen from large retailers of Myanmar Retailers Association in Yangon for this study.

Scope and Limitation of the Study

In this study, large retail businesses in Yangon which are members of Myanmar Retail Association in Yangon are sample units. Yangon is justified for the research because Yangon is the economics city of Myanmar. Large retail businesses in Yangon are leading business in Myanmar. The data for the study depend largely on the quality of the data available from the respondents' perceptions. The results were limited to the information from the data source. The financial performance indicators were not included for the study. This study only focuses on retail industry in Yangon.

Literature Review

Logistics Strategy

Extending the concept of 'strategy' from Hayes and Wheelwright (1984), logistics strategy is the process that helps to coordinate goals, plans and policies, and which are reinforced through conscious and subconscious behaviour within and between partners across a network. Process strategy is management of traditional logistics activities with the goal of controlling costs. Management emphasizes achieving maximum efficiency from purchasing, manufacturing, and distribution. Market strategy is management of selected traditional logistics activities across business units to reduce complexity faced by customers. Management emphasizes achieving coordinated physical distribution to customers served by several business units. Channel strategy is (also referred to as "Information strategy" by some researchers) a diverse group of traditional logistics activities and other activities managed as a system to achieve inter-organizational coordination and collaboration through the channel. In the company/division, management emphasizes coordination and control of channel members (distributors, wholesalers, dealers, retailers) activities (Murphy and Wood, 2008).

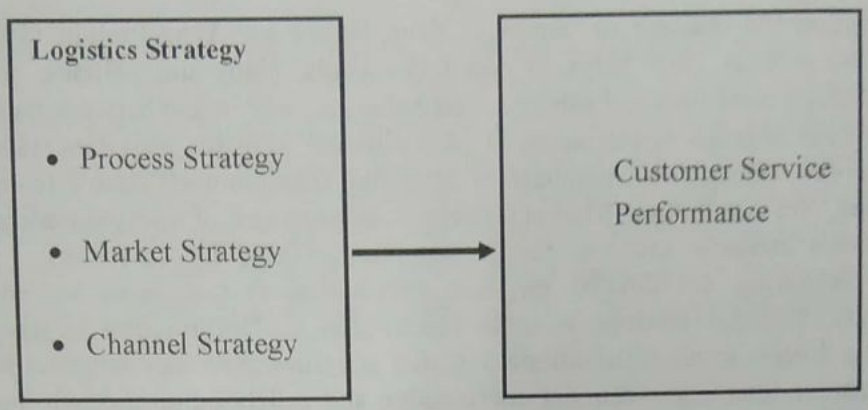
Measuring Organizational Performance

Performance has been viewed in a great variety of ways by logistics researchers (Chow et al., 1994) (Bowersox et al., 1999).The effect of logistics management on organizational performance has been explored in a large number of studies (Green et al., 2006).Organizational performance is measured in terms of internal performance measurement that focuses on the activities required for customer service and external performance measurement that focuses on customer perception and best practices of benchmarking. Customer service performance is measured by customer satisfaction, customer complaints, ability to respond, delivery times in this study.

Conceptual Framework of the Study

This study is examined the factors that effect on logistics strategy and the logistics strategies and their effect on the retail businesses. Logistics strategy classifications are developed by Bowersox and Daugherty (1987) Logistics activities in each logistics strategy in the study are developed by Antry et al (2008). They are Collaboration and coordination activities, Inventory management, Order processing, Procurement, Information technology system. Activities related in process strategy are coordination with functions, inventory control, order processing, and procurement for material with lowest cost, information technology and communication with internal departments. In this study, Activities related in coordination with across business units, information and communication system within department, with functions, across business units and customers, and inventory management for customized order and customer service for special request service are included in market strategy. In channel strategy, coordination with external parties, inventory management with suppliers / vendor, channel distribution system and information technology with suppliers and customers, integrated customer service with supply chain members are included.

Figure (1) Conceptual Framework of the Study



Sources: Own Compilation (2018)

Analysis on Demographic Characteristics of Retail Businesses in the Study

This section studies the profile of retailers in Yangon through six factors. They are year of establishment, number of employees, year of working in job, occupation, education and type of the main products. This can be seen in Table (1).

Table (1)Demographic Characteristics of Retail Businesses in the Study

Items	No. of firms	Percentage (%)
Year of Establishment		
41-45	2	5
36-40	-	-
31-35	2	5
26-30	8	20
21-25	9	21
16-20	4	10
11-15	7	17
5-10	7	17
>5	2	5
Total	41	100
No. of Employees		
60-69	14	34
70-79	2	5
80-89	3	7
90-99	3	7
Above 99	19	47
Total	41	100

Source: Survey Data (July, 2018)

Table (2)Type of Main Products Sold in Retail Businesses in the Study

Type of Main Products	No. of firms	Percentage (%)
Electrical Products & Telecom	15	18
Construction Equipment	4	5
Food & Beverage	11	13
Machinery	6	7
Chemicals	1	1
Consumer Products	14	17
Pharmaceutical/Health Products	12	15
Others (Specify)	20	24
Total	83	100

Source: Survey Data (July, 2018)

According to the Table (1), year of establishment of retail firm is divided into nine groups: 21 % of retail firms that have been operatingfrom 21 years to 25 years is maximum. 20% of retail firms operate from 26 years to 30 years. 17% of retail firms have been operating from 11 years to 15 years and from 5 years to 10 years. 10% of retail firms operate from 16 years to 20 years 5% of retail firms have been operated from 41 years to 45 years, from 31 years to 35 years and less than 5 years.Therefore, it can be seen that retail firms are well experienced in their respective business areas.

By concerning with the number of employees, most of retail firms are above 99 employees which is 47% of the respondents. And34% of retailers have 60-69 employees. 5% of retailers have 70-79 employees 7% of retailers have 80-89 and 90-99 employees respectively. Some of surveyed firms have professionalized upgraded logistics systems and logistics managers. Therefore, it can be seen that large retailers have above 99 employees.

Most of retail firms sell customer products, electronic, food and beverage and electrical products &telecom . 17% of respondents sold consumer products.18% of respondents sold electrical products and telecom.13% of the respondents sold food& Beverage .7% of respondents sold machinery. The others included monk robe, books, watch, bags, sportware which was accounted for 24% of the respondents.

Reliability Test

To determine the respondent perceptions, reliability is a measure of the degree of consistency between multiple measurements of a variable. A common used of measure reliability is internal consistency, which applies to the consistency among the variable in a summated scale. In order to examine the internal consistency of the factors obtained or the scale used in this study, Cronbach's alpha was calculated. Generally, an alpha value close to 1.0 indicates high internal consistency reliability, an alpha value less than 0.6 is considered to be poor, values of 0.7 are considered acceptable and values above 0.8 are deemed to be good.

The following table describes the reliabilities (Alpha Values) and Validity of the variables.

Table (3) Cronbach's Alpha Scores for Reliability and Validity of the Variables

Sr. No	Variable	Items	Items Deleted	Alpha	Validity KMO	Bartlett's test
1	**Process Strategy:** 1.Coordination within the department	7	-	0.869	0.774	0.000
	2. Inventory Control	5		0.795	0.782	0.000
	3. Order processing	7		0.812	0.725	0.000
	4. Procurement	6		0.713	0.723	0.000
	5.Information technology within department	6	1	0.747	0.698	0.000
2	**Market Strategy:** **1.** Coordination across the department	5		0.769	0.757	0.000
	2. Customer service for special request	9		0.760	0.677	0.000
	3. Information technology with customer	6		0.785	0.781	0.000
	4. Inventory management for customized order	5		0.868	0.803	0.000
3	**Channel Strategy:** 1. Coordination with external parties	7	1	0.770	0.732	0.000
	2. Inventory management with suppliers	5		0.837	0.820	0.000
	3. Information technology with suppliers and customers	6	2	0.775	0.679	0.000
	4.Integrated customer service	5		0.852	0.799	0.000
4	Customer Service Performance	9	1	0.911	0.799	0.000

Source: SPSS Outputs

Analysis of Customer Service Performance on Logistics Strategy

As the main analysis, the study was applied multiple regression analysis to test the objectives of the effect of logistics strategy (process strategy, market strategy and channel strategy) on customer service performance.

Table(5) The Effect of Customer Service Performance on Logistics Strategy

Model	Unstandardized Coefficient		Standardized Coefficient	t	Sig.	VIF
	B	Std. Error	Beta			
(Constant)	-.087	.571		-.153	.879	
Process Strategy	.531***	.178	.419	2.978	.005	2.032
Market Strategy	.375*	.219	.296	1.710	.096	3.064
Channel Strategy	.175	.175	.172	.996	.326	3.043
R	0.799					
R Square	0.639					
Adjusted R square	0.610					
F Value	21.824***					
Durbin –Watson	1.584					

Source: Survey Data (July, 2018)

***Significant at 1%,**5% level and*10% level (Dependent variable=Customer Service Commitment)

The following equation explains the relationship between the independent variables and dependent variables.

The Proposed Model is

$y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \varepsilon_0$

Thus, the estimated model,

$y = a + b_1 X_1 + b_2 X_2 + b_3 X_3$

Where,

y= y= Customer Service Performance

a= Constant (intersection)

b= Coefficient (the scope of the regression)

X_1= Process Strategy

X_2= Market Strategy

X_3= Channel Strategy

Customer Service Performance = -0.087+ 0.531 Process Strategy

According to the equation, if retail industry is nothing to do the logistics strategy (process logistics strategy, market logistics strategy, and channel logistics strategy), logistics customer service commitment will be decreased 0.087.

According to the above equation, customer service commitment is influenced by market strategy at 1 percent significant level and has value of 0.531. The value of calculated

(Durbin-Watson) is 1.584 and each Variance Inflation Factor (VIF) is less than 10. These results show that serial correlation and multi-collinearity problems are not included in this analysis.

Customer service performance is influenced by process strategy. In retail industry, customer service performance is important and it can be achieved by coordination with functions of business. So they know customer needs exactly respond quickly. They can provide excellent customer service. By using market strategy, they can enhance the customer service program. Customer service is increased through product availability, accurate delivery time.

Findings and Discussions

Retailers have good result in purchasing and distribution, internal integration, efficiency from consolidating purchasing, selling and distribution. All of the retailers have formal ordering policies and their material and components are high percentage of the cost in overall value added process. Retailers have internal order checking, demand smoothing for order planning. So employees' satisfaction is getting forsmooth flow of order processing and picking. The procurement department is linked accounting and warehousing (inventory) departments. They use IT to check the inventory balance, to improve transaction speeds and reduced costs. Most of companies do not agree that they have ability to accommodate delivery times for specific customers. Therefore they do not deliver goods to customers except furniture. Moreover customer satisfaction is increased product availability.In reverse logistics, retailers responds timely manner. Therefore customer complaints are reduced.

Recommendation

This research assesses the logistics strategy on customer service performance of retail industry. In Myanmar retail industry, dominant logistics strategy is process strategy. Some retail firms are more emphasize on market strategy on logistics management, but customer service they provided is standardized and they cannot respond quickly to customer special requests. The leading retail firms apply to channel strategy but their suppliers cannot support to align their strategy. So they use process strategy as main logistics strategy to get logistics coordination effectiveness and customer service performance. Moreover it can be found that process strategy improve customer service performance that are not supported by marketing department in bad weather condition. It was unfortunate that logistics strategy did not have a significant impact on cost reduction and growth. The reason is that most of the products they sold are imported goods. So foreign exchange rate fluctuationaffects on profits.The location of the retail shop is in crowded area and they incurred high rental charges. As logistics is increasing in importance, managers should be concerned about how logistics strategy affects organizational performance.

Conclusion

In this research, role of logistics is increasing important in customer service performance. The perception of three dimensions of logistics strategy on customer service performance is studied at 41 logistics managers of large retail businesses. All the component of process strategy can provide more customer service performance than market strategy. Using market strategy incurs additional cost becausethey need to respond to customer demands. So retailers in Myanmar emphasize on process strategy to improve customer satisfaction.

Acknowledgement

Many of people have contributed to this research to be successfully completed. I would like to express to my gratitude to each of them. I would like to thanks the respondents who respond in the survey for their contributions. I would like to thanks my supervisor, my colleagues who help this research by giving ideas.

References

Bobbitt, L. M. (2004). An examination of the logistics leverage process: implications for marketing strategy and competitive advantage.

Bowersox, D. J., Closs, D. J., & Stank, T. P. (1999). *21st Century Logistics: Making Supply Chain Integration a Reality*.

Chen, H., D. D. Mattioda, and P. J. Daugherty.(1997). Firm-Wide Integration and Firm Performance: *The International Journal of Logistics Management*, (18), 5-21.

Civelek, M. E., Çemberci, M., Artar, O. K., &Uca, N. (2015). Key factors of sustainable firm performance: a strategic approach.

Fugate, B. S., Mentzer, J. T., & Stank, T. P. (2010). Logistics performance: efficiency, effectiveness, and differentiation. *Journal of business logistics*, 31(1), 43-62.

Green Jr, K. W., Whitten, D., & Inman, R. A. (2008).The Impact of Logistics Performance on Organizational Performance in a Supply Chain Context.*Supply Chain Management: An International Journal*, 13(4), 317-327.

Hayes, R. H., & Wheelwright, S. C. (1984).*Restoring Our Competitive Edge: Competing through Manufacturing* (8). New York, NY: John Wiley & Sons.

Kudo, T.,Kimura, F., &Umezaki, S. (2010). ASEAN-India Connectivity: A Regional Framework and Key Infrastructure Projects. *ASEAN India Connectivity: The Comprehensive Asia Development Plan, Phase II, ERIA Research Project Report*, (7).

McGinnis, M .A, J.W.& Kohn. (2001). Longitudinal Study of Logistics Strategy.*Journal of Business logistics*, 31, 1.

Mentzer, J. T., DeWitt, W., Keebler, J. S., Min, S., Nix, N. W., Smith, C. D., &Zacharia, Z. G. (2010). Defining Supply Chain Management.*Journal of Business logistics*, 22(2), 1-25.

Mentzer, J.T., Min, S., & Bobbitt, L.M. (2004).Toward a Unified Theory of Logistics: *International Journal of Physical Distribution & Logistics Management* 34(8), 606-627

Murphy, P. R., & Wood, D. F. (2008).*Contemporary Logistics*.Pearson College Division.

Savitskie, K. P. (2003). *The Impact of Logistics Strategy and Logistics Information Technology Processes on Service Performance* (Doctoral dissertation, Michigan State University.Department of Marketing and Supply Chain Management).

Stock, G. N., Greis, N. P., &Kasarda, J. D. (2000). Logistics, Strategy and Structure: a Conceptual Framework. *International Journal of Operations & Production Management*, 18(1), 37-52.

Taguchi, H. (2013). Trade Integration of Thailand with Mekong region: An Assessment Using Gravity Trade Model.*International Journal of Development Issues*, 12(2), 175-187.

A Simulation Study on Robust Alternatives of Least Squares Regression

Maw Maw Khin[1]

Abstract

Five methods of regression namely the ordinary least squares, least absolute value, *M*, least median squares and least trimmed squares are applied to the multiple regression model. The several distributional assumptions of errors are considered in this study. The required data sets are generated by using multiple linear regression models with three explanatory variables. Then, these data sets are transformed into outlier contaminated data sets. After that, the performances are compared in terms of bias and mean squared errors criteria and then the most suitable estimation method is chosen. Same sets of simulated data are used and mean squared errors and bias of these methods are compared. It is found that ordinary least squares estimation under a heavy-tailed distribution does not yield outlier robust estimates. Indeed, not only with the Gaussian distribution but also with the skewed distributions, ordinary least squares estimators collapse in the presence of small levels of outlier contamination. The Huber *M*-estimate and bisquare *M*-estimate estimate have shown to be more appropriate alternatives to the ordinary least squares in heavy-tailed distributions whereas the LMS estimates are better choices for skewed data. One best method could not be suggested in all situations; however the use of more than one method of exploratory data analysis is recommended in practice.

Keywords: Robust Estimators, Ordinary Least Squares, Heavy Tailed Distributions, Skewed Distribution, Gaussian Distribution.

1. Introduction

Modeling data by the means of linear least squares method is very important and crucial but the well-known ordinary least squares (OLS) regression procedure is only optimal under certain distributional assumption of errors. In practice, this assumption may not hold because of possibility of the skewness or presence of outliers in data. In theory, the assumption of normality does not meet, the standard least squares estimation for the regression coefficients $\beta s'$ will be biased and / or in-efficient [Hampel et al., (1986)] [2].

To overcome this problem, several alternative methods of the standard least squares regression (robust procedures) have been proposed. Among these, four methods *M*-estimation (based on Huber and Turkey weight function), Least Absolute Value estimation (LAV), Least Median Squares estimation (LMS) and Least Trimmed Squares estimation (LTS) methods are

[1] Professor and Head, Department of Statistics, Yangon University of Economics

used in this study. The aim of this paper is to make a comparison of these methods through a simulation study.

2. Data and Methods

In this study, the simulation data were used and transformed these data into the outliers contaminated data to make a comparison among traditional and robust estimation methods. These simulation data were generated based on the multiple regression model with three explanatory variables. The OLS and robust estimations methods were applied to these simulated data to estimate the parameters of the multiple regression model. For comparing the properties of estimation procedures, the mean squared errors (MSE) and bias criteria were used.

3. Results and Discussion

To analyze the effects of outliers on parameter estimation in regression, a simulation study was carried out. When performing such a simulation study, different error structures were taken into account in this study. The multiple linear regression model with three explanatory variables was applied. The multiple regression model is

$$Y = X\beta + e$$

where, Y is an $(n\times 1)$ vector of observations with the design matrix X of the order $n\times p$ such that $X_{i1} = 1$, i = 1,..., n. β is a $(p \times 1)$ vector parameter and e is an $(n\times 1)$ vector of errors. In this above model, the intercept and slopes were equal to one. These explanatory variables ($p = 3$) were generated from standard normal distribution. In this simulation study, the errors contained outliers were generated using heavy-tailed distribution (compare to standard normal distribution (N)) such as logistic (LOG), Cauchy(C) and skewed independent data sets like gamma (GAM) and exponential distribution (EXP). Thus, the errors were simulated from the following densities: N (0, 1), LOG (0, 1), EXP (1), C (0, 1), and GAM (1, 0.5). Table 1 shows the notations and parameters of distributions, which were used in the simulation process.

In each case, 10 replications were simulated and regression coefficients of OLS, LAV, Huber and Turkey M-estimates, LMS and LTS were calculated. To compare the properties of the estimation procedures, the mean squared errors (MSE) and bias of the estimated coefficients were computed using the following formulas

$$MSE = \frac{1}{10}\sum_{i=1}^{10}\left(\hat{\beta}_i - \beta\right)^2$$

$$Absolute\ Bias = \frac{1}{10}\sum_{i=1}^{10}\left|\hat{\beta}_i - \beta_i\right|$$

Table (1) Notations and Parameters of Distribution

Distribution	Notations and Parameters	p.d.f. [$f(x)$]
Normal	$x \sim N(\mu,\sigma^2)$, $-\infty<\mu<+\infty, \sigma>0$	$\frac{1}{\sqrt{2\pi\sigma^2}} e^{-[(x-\mu)/\sigma]^2/2}, -\infty<x<+\infty$
Logistic	$x \sim LOG(\theta,\eta), \theta>0$	$\frac{1}{\theta}\frac{\exp[(x-\eta)/\theta]}{\{1+\exp[(x-\eta)/\theta]\}^2}, -\infty<x<+\infty$
Exponential	$x \sim EXP(\theta), \theta>0$	$\frac{1}{\theta}\exp\left(\frac{-x}{\theta}\right), x>0$
Cauchy	$x \sim C(\mu,\sigma)$, $-\infty<\mu<+\infty, \sigma>0$	$\frac{1}{\pi\sigma\left[1+\left(\frac{x-\mu}{\sigma}\right)^2\right]}, -\infty<x<+\infty$
Gamma	$x \sim GAM(\theta,k), \theta>0, k>0$	$\frac{1}{\theta^k\Gamma(k)}x^{k-1}e^{-x/\theta}, x>0$

Overall results of the methods under study and corresponding MSE and bias of 10 simulations for each estimation method were shown in Tables (2) to (6) and Figures (1) to (5). These figures illustrate the results of MSE and bias for the coefficients of multiple linear regression model with three explanatory variables ($p = 3$).

Based on the results of normal distribution, the bias of OLS is the smallest as expected, followed by the bias of Turkey and Huber-*M*, respectively. Moreover, in this case, the MSE of OLS is the smallest followed by the values of MSE of Huber and Turkey-*M*, respectively. Under the normal error distribution, it is found that the OLS method is more efficient than the robust methods. Thus, the low bias and MSE values of the OLS method are in line with the asymptotic robustness properties. In this normal distribution, the bias and MSE of LMS are much greater which followed by the biases and MSEs of LTS and LAV methods. The LMS method performs much worst in this case.

Regarding the logistic distribution, the bias of OLS, Turkey-*M* and Huber-*M* are close to each other and perform better than LAV, LTS and LMS methods. In this case, the MSE of OLS, Turkey and Huber-*M*, LAV and LTS methods are much close to each other but this value for LMS is significantly larger. Furthermore, although biases and MSEs of OLS, Turkey and Huber-*M* are significantly smaller than the bias and MSE of LMS, their patterns as shown in Figure 2(a) to (h) are intermingled and so no methods have a preferable bias and MSE in this situation. The bias and MSE of LMS are much larger than the others.

In exponential distribution, the LAV, LTS and Turkey-*M* are close to each other, but inferior to the Huber-*M* in terms of intercept. The bias of LMS is the smallest in this case. The OLS method as shown in part (a) of Figure 3 performs much worst in these situations. The MSE of OLS, for this situation is much greater which followed by the MSE values of Huber-*M*, Turkey-*M*, LTS and LAV respectively. The MSE of LMS is the smallest in this case. As indicated in Figure 3(c) to (h), the general pattern of the bias and MSE values for all methods are intermingled so that no preferred method could be chosen for the study of slope coefficients.

In Cauchy distribution, the biases of the robust methods for the intercepts are so close to each other, but the OLS method as shown in Figure 4(a) performs much worst in this situation. Furthermore, the MSE of OLS is significantly larger than the MSE of robust methods. The robust methods are so close to each other and their pattern as shown in Figure 4(b) are intermingled. So, no methods have a preferable MSE in this case. The similar results are found in the study of slope coefficients. The OLS method performs much worst based on bias criterion in this study. The biases of LAV, LTS, Turkey and Huber-*M* and LMS are so close to each other. In this case, the MSE of OLS is significantly larger than the MSE of robust methods. From this study, it is found that, the general patterns of the bias and MSE values for all robust methods are intermingled so that no preferred method can be selected for this case.

Concerning the case of gamma distribution, the intercept of LAV, LTS and Turkey-*M* are close to each other, but lower to the Huber-*M* depending on bias criterion. In this situation, the bias of LMS is significantly smaller than the bias of other methods. The OLS method as described in Figure 5(a) performs much worst. In addition, in this case, the MSE of LAV, LTS and Turkey-*M* are close to each other. The MSE of LMS is the smallest and performs better than the other methods. The OLS method as described in Figure 5(b) performs much poorest.

Moreover, the bias and MSE of Turkey-*M* are the smallest in terms of the slope. It is closely followed by the bias and MSE values of Huber-*M*, LAV, LTS and OLS.

Table (2) Performances of OLS and Robust Methods of Normal Distribution

Sample Size	Estimation Method		β_0	β_1	β_2	β_3
n =10	OLS	Bias	0.3086	0.2048	0.2738	0.2051
		MSE	0.1757	0.0644	0.1107	0.1176
	LAV	Bias	0.4002	0.2181	0.3676	0.2434
		MSE	0.2544	0.0695	0.2465	0.0907
	M-Huber	Bias	0.2974	0.2060	0.2266	0.2026
		MSE	0.1453	0.0685	0.0938	0.1038
	M-Turkey	Bias	0.3015	0.3553	0.3434	0.3000
		MSE	0.1488	0.3310	0.2575	0.1934
	LTS	Bias	0.3432	0.2608	0.3072	0.2854
		MSE	0.1584	0.1668	0.1986	0.1045
	LMS	Bias	0.5234	0.5989	0.5645	0.4626
		MSE	0.4554	0.5986	0.5141	0.8200
n =20	OLS	Bias	0.1912	0.1865	0.2020	0.1403
		MSE	0.0602	0.0617	0.0744	0.0276
	LAV	Bias	0.2116	0.2230	0.2501	0.2515
		MSE	0.0602	0.0777	0.1012	0.1050
	M-Huber	Bias	0.2020	0.2012	0.2022	0.1145
		MSE	0.0701	0.0647	0.0720	0.0226
	M-Turkey	Bias	0.1963	0.1941	0.2146	0.1186
		MSE	0.0641	0.0634	0.0719	0.0235
	LTS	Bias	0.2531	0.2828	0.2812	0.2082
		MSE	0.1131	0.1352	0.1375	0.0776
	LMS	Bias	0.5271	0.4909	0.4668	0.3154
		MSE	0.4082	0.3397	0.3225	0.1779
n = 30	OLS	Bias	0.1642	0.1703	0.1450	0.1526
		MSE	0.0376	0.0494	0.0304	0.0334
	LAV	Bias	0.2056	0.2868	0.1536	0.1546
		MSE	0.0603	0.1480	0.0319	0.0306
	M-Huber	Bias	0.1940	0.1567	0.1554	0.1365
		MSE	0.0473	0.0446	0.0286	0.0249
	M-Turkey	Bias	0.1860	0.1578	0.1491	0.1342
		MSE	0.0443	0.0441	0.0273	0.0255
	LTS	Bias	0.2227	0.1474	0.1598	0.0857
		MSE	0.0677	0.0400	0.0319	0.0132
	LMS	Bias	0.2395	0.1996	0.3296	0.3494
		MSE	0.0948	0.0549	0.1444	0.2118
n =50	OLS	Bias	0.1609	0.2201	0.1345	0.0908
		MSE	0.0328	0.0588	0.0265	0.0104
	LAV	Bias	0.1434	0.2307	0.1200	0.0979
		MSE	0.0284	0.0807	0.0200	0.0132
	M-Huber	Bias	0.1602	0.2016	0.1367	0.0905
		MSE	0.0315	0.0586	0.0254	0.0097
	M-Turkey	Bias	0.1643	0.1964	0.1331	0.0857
		MSE	0.0331	0.0550	0.0242	0.0090
	LTS	Bias	0.1679	0.2641	0.1527	0.0923
		MSE	0.0388	0.0878	0.0316	0.0106
	LMS	Bias	0.2383	0.3356	0.1687	0.2540
		MSE	0.0977	0.1592	0.0445	0.1204
n =80	OLS	Bias	0.1396	0.1424	0.0917	0.0710
		MSE	0.0232	0.0279	0.0110	0.0108
	LAV	Bias	0.1446	0.1501	0.1034	0.0653
		MSE	0.0266	0.0358	0.0161	0.0075
	M-Huber	Bias	0.1358	0.1374	0.0877	0.0641
		MSE	0.0231	0.0294	0.0106	0.0098
	M-Turkey	Bias	0.1413	0.1304	0.0893	0.0611
		MSE	0.0252	0.0273	0.0108	0.0010
	LTS	Bias	0.1184	0.1761	0.1093	0.1218
		MSE	0.0207	0.0478	0.0168	0.0268
	LMS	Bias	0.2239	0.1566	0.1329	0.2327

		MSE	0.0748	0.0343	0.0397	0.0876
n =100	OLS	Bias	0.1253	0.1307	0.0826	0.0697
		MSE	0.0229	0.0217	0.0089	0.0092
	LAV	Bias	0.1559	0.1067	0.0858	0.0728
		MSE	0.0395	0.0184	0.0108	0.0080
	M-Huber	Bias	0.1308	0.1307	0.0742	0.0696
		MSE	0.0255	0.0230	0.0080	0.0090
	M-Turkey	Bias	0.1330	0.1255	0.0777	0.0705
		MSE	0.0266	0.0217	0.0086	0.0091
	LTS	Bias	0.1249	0.1651	0.0681	0.0894
		MSE	0.0290	0.0333	0.0070	0.0102
	LMS	Bias	0.2392	0.2121	0.2529	0.1743
		MSE	0.0761	0.0825	0.0919	0.0394

Source: Calculations based on simulated data

Table (3) Performances of OLS and Robust Methods of Logistic Distribution

Sample Size	Estimation Method		β_0	β_1	β_2	β_3
n = 10	OLS	Bias	0.6008	0.5992	0.6534	0.6685
		MSE	0.5172	0.6685	0.6845	0.7979
	LAV	Bias	0.6979	0.7139	0.8887	0.8093
		MSE	0.8873	0.9214	1.1780	1.0937
	M-Huber	Bias	0.6727	0.5797	0.7264	0.7172
		MSE	0.8082	0.7134	0.8194	0.9156
	M-Turkey	Bias	0.7320	0.6707	0.7471	0.8297
		MSE	0.8665	1.0874	0.8327	1.3582
	LTS	Bias	0.8595	0.5997	0.9042	0.9234
		MSE	1.1525	0.7990	1.1726	1.2751
	LMS	Bias	1.3391	0.7972	1.1474	1.3129
		MSE	2.3115	1.1169	1.4996	2.7096
n = 20	OLS	Bias	0.2985	0.4272	0.4600	0.3331
		MSE	0.1225	0.2685	0.2970	0.1586
	LAV	Bias	0.3014	0.4991	0.4726	0.4228
		MSE	0.1230	0.4735	0.4369	0.2700
	M-Huber	Bias	0.2786	0.4063	0.4641	0.3586
		MSE	0.1150	0.2573	0.3216	0.1796
	M-Turkey	Bias	0.2655	0.4036	0.4596	0.3478
		MSE	0.1071	0.2581	0.3210	0.1744
	LTS	Bias	0.3326	0.5109	0.6293	0.4290
		MSE	0.1207	0.5581	0.5929	0.2601
	LMS	Bias	0.4507	0.6996	1.0963	0.9802
		MSE	0.2784	0.8511	1.6086	1.6227
n =30	OLS	Bias	0.2664	0.2581	0.3643	0.1759
		MSE	0.1078	0.2136	0.1852	0.0522
	LAV	Bias	0.2543	0.3313	0.3976	0.2949
		MSE	0.0914	0.2682	0.1793	0.1186
	M-Huber	Bias	0.2501	0.2630	0.3493	0.1980
		MSE	0.0871	0.2155	0.1685	0.0577
	M-Turkey	Bias	0.2459	0.2625	0.3455	0.1945
		MSE	0.0787	0.2153	0.1732	0.0555
	LTS	Bias	0.2799	0.3272	0.4033	0.4543
		MSE	0.1065	0.1966	0.1945	0.2414
	LMS	Bias	0.5637	0.9437	0.5797	0.3814
		MSE	0.3630	1.1606	0.4564	0.2530
n =50	OLS	Bias	0.1597	0.2760	0.2470	0.3024
		MSE	0.0493	0.1430	0.0891	0.1107
	LAV	Bias	0.2593	0.3333	0.2142	0.2767
		MSE	0.0869	0.1754	0.0626	0.1248
	M-Huber	Bias	0.1625	0.2748	0.2582	0.2643
		MSE	0.0448	0.1357	0.1042	0.0886
	M-Turkey	Bias	0.1554	0.2684	0.2747	0.2420
		MSE	0.0403	0.1312	0.1154	0.0813
	LTS	Bias	0.2061	0.2707	0.2730	0.2834
		MSE	0.0819	0.1287	0.1338	0.1440
	LMS	Bias	0.5312	0.5433	0.6406	0.4673
		MSE	0.3731	0.5662	0.8952	0.3356
n =80	OLS	Bias	0.1427	0.1660	0.2487	0.1713

		MSE	0.0305	0.0381	0.0849	0.0392
	LAV	Bias	0.1856	0.1278	0.2423	0.1935
		MSE	0.0646	0.0230	0.1177	0.0472
	M-Huber	Bias	0.1496	0.1269	0.2279	0.1816
		MSE	0.0329	0.0248	0.0833	0.0421
	M-Turkey	Bias	0.1524	0.1208	0.2276	0.1701
		MSE	0.0328	0.0219	0.0862	0.0384
	LTS	Bias	0.1775	0.1307	0.2478	0.1787
		MSE	0.0520	0.0251	0.1040	0.0510
	LMS	Bias	0.3531	0.2450	0.2971	0.3855
		MSE	0.1638	0.0851	0.1457	0.1698
n =100	OLS	Bias	0.1248	0.1285	0.1792	0.1459
		MSE	0.0185	0.0285	0.0525	0.0304
	LAV	Bias	0.1408	0.0968	0.1893	0.2056
		MSE	0.0289	0.0160	0.0593	0.0569
	M-Huber	Bias	0.1349	0.0985	0.1723	0.1672
		MSE	0.0228	0.0192	0.0559	0.0364
	M-Turkey	Bias	0.1412	0.0949	0.1700	0.1670
		MSE	0.0249	0.0163	0.0568	0.0373
	LTS	Bias	0.1737	0.1063	0.2237	0.2346
		MSE	0.0422	0.0196	0.0996	0.0734
	LMS	Bias	0.3532	0.2339	0.2436	0.3622
		MSE	0.1769	0.0805	0.1291	0.1676

Source: Calculations based on simulated data

Table (4) Performances of OLS and Robust Methods of Exponential Distribution

Sample Size	Estimation Method		β_0	β_1	β_2	β_3
n =10	OLS	Bias	0.8869	0.4223	0.1918	0.2208
		MSE	0.8400	0.3801	0.0503	0.0698
	LAV	Bias	0.8068	0.4030	0.1430	0.1966
		MSE	0.7369	0.3578	0.0402	0.0632
	M-Huber	Bias	0.7993	0.4430	0.1904	0.2118
		MSE	0.6795	0.4550	0.0454	0.0675
	M-Turkey	Bias	0.7601	0.4563	0.2263	0.2151
		MSE	0.6432	0.4974	0.0705	0.0734
	LTS	Bias	0.6763	0.5282	0.2992	0.2817
		MSE	0.5482	0.7216	0.1790	0.2005
	LMS	Bias	0.7246	0.7137	0.3599	0.4490
		MSE	0.6232	0.8143	0.1961	0.3464
n =20	OLS	Bias	0.9875	0.1521	0.2115	0.1170
		MSE	1.0145	0.0323	0.0713	0.0157
	LAV	Bias	0.7316	0.1719	0.1408	0.1462
		MSE	0.6027	0.0533	0.0362	0.0288
	M-Huber	Bias	0.8483	0.1322	0.1651	0.1312
		MSE	0.7599	0.0231	0.0450	0.0207
	M-Turkey	Bias	0.8008	0.1512	0.1453	0.1400
		MSE	0.6883	0.0425	0.0403	0.0273
	LTS	Bias	0.7500	0.2065	0.1719	0.1410
		MSE	0.6225	0.0678	0.0560	0.0298
	LMS	Bias	0.4050	0.1926	0.2943	0.2452
		MSE	0.1790	0.0509	0.1541	0.1608
n =30	OLS	Bias	0.9582	0.1562	0.1160	0.1363
		MSE	0.9524	0.0279	0.0216	0.0311
	LAV	Bias	0.7201	0.1580	0.1097	0.1080
		MSE	0.5627	0.0354	0.0169	0.0189
	M-Huber	Bias	0.8055	0.1222	0.1107	0.1184
		MSE	0.7929	0.0246	0.0208	0.0207
	M-Turkey	Bias	0.7354	0.1253	0.1247	0.0962
		MSE	0.5590	0.0254	0.0232	0.0136
	LTS	Bias	0.7095	0.1063	0.0962	0.1040
		MSE	0.5175	0.0238	0.0126	0.0150
	LMS	Bias	0.4909	0.1890	0.1376	0.1206
		MSE	0.2991	0.0686	0.0308	0.0281
n =50	OLS	Bias	0.9627	0.1069	0.1066	0.1008
		MSE	0.9419	0.0137	0.0165	0.0132

	LAV	Bias	0.6673	0.0875	0.1037	0.0739
		MSE	0.4551	0.0127	0.0142	0.0090
	M-Huber	Bias	0.7972	0.0706	0.0975	0.0903
		MSE	0.6482	0.0073	0.0123	0.0099
	M-Turkey	Bias	0.6945	0.0716	0.1055	0.0732
		MSE	0.4922	0.0081	0.0143	0.0077
	LTS	Bias	0.6937	0.0684	0.1143	0.1075
		MSE	0.4889	0.0068	0.0170	0.0161
	LMS	Bias	0.4415	0.0908	0.0847	0.1069
		MSE	0.2040	0.0117	0.0140	0.0188
n =80	OLS	Bias	0.9860	0.0661	0.0961	0.0642
		MSE	0.9849	0.0060	0.0132	0.0046
	LAV	Bias	0.6673	0.0854	0.0918	0.0806
		MSE	0.4537	0.0134	0.0118	0.0091
	M-Huber	Bias	0.8195	0.0667	0.0769	0.0513
		MSE	0.6854	0.0063	0.0097	0.0030
	M-Turkey	Bias	0.6996	0.0743	0.0823	0.0474
		MSE	0.4996	0.0083	0.0093	0.0037
	LTS	Bias	0.7229	0.0657	0.0987	0.0494
		MSE	0.5319	0.0064	0.0175	0.0035
	LMS	Bias	0.4021	0.0549	0.0550	0.0742
		MSE	0.1784	0.0052	0.0055	0.0101
n =100	OLS	Bias	0.9979	0.0574	0.0942	0.0614
		MSE	1.0088	0.0052	0.0132	0.0061
	LAV	Bias	0.6812	0.0877	0.1129	0.0625
		MSE	0.4737	0.0142	0.0162	0.0055
	M-Huber	Bias	0.8355	0.0667	0.0767	0.0415
		MSE	0.7119	0.0058	0.0097	0.0022
	M-Turkey	Bias	0.7175	0.0704	0.0853	0.0385
		MSE	0.5241	0.0080	0.0102	0.0025
	LTS	Bias	0.7280	0.0683	0.0822	0.0420
		MSE	0.5378	0.0066	0.0118	0.0026
	LMS	Bias	0.4288	0.0730	0.1042	0.0431
		MSE	0.1981	0.0077	0.0156	0.0032

Source: Calculations based on simulated data

Table (5) Performances of OLS and Robust Methods of Cauchy Distribution

Sample Size	Estimation Method		β_0	β_1	β_2	β_3
n = 10	OLS	Bias	2.6781	1.7431	2.8656	2.4600
		MSE	22.0394	8.3795	19.2347	17.3125
	LAV	Bias	0.9250	1.1730	1.2433	1.2245
		MSE	1.3160	2.7178	3.2583	2.4527
	M-Huber	Bias	1.1229	1.0392	1.7524	1.2515
		MSE	2.0275	1.6833	9.6928	2.2957
	M-Turkey	Bias	1.0268	0.7001	1.6003	1.0101
		MSE	1.7355	0.8209	10.472	1.5833
	LTS	Bias	0.9644	0.7875	1.2490	1.2296
		MSE	1.4443	1.0583	3.2550	2.6758
	LMS	Bias	0.7397	0.8135	0.9280	1.2161
		MSE	1.0858	1.2536	1.5602	3.3787
n = 20	OLS	Bias	2.2200	1.7870	1.6756	1.2306
		MSE	8.3993	6.6070	3.9963	3.4722
	LAV	Bias	0.3561	0.2274	0.5412	0.3553
		MSE	0.2330	0.0982	0.4833	0.1745
	M-Huber	Bias	0.3121	0.2656	0.5713	0.3249
		MSE	0.2045	0.1198	0.6117	0.1842
	M-Turkey	Bias	0.3683	0.3388	0.5146	0.3765
		MSE	0.1670	0.1502	0.4428	0.1782
	LTS	Bias	0.3011	0.3056	0.5078	0.2908
		MSE	0.1566	0.1157	0.4263	0.1383
	LMS	Bias	0.3995	0.2609	0.4618	0.4490
		MSE	0.2390	0.1140	0.3158	0.2748
n =30	OLS	Bias	4.3323	5.8791	1.5400	1.5029
		MSE	97.9254	235.9916	5.4072	9.3752
	LAV	Bias	0.2233	0.2265	0.4099	0.1742
		MSE	0.0657	0.0824	0.2798	0.0398

	M-Huber	Bias	0.2551	0.1866	0.5672	0.2752
		MSE	0.0884	0.0459	0.4956	0.1044
	M-Turkey	Bias	0.1766	0.1929	0.5003	0.3177
		MSE	0.0427	0.0554	0.3877	0.1151
	LTS	Bias	0.2158	0.2688	0.6248	0.3137
		MSE	0.0806	0.1131	0.6523	0.1682
	LMS	Bias	0.3576	0.3978	0.5022	0.4450
		MSE	0.2412	0.2607	0.3258	0.3863
n =50	OLS	Bias	2.4380	3.3922	1.2825	2.1126
		MSE	23.9028	67.9288	4.1653	20.6503
	LAV	Bias	0.1430	0.1777	0.2044	0.2255
		MSE	0.0331	0.0488	0.0637	0.0804
	M-Huber	Bias	0.1170	0.1531	0.2824	0.2241
		MSE	0.0227	0.0377	0.1051	0.0967
	M-Turkey	Bias	0.1387	0.1916	0.2494	0.2393
		MSE	0.0314	0.0454	0.0846	0.0848
	LTS	Bias	0.1595	0.2127	0.3489	0.2284
		MSE	0.0418	0.0522	0.1596	0.0937
	LMS	Bias	0.2338	0.2931	0.2854	0.2233
		MSE	0.0738	0.1162	0.1304	0.1053
n =80	OLS	Bias	1.5801	2.3042	1.0224	1.4368
		MSE	8.4181	31.4442	3.7895	7.2829
	LAV	Bias	0.1200	0.1266	0.0915	0.1574
		MSE	0.0197	0.0213	0.0193	0.0388
	M-Huber	Bias	0.1139	0.1350	0.1586	0.1872
		MSE	0.0231	0.0249	0.0342	0.0622
	M-Turkey	Bias	0.1237	0.2073	0.1480	0.2121
		MSE	0.0361	0.0481	0.0401	0.0670
	LTS	Bias	0.1428	0.2518	0.1406	0.2555
		MSE	0.0561	0.0658	0.0374	0.0884
	LMS	Bias	0.3140	0.3346	0.1615	0.1461
		MSE	0.1215	0.1532	0.0465	0.0392
n =100	OLS	Bias	1.5374	2.0641	1.0080	1.0555
		MSE	6.4297	22.3868	2.9185	3.0349
	LAV	Bias	0.1039	0.1206	0.0469	0.1557
		MSE	0.0154	0.0180	0.0073	0.0350
	M-Huber	Bias	0.0824	0.1186	0.1001	0.1559
		MSE	0.0112	0.0188	0.0162	0.0421
	M-Turkey	Bias	0.1182	0.1855	0.1105	0.1698
		MSE	0.0206	0.0421	0.0205	0.0457
	LTS	Bias	0.1355	0.2186	0.1286	0.1704
		MSE	0.0280	0.0627	0.0240	0.0406
	LMS	Bias	0.2323	0.1966	0.1657	0.2029
		MSE	0.0838	0.0522	0.0391	0.0536

Source: Calculations based on simulated data

Table (6) Performances of OLS and Robust Methods of Gamma Distribution

Sample Size	Estimation Method		β_0	β_1	β_2	β_3
n =10	OLS	Bias	2.3935	0.8216	0.6492	0.5599
		MSE	7.3810	1.2113	0.7848	0.4866
	LAV	Bias	2.3062	1.1021	0.6106	0.7862
		MSE	7.3690	2.8982	0.5796	1.0408
	M-Huber	Bias	2.2569	0.8284	0.6746	0.5358
		MSE	6.8373	1.2261	0.8309	0.4439
	M-Turkey	Bias	2.0283	0.9482	0.6500	0.5055
		MSE	5.6560	2.1358	0.7479	0.3862
	LTS	Bias	2.1743	1.0324	0.9422	0.6483
		MSE	6.5913	2.3942	2.3276	0.5631
	LMS	Bias	1.5070	0.8757	0.6243	0.4788
		MSE	2.7178	1.8015	0.4890	0.3060
n =20	OLS	Bias	2.1462	0.3684	0.3527	0.5616
		MSE	4.9348	0.2569	0.2105	0.4424
	LAV	Bias	1.5007	0.4235	0.3415	0.5842
		MSE	2.4972	0.2949	0.2167	0.4840
	M-Huber	Bias	1.9125	0.3363	0.3164	0.4549

		MSE	4.0267	0.2019	0.1985	0.2724
	M-Turkey	Bias	1.7407	0.3463	0.3121	0.4594
		MSE	3.5293	0.2229	0.1919	0.2590
	LTS	Bias	1.8206	0.4639	0.4945	0.5835
		MSE	3.8613	0.3158	0.6900	0.4384
	LMS	Bias	1.0030	0.3097	0.4122	0.5455
		MSE	1.3840	0.1284	0.3720	0.5856
n =30	OLS	Bias	2.0303	0.3283	0.1996	0.4099
		MSE	4.2804	0.1445	0.0567	0.3006
	LAV	Bias	1.4922	0.2176	0.1931	0.3677
		MSE	2.4788	0.0725	0.0701	0.2350
	M-Huber	Bias	1.7707	0.2070	0.1685	0.3525
		MSE	3.2870	0.0587	0.0403	0.1965
	M-Turkey	Bias	1.5254	0.1952	0.1656	0.2685
		MSE	2.5688	0.0571	0.0462	0.1467
	LTS	Bias	1.5158	0.2370	0.2220	0.2505
		MSE	2.3865	0.0768	0.0645	0.1009
	LMS	Bias	1.1215	0.3789	0.3694	0.5825
		MSE	1.7866	0.3366	0.2039	0.5754
n=50	OLS	Bias	1.9751	0.2472	0.1459	0.2949
		MSE	4.0195	0.0927	0.0295	0.1209
	LAV	Bias	1.4359	0.1300	0.1245	0.3035
		MSE	2.2758	0.0249	0.0304	0.1276
	M-Huber	Bias	1.6864	0.1899	0.0695	0.2437
		MSE	2.9755	0.0484	0.0103	0.0785
	M-Turkey	Bias	1.4592	0.1921	0.0731	0.2034
		MSE	2.3139	0.0459	0.0086	0.0483
	LTS	Bias	1.4650	0.1921	0.0969	0.2202
		MSE	2.2362	0.0463	0.0173	0.0793
	LMS	Bias	0.9384	0.1761	0.2219	0.3415
		MSE	1.0656	0.0455	0.0657	0.3257
n =80	OLS	Bias	1.9789	0.1801	0.1203	0.1844
		MSE	3.9942	0.0428	0.0223	0.0474
	LAV	Bias	1.3392	0.1363	0.1095	0.2038
		MSE	1.8845	0.0277	0.0202	0.0717
	M-Huber	Bias	1.6679	0.1108	0.0727	0.1702
		MSE	2.8548	0.0245	0.0174	0.0448
	M-Turkey	Bias	1.4060	0.1706	0.0934	0.1567
		MSE	2.0780	0.0372	0.0183	0.0435
	LTS	Bias	1.4632	0.1718	0.1490	0.1665
		MSE	2.1798	0.0401	0.0340	0.0429
	LMS	Bias	0.8983	0.1404	0.2250	0.1698
		MSE	0.8930	0.0288	0.0967	0.0487
n =100	OLS	Bias	1.9481	0.1523	0.1187	0.1160
		MSE	3.8355	0.0294	0.0225	0.0207
	LAV	Bias	1.2564	0.0945	0.0857	0.1388
		MSE	1.6309	0.0162	0.0115	0.0342
	M-Huber	Bias	1.6520	0.0876	0.0825	0.1111
		MSE	2.7621	0.0117	0.0142	0.0183
	M-Turkey	Bias	1.3776	0.1100	0.0821	0.1111
		MSE	1.9417	0.0149	0.0130	0.0227
	LTS	Bias	1.4092	0.1065	0.1148	0.1262
		MSE	1.9995	0.0141	0.0183	0.0282
	LMS	Bias	0.7951	0.1509	0.1847	0.1000
		MSE	0.6746	0.0380	0.0673	0.0146

Source: Calculations based on simulated data

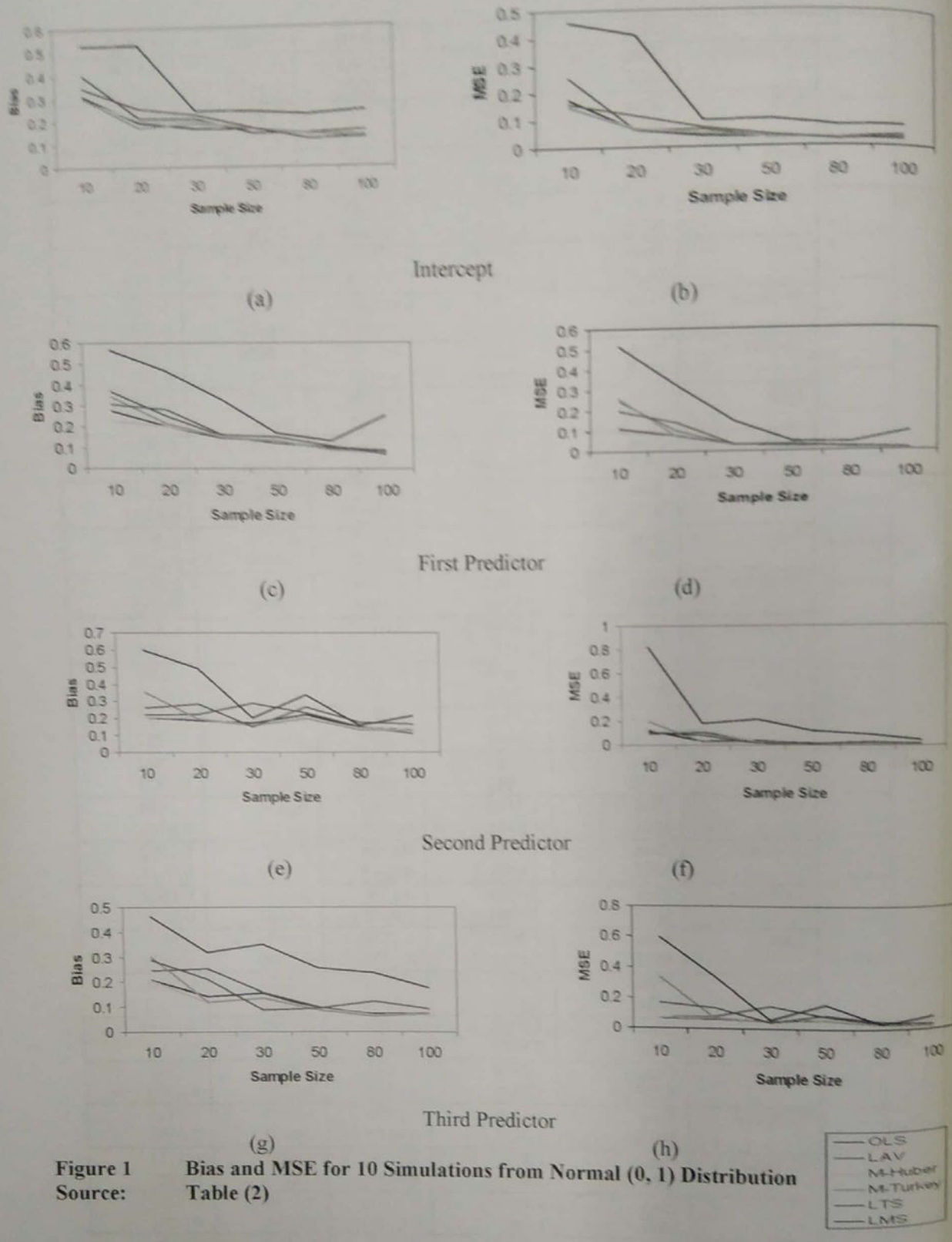


Figure 1 **Bias and MSE for 10 Simulations from Normal (0, 1) Distribution**
Source: **Table (2)**

Source: **Table (2)**

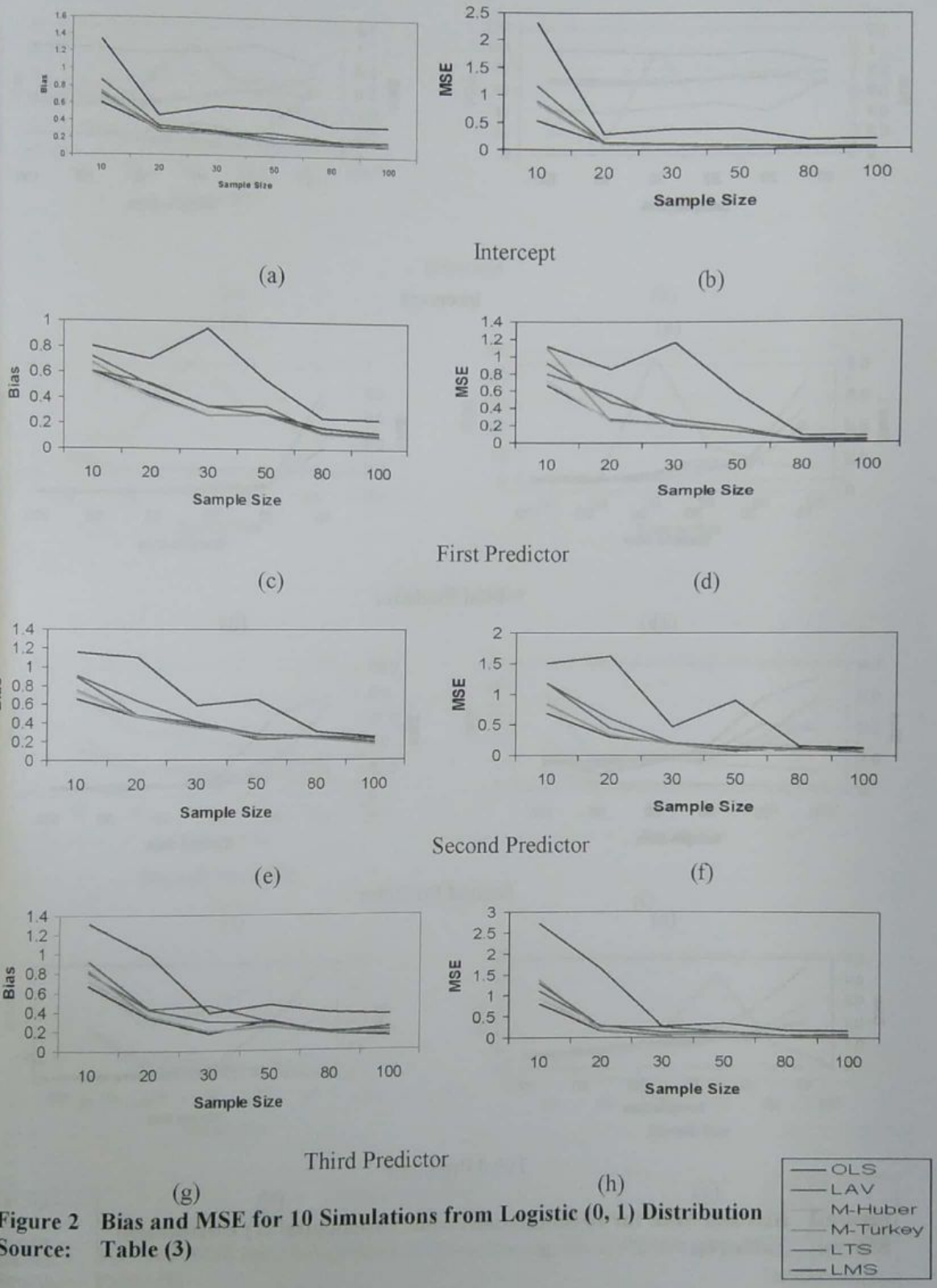


Figure 2 Bias and MSE for 10 Simulations from Logistic (0, 1) Distribution
Source: Table (3)

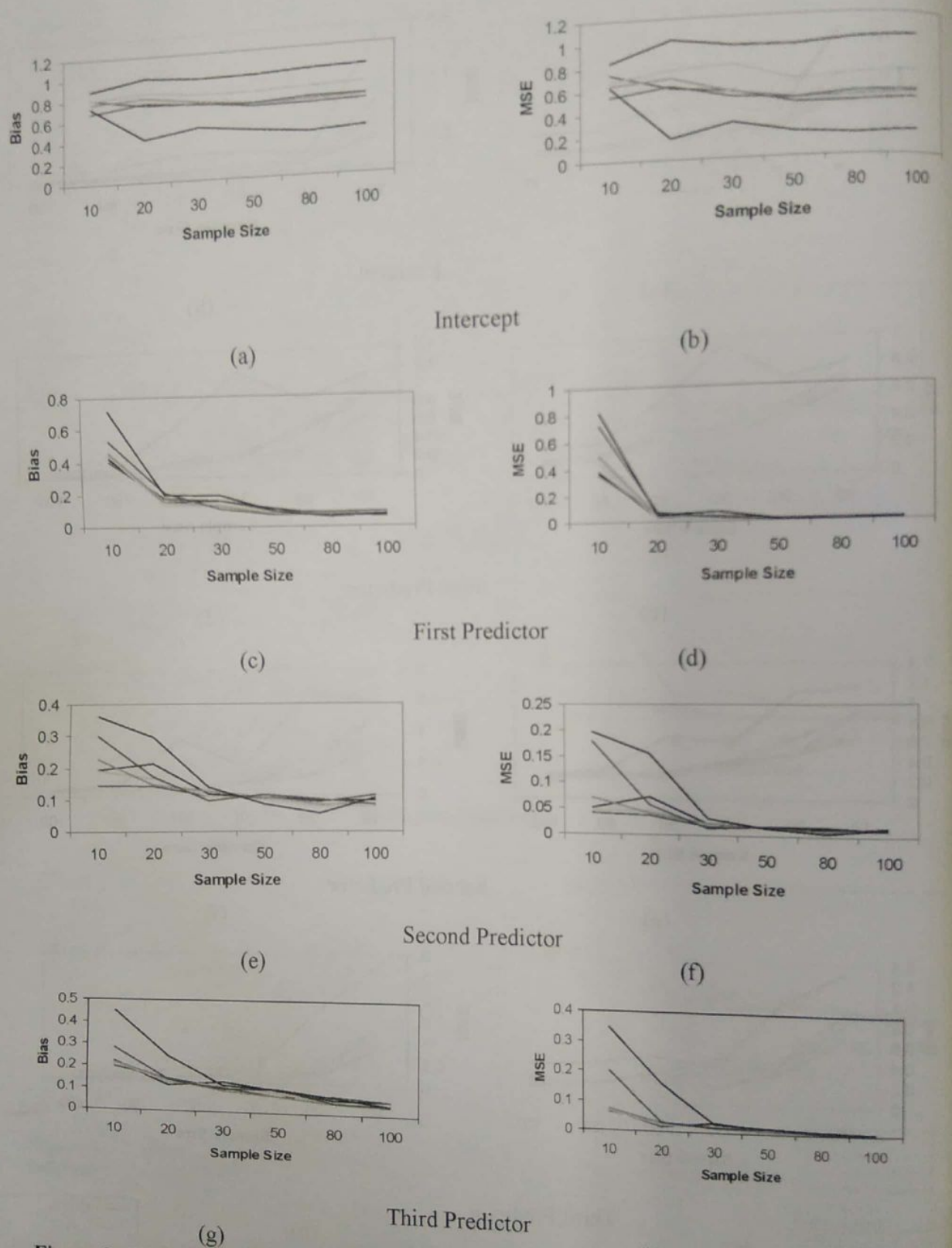


Figure 3 Bias and MSE for 10 Simulations from Exponential (1) Distribution
Source: Table (4)

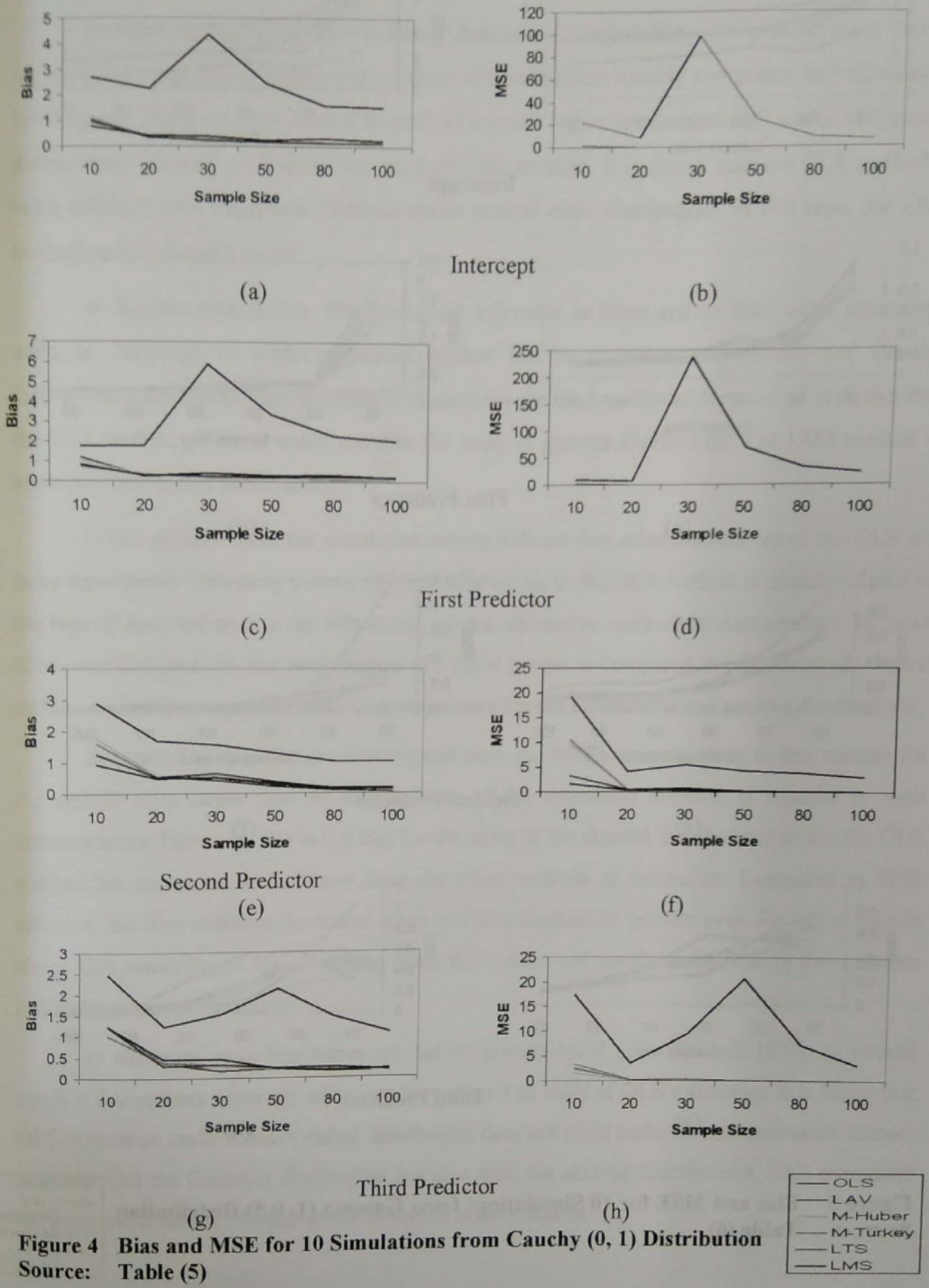
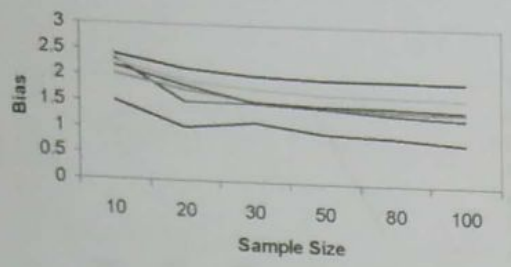
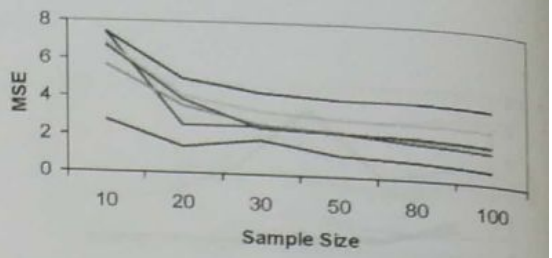


Figure 4 Bias and MSE for 10 Simulations from Cauchy (0, 1) Distribution
Source: Table (5)

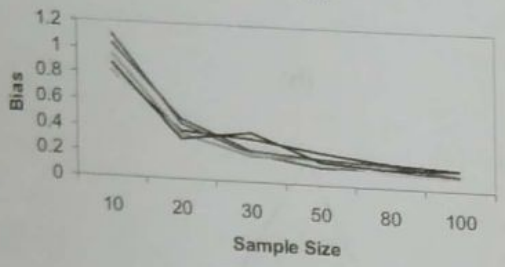


(a)

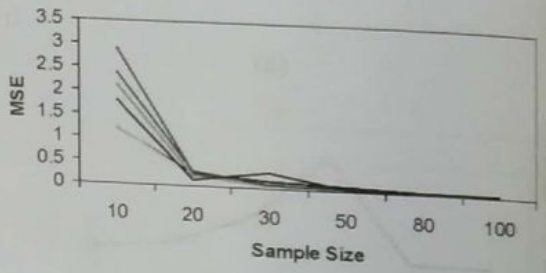


(b)

Intercept

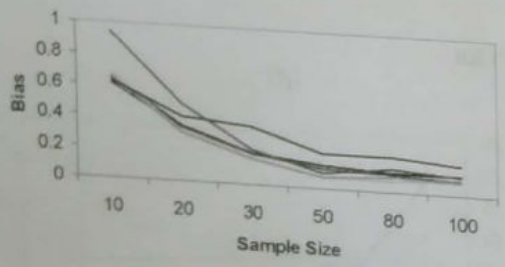


(c)

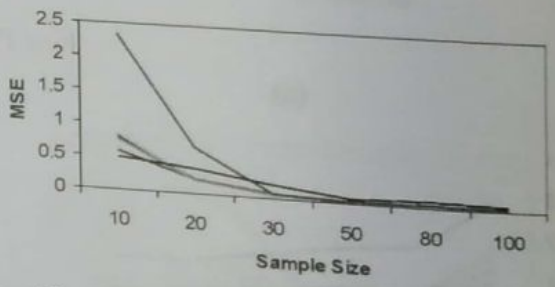


(d)

First Predictor

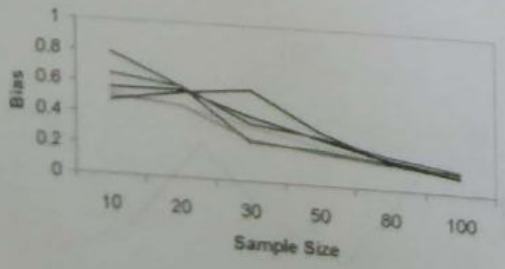


(e)

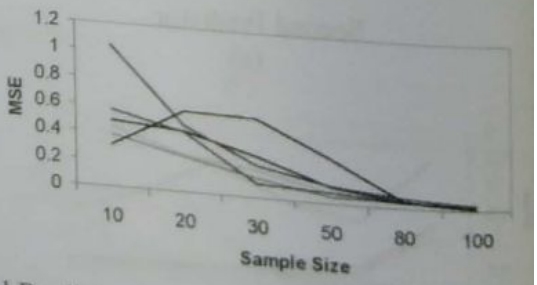


(f)

Second Predictor



(g)



(h)

Third Predictor

Figure 5 **Bias and MSE for 10 Simulations from Gamma (1, 0.5) Distribution**
Source: **Table (6)**

4. Conclusion

In order to study of distribution robustness in regression, the performances of six regression methods for two important classes of distributions namely symmetric and skewed are investigated. Different error structures such as normal, logistic, exponential, Cauchy and gamma distributions are used to find out the most suitable method. It is found that, the OLS method is more efficient than the robust methods under normal error distribution. In this case, the LMS method performs much worst.

In logistic distribution, the Turkey-*M* estimator is more robust than other estimation methods. Although no preferred robust method can be chosen in exponential and Cauchy distributions, the robust methods clearly outperform the OLS method. Moreover, it is shown that the OLS method performs much worst in the study of gamma distribution. The LMS method is more resistant in this distribution.

When outliers exist, the simulation results indicate that other alternatives of the OLS are more appropriate. Selecting a more efficient alternative to the OLS method is closely related to the type of data and so it is suitable to use several alternative methods in data analysis. In cases of skewed distributions, the performance of OLS is poorer as compared to other methods. Based on bias and MSE criteria, the LMS is more suitable for the exponential and gamma distributions.

In symmetric distributions investigated here, the MSEs are very close to one another for the sample sizes larger than 50 and so none of the estimation methods is superior in such circumstances. However, this is not true for the cases of the skewed distributions where the OLS method has shown to be far lower from the other methods of estimation. Compared to MSE criterion, the bias criterion fluctuated more and this fluctuation persists even for larger sample sizes. This instability of biases created some difficulties and confusion in finding the optimum estimation in some situations.

In summing up, when series are outlier contaminated (1%, 5% and 10%), an overall result is that outliers adversely affect the bias as well as MSE of OLS estimators. It is found that OLS estimation under a heavy-tailed distribution does not yield outlier robust estimates. Indeed, not only with the Gaussian distribution but also with the skewed distributions, OLS estimators failure in the presence of small levels of outlier contamination.

Acknowledgement

I'd like to thank to Dr. Tin Win, Rector of Yangon University of Economics, and Dr. Ni Lar Myint Htoo, Pro-rector of Yangon University of Economics, Who gave me a chance to participate in the Journal of Yangon University of Economics.

References

1. Draper, N. R., and H. Smith (1981), Applied *Regression Analysis*, New York: John Wiley.

2. Hampel, F. R., E. M. Ronchetti, P. J. Rousseeuw, and W.A. Stahel (1986), *Robust Statistics, The Approach Based on Influence Functions*, New York: John Wiley and Sons.

3. Huber, P. J. (1964), Robust Estimation of a Location Parameter, Annals *of Mathematical Statistics*, vol. 35(1): 73-101.

4. Huber, P. J. (1973), Robust Regression: Asymptotic, Conjectures and Monte Carlo, *The Annals of Statistics*, vol. 1, 799-821.

5. Huber, P. J. (1981), *Robust Statistics*, New York: John Wiley and Sons.

Experiencing Domestic Violence and Help Seeking Behaviors in Myanmar

Mya Thandar[1] and Hlaing Hlaing Moe[2]

Abstract

At the present time domestic violence is a problem of great magnitude around the world. The prevalence of domestic violence directly and indirectly affects health, livelihoods and opportunities of women in worldwide. The vast majority of violence against women is committed not only by a stranger but also by an intimate partner. One of the most pervasive forms of violence against women is intimate partner violence which is committed by a current or former intimate partner or husband, whether cohabitating or not. Since violence against women occurs in all societies, within the home or in the wider community and it affects women and girls disproportionately. This study endeavors to fill the gap by comprehensively analyzing how socioeconomic and demographic characteristics shape three aspects of domestic violence: experiencing physical, emotional and sexual violence. The study also highlights the relationship between the domestic violence and help seeking behaviors of women who are experienced the domestic violence. Data for ever women age (15-49) from the 2015-2016 Myanmar Demographic and Health Survey (MDHS) are analyzed using logistic regression analysis. This study shows that emotional and physical violence are associated with women's education, wealth quintile, having children, States/Regions, husband's education, and woman afraid of husband. Women's experience sexual violence is related to States/Regions, residence, age difference and woman afraid of husband. Helping seeking behavior is correlated with types of violence, women's age, wealth quintile, education, States/Regions, and residence. The results of this study could contribute to the government's efforts to mainstream the gender dimension into the country's development policies and programs.

Keywords: domestic violence, help seeking, logistic regression

1. Introduction

1.1 Rationale of the Study

Domestic violence is use of physical force or power, threatened or actual, against oneself, another person, or against a group or community that either results in or has a high likelihood of resulting in injury or death. It is defined as domestic abuse, spousal abuse, battering family violence, and intimate partner violence on the women. The second-wave women's movement occurring at the end of the 1960s is onset of awareness-raising and the public discourse on male violence against women within society. Therefore, the United Nations recognized the violence against women as the society phenomenon with the declaration on the elimination of violence against women in 1994. Although, enormous efforts have been made to overcome violence against women, worldwide studies have shown that domestic violence against women still exists as a human right issue.

[1] Professor, Department of Statistics, Yangon University of Economics
[2] Lecturer, Department of Statistics, Yangon University of Economics

Domestic violence is not a new phenomenon and has been prevalent in both the west and east for a long time. According to the worldwide statistical records, 10% to 70% of all women have reported being physically assaulted by an intimate partner at some point in their lives, and intimate partners commit 40% to 70% of fetishism (Bloom, 2008 and WHO, 2005). More than 35% of the murders of women are committed by intimate partners (WHO, 2013). The 2010 Euro-Barometer study indicated that one in every four European women have experienced domestic violence (European Commission, 2010). Violence affects the lives of women worldwide, over long time periods and in many forms. In most countries, between 20% and 36% of women are physically or sexually assaulted and between 40% and 75% of women are psychologically assaulted by their husbands or other intimate male partners (Smith, 1987; Straus and Sweet, 1992 and Jewkews et al., 2002).

Today, all over the world, governments, non-government and international organizations are trying to collaborate to come out with appropriate ways to handle these burning issues. It cuts across ethnic, class, culture and impedes the rights of women to fully participant in society (United Nations, 1996). Like other countries, in Myanmar embedded by social problem and it's considered normal personal and family matter which outsiders should not intervene. Thus, it has to evaluate the public awareness to those who suffer the domestic violence and perpetrators who commit it.

Until recently, domestic violence was considered largely a private matter and hidden as a shameful secret. However, in 1996, the Myanmar government created a national committee called the 'Myanmar National Committee for Women's Affairs (MNCWA). The Government released the national Strategic Plan for Advancement of Women 2013-2022. This ten-year plan covers 12 priority areas, which correspond to the Beijing Platform for action, and the principles of the Convention on Elimination of All forms of Discrimination against Women (CEDAW), to which Myanmar became a signatory in 1997. Therefore, Myanmar is obligated to take all appropriate measures to eliminate discrimination against women. In many Asia countries, culture plays an important role in growing the philosophy of harmony (Huisman, 1996).

According to the 2014 Myanmar Population and Housing Census, a total population of Myanmar is 51.4 million and 52% is women. More than 70% of total population is residing in rural areas. Among female population proportion of women at 15 to 49 ages is 51.5 percent. In Myanmar family, man is always the leader and woman is dependent. Men think to be a brave and dominant person while woman thinks to be gentle and polite to perform the household duties and to be strictly faithful to her husband. Because of these grounds most of Myanmar women do not dispute with their husbands. Normally, women do not express their feelings even if they faced with physical or emotional or sexual violence. According to Myanmar tradition, women always hesitate to go the court for many reasons. Some of that reasons are that Myanmar women are very kind, patient, polite, love their family and more likely kept silent due to considered it as part of family life, show of love and economic dependency on the husband. In addition, Myanmar women do not want to live as a divorce and to become their children as a fatherless child. However, Myanmar's women are experiencing incidence of domestic violence; there is no precise law to cure that form of violence.

1.2 Objectives of the Study

This study mainly aims to examine domestic violence among ever married women and their help seeking behaviors in Myanmar. The specific objectives of this study are

(i) To examine the extent of domestic violence against ever married women
(ii) To investigate demographic, economic and social factors which can explain the domestic violence against ever married women and
(iii) To investigate the help seeking behaviors of ever married women when they experience the domestic violence.

1.3 Scope and Limitations of the Study

This study focuses on the determinants of domestic violence against ever married women aged 15-49 years in Myanmar and their help seeking behaviors based on the secondary data for the 2014-2015 Myanmar Demographic and Health Survey (MDHS). Only three dimensions of domestic violence such as physical, sexual and emotional violence committed by their husband are considered in this study.

1.4 Method of Study

To achieve the objectives of the study, Binary Logistic Regression analysis is applied to investigate the determinants of physical, sexual and emotional violence. The extent of domestic violence against ever married women is obtained based on 3 dimensions of domestic violence. In addition, the help seeking behaviors of ever married women when they experience the domestic violence is explored using Binary Logistic Regression analysis.

2. Data and Methods

2.1 Data

In analyzing domestic violence, a wide variety of political, demographic, social, and economic determinants can be used. Moreover, domestic violence can be explored at the national, community, and household levels. In this study, emphasis is made on women's domestic violence at the national level in a household-based analysis that considers only demographic, social and economic aspects.

The analysis uses datasets from the newly available national 2015-16 Myanmar Demographic and Health Survey (MDHS), which collected data for multiple indicators of demographic and health information (Ministry of Health and Sports and ICF 2017). The data analysis of this study focuses only on ever married women aged 15-49. Although data on 12,885 women are available from the 2015-16 MDHS, this study was limited to 3425 ever married women age 15-49 who have experienced domestic violence. To obtain nationally representative estimates, sampling weight was applied and the final weighted samples included only 3059 ever married women age 15-49 who have experienced domestic violence were considered.

2.2 Key Variables and Measurements

Appendix-Table 1 shows the identification and measurement of dependent and independent variables considered for fitting four models in this study.

2.3 Logistic Regression

Logistic regression is used in many fields such as business and finance, engineering, marketing, economics, and medicine. Logistic regression deals with relationships among variables, with one variable being the dependent (outcome or response) variable and the others the independent (predictor or explanatory) variables. The independent variables can be continuous or categorical in nature. Logistic regression revolves around a core concept called the odds ratio. The goal of logistic regression is to predict the category of outcome for individual cases using the most parsimonious model. It uses the prediction of group membership and measures the associations and strengths among the variables.

The dependent variable in logistic regression is dichotomous—that is, the dependent variable can take the value 1 with a probability of success, $P(Y=1) = p_i$, or the value 0 with a probability of failure, $P(Y=0) = 1 - p_i$. This type is called a Bernoulli or binary variable. The applications of logistic regression have been extended to cases where the dependent variable is more than two cases, known as multinomial logistic regression.

The binary logistic regression model is

$$Y_i = E(Y_i \mid X_i) + \varepsilon_i \tag{1}$$

where $$E(Y_i \mid X_i) = p_i = \frac{1}{1 + e^{-(\beta_0 + \beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_i X_i)}} \tag{2}$$

β_0 = the constant of the equation

β_i = the coefficient of the predictor variable i

ε_i = the error term

p_i = probability of success

$1 - p_i$ = probability of failure

$$\text{Odds ratio} = \frac{p_i}{1 - p_i} \tag{3}$$

Taking the natural log of equation (3)

$$L_i = \ln\left(\frac{p_i}{1 - p_i}\right) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_i X_i \tag{4}$$

3. Results

3.1 Descriptive Analysis

Information on characteristics of women and their husbands included in the study, as well as descriptive statistics on women who have ever experienced physical, emotional or sexual violence committed by their husbands are presented in Appendix-Table 2. It is found that the percentage of experiencing physical and emotional violence by women's and husband's background characteristics are not appreciably different but the percentage of experiencing sexual violence are significantly lower than physical and emotional violence.

Among ever married women, the percentage of experiencing any one type, any two and all three types of domestic violence are 12%, 7% and 2% respectively. However, 79% of the ever married women have no experience of domestic violence (Table 1).

Table 1: Percentage of ever-married women who experienced physical or emotional or sexual violence by husband

Experiencing domestic violence	Percent
No experienced	79
Any one type	12
Any two types	7
All three types	2

Source: MDHS (2017)

When women have experienced physical, emotional or sexual violence committed by anyone, they have sought help to stop the violence but some of them have never told anyone about the violence. Table 2 describes the help seeking behaviours of women experiencing domestic violence. About 30% of women sought help from any source when they experience domestic violence while about 70% of the women did not seek any help. The percentages of seeking help for physical and sexual violence are similar on the other hand that of emotional violence is slightly lower. Percentage of seeking help from women's own family and neighbors are apparently higher than those form husband's family and other sources.

Table 2: Percent distribution of ever-married women age 15-49 who have experienced domestic violence sought help by sources

Help seeking behavior		Types of violence		
		Physical	Emotional	Sexual
Did not seek help		71.6	68.3	71.6
Source	Seek help	28.4	31.7	28.4
	Own family	12.3	13.1	9.2
	Husband's family	4.2	3.9	2.3
	Neighbors	8.9	10.8	12.9
	Others (Social service organization, friend, police, religious, lawyer, doctor)	3.0	3.9	4.0

Source: MDHS (2017)

3.2 Multivariate Analysis

3.2.1 Model 1

Binary logistic regression model was performed on ever-married women who have experienced physical violence. The summary results are shown in Appendix-Table 3. Number of living children (5 children or more), husband's education level, number of reasons for wife beating is justified (1-2), woman's father beat her mother and woman afraid of husband are statistically significant and have a positive association with experiencing physical violence. In contrast, women's education level (secondary), States/Regions (Bago, Mandalay, Kayah, Chin and Shan) and spousal education difference are statistically significant and have a negative association with experiencing physical violence.

3.2.2 Model 2

Binary logistic regression model was performed on ever-married women who have experienced emotional violence. The summary results are shown in Appendix-Table 3. Number of living children, husband's education level, alcohol consumption (often drunk), and number of reasons for wife beating is justified (1-2), woman's father beat her mother and woman afraid of husband are statistically significant and have a positive association with experiencing emotional violence. In contrast, women's education level, wealth quintile (middle), residence, States/Regions (Bago, Yangon and Shan) and spousal age difference (wife is 1-4 years, wife is 5-9 years and wife is 10 or more younger) are statistically significant and have a negative association with experiencing emotional violence.

3.2.3 Model 3

Binary logistic regression model was performed on ever-married women who have experienced sexual violence. The summary results are shown in Appendix-Table 3. States/Region (Tanintharyi, Kayah and Rakhine) and woman afraid of husband are statistically significant and have a positive association with experiencing sexual violence. In contrast, residence and spousal age difference (wife is same age) are statistically significant and have a negative association with experiencing sexual violence.

3.2.4 Model 4

Binary logistic regression model was performed on help-seeking behavior women who have ever experienced physical, emotional and sexual violence. The summary results are shown in Appendix-Table 4. Women's age, States/Regions (Mandalay, Yangon and Kayin), women's educational level (secondary) and women who have experienced emotional violence are statistically significant and have a positive association with their help-seeking behavior. In contrast, women's wealth quintile, and residence are statistically significant and have a negative association with their help-seeking behavior.

4. Discussions and Conclusions

Domestic violence is a violation of basic human rights and has documental adverse health, demographic, and economic consequences for women, children and societies. Domestic violence is abroad term that includes different types of violence such as spouse battering, child abuse, elderly abuse, domestic abuse, intimate partner violence and violence against women (McCue, 2008). In recent years, domestic violence has been one of the burning issues in Myanmar. It is evident that gender equality is important for economic growth, poverty reduction, and enhanced human well-being of a country. It is essential to analyze the determinants of domestic violence to inform policies for national development. Thus, this study explored the women background factors and their husband's factors related to domestic violence and help seeking behaviors when experiencing domestic violence in Myanmar.

The investigation of this study revealed the following points:

(i) Women who are educated, in a high wealth quintile, and whose husbands have a higher level of education show the decreasing experience of physical and emotional violence.

(ii) Women with having children tend to increase in experiencing physical and emotional violence than women without any children. Women who afraid their husband sometimes or most of the time tend to increase in experiencing physical and emotional violence than those who never afraid their husband.

(iii) Women who are residing in rural area tend to decrease experiencing sexual violence but women who afraid their husband tend to increase experiencing sexual violence.

(iv) Women's age, education, States/Region, and experiencing emotional violence tend to increase their help seeking behavior whereas women in high wealth quintiles and residing in rural areas tend to decrease their help seeking behavior.

Based on the findings of this study, the key areas of policy priority are:

- Protecting of rights of women
- Increasing the quality of life of women
- Continuing to eliminate gender differences
- Developing community awareness
- Removing hesitation to seek help due to tradition and custom
- Founding counseling centre and support centre
- Implementing a suitable law which can protect for the abused victim women

This study has limitation to determine causality because it used cross-sectional study design. This might induce social desirability bias during self-reporting of the domestic violence because of cultural barrier for disclosure sensitive and family secrets.

To sum up, spousal violence can be caused by many factors such as emotion factors, economic conditions, social and cultural behaviors and so on. The effects of spousal violence are immense and it affects every area of life. The victims will suffer from physical, psychological, sexual, or financial problems. Occasionally, such violence results in the victim death which may be caused by suicide. It also causes great harm to society as a whole. Furthermore, such violence may continue for a long period of time after it begins.

Therefore, it is required to pay attention to prevent spousal violence. There are two main pillars such as legal protection and social policies relating to the prevention of the spousal violence. If the law is not enforced effectively and the response of police does not address the problem of spousal violence, that weaker spouse or the victim will continue to be violated and

Straus, M.A. and Sweet, S. (1992), Verbal/Symbolic Aggression in Couples: Incidence Rates and Relationships Personal Characteristics. *Journal of Marriage and the Family*, 54, 346-357.

United Nations (1996), *Report of the Fourth World Conference on Women*. New York: United Nations.

United Nations (2010), *Report on Violence against Women Violence against Women: A Global Phenomenon*. Pre Release: United Nations.

Wayak Pambè, M., B. Gnoumou/Thiombiano, and I. Kaboré. (2014), Relationship between Women's Socioeconom Status and Empowerment in Burkina Faso: A Focus on Participation in Decision-making and Experien of Domestic Violence. *African Population Studies*, 28 (2). Available from: http://aps.journals.a .za/pub/article/view/ 563/463.

WHO (2005), *Multi-country Study on Women's Health and Domestic Violence Against Women*, Geneva: Wor Health Organization.

WHO (2013), Violence against Women: A Global Health Problem of Epidemic Proportions, Available fro http://www.who.int>releases>2013.

Wooldridge, J. M. (2013), *Introductory Econometrics: A Modern Approach*, 5th edition, South-Western: Cengag Learning.

Appendix

Table 1: Identification of dependent and independent variables

Dependent Variables	Independent Variables	
Model (1) Experienced physical violence Y=1 if woman experiences physical violence Y=0 if woman does not experience physical violence	Women's age X_1 = 1 if 15-24 years = 2 if 25-39 years = 3 if 40-49 years Marital status X_2 = 1 if divorced, separated and widowed = 2 if married No. of living children X_3 = 1 if no children = 2 if 1 and 2 children = 3 if 3 and 4 children = 4 if 5 children or more	Women's educational level X_7 = 1 if no education = 2 if primary = 3 if secondary = 4 if higher Residence X_8 = 1 if urban = 2 if rural Men's educational level X_9 = 1 if no education = 2 if primary = 3 if secondary = 4 if higher
Model (2) Experienced emotional violence Y=1 if woman experiences emotional violence Y=0 if woman does not experience emotional violence	Women's employment X_4 = 1 if unemployed for cash = 2 if unemployed not for cash = 3 if not employed Wealth quintile X_5 = 1 if poorer and poor = 2 if middle = 3 if richer and richest States/ Regions X_6 = 1 if Nay Pyi Taw =2 if Sagaing =3 if Tanintharyi	Husband's alcohol consumption X_{10} = 1 if does not drink alcohol and drink alcohol but is never drunk = 2 if sometimes drunk = 3 if often drunk Spousal education difference X_{11} = 1 if wife has more education =2 if both have equal education = 3 if husband has more education Spousal age difference X_{12} = 1 if wife older = 2 if wife is same age = 3 if wife 1-4 years younger

Model (3) Experienced sexual violence Y=1 if woman experiences sexual violence Y=0 if woman does not experience sexual violence	=4 if Bago =5 if Magway =6 if Mandalay =7 if Yangon =8 if Ayeyarwady =9 if Kachin =10 if Kayah =11 if Kayin =12 if Chin =13 if Mon =14 if Rakhine =15 if Shan	= 4 if wife 5-9 years younger = 5 if wife 10 or more years younger No. of reasons for wife beating is justified X_{13} = 1 if 0 = 2 if 1-2 = 3 if 3-4 = 4 if 5 Woman's father beat her mother X_{14} = 1 if no and don't know = 2 if yes Woman afraid of husband X_{15} = 1 if never afraid = 2 if sometimes afraid = 3 if afraid most of the time
Model (4) Experienced sexual violence Y=1 if woman sought help when experiencing violence Y= 0 if woman did not seek any help	X_1 = 1 if 15-19 years = 2 if 20-24 years = 3 if 25-29 years = 4 if 30-39 years = 5 if 40-49 years X_2 to X_9 are defined as in Model 1to 3. X_{16} = 1 if woman does not experience physical violence = 2 if woman experiences physical violence	X_{17} = 1 if woman does not experience emotional violence = 2 if woman experience emotional violence X_{18} = 1 if woman does not experience sexual violence = 2 if woman experience sexual violence

Table 2: Percent distribution of ever-married women age 15-49 who have experienced domestic violence by woman's characteristics and husband's characteristics

	Physical violence	Emotional violence	Sexual violence
Women's age			
15-24 years	38.2	31.1	8.7
25-39 years	31.6	29.1	5.1
40-49 years	14.6	13.4	3.5
Marital status			
Divorced, separated and widowed	30.8	36.7	8.5
Married	13.7	10.9	2.3
No. of living children			
no children	16.5	14.0	2.6
1 and 2 children	13.8	12.7	2.7
3 and 4 children	15.1	12.0	2.8
5 children or more	24.7	22.5	5.9
Women's employment			
Employed for cash	16.2	14.7	3.1
Unemployed not for cash	16.5	15.0	1.5
Not employed	13.4	10.4	3.0
Wealth quintile			
Poorer and poor	39.9	33.4	7.7
Middle	14.7	11.5	3.9
Richer and richest	21.2	22.0	2.9
States/ Regions			
Nay Pyi Taw	20.4	16.6	1.4
Sagaing	19.4	16.3	3.5
Tanintharyi	28.7	27.7	11.1
Bago	15.1	10.4	1.2
Magway	21.2	13.0	2.5
Mandalay	7.1	8.6	0.3
Yangon	9.3	6.2	0.9

Ayeyarwady	16.0	13.3	3.0
Kachin	24.4	17.1	2.2
Kayah	12.7	25.3	10.9
Kayin	18.7	22.5	3.7
Chin	10.7	14.3	2.2
Mon	12.8	19.5	3.6
Rakhine	31.3	25.1	11.5
Shan	7.7	12.9	3.1
Women's educational level			
No education	17.1	17.4	3.9
Primary	16.5	13.1	3.1
Secondary	14.9	13.5	2.8
Higher	6.8	8.6	1.0
Residence			
Urban	13.6	13.7	3.2
Rural	16.0	13.5	2.9
Men's educational level			
No education	14.9	15.4	4.0
Primary	16.5	13.7	3.1
Secondary	15.3	13.3	3.0
Higher	8.9	10.5	0.1
Husband's alcohol consumption			
Does not drink alcohol and drinks alcohol but is			
Never drunk	25.6	28.6	3.6
Sometimes drunk	15.9	13.4	2.8
Often drunk	38.3	39.8	8.6
Spousal education difference			
Wife has more education	14.5	13.2	2.7
Both have equal education	14.8	11.4	2.0
Husband has more education	16.2	14.4	3.4
Spousal age difference			
Wife older	9.9	10.7	2.4
Wife is same age	15.1	12.5	1.4
Wife 1-4 years younger	14.5	11.4	2.1
Wife 5-9 years younger	14.6	9.4	3.0
Wife 10 or more years younger	15.5	10.9	2.9
No. of reasons for wife beating is justified			
0	13.1	11.8	2.3
1-2	18.0	16.2	3.7
3-4	16.0	11.5	3.3
5 and above	19.7	16.4	3.2
Woman's father beat her mother			
No and don't know	32.9	29.7	7.8
Yes	27.4	24.2	5.8
Woman afraid of husband			
Never afraid	9.7	8.4	1.4
Sometimes afraid	27.2	22.4	4.9
Afraid most of the time	63.8	67.8	23.2

Note: Missing data on women's education for 3 cases, on husbands' education for 69 cases, on women afraid of their husband.

Source: MDHS (2017)

Table 3: Summary results of logistic regression among ever-married women age 15-49 experiencing physical, emotional and sexual violence

	Model (1) Experienced physical violence	Model (2) Experienced emotional violence	Model (3) Experienced sexual violence
Independent variables	Odds ratio (95% CI)	Odds ratio (95% CI)	Odds ratio (95% CI)
Constant	0.24** (0.06-0.96)	0.17** (0.04-0.71)	0.002*** (0.00004-0.09)
Women's age			
15-24 years	1	1	1
25-39 years	0.82 (0.49-1.37)	0.83 (0.48-1.44)	1.81 (0.44-7.42)
40-49 years	0.44 (0.23-0.86)	0.63 (0.33-1.20)	1.33 (0.23-7.52)
No. of living children			
no children	1	1	1
1 and 2 children	1.16 (0.58-2.31)	2.27** (1.07-4.84)	1.59 (0.46-5.56)
3 and 4 children	1.32 (0.64-2.75)	2.57** (1.18-5.62)	2.22 (0.51-9.67)
5 children or more	3.10** (1.16-8.28)	4.00*** (1.46-10.99)	1.64 (0.26-10.46)
Women's employment			
Employed for cash	1	1	1
Unemployed not for cash	0.63 (0.31-1.30)	1.02 (0.55-1.90)	0.56 (0.10-3.06)
Not employed	0.77 (0.51-1.15)	0.76 (0.48-1.20)	0.78 (0.38-1.57)
Wealth quintile			
Poorer and poor	1	1	1
Middle	0.75 (0.44-1.28)	0.56** (0.32-0.99)	1.17 (0.39-3.5)
Richer and richest	0.79 (0.49-1.26)	0.76 (0.48-1.22)	0.81 (0.32-2.06)
States/ Regions			
Nay Pyi Taw	1	1	1
Sagaing	0.89 (0.40-1.95)	1 (0.5-1.98)	1.36 (0.09-21.62)
Tanintharyi	1.58 (0.67-3.69)	1.86 (0.8-4.32)	16.33** (1.6-166.88)
Bago	0.46** (0.23-0.94)	0.30*** (0.14-0.63)	0.74 (0.59-9.24)
Magway	0.84 (0.38-1.87)	0.76 (0.31-1.82)	2.50 (0.2-32.15)
Mandalay	0.27*** (0.10-0.74)	0.55 (0.24-1.26)	0.6 (0.05-7.3)
Yangon	0.55 (0.26-1.16)	0.25*** (0.09-0.71)	1.55 (0.1-23.86)
Ayeyarwady	0.62 (0.29-1.30)	0.70 (0.31-1.56)	4.33 (0.39-47.55)
Kachin	1.27 (0.58-2.79)	0.84 (0.36-1.99)	4.55 (0.38-54.11)
Kayah	0.23*** (0.10-0.51)	1.17 (0.58-2.36)	9.31* (0.9-96.61)
Kayin	0.61 (0.29-1.30)	1.25 (0.57-2.72)	3.33 (0.28-39.24)
Chin	0.36* (0.13-1.04)	0.62 (0.23-1.66)	6.33 (0.52-77.46)
Mon	0.55 (0.25-1.21)	1.61 (0.7-3.69)	6.31 (0.46-86.07)
Rakhine	1.08 (0.53-2.32)	1.58 (0.69-3.60)	19.79** (2-194.97)
Shan	0.28** (0.09-0.92)	0.39* (0.14-1.09)	0.83 (0.02-28.79)

Women's educational level			
No education	1	1	1
Primary	0.79 (0.42-1.46)	0.61* (0.33-1.12)	0.98 (0.33-2.95)
Secondary	0.46* (0.2-1.05)	0.42* (0.15-1.2)	0.9 (0.14-5.68)
Higher	0.44 (0.13-1.50)	0.20* (0.04-1.09)	0.07 (0.002-2.24)
Residence			
Urban	1	1	1
Rural	0.94 (0.59-1.51)	0.51 (0.32-0.82)	0.44* (0.17-1.11)
Men's educational level			
No education	1	1	1
Primary	2.22** (1.17-4.2)	3.37*** (1.57-7.22)	1.46 (0.37-5.72)
Secondary	3.45*** (1.59-7.51)	4.52*** (1.48-13.80)	1.38 (0.2-9.73)
Higher	3.79* (0.95-15.13)	7.64** (1.21-48.1)	0.28 (0.01-9.09)
Husband's alcohol consumption			
Does not drink alcohol and drinks alcohol but is Never drunk	1	1	1
Sometimes drunk	0.89 (0.39-2.05)	0.80 (0.32-2.00)	1.08 (0.22-5.3)
Often drunk	1.86 (0.77-4.48)	2.46* (0.98-6.15)	2.02 (0.42-9.72)
Spousal education difference			
Wife has more education	1	1	1
Both have equal education	0.54** (0.33-0.89)	0.64 (0.35-1.18)	1.64 (0.4-6.75)
Husband has more education	0.35*** (0.18-0.69)	0.49 (0.18-1.31)	1.29 (0.15-11.07)
Spousal age difference			
Wife older	1	1	1
Wife is same age	1.68 (1.06-2.25)	1.34 (0.68-2.64)	0.09** (0.01-0.7)
Wife 1-4 years younger	1.04 (0.6-1.8)	0.63* (0.37-1.07)	0.44 (0.16-1.21)
Wife 5-9 years younger	1.29 (0.72-2.29)	0.59* (0.33-1.05)	0.94 (0.33-2.65)
Wife 10 or more years younger	0.95 (0.47-1.91)	0.53* 90.27-1.03)	0.72 (0.26-1.96)
No. of reasons for wife beating is justified			
0	1	1	1
1-2	1.54** (0.88-3.21)	1.41* (0.94-2.1)	1.83 (0.87-3.89)
3-4	1.26 (0.69-2.27)	0.99 (0.59-1.67)	3.28 (1.14-9.41)
5	0.22 (0.05-0.91)	0.92 (0.28-2.95)	1.42 (0.26-6.76)
Woman's father beats her mother			
No and don't know	1	1	1
Yes	1.84*** (1.22-2.77)	1.46* (0.95-2.25)	1.38 (0.66-2.88)
Woman afraid of husband			
Never afraid	1	1	1
Sometimes afraid	2.89*** (2.07-4.03)	2.84*** (1.88-4.29)	2.66** (1.12-6.33)
Afraid most of the time	26.34*** (10.39-66.81)	29.57*** (11.4-76.7)	21.4*** (8.39-54.61)

Note: ***, **, * represent 1%, 5% and 10% level of significance, respectively.
Results for marital status are omitted because of multicollinearity.
Source: MDHS (2017)

Table 4: Summary results of logistic regression among ever-married women age 15-49 experiencing physical, emotional or sexual violence according to their help-seeking behavior

Independent variables	Women's help-seeking behavior	
	Odds ratio	95% CI
Constant	0.05***	0.01-0.31
Women's age		
15-19 years	1	
20-24 years	5.99**	1.24-28.99
25-29 years	3.50*	0.77-15.97
30-39 years	5.68**	1.35-23.93
40-49 years	3.38*	0.80-14.23
Marital status		
Divorced, separated and widowed	1	
Married	0.73	0.39-1.38
No. of living children		
no children	1	
1 and 2 children	1.63	0.73-3.63
3 and 4 children	1.55	0.67-3.59
5 children or more	1.55	0.53-4.57
Women's employment		
Employed for cash	1	
Unemployed not for cash	0.61	0.23-1.61
Not employed	0.84	0.49-1.44
Wealth quintile		
Poorer and poor	1	
Middle	0.56*	0.31-1.02
Richer and richest	0.33***	0.16-0.68
States/ Regions		
Nay Pyi Taw	1	
Sagaing	1.55	0.64-3.7
Tanintharyi	1.21	0.51-2.85
Bago	0.84	0.31-2.32
Magway	1.47	0.64-3.42
Mandalay	3.07**	1.07-8.84
Yangon	5.03***	1.48-17.07
Ayeyarwady	0.88	0.40-1.96
Kachin	1.14	0.49-2.68
Kayah	2.14	0.81-5.68
Kayin	3.51***	1.44-8.55
Chin	1.34	0.48-3.74
Mon	1.48	0.47-4.60
Rakhine	0.49	0.18-1.33
Shan	1.13	0.40-3.23
Women's educational level		
No education	1	
Primary	1.71	0.83-3.54
Secondary	2.79**	1.26-6.19
Higher	0.55	0.07-4.18
Residence		
Urban	1	
Rural	0.56*	0.30-1.05
Physical violence		
No	1	
Yes	1.08	0.61-1.90
Emotional violence		
No	1	
Yes	1.62**	1.02-2.57
Sexual violence		
No	1	
Yes	0.79	0.44-1.43

Note: ***, **, * represent 1%, 5% and 10% level of significance, respectively.
Source: MDHS (2017)

A STUDY ON COMMERCIAL PERFORMANCE OF DOMESTIC AIRLINES IN MYANMAR

Nu Nu Lwin[1] & Lay Sandar Tun[2]

ABSTRACT

This paper aims to study the **commercial performance of domestic airlines in Myanmar** through identifying the environmental forces of domestic airlines, examining the marketing mix activity of domestic airlines and analyzing the effect of those environmental forces and marketing mix activities on commercial performance of domestic airlines in Myanmar. The study found that among environmental forces, technology factor is the most influencing factor on the commercial performance whereas all remaining factors also have influence on commercial performance except for political factor. Regarding marking mix activities, while all variables affect commercial performance of domestic airlines, the place (distribution) is the most influential one. Thus, domestic airlines should focus on direct and indirect sales distribution channels with the support of technology such as computer reservation system, global distribution system, internet web booking facilities, E-ticketing facilities can enhance the commercial performance of domestic airlines in Myanmar.

Keywords: Load factor, Open Skies, Global Distribution System, Computer Reservation System

I. INTRODUCTION

Airline industry in Myanmar exists in an intensely challenging and hyper competitive market due to oversupplied in recent years which are impacting load factors and profitability. There has been an industry-wide shakedown, which will have far-reaching effects on the industry's trend towards expending and surviving domestic air transport services.

Myanmar currently has 11 national airlines in which there are ten airlines offering domestic services and two airlines offering international services. Most of these carriers focus on the domestic market, operating similar routes with similar aircraft type, similar strategies with similar

[1] Professor & Head, Dr., Management Studies Department, Yangon University of Economics
[2] EMBAII-69, EMBA 14th Batch, MBA Programme, Yangon University of Economics

business model. The current situation, with several airlines competing on relatively small trunk routes, is unsustainable. During the period of transformation, short-term problems including economic recession and long-term difficulties such as cost, regulatory, competitive and environmental issues have caused substantial uncertainties for airline industry in Myanmar

The environmental forces such as political, economic, social and technological are major consideration for policy maker and organizational marketing mix such as pricing, product, promotion and distribution are also major activities for airlines in marketing strategic decision. Therefore, it can be worthwhile to identify and understand the influencing environmental forces and marketing activities on commercial performance of airline industry in Myanmar.

Objectives of the Study

This study specifies the following objectives:

(1) To examine the environmental forces and marketing mix activities of domestic airlines in Myanmar.
(2) To analysis the effect of environmental forces and marketing mix activities on commercial performance of domestic airlines in Myanmar.

Methodology and sources of Data

This study focusses on the environmental forces and organizational marketing mix activities of domestic airlines industry in Myanmar by identifying PESTEL analysis (PEST) of industry and examining marketing mix of each airline that effect on commercial performance. This study covers all domestic airlines in Myanmar in order to get more reliable data. This study uses both descriptive and analytical methods based on primary and secondary data. Primary data are collected by structured questionnaires with 5-point Likert scale from top executive level of each from 10 domestic airlines. Secondary data are obtained by Airlines' annual report and website, annual report of Department of Civil Aviation, international research papers and other related information resources.

II. BACKGROUND OF DOMESTIC AIRLINES IN MYANMAR

Myanmar domestic airline industry was started dated back to 1948, September 15 after we got independent in 1947 by establishing United Burma

Airways (UBA). It initially operated domestic services only and international services were added in 1950. The name was changed to Burma Airways in December 1972, and to Myanma Airways on 1 April 1989 following the renaming of the country from Burma to Myanmar. In December 2014, Myanma Airways re-branded itself as Myanmar National Airlines (MNA).

In 1994, Air Mandalay was established and in 1996, Yangon Airways came into the market. With the development of the air travel industry, Air Bagan emerges in 2004. In the year 2011, the new airlines: Asain Wings Airways and Air KBZ penetrates the market as the newcomers in January and April. After 2011, Golden Myanmar Airlines entered into the market as low cost carrier in 2013, Air Mann Yadanarpon came in 2014 and Apex airline was established as special carrier of Tanintharyee division such as Dawei, Myeik and Kawthaung destinations. Recently, ten domestic airlines are operating in Myanmar and the market is extremely fragmented with no single airline accounting for more than a 20 percent share.

In fact, domestic airline market in Myanmar has huge potential for both local and foreign carriers as the country has recorded some of passenger growth rates in Asia since opening up in 2012. However, there are still having huge challenges, including infrastructure constraints, uncertainty environment, over capacity and unprofitability. Even if airlines have gradually removed existing barriers and lower fares, low discretionary income hinders the air travel of local people. Accordingly, foreigners become larger portion of domestic air travelers.

Environmental Forces on Domestic Airlines

The external environment consists of external influences that affect the firm's strategy formulation and its performance. Political, economic, social and technological environments are the frameworks used for analyzing the macro-environmental factors affecting the performance of domestic airlines industry in Myanmar.

Political Factors

Prior to 20 years ago, there was only government own airline known as Myanmar Airways (UB) since air transport sector was restricted to operate only by government in Myanmar. Since implementation of economic reforms in 1990s, deregulation in several sectors are initiated, privatization and join venture business pattern was founded in aviation industry. The first joint venture domestic airline in Myanmar was Air Mandalay established in 1994

and then Yangon Airways in 1996. In 2004, Air Bagan was established as the first private domestic airline in Myanmar. Nowadays, ten domestic airlines which are privately owned or public limited company are operating domestic air trasport.in Myanmar.

Even though Myanmar domestic airline industry was liberalized gradually, new entrance was very rare till 2011. Later on, new domestic airlines like Air KBZ, Asian Wings, Mann Yadanarpon, Golden Myanmar, Apex and FMI were coming into the market. It leads to price competition among airlines so as to seize and maintain the market shares. Since the market demand is not good enough to support the supply side, inevitably, some domestic airlines cannot compete and survive to operate in the market for a long run.

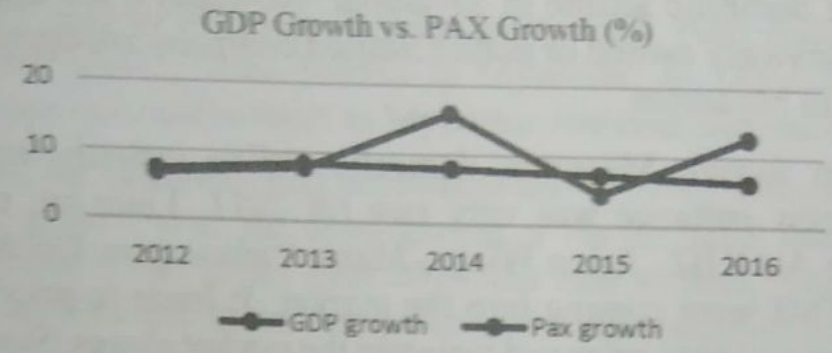
Taxes and duties levied by the Government are also large burden for aviation sector. These costs are significantly high compared to those of other businesses due to the high cost of equipment and materials used in the aircraft and airline operations.

The Open Skies policy, which is also known as the ASEAN Single Aviation Market (ASEAN-SAM), is intended to increase regional and domestic connectivity, integrate production networks and enhance regional trade by allowing airlines from ASEAN member states to fly freely throughout the region. After participating in ASEAN open skies policy, the number of international airlines landing to Myanmar has increased from 13 airlines to 28 airlines in 2017. The number of international passengers has also grown two times during four-year period from 2012 to 2016.

Disasters and political instabilities in some ethnic regions also have an impact on the airlines industry. Rakhaing State situation or other political instability in some domestic region can have large impact on the domestic airlines industry in Myanmar.

Economic Factors

The factors that are most relevant with domestic airline industry in Myanmar. The growth of gross domestic product (GDP) and foreign trade investment (FDI) are highly influence on the growth of air travel. Figure 1 shows the relationship between domestic passenger growth and real annual GDP growth in Myanmar in the period of 2012-16. It highlights the fact that demand for air travel has been grown with the growth of country GDP.

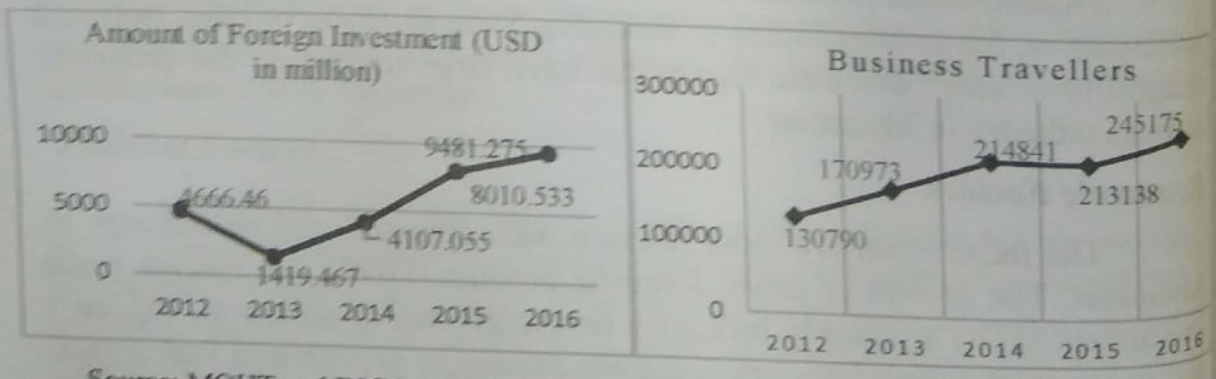


Source: Department of Civil Aviation & Central Bank of Myanmar

Figure-1 GDP Growth vs. Passenger Growth

The new investment law of Myanmar has been finally approved in October 2016 and came into force on April 1 2017, Due to the widespread of multinationals organizations, air travel is often required as a means to engage in face-to-face contacts within the business group. As shown in Figure 2, the number of business travelers has increased in accordance with the investment growth.

The trend of increasing fuel prices is definitely a cause of concern for airlines industry in Myanmar, which is the second highest cost in the cost structure. A total expenditure for fuel is the highest ever recorded, but it happened twice- in 2012 and 2013. It is a major cost component of the domestic airlines in Myanmar accounted for almost 40 percent of operating cost of domestic carriers. Table-1presents the fuel price at various countries in the region. As shown in the table, the price of aviation fuel (Jet A1) in Myanmar is highest compare to other countries.



Source: MOHT and DICA (website)

Figure-2 Business Travelers vs. Amount of Foreign Investment

Table -1 Jet –A1 Price in Myanmar, Thailand, Singapore, Malaysia, India, Vietnam

Countries	Myanmar	Thailand	Singapore	Malaysia	India	Vietnam
Jet-A1 (USD/IG)	3.78	1.44	0.97	1.06	1.53	1.63

Source: aeroportos.weebly.com (23rd Feb 2018)

Social Factors

Life style changes compared to previous decade has been seen in travelling school vacation and holidays effect on YFR as well as leisure travelers in domestic market in Myanmar. The social perception of air travel has changed towards to be more safety and convenient in travelling. Moreover, with increasing awareness and usage of technology lead to create air travelers in larger numbers. The availability of online sale method has been beneficial to industry supply chain including travel service provider, opened up opportunity for online travel agencies, passengers and airlines.

Technology Factors

Technological advancement has been the driving factor for improving airlines' operational efficiency. Airlines have been able to reduce costs and improvement by using advanced aircraft engine technology, IT solutions and mobile technology. The technology has created better connectivity and enhanced passengers' travel experience. Today, through the use of airlines' booking engine, customers are now able to better compare prices and find the cheapest tickets on any given domestic route in Myanmar. Nowadays, domestic airlines in Myanmar are also moving away from paper system.

Technological developments continuously make it possible to upgrade aircrafts that operate more fuel-efficient, emit less CO_2, and reduce noise than older versions. A state-of-the-art aircraft fleet can enhance a company's competitive edge in terms of costs and quality of service. In Myanmar domestic airline industry, 65 percent of aircraft type are ATR72 turbo prod and remaining 35 percent are jet engine aircrafts which are more modernized than those of last two decade.

Marketing Activities of Domestic Airlines

To identify the influencing marketing factors on the performance of domestic airlines, the study examines the marketing mix (4Ps) activities of domestic airlines in Myanmar.

Product

The airline industry's "product" includes both intangible services and tangible physical products such as aircraft, seat and lounges respectively. Domestic airlines' products in Myanmar can be examined with the types and number of aircraft, destinations, booking classes, business lounges facilities, inflight catering, free baggage allowances, frequent flyer program for loyal customers and booking control system respectively.

Price

Domestic airlines industry in Myanmar can be classified as oligopoly market because there are less than 10 airlines are playing in the market. Since the market size is not enlarge much to support the supply of 10 domestic airlines, each airline is attracted by offering low price with full service due to high competition in the market. Since airline service is perishable and substitutable, a decrease in the price of a airline leads to decrease the demand for others. Domestic airlines in Myanmar mainly practice market-based pricing strategy in which the prevailing fares are more emphasized than operating costs to attract the customer. By doing so, the airlines try to meet the needs of customer through the competitive offerings. However, it leads to price war and ultimately no one can benefit from this strategy.

Promotion

One crucial marketing strategies of domestic airlines in Myanmar is promotion activities. There are two seasons in the market: high season from October to April and slack season from May to September. Since the market size is not good enough for 10 domestic airlines in Myanmar, all airlines face difficulties especially in slack season. All domestic airlines emphasis seasonal promotional activities in slack season including all in one promotion programs, route by route promotion programs, and conduct public relation activities like sponsorship in events and workshop, participate in travel road show accordingly.

Frequent Flyer Programs is enabling airlines to produce effective databases. Today, domestic carriers in Myanmar are seeking to emphasis better contact with their loyal customers as a component of their strategy to make database marketing as a way of giving updated information or promotion programs to target customer group.

Table-3 Domestic Airlines with Facilities

Airline	Class of service	Lounge	FFP	Inflight catering	Baggage allowance	Booking system
Myanmar National Airlines (UB)	Business, Premium, Economy	RGN, airport	MNA club	Hot meal, Cool	30,25,20 kgs + 7 kg	CRS, GDS, Web booking
Air Mandalay (6T)	Economy	Nil		Snack & drinks	20 +5 kg	CRS
Yangon Airways (YH)	Economy	Nil	yes	Snack & drinks	20+5 kg	CRS
Air Bagan (W9)	Economy	-	-	-	-	-
Asian Wings Airways (YJ)	Economy	Nil	yes	Snack & drinks	20+5 kg	CRS, GDS, Web booking
Air KBZ (K7)	Economy		yes	Snack & drinks	20+5 kg	CRS, Web booking
Golden Myanmar (Y5)	Economy	Nil	yes	Snack & drinks	20+5 kg	CRS, Web booking
Mann Yadanarpon Airlines (7Y)	Economy	Nil	yes	Snack & drinks	20+5 kg	CRS, Web booking
FMI Air(ND)	Economy	Nil	yes	Snack & drinks	20+5 kg	CRS, Web booking
Apex Airline (SO)	Economy	Nil	Nil	Snack & drinks	20+5 kg	CRS

Source: Airlines' website

Note: FFP: Frequent Flyer Program
CRS: Computer Reservation System
GDS: Global Distribution System

Place (Distribution)

Domestic Airlines use both direct and indirect platforms. Direct channel where domestic carriers make direct contact with passengers for buying air tickets, without any intermediaries being involved at all. Direct channels bring the advantage that no mark-ups or commissions have to be paid to channel intermediaries and be able in touch with the true sources of

demand for their airline's ticket. Domestic airlines in Myanmar also use indirect channel relationship: ticketing agencies or travels and tours companies that is also one of B2B channel distributions.

III. EMPIRICAL ANALYSIS

To identify the influencing environmental forces and marketing mix activities, commercial performance of domestic airlines is regressed with environmental and marketing mix variables. Environmental factors are measured with political, economic, social and technological dimensions while marketing mix activities are identified with product, price, promotion, and place variables. For commercial performance, the study uses important efficiency scores based on available seat miles and revenue passenger mile which are computed as passenger load factor. All data are collected by structured questionnaires with 5-point Likert scale from 32 officials of top executive level from 10 domestic airlines. Regression results for influencing environmental forces on commercial performance of domestic airlines presented in Table-4.

Table – 4 Effect of Environmental Forces on Commercial Performance

Variable	Unstandardized Coefficients		β	t	Sig
	B	Std Error			
(Constant)	-.036	.092		-.389	.700
Political	.064	.083	.062	.769	.448
Economic	.281**	.107	.280	2.626	.014
Social	.250***	.074	.263	3.384	.002
Technology	.405***	.088	.409	4.581	.000
R Square	.983				
Adjusted R Square	.981				
F Value	416.554***				

Source: Survey Data (2017)

*** Significant at 1% level, ** Significant at 5% level, * Significant at 10%level

The specified model could explain well about the variation of the commercial performance of the domestic airlines in Myanmar since the value of R^2 is about 98 percent. Since the value of F test, the overall significance of the model, is highly significant at 1 percent level, the specified model can be said valid. The overall evaluation reveals that models explain the variation in commercial performance of the domestic airlines well because the estimation produced expected signs and significant coefficients for most variables.

The coefficients of social and technology variables show expected positive sign and highly significant at 10 percent level while that of economic variable is significant at 5 percent level. It highlights that economic, social, and technology factors have significant effects on commercial performance of the airlines. It can be said that improvement in economic variables leads to enhance the commercial performance of domestic airlines in Myanmar. Moreover, the results suggested that transformation of social and cultural factors and development in technology will impact on whole travelling industry and thereby, improve the commercial performance on Domestic airlines.

Among four explanatory variables, when the variance explained by other variables is controlled for, technology has the greatest contribution to increase the commercial performance of the domestic airlines.

Regression results for influencing marketing mix variables on commercial performance of domestic airlines presented in Table-5. As shown in table, the specified model could explain well about the variation of the commercial performance of the domestic airlines in Myanmar since the value of R^2 is about 99 percent. Since the value of F test, the overall significance of the model, is highly significant at 1 percent level, the specified model can be said valid. The overall evaluation reveals that models explain the variation in commercial performance of the domestic airlines well because the estimation produced expected signs and significant coefficients for most variables.

The coefficients of all marketing mix variables show expected positive sign and highly significant at 1 percent level in all variables except product variable which is significant at 5 percent level.

In Myanmar, domestic airlines use the same type of airplanes and there is limited chance for passengers to choose time, routes, aircraft, facilities and etc. All the schedules, departure time and other facilities (in flight & ground) are very similar to each other. Nevertheless, the significant

positive effect of product factor indicates that improve in product factors leads to more commercial performance of the domestic airlines. Highly significant effect of price variable suggests that variation in price based on different target markets with different booking class can enhance the commercial performance of the airlines.

Table-5 Effect of Marketing Mix on Commercial Performance

Variable	Unstandardized Coefficients		β	t	Sig
	B	Std Error			
(Constant)	-.168	.054		-3.097	.004
Product	.195**	.087	.180	2.254	.032
Price	.261***	.086	.255	3.015	.005
Promotion	.272***	.073	.264	3.722	.001
Place (Distribution)	.302***	.086	.305	3.505	.002
R Square	.996				
Adjusted R Square	.995				
F Value	1620.676***				

Source: Survey Data (2017)

*** Significant at 1% level, ** Significant at 5% level, * Significant at 10%level

The results suggested that offering seasonal promotion and advertising will also attract people, stimulate demand, and thereby, improve the commercial performance. Moreover, if the airlines can provide privileges to loyal customer, the passengers will be more interested to take the airlines rather than using other transport methods.

The results also highlight the importance of distribution channel for improving commercial performance of the airlines. By expanding distribution channels, domestic airlines can reach more market segments and accordingly, recruit more passengers and thereby, promote the commercial performance of domestic airlines in Myanmar.

Among four explanatory variables, when the variance explained by other variables is controlled for, place (distribution) has the greatest contribution to improve the commercial performance of the domestic airlines in Myanmar.

IV. Conclusion Remarks

This paper has traced the environmental forces and marketing mix activities that affect commercial performance of domestic airlines in Myanmar. According to survey data, among the four environmental forces, economic, social and technology influence on commercial performance of domestic airlines with highly significant level. In practice, worsen political situation impact on travelling industry and thereby, affect domestic airlines in Myanmar. It can be expected that the more favorable political situation, the better the commercial performance of the domestic airlines will be result. In economic factor, the price of fuel highly affects the performance of domestic airlines because fuel expense is the largest proportion of airlines operating cost. Social factor, such as changes in life style also influence airlines' performance. The awareness and interest of people in vacation trip will have the big impact on airline industry. Moreover, under the context of today virtual world, applications of online system like reservation control system, E-ticketing and online banking facilities are imperative for improving business performance of domestic airlines.

All marketing mix activities have direct impact on commercial performance of the airlines. For product factors, schedule, frequency, timing, and flexibility of flights, and providing facilities are the most influence on commercial performance. The more the flexible way, the more passengers have the chance to choose the airline and as the consequences, the high load factor can get by the airline. Regarding price, air fare can be set upon different booking classes in order to improve the commercial performance of the domestic airlines. Seasonal sales promotion and advertising are the most attractive activities for passengers in order to enhance the commercial performance. Place (distribution) factors also strongly influence on commercial performance of domestic airlines. Computer reservation system(CRS), global distribution system(GDS) for worldwide distribution, and Web booking and E-ticketing facilities together with direct and indirect distribution with the support of information technology can enhance the commercial performance of domestic airlines.

As overall empirical research finding, it can be concluded that environmental forces of technology has the greatest contribution to increase the commercial performance while place (distribution) has the highest influence on commercial performance of domestic airlines in Myanmar.

ACKNOWLEDGEMENT

We would like to express our profound gratitude to Dr. Tin Win, Rector of Yangon University of Economics for giving us an opportunity to conduct the research. We wish to express our sincere thanks to all teachers of Management Studies Department for their support, advice and encouragement in preparing to complete this research successfully. We are heartily grateful to all responsible persons of ten domestic airlines for participating in the research and sharing their knowledge and experience for the accomplishment of this research work

REFERENCES

Aviation Training and Development Institute . (2003). *Airline marketing: independent study.* Montreal-Geneva.

CAPA. (2016, SEP-OCT). The Strategy Journal for Airline CEOS. *AIRLINE LEADER*(36).

CAPA Centre for Aviation. (2016 April). *Myanmar Aviation Outlook:*. Sydney, Australia.

Isoraite, M. (2016). Marketing Mix Theoretical Aspects. *Internal Journal of Research-Granthaalayah, 4*(6).

Kankaew, K. (n.d.). Improtance-performance analysis in airlines service quality. *International Colleague: Suan sunandha Rajabhat University*.

Khaled, G. (2016, July). Exploring the Development Potential of Saudi Arabian Airlines, the National Flag Carrier of Saudi Arabia. *Master of Aviation at Massey University (Manawatu), New Zealand*.

Kim-Keung, H. J. (2014, August). Formulation of a Systemic PEST Analysis for Strategic Analysis. *European Academic Research, 2*(5).

Kjaersgaard, M. A. (2013, September). Strategic Analysis and Valuation of Scandinavian Airlines. *Master's Thesis*, 80.

Kotler, P., & Keller, K. L. (2017). *Marketing Management* (15th ed.) UPrentice-Hall, Inc.

Schefczyk, M. (1993). Operational performance of airline: an extension of traditional measurement paradigms. *Strategic Management Journal, 14*(301-317).

Shaw, S. (2007). *Airline Marketing and management* (6th ed.). England: Ashgate Publishing Limited.

Simon Mamadi Shiamwama, Ombayo, J. A., & Mukolwe, M. S. (2014, March). Internal Factors Affecting the Performance of Business of Retiress in Kakamega Municipality. *International Journal of Business, Humanities and Technology, 4*(2).

Tom, S., Usman , K., & Taylor, A. (2015-16). *Airline Economic Analysis.* Oliver Wyman.

Tssikriktsis, N. (2016, September). The effect of operational performance and focus on profitability: A longitudinal study of the U.S Airline industry. *Manufacturing & Service Operations Management, 9*(4).

Varbo, K. Y. (2014). Strategic analysis and evaluation of Norwegian Air Shuttle ASA. *Copenhagen Business School*, 120.

Career Fit and Career Satisfaction of NMDC Business Management Graduates

Dr. Sanda Win[1], Moe Khant Thu[2]

Abstract

It is very important that people are making the right career choices as they have a huge impact on their future. There are several factors affecting career choice decision, such as external factors, job-related factors and personal factors, etc. Understanding what factors are influencing and how they are affecting career fit can help us better understand about career choice and it can lead to making the right career decision. Choosing a right career is not only important in a person's life, but also vital for the organizations. This study focuses on business management graduates' career fit and what factors are affecting their career fit. The objectives of the study are to investigate the influencing career choice factors on career fit and to analyze the effect of career fit on career satisfaction of business management graduates from National Management Degree College (NMDC). Ninety-three of NMDC business management graduates who currently have careers are selected to participate in the study. Among the external factors, family factor has significant effect on not only person-job fit but also person-organization fit, and school factor has effect on person-organization fit. It is found that in job-related factors, career growth and company brand factors have significant influence on both person-job fit and person-organization fit. Among the personal factors, interest factor and skills factors have significant effect on person-job fit while value factor has significant influence on person-organization fit. Career fit of both person-job fit and person-organization have significant influence on career satisfaction.

Key Words: Career Choice Factors, Career Fit, Career Satisfaction

Introduction

Choosing a career is one of the most difficult decisions in life as it plays a vital role and has a huge impact on life. This is a widely discussed topic since people were young as they have to spend a lot of our time on careers. According to Rachel Premack (2018), the average person spends more than 90,000 hours in lifetime at work and it affects personal lives. People need to be very careful about career choices and there are several factors affecting the career choice, such as external factors, job-related factors, personal factors, etc.

Choosing a career is easy, but choosing a right career is not easy. It is not only very important to choose the right career which is a good fit, but also people need to be satisfied and happy in those careers. Wrong career decisions can have many negative consequences in life. A career fit includes two types – P-J (Person-Job) fit and P-O (Person- Organization) fit, and people need to be a good fit with both the job and organization. Life is short and people need to spend most of their time of life in careers. Thus, people need to be satisfied and proud of their careers. Individuals who are not fit with the jobs and organizations are not productive. Job satisfaction is vital not only to the individuals but also to the organizations. Performance of organizations largely depends on the performance of the employees, and the performance of the employees largely depends on the how they are satisfied with the jobs.

[1] Associate Professor, Department of Management Studies, Yangon University of Economics
[2] Chief Strategist, Malikha Inland Water Transport

Method of the Study

The primary focus of the study is how influencing career choice factors (external factors, job-related factors and personal factors) are affecting the career fit of business management graduates of NMDC, and how their career fit is also affecting the career satisfaction is also analyzed.

In Myanmar, public universities are considered more prestigious than private universities. Among the public universities, NMDC is chosen because NMDC has good reputation about business management subjects and admission requirements can be regarded the highest among the business management programs in Myanmar. The focus is on NMDC business management graduates and thus, it may not cover the other aspects.

There are altogether 1,165 business graduates from NMDC (as at the end of academic year 2016-2017). According to Yamane, the recommended sample size is 93 at 90% confidence level.

$$n = N/1+Ne^2$$

$$= 1165/1+1165(0.1)^2$$

$$= 92.09$$

Primary data are collected from 93 business management graduates of NMDC who currently have a career by using questionnaires with five-point Likert Scale, ranging from 1(strongly disagree) to 5(strongly agree). Those 93 persons are selected by using proportionate stratified random sampling. Secondary and other necessary data are collected from previous research papers, journals, websites, textbooks, etc. accordingly. Multiple linear regression method is used for the study.

Objectives of the Study

(1) To investigate the influencing career choice factors on career fit of NMDC business management graduates; and

(2) To analyze the effect of career fit on career satisfaction of NMDC business management graduates

Conceptual Framework of the Study

The emphasis of the study is to find out how external factors, job-related factors and personal factors are affecting career fit of business management graduates, and how career fit is affecting career satisfaction.

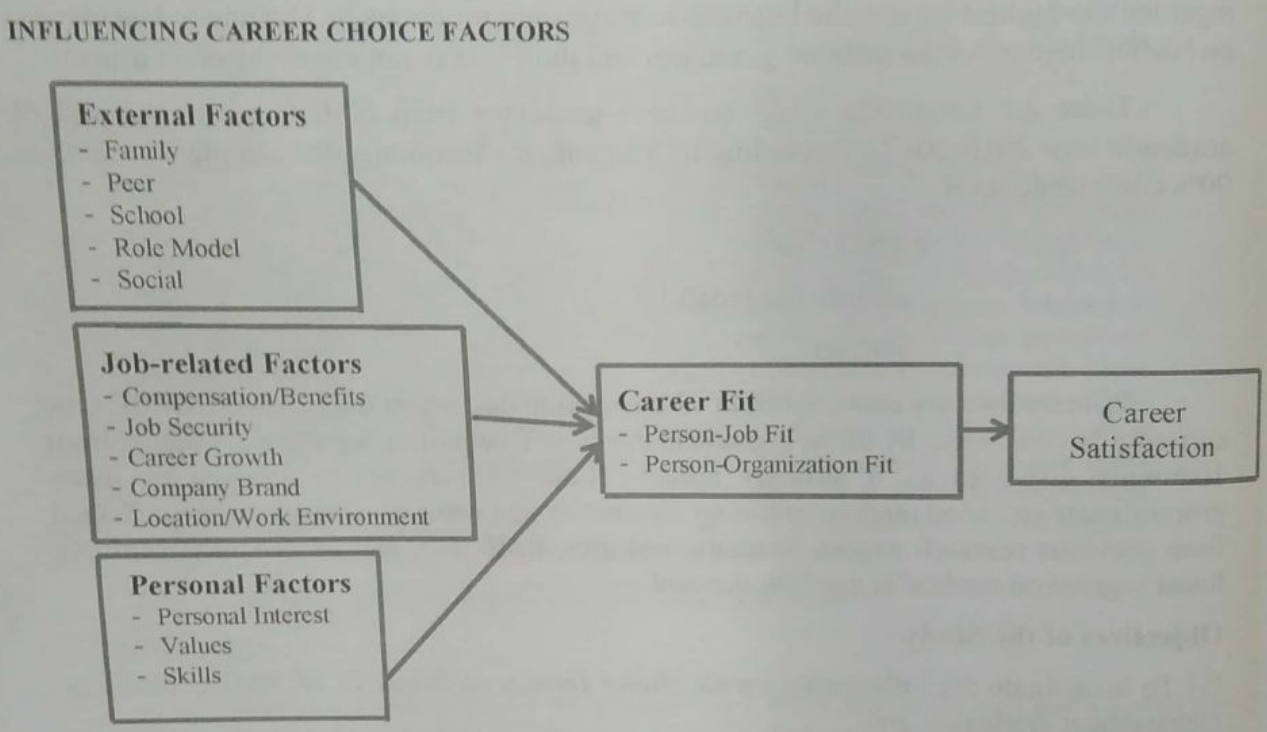
External factors such as family, peer, school, role model and social factors are included in the study. This is because Myanmar young people are close with their families and teachers. People have friends and role models, thus they may also have an effect on career fit. Society also has a role in career decision-making processes as there are occupational stereotypes.

Job-related factors such as compensation/benefits, job security, career growth, company brand, and location/work environment are included in the study, as people care about compensation/benefits. For those who like security, they may think about job security factor, and some people may emphasize on career growth. Prestige of the organization is also important for some people. Location/work environment factor is also important for those who prefer convenience about work.

Personal factors such as personal interest, values and skills are included in the study, as these factors could be considered important in careers. Someone's interests, values and what he or she is good at may be important in the careers.

People need to be fit with not only with the jobs but also with the organizations they work in. That's why P-J fit and P-O fit are included in the study for career fit. It is also very important that people are satisfied and happy with their careers and thus career satisfaction is included in the study.

Figure (1) Conceptual Framework of the Study



Source: Own Compilation (2019)

Results/ Findings

Table (1) External Factors on Career Choice

No.	Description	Mean
1	Family Factor	3.94
2	Peer Factor	3.33
3	School Factor	3.32
4	Role Model Factor	3.45
5	Social Factor	2.77
	Overall Mean	3.36

Source: Survey Data (2019)

As mentioned in Table (1), the overall mean value of the influence of external factors on career choice is 3.36, which is greater than the neutral mean value of 3. Thus, in general, respondents agree that there are external factors' influence in career decision making processes. Family factor impact is the highest among the external factors, and they also mention the impact of peer, school and role model factors. But, respondents have slightly negative perspectives about social factor impact in choosing career. Social factor impact could be considered low nowadays, as people don't pay much attention to social

factors, and they choose careers if they believe that those particular careers are right for them. Thus, role of social factor is not very important in making career choices.

Table (2) Job-related Factors on Career Choice

No.	Description	Mean
1	Compensation/Benefits Factor	3.54
2	Job Security Factor	3.89
3	Career Growth Factor	3.37
4	Company Brand Factor	3.48
5	Location/Work Environment Factor	4.12
	Overall Mean	3.68

Source: Survey Data (2019)

Respondents agree that there is the influence of job-related factors in choosing careers. As shown in Table (2), the overall mean value is 3.68, and respondents also agree that there is impact of individual factor such as compensation/benefits, job security, career growth, and company brand and location/work environment. Among the job-related factors, location/ work environment impact is found to be the highest, and it suggests that respondents put strong emphasis on whether it will be convenient for them to work and location of work in making career choices.

Table (3) Personal Factors on Career Choice

No.	Description	Mean
1	Personal Interest Factor	3.35
2	Values Factor	3.94
3	Skills Factor	4.06
	Overall Mean	3.78

Source: Survey Data (2019)

As shown in Table (3), overall value of the influence of personal factors on career choice is 3.78, and thus, respondents agree that there is the impact of personal factors such as personal interest, values and skills in career decision making processes. The highest impact among personal factors on career choice is skills factor, and this reflects that respondents like to choose careers based on what they are good at.

Table (4) Career Fit

No.	Description	Mean
1	Person-Job Fit (P-J Fit)	3.91
2	Person-Organization Fit (P-O Fit)	3.63
	Overall Mean	3.77

Source: Survey Data (2019)

Career Fit (P-J Fit) determines whether there is a match between a respondent and requirements of his or her career and Career Fit (P-O Fit) measures whether there is a match between respondents and broader organizational attributes and how well respondents fit with the values of their company and culture. The overall mean value of career fit is 3.77, which is very much higher than neutral mean value of 3 and it is very close to 4. Thus, this suggests that respondents agree that there is both P-J Fit and P-O Fit.

As shown in Table (5), F Value, which is overall significance of the model is highly significant at 1% level. Adjusted R Square is 0.406 which means this model can explain 40.6% about the variance of dependent variable with the independent variable. Variance Inflation Factor (VIF) measures the degree of multi-collinearity and all the values of VIF are just more than 1, which is well below the cut-off point of 10 (Neter, Wasserman & Kutner, 1985). Thus, there is no multi-collinearity problems in this model.

Table (5) Influencing External Factors on Career Fit (P-J Fit)

Variable	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	VIF
	B	Std. Error	Beta			
(Constant)	1.989	.297		6.704	.000	
Family	.392***	.074	.540	5.282	.000	1.617
Peer	.105	.068	.167	1.551	.124	1.788
School	-.019	.050	-.032	-.372	.711	1.145
Role Model	.032	.077	.041	.422	.674	1.442
Social	-.008	.037	-019	-.210	.834	1.207
R square	.438					
Adjusted R Square	.406					
Durbin Watson	2.019					
F Value	13.554***					

***, **,* significant at 1%, 5%, 10%

Source: Survey Data (2019)

Among the variables, only family factor is significant, and it is significant at 1% level. The family factor has positive relationship with the dependent variable which is career fit (P-J Fit). Parents know their children best and want the best for their children. Family members also know well about a person. Parents and family members can help a person choose the right job because of close relationships. Therefore, having family influence in choosing careers can lead to higher chances of person-job fit (P-J fit). Thus, family factor has a significant positive effect on the career fit (P-J Fit) of business management graduates.

Table (6) Influencing External Factors on Career Fit (P-O Fit)

Variable	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	VIF
	B	Std. Error	Beta			
(Constant)	.348	.449		.774	000	
Family	.796***	.112	.696	7.079	.000	1.617
Peer	-.003	.102	-.003	-.029	.977	1.788
School	.158**	.076	.174	2.095	.039	1.145
Role Model	-.089	.116	-.071	-.766	.446	1.442
Social	-.021	.055	-032	-.378	.706	1.207
R square	.479					
Adjusted R Square	.449					
Durbin Watson	2.254					
F Value	16.004***					

***, **,* significant at 1%, 5%, 10%

Source: Survey data (2019)

As shown in Table (6), F Value, which is overall significance of the model is highly significant at 1% level. Adjusted R Square is 0.449 which means this model can explain 44.9% about the variance of dependent variable with the independent variable. Values of Variance Inflation Factor (VIF) are just more than 1, which is well below the cut-off point of 10 (Neter, Wasserman & Kutner, 1985). Thus, there is no multi-collinearity problems in this model.

Family and school factors are significant on career fit. Family factor is significant at 1% level, while school factor is significant at 5% level. Both family and school factors have positive relationships with the dependent variable which is career fit (P-O Fit). Parents and family members know well about a person, thus they know what he or she values. With close relationships, they can help the person choose the right organization which is a good fit. School teachers can also help a person choose the right organization in making career

choices, they can be influential in what students believe. School career trips or favorite subjects can help a person better about what he or she values. Therefore, having family and school factor influence in making career choices can lead to higher chances of person-organization fit (P-O Fit). Thus, family factor and school factor have significant positive effect on the career fit (P-O Fit) of business management graduates.

Table (7) Influencing Job-related Factors on Career Fit (P-J Fit)

Variable	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	VIF
	B	Std. Error	Beta			
(Constant)	1.313	.354		3.711	.000	
Compensation/ Benefits	-.014	.049	-.023	-.280	.780	1.198
Job Security	.129	.080	-.146	1.618	.109	1.432
Career Growth	.211***	.050	.351	4.222	.000	1.214
Company Brand	.336***	.081	.394	4.166	.000	1.568
Location/ Work environment	.064	.066	.076	.962	.339	1.095
R square	.504					
Adjusted R Square	.475					
Durbin Watson	1.947					
F Value	17.659***					

***, **,* significant at 1%, 5%, 10%

Source: Survey data (2019)

As shown in Table (7), the values of VIF are just more than 1, which is well below the cut-off point of 10 (Neter, Wasserman & Kutner, 1985). Thus, there is no multi-collinearity problems in this model.

Career growth factor and company brand factor are significant. Both career growth and company brand factors are significant at 1% level. These two significant variables have positive relationship with the dependent variable which is career fit(P-J fit). People like to be successful, and they like to improve themselves. Having career growth opportunities in jobs can make people satisfied with the tasks of the jobs and their progress. Jobs in companies with good reputation have better, clearer tasks and job descriptions. Therefore, having career growth and company brand factors influence in choosing careers can lead to higher chances of person-job fit (P-J Fit). Thus, career growth and company brand factors have positive effect on career fit (P-J Fit) of business management graduates. F Value, which is overall significance of the model is highly significant at 1% level. Adjusted R Square is 0.475 which means this model can explain 47.5% about the variance of dependent variable with the independent variable.

As shown in Table (8), F Value, which is overall significance of the model is highly significant at 1% level. Adjusted R Square is 0.427 which means this model can explain 42.7% about the variance of dependent variable with the independent variable.

Table (8) Influencing Job-related Factors on Career Fit (P-O Fit)

Variable	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	VIF
	B	Std. Error	Beta			
(Constant)	1.257	.582		2.161	.033	
Compensation/ Benefits	-.028	.081	-.030	-.350	.727	1.198
Job Security	-.038	.131	-.027	-286	.776	1.432
Career Growth	.517***	.082	.546	6.281	.000	1.214
Company Brand	.382***	.133	.284	2.875	.005	1.568
Location/ Work Environment	-.109	.109	-.083	-1.002	.319	1.095
R square	.458					
Adjusted R Square	.427					
Durbin Watson	2.147					
F Value	14.717***					

***, **,* significant at 1%, 5%, 10%

Source: Survey data (2019)

Career growth factor and company brand factor are significant at 1% level. These two significant variables have positive relationship with the dependent variable which is career fit (P-O Fit). Organizations with good reputation more likely to have good values and treat employees well. And organizations that provide career growth opportunities are also more likely to be good organizations with big ambitions. Therefore, having career growth and company brand influence in making career choices can lead to higher chances of person-organization (P-O Fit). Thus, career growth and company brand factors have positive effect on career fit (P-O Fit) of business management graduates. Variance Inflation Factor (VIF) values are just more than 1, which is well below the cut-off point of 10 (Neter, Wasserman & Kutner, 1985). Thus, there is no multi-collinearity problems in this model.

Table (9) Influencing Personal Factors on Career Fit(P-J Fit)

Variable	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	VIF
	B	Std. Error	Beta			
(Constant)	1.564	.351		4.225	.000	
Personal Interest	.357***	.086	.511	4.136	.000	2.826
Value	.149	.095	.190	1.562	.122	2.739
Skills	.139*	.075	.140	1.840	.069	1.071
R square	.519					
Adjusted R Square	.503					
Durbin Watson	2.316					
F Value	31.995***					

***, **,* significant at 1%, 5%, 10%

Source: Survey data (2019)

As shown in Table (9), values of Variance Inflation Factor (VIF) are around 1 or 2, which is well below the cut-off point of 10 (Neter, Wasserman & Kutner, 1985). Thus, there is no multi-collinearity problems in this model.

Among the variables, personal interest factor and skills factor are significant. Personal interest factor is significant at 1% level, while on the other hand, skills factor is significant at 10% level. Both factors have a positive relationship with the dependent variable which is career fit(P-J Fit). If people choose careers based on what they are interested in or what they are good at, they can be a good fit with the jobs. Choosing careers based on personal interest and skills can lead to higher chances person-job fit (P-J Fit). Thus, personal interest and skills have positive effect on career fit (P-J Fit) of business management graduates. F Value, which is overall significance of the model is highly

significant at 1% level. Adjusted R Square is 0.503 which means this model can explain 50.3% about the variance of dependent variable with the independent variable.

Table (10) Influencing Personal Factors on Career Fit (P-O Fit)

Variable	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	VIF
	B	Std. Error	Beta			
(Constant)	.131	.577		.227	.821	
Personal Interest	.171	.142	.155	1.199	.234	2.826
Value	.674***	.157	.547	4.294	.000	2.739
Skills	.067	.124	.043	.536	.593	1.071
R square	.473					
Adjusted R Square	.455					
Durbin Watson	2.216					
F Value	26.594***					

***, **,* significant at 1%, 5%, 10%

Source: Survey data (2019)

As shown in Table (10), F Value, which is overall significance of the model is highly significant at 1% level. Adjusted R Square is 0.455 which means this model can explain 45.5% about the variance of dependent variable with the independent variable.

Only value factor is significant, and it is significant at 1% level. The value factor has a positive relationship with the dependent variable which is career fit (P-O Fit). Values influence on career choice can help people better fit with organization's values. Making career decisions based on someone's values can lead to higher chances of person-organization (P-O Fit). Thus, value has positive effect on career fit (P-O Fit) of business management graduates. Variance Inflation Factor (VIF) values are around 1 or 2, which is well below the cut-off point of 10 (Neter, Wasserman & Kutner, 1985). Thus, there is no multi-collinearity problems in this model.

Table (11) Career Satisfaction

No.	Description	Mean
1	Satisfaction with progress towards meeting income goals	3.73
2	Satisfaction with progress towards meeting career goals	4.22
3	Satisfaction with progress towards meeting advancement goals	3.96
4	Satisfaction with progress towards meeting development of new skills goals	3.86
	Overall Mean	3.94

Source: Survey Data (2019)

Career satisfaction determines how respondents are satisfied with their careers, and as shown in Table (11), the overall mean value of career satisfaction is 3.94, which is much higher than the neutral mean value of 3 and also very close to 4. Individual mean scores are also close to 4 or greater than 4. This suggests that there is high career satisfaction level among the respondents.

Table (12) Influence of Career Fit on Career Satisfaction

Variable	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	VIF
	B	Std. Error	Beta			
(Constant)	1.208	.407		2.969	.004	
P-J Fit	.392**	.158	.308	2.479	.015	2.573
P-O Fit	.330***	.100	.409	3.288	.001	2.573
R square	.459					
Adjusted R Square	.447					
Durbin Watson	1.668					
F Value	38.212***					

***, **,* significant at 1%, 5%, 10%, Source: Survey data (2019)

As shown in Table (12), F Value, which is overall significance of the model is highly significant at 1% level. Adjusted R Square is 0.447 which means this model can explain 44.7% about the variance of dependent variable with the independent variable.

Variance Inflation Factor (VIF) values are just more than 2, which is well below the cut-off point of 10 (Neter, Wasserman & Kutner, 1985). Thus, there is no multi-collinearity problems in this model. Both career fit (P-J Fit) factor and career fit (P-O Fit) factor are significant. Career fit (P-J Fit) factor is significant at 5% level while career fit (P-O Fit) factor is significant at 1% level. These two significant variables have positive relationship with the dependent variable which is career satisfaction. Both career fit (P-J Fit) factor and career fit (P-O fit) factor have positive effect on career choice of business management graduates. High career satisfaction can be expected from high career fit. High career fit of person-job fit (P-J Fit) and person-organization (P-O Fit) can lead to higher chances of career satisfaction.

Summary

The objectives of this study are to investigate the influencing career choice factors on career fit, and to analyze the effect of career fit on career satisfaction of NMDC business management graduates. There are three main factors included in the influencing factors of career choice in this study - external factors, job-related factors and personal factors.

External factors include factors such as family, peer, school, role model and social. Among those external factors, only family factor has significant positive impact on career fit(P-J fit) of respondents while on the other hand, family and school factors have significant positive impact on career fit(P-O fit). This suggests that family factor has a positive influence on the respondents' fit with not only with the jobs but also with the organizations, and school factor has a positive influence on the respondents' fit with the organization.

Job-related factors include factors such as compensation/benefits, job security, career growth, company brand, and location/work environment. Among those factors, only career growth and company brand factors have significant impact on career choice (P-J fit) of respondents. Both career growth and company brand factors are found to be positively significant on career fit (P-O fit) as well. This means that career growth and company brand factors have positive influence on the respondents' fit with the jobs, and those two factors also have positive influence on the respondents' fit with the organization.

Personal factors include personal interest, values and skills factors and among those factors, personal interest factor and skills factor have significant impact on career fit(P-J fit) while on the other hand, only value factor is found to have significant impact on career fit (P-O fit). This suggests that what someone's interested in has a positive influence on his or her fit with the jobs, and value factor has a positive influence on the respondents' fit with the organizations.

Career fit is high in terms of both person-job fit and person-organization fit. It is found that career choice has significant impact on career fit (P-J fit) and career fit (P-O fit).

Respondents also agree that there is high career satisfaction and it is also found that career fit has significant impact on career satisfaction. In general, high career satisfaction can be expected from high career fit. Since respondents have high career fit, the results match with expectations.

Suggestions and Recommendations

Making decisions about careers is one of the main decisions people need to make in lives and they have a huge impact. Thus, it is highly recommended to make those decisions very carefully. There are several factors affecting those decisions and therefore, understanding well about how those factors are affecting career fit can help us make better decisions.

Most of the respondents highly agree that there is high career fit (both person-job fit and person-organization fit) and career satisfaction. Thus, it could be said that they are on the right track of careers in general, and the ways the factors that are influencing the career fit of respondents have no big problems.

Among the external factors, family factor has significant positive effect on not only person-job fit (P-J Fit) but also person-organization fit (P-O Fit), and school factor has positive effect on person-organization fit (P-O Fit). Thus, people should value and pay attention more to the family factor influence and school influence in choosing careers rather than factors such as peer, role model and social as they have significant influence on career fit. It is recommended to consider family and school factors as it can lead to higher chances of career fit.

Among the job-related factors, career growth and company brand factors have significant positive effect on career fit of both person-job fit (P-J Fit) and person-organization fit (P-O Fit). Thus, people should prioritize career growth and company brand factors in career decision-making processes as it has an effect on a good career fit with both P-J fit and P-O fit. Career growth factor is important as people need to keep improving themselves and keep moving forward. Taking company brand into account in career decisions is also advisable as a good company brand with a good reputation is more likely to have good values and better treatment to their employees, which in turn can lead to better career fit and career satisfaction. Career growth and company brand factors should be emphasized more than compensation/benefits, job security, and location/work environment factors.

Among the personal factors, personal interest and skills factor have significant positive effect on person-job fit (P-J fit) while value factor has significant positive effect on person-organization fit (P-O Fit). Personal interest is important when choosing a career as when a career is aligned with one's interest, there may have more motivation to devote effort into developing relevant knowledge and skills, higher career-related goals. Skill factor is also important in career decisions-making processes, as skills are essential part of being able to overcome challenges of careers. If someone chooses a career based on what he or she is good at, then, there may be higher chances of career fit and he or she may be more likely to be satisfied with the career as well. People should choose careers based on personal interests and skills as it can also lead to higher chances of career fit. People should also choose careers based on their values so that there will be better fit with the organizations Thus, it is recommended to choose careers based on the personal interests, values and skills, so that it will be more likely to have career fit.

It is also found that career fit has a positive effect on career satisfaction. Higher level of career satisfaction can be expected from higher level of career fit. Thus, people should emphasize on career fit so that it will be more likely to enjoy career satisfaction.

To summarize, according to the results, it is advisable to prioritize career growth, company brand factors. People should also consider family and school factors in making career-decisions, as it can more likely to lead to high career fit. It is also encouraged to

choose careers based on the interests, values and skills, because there can be higher chances of career fit. People should focus on career fit as well, since high career satisfaction can be expected from high career fit.

Limitations and Needs for Further Research

The primary focus of this study is on the external factors, job-related factors and personal factors affecting the career fit of business management graduates of NMDC, and and how that career fit is affecting career satisfaction. Thus, this study might not represent all the influencing factors about career fit and findings might not be relevant to all business management graduates as the focus is on NMDC business management graduates and only 93 graduates are selected for this study. Further studies are recommended if more details about influencing factors on career fit are expected and if the findings are expected to be relevant to all business management graduates in Myanmar.

Acknowledgements

We would like to express our gratitude to Professor Dr. Tin Win, Rector of the Yangon University of Economics, for allowing us to conduct this study. Secondly, we are grateful to Professor Dr. Nilar Myint Htoo, Pro-Rector of Yangon University of Economics, for helping us to accomplish the paper. We are also grateful to all of the professors, associate professors, teachers and visiting lecturers who provided assistance in completing this study. We would like to extend my appreciation to all respondents of questionnaire for our paper and all the people who helped us successfully complete the paper.

References

1. Gavo, O. S. (2014). *Strategic Factors That Influence Students' Career Choice in Kenyan Universities: A Study of United States International University* (MBA Thesis). United States International University, Nairobi, Kenya.
2. Farooqui, S. & Nagendra, A. (2014). The Impact of Person Organization Fit on Job Satisfaction and Performance of the Employees. *Procedia Economics and Finance, 11*(2014), 122-129.
3. Kazi, A. S. & Akhlaq, A. (2017). Factors Affecting Students' Career Choice. *Journal of Research and Reflections in Education, 2*, 187-196.
4. Swapnika, S., Manohar, K. & Jayant, S. (2011). Factors Which Affect the Career and Subject Preference of the Female Students of Business Schools. *Journal of Women's Entrepreneurship and Education, 1*(2), 89-107.
5. Sharif, N. & Ahmad, N. (2017). Factors Influencing Students' Career Choices: Empirical Evidence From Business Students. *Journal of Southeast Asian Research, 15*.
6. Mitemeri, J. (2017). *Factors Influencing The Choice of Career Pathways Among High School Students In Midlands Province, Zimbabwe.* (Doctoral Dissertation), Univeristy of South Africa, Pretoria, South Africa.
7. Rodgers, C. A. (2000). Person-Job Fit and Person-Organization Fit as Components of Job Seeking. (MSc Thesis), California State University, San Bernardino, United States.
8. Tableb, A. (2013). *Organizational Culture, Career Satisfaction and Work Outcomes in 3, 4, 5 Star Hotels in North Cyprus.* (MA Thesis), Eastern Mediterranean University, North Cyprus.
9. Sears, S. J. & Gordon, V.N. (2002). *Building Your Career*: A Guide to Your Future (3rd ed.). Boston: Pearson Education
10. Sears, S. J. & Gordon, V.N. (2011). *Building Your Career*: A Guide to Your Future (4th ed.). Boston: Pearson Education
11. Ghuangpeng, S. (2011). *Factors Influencing Career-Decision Making: A Comparative Study on Thai and Australian Tourism and Hospitality Students.* (Doctoral Dissertation), Victoria University, Melbourne.
12. Kaygin, E. & Gulluce, A.C. (2013). The Relationship Between Career Choice and Individual Values: A Case Study of a Turkish University. *International Journal of Humanities and Social Science, 3*(3).
13. Njeri, M. B. (2013), *Factors Influencing Career Choices Among Undergraduate Students in Public Universities in Kenya: A Case of Compassion International Sponsored Students.* (MA Thesis), University of Nairobi, Nairobi.

14. Chellappah, M. & Garnham, L. (2014). Medical Students' Attitudes Towards General Practice and Factors Affecting Career Choice: A Questionnaire Study. *London Journal of Primary Care, 6*(6), 117-123.
15. Tope, O. (2011), *The Influence of Environmental Factors on Career Choice of Career Among Secondary School Students in Nigeria*. Ogun State: EgoBooster Books.
16. Ahmad, N. A., Aziz, A. A., Kamaruddin, S. Y., Aziz, A. A. & Bakhtiar, M. F. S. B. (n.d.). *The Influence of Direct Financial Compensation Towards Future Graduates Career Choice in Hotel Industry*.
17. Holland, J. L. (1997), *Making vocational choices: A theory of vocational personalities and work environments* (3rd ed.). Odessa, FL: Psychological Assessment Resources
18. Sokro, E., Osei-Bonsu, N., Agbola, R. M., & Ankrah, E. (2011). The Impact of Career Choice on Job Satisfaction Among Employees in Ghana. *Indian Journal of Commerce & Management Studies. 2*(6), 83-88.

APPENDIX

Family Factor on Career Choice

No.	Description	Mean	SD
1	Being influenced by family's dominant profession	3.70	0.84
2	Being influenced by parents	4.28	0.80
3	Being influenced by occupation of parents	3.91	1.06
4	Being influenced by siblings	3.86	0.72
	Overall Mean	3.94	

Source: Survey Data (2019)

Peer Factor on Career Choice

No.	Description	Mean	SD
1	Being influenced by friends	3.38	1.05
2	Choosing a career similar to my friends'	3.33	0.97
3	Choosing a career validated by friends	3.06	0.99
4	Being helped by peer advice in choosing career	3.55	0.79
	Overall Mean	3.33	

Source: Survey Data (2019)

School Factor on Career Choice

No.	Description	Mean	SD
1	Choosing a career that is linked to favourite subjects	3.61	1.11
2	Being influenced by school teachers	3.56	0.99
3	Being influenced by career trips or field trips	3.15	1.01
4	Being influenced by former students' careers	2.96	1.55
	Overall Mean	3.32	

Source: Survey Data (2019)

Role Model Factor on Career Choice

No.	Description	Mean	SD
1	Being influenced by role model's career	3.47	0.88
2	Being influenced by role model's advice	3.43	0.71
3	Being influenced by role model's actions	3.25	0.86
4	Being influenced by role model's values and beliefs	3.69	0.75
	Overall Mean	3.45	

Source: Survey Data (2019)

Social Factor on Career Choice

No.	Description	Mean	SD
1	Being influenced by occupational stereotypes of the society	2.92	1.35
2	Being influenced by economic status	2.85	1.36
3	Being influenced by gender stereotypes	2.77	1.33
4	Being influenced by religions and beliefs of the society	2.54	1.55
	Overall Mean	2.77	

Source: Survey Data (2019)

Compensation/Benefits Factor on Career Choice

No.	Description	Mean	SD
1	Being influenced by salary	3.66	1.03
2	Being influenced by annual leave and holiday entitlements	3.39	0.97
3	Being influenced by benefits (health insurance, car, bonus, etc.)	3.63	1.10
4	Being influenced by allowances	3.47	1.09
	Overall Mean	3.54	

Source: Survey Data (2019)

Job Security Factor on Career Choice

No.	Description	Mean	SD
1	Being influenced by retirement program	3.68	0.74
2	Being influenced by the ability to keep my job in the face of economic problems	3.78	0.53
3	Being influenced by the job's possibility to go extinct	4.00	0.93
4	Being influenced by long-term employment	4.10	0.69
	Overall Mean	3.89	

Source: Survey Data (2019)

Career Growth Factor on Career Choice

No.	Description	Mean	SD
1	Being influenced by future job opportunities	3.73	0.98
2	Being influenced by opportunities for career advancement (promotions)	3.33	0.95
3	Being influenced by opportunities to be mentored	3.02	1.09
4	Being influenced by opportunities for personal growth and development	3.39	1.48
	Overall Mean	3.37	

Source: Survey Data (2019)

Table (3.10) Company Brand Factor on Career Choice

No.	Description	Mean	SD
1	Being influenced by how the organization is respected in public	2.73	1.09
2	Being influenced by values of the organization	3.52	0.95
3	Being influenced by prestige of the organization	3.60	0.84
4	Being influenced by organization image of treating their employees	4.25	0.62
	Overall Mean	3.48	

Source: Survey Data (2019)

Location/Work Environment Factor on Career Choice

No.	Description	Mean	SD
1	Being influenced by location of work	4.18	0.87
2	Being influenced by work environment	3.85	0.90
3	Being influenced by working hours	4.00	0.57
4	Being influenced by convenience of working in the job	4.35	0.76
	Overall Mean	4.12	

Source: Survey Data (2019)

Personal Interest Factor on Career Choice

No.	Description	Mean	SD
1	Being influenced by my hobbies	2.24	1.21
2	Being influenced by my personality	3.35	1.27
3	Being influenced by my belief that it is more likely to be successful if I do what I like	3.56	0.96
4	Being influenced by what I am interested in	4.25	0.62
	Overall Mean	3.35	

Source: Survey Data (2019)

Values Factor on Career Choice

No.	Description	Mean	SD
1	Being influenced by my religion	3.68	0.77
2	Being influenced by whether my sense of achievement can be fulfilled	4.16	0.76
3	Being influenced by my value	3.99	1.03
4	Being influenced by my beliefs	3.95	0.76
	Overall Mean	3.94	

Source: Survey Data (2019)

Skills Factor on Career Choice

No.	Description	Mean	SD
1	Being influenced by my talents	3.98	0.78
2	Being influenced by other people's opinions about what I am good at	3.94	0.64
3	Being influenced by my belief that it is more likely to be successful if I do what I am good at	4.03	0.79
4	Being influenced by my strengths	4.28	0.63
	Overall Mean	4.06	

Source: Survey Data (2019)

Career Fit (P-J Fit)

No.	Description	Mean	SD
1	Knowledge match with the job	3.71	0.64
2	Reflection of my talents	3.73	0.51
3	Attraction to the tasks of the job	4.13	0.78
4	Similarity of the tasks I want to perform	4.08	0.94
	Overall Mean	3.91	

Source: Survey Data (2019)

Career Fit (P-O Fit)

No.	Description	Mean	SD
1	Value congruence with organization	3.90	1.03
2	Goal congruence with organization	3.40	0.99
3	Personality/Climate congruence with organization	3.66	0.65
4	Needs/Supplies fit with organization	3.57	1.39
	Overall Mean	3.63	

Source: Survey Data (2019)

Reducing Potential Risks for Hepatitis B Virus Transmission: Women's Knowledge of HBV Infection and Prevention

(Case Study in 500-Bedded Specialty Hospital, Yangon)

Pwint Phyu Aung[1], Ei Ei Aung[2], Wint Theingi Naing[3]

Abstract

Hepatitis B is one of the serious infectious diseases caused by virus that attacks the liver. Most infections worldwide are acquired through horizontal and vertical transmissions of HBV. The objective is to examine the level of women's knowledge of Hepatitis B Virus infection and prevention to reduce the potential risks for HBV transmission. This survey included females from aged 16 to 70 and the survey period is from 9 April to 27 April 2018 at IPD and OPD in the 500 Bedded Specialty Hospital in Yangon. 68 % of the female respondents knew both vertical and horizontal transmissions of HBV. The high point of hepatitis B infection was found in married type. Some female respondents lacked the knowledge of HBV infection and they had not been vaccinated against HBV. Expansion of medical educational programs is needed to include provider teams from rural communities with a high burden of liver diseases.

Keywords: Hepatitis B, horizontal HBV transmission, liver cancer, vertical HBV transmission, women's knowledge HBV

1. Introduction

Hepatitis B is one of the global health problems and about 2 billion of HBV infected people are an enormous burden not only on the health care system but also on the patients as miseries. What is Hepatitis B? Hepatitis B is one of the serious infectious diseases caused by virus that attacks the liver to cause both severe and chronic disease and puts people at the high risk of death from liver cancer. According to the Global Policy Report on the Prevention and Control of Viral Hepatitis in WHO Member States (2013), the HBV is found worldwide especially in sub-Saharan Africa, Southeast Asia, Eastern Europe, and the Middle East, as well as local communities is Hepatitis B carriers. A chronic HBV infection rate is more than 8% before the introduction of hepatitis B vaccination in Southeast Asian countries and the Western Pacific region of WHO is also expected to have a high prevalence of hepatitis B. In addition, people getting tattoos, using illegally drug, sharing needles and razor blades, undertaking dental or medical procedures, and having unprotected sex are at risk. Being

[1] Dr., Lecturer, Department of Applied Economics, Yangon University of Economics
[2] Ma, DipDS-93, 15th Batch, Yangon University of Economics
[3] Ma, DipDS-96, 15th Batch, Yangon University of Economics

worldwide, nearly 350 million people suffer from chronic hepatitis B infection and face the risk for serious liver cancer. Matthew J. Thompson; et al (2003) found that liver cancer rates were higher in North American Chinese than non-Asian ethnic groups, largely due to chronic HBV infection.

Indeed, half of the chronic hepatitis B problem results from vertical transmission of HBV that is the transmission of HBV from mother to infant that is in near delivery, during delivery, and post-delivery. Mother-to-child transmission of HBV is the major mode of transmission in HBV widespread area where there is little knowledge of pregnant women about HBV infection and prevention. Therefore HBV transmission during pregnancy is important and women in all ages and women of childbearing ages are special key stakeholders in preventing the vertical transmission of HBV and reducing the risk of HBV infection. Doganci, T; et al (2005) found that 302 children with chronic HBV infection, mothers of 38% were Hepatitis B surface antigen (HBsAg) positive and it is well known that the horizontal transmission is quite common in Turkey.

In addition, the most common underlying cause of liver cancer in the majority of Asian populations is horizontal transmission of HBV and people can be infected probably via saliva, injury, households with a persistent carrier, and sexual transmission. It is well known that the horizontal transmission of HBV is quite common in poor socioeconomics and hygienic conditions or populated regions such as the east and southeast countries where the families are highly populated. Therefore the majority of horizontal HBVs transmission is acquired since childhood and during in early adult adulthood in these regions or areas. Victoria M. Taylor, et al. (2002) found that Cambodian American women have low levels of HBV knowledge and vaccination. Thus they suggested that demonstration is a need for targeted educational interventions to reduce HBV-related liver cancer mortality among Southeast Asian communities. Han, Z; et al. (2017) found that higher education level was associated with better knowledge and attitude scores by measuring HBV knowledge and attitudes of pregnant women in Guangdong Province, China and using a questionnaire at one tertiary and two rural hospitals. Hakim, S.T., et al. (2008) also suggested based on their study that although the presence of these pathogenic viruses was not very high in healthy females of Karachi-Pakistan, it was still an important matter to control the unregulated spread of these deadly infections by promoting increased awareness and regular immunization programs in the community and local manufacturing of vaccines and related products reducing these infections.

The government of the Republic of the Union of Myanmar conducted its latest census in April 2014 and a total population was 51,486,253 in that year. According to the recent nationwide prevalence study, about 5 million people are affected by Hepatitis B Virus (HBV) and most of them are infected through contact with blood and body fluids of an infected person, homosexual or heterosexual, prohibited drug use as well as from an HBV infected mother to her infant during delivery. The prevalence of Hepatitis B virus infections in Myanmar is known at the overall level but there is still unknown at the national level of the exposure rate to HBV, the number of being carriers, and the number of people having anti-HBV surface antibodies through natural conversion, separately.

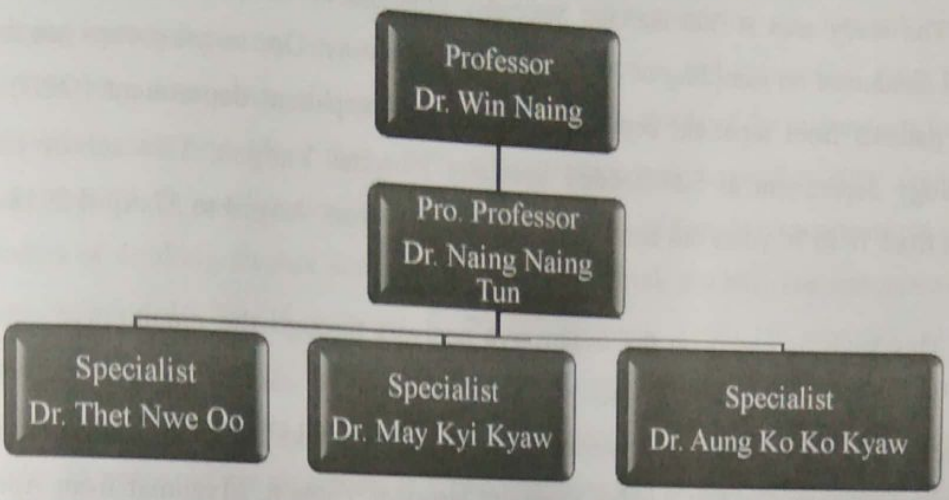
In Census (2014), the density of population in Myanmar is 76 persons per square kilometer and Yangon region is the most densely populated area (716 persons/sq km) followed by Mandalay region (200 persons/sq km). Therefore transmission patterns are believed to be the important features for targeting campaigns for reducing HBV infection in Myanmar. Currently, participation of female labor force is also important in the growth and development of a country. Women can quickly withdraw from the labor force when they are infected by the serious virus like HBV infection and they face the related risks of HBV. In this study, therefore; examining the level of women's knowledge about the HBV infection and prevention is needed as an urgent to know the prevalence of HBV transmission and to reduce the potential risks for HBV transmission by conducting the survey research at the 500-Bedded Specialty Hospital Yangon, Myanmar.

2. Profile of the 500-Bedded Specialty Hospital in Yangon

The 500-Bedded Specialty Hospital aimed to be the main facility for liver and kidney transplants is located on Min Ye Kyaw Swar Road, Lanmadaw Township in Yangon Division. It is a new specialty hospital that was formally opened on August 25, 2014 in Yangon, Myanmar and near the Yangon General Hospital. It was built by the Ministry of Health, Myanmar in cooperation with four private companies namely Original Group, A1, Golden Flower and Shwe Taung Development.

There are eight specialist departments, 5 professors, 8 senior consultants, 22 junior consultants, 25 civil assistant surgeons and 130 nurses in this hospital. It is also a Tertiary Care Teaching Hospital attached with University of Medicine 1, Yangon and University of Medicine 2, Yangon. Among these eight specialist departments, the department of Hepatology is responsible for curing Hepatitis diseases and caring the infected patients from both Inpatient Department (IPD) and Outpatient Department (OPD) in this hospital.

Figure (1) The Structure of Hepatology Department



Source: Department of Hepatology, 500-Bedded Specialty Hospital inYangon, Myanmar

3. Problem Statement

Most infections worldwide are acquired through horizontal and vertical transmissions of HBV. Currently, the prevalence of hepatitis B differs throughout the world and hepatitis B vaccination is used as the most effective measure in prevention of chronic disease, and liver cancer due to HBV infection. No matter what the effective vaccine against hepatitis B has been available, knowing the ways of hepatitis B virus transmission between human beings is desirable for many developing countries including Myanmar to reduce the burdens of this serious disease. Therefore the routes of transmission may have declined or should be tested by measuring the level of knowledge of HBV infection and prevention in reducing the risks for HBV transmission (especially for women in this case).

4. Research Questions

- How does the level of women's knowledge affect reducing the potential risks for HBV transmission?
- Why is the prevention of horizontal and vertical transmissions of HBV important for women?

5. Objective of the Study

The objective of the study is to examine the level of women's knowledge of Hepatitis B Virus infection and prevention in order to reduce the potential risks for HBV transmission by focusing on female patients at Inpatient Department (IPD) and Outpatient Department (OPD) in the 500 Bedded Specialty Hospital in Yangon.

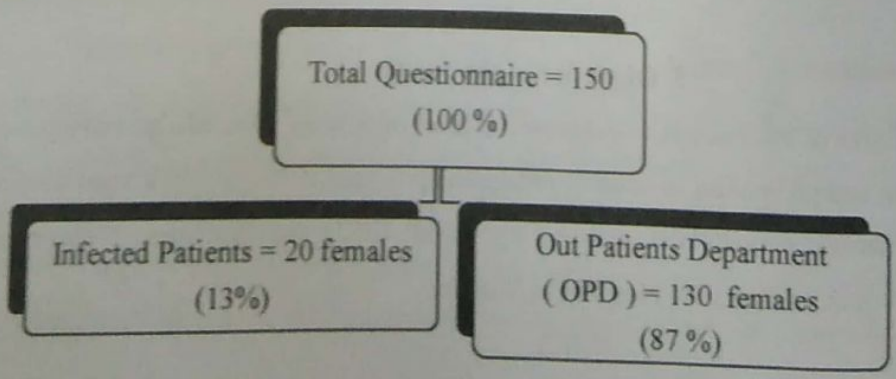
6. Scope of the Study

The study area is 500 Bedded Specialty Hospital in Yangon City, Myanmar. The study is conducted on sampling of 150 questionnaire survey. Our target groups are the only female patients from inpatient department (IPD) and outpatient department (OPD) in the herpetology department at 500-Bedded Specialty Hospital Yangon. This survey included females from 16 to 70 years old and the survey period is from 9 April to 27 April 2018.

7. Methodology

This study is based on the descriptive analysis through the quantitative structured survey questionnaire as well as face to face discussion to assess the level of women's knowledge of HBV infection and prevention to reduce the risks for HBV transmission. The survey was conducted in 500-Bedded Specialty Hospital Yangon, Myanmar from April 9 to April 27, 2018 because the outpatients are being allowed to meet the doctors on every Tuesday of a week. Questionnaire was translated into Myanmar and survey participants were given the completion of questionnaire items in Myanmar. It consists of a set of twenty three questions about the knowledge of HBV infection and prevention.

The study design includes surveying female patients in inpatient and outpatient departments, aged 16 and older on three times visit. The questionnaire was completed by 150 women and this study includes all 20 female of HBV infected patients currently in this hospital for curing HBV. The rest 130 female patients from the outpatient department are randomly selected through three visits' survey. By percentage, therefore; the infected patients represent 13% and outpatients represent 87% in this survey. The patients attending the outpatient department (OPD) and their attendants are subjected to a structured questionnaire about different aspects of Hepatitis B. The discussion and conversation had been conducted with Professors, Doctors, Consultant Physician and respondents in this hospital. We developed the sampling frame for our study based on the sources of available data at the target area.



8. Results and Discussion

We computed a summary of knowledge of women for the research questions addressing personal history, disease transmission, infection and prevention. Prior to being provided with a description of Hepatitis B, more than two thirds of the respondents had heard of HBV infection and More than 69% of the respondents knew that HBV could cause chronic hepatitis B and liver cancer. In this survey, 95% of female respondents do not have the habits of drinking alcohol and only 5% sometime drink alcohol. The age groups in this survey included 16-20 (11 women), 21-30 (43 women), 31-40 (36 women), 41-50 (28 women), 51-60 (20 women), and 61-70 (12 women), respectively. The number of household members per female patient are maximum 9 , minimum 1 and average 4 in which the number of under 15 years old are maximum at 3, and minimum at 1 as well as the number of under 5 years old are maximum at 3, and minimum at 1.

(i) Patient History

Figure (2) shows the background of patient history and status. In this study, a total of 150 female respondents were included to give some findings regarding the level of women's knowledge of the Hepatitis B virus infection and prevention to reduce the risks for transmission of HBV.

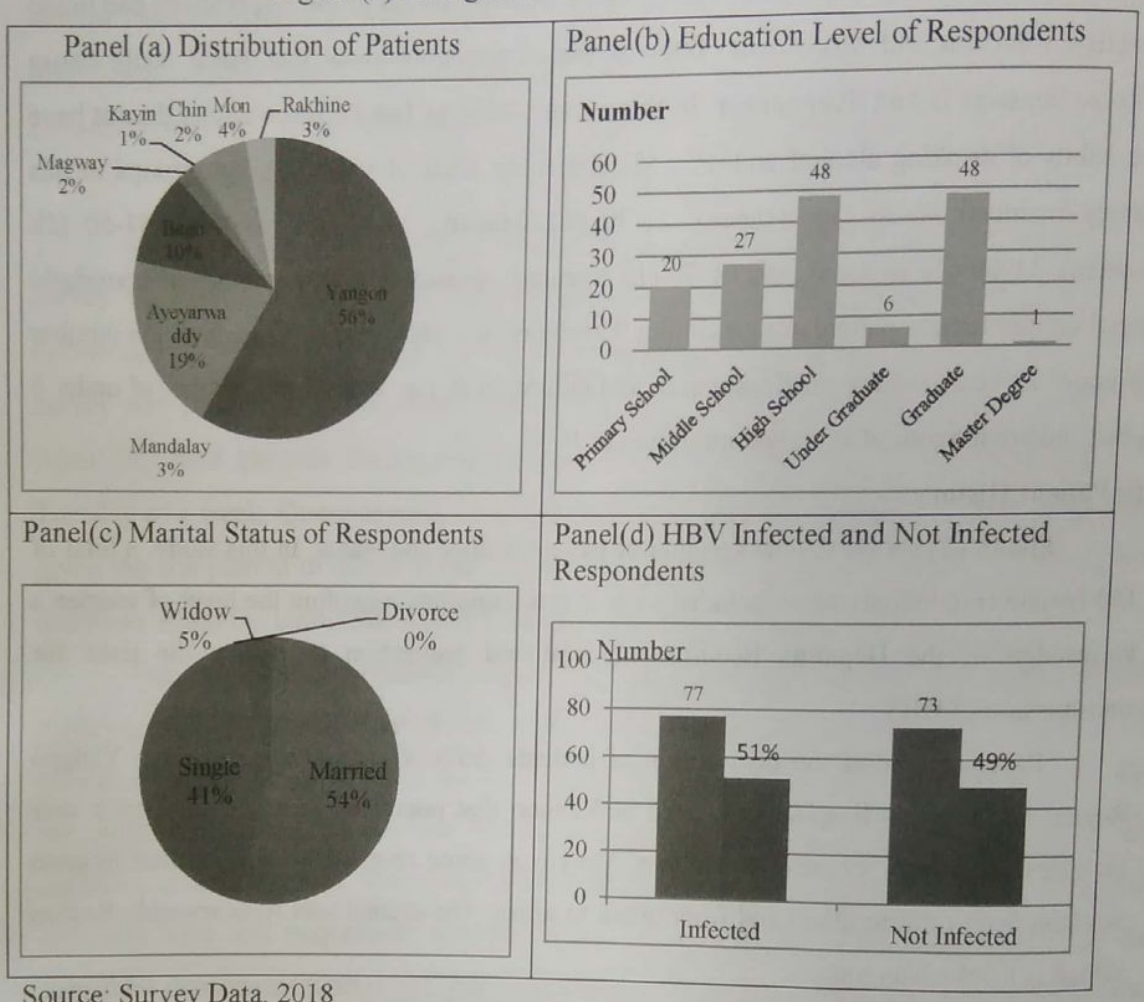
Panel (a) shows the distribution of patients. 56% of respondents are from Yangon Region because this hospital is located at Yangon that populated area and the health care facilities are mostly situated in Yangon. Moreover, some respondents are internal migrant workers from rural to urban and from urban to urban. The second was Ayeyarwaddy Region which is nearby Yangon.

In panel (b), most of the female respondents finished high school and are graduates and followed by middle school, primary school and under graduate school level respondents. 20 (13 %) had primary education; 27 (18 %) had middle education; 48 (32 %) had high school education; 6 (4 %) are under graduate; 48 (32 %) are graduates; and 1 (1 %) had done master degree as their highest level of education. Only 31 female respondents are dependent and the rest are having jobs such as teacher, lawyer, accountant, office and company staff, sale promoter, sale girls, nursemaid, casher, factory labor, designer, shopkeeper, and so on.

Panel (c) and (d) represents the summarizing of the marital status, HBV infected and not infected female respondents (not infected but they might be suspected as the suspended people with HBV carrier). There are 81 numbers of married women and 27% out of these married women are pregnant. According to panel (c), 54% of the female respondents (i.e. 81

numbers of married women) are married, 41% is single, and 5% is widows. In panel (d), there are 77 women of HBV infected in which 61% are married 32% are single. Similarly, 73 women are not infected in which 38% are married and 51% are single.

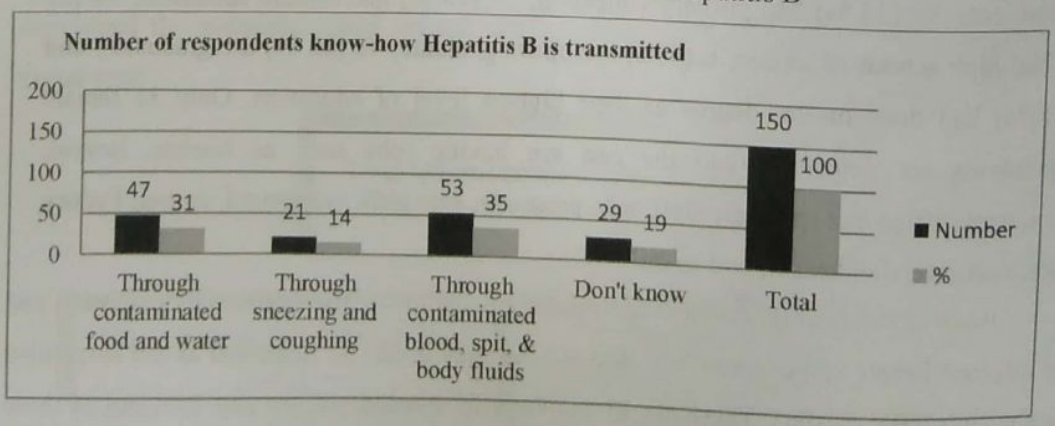
Figure (2) Background of Patient History and Status



Source: Survey Data, 2018

(ii) Know-how Hepatitis B is transmitted

Figure (2) Source of Infection with Hepatitis B



Source: Survey Data, 2018

Based on the survey data, Figure (2) shows the source of infection with Hepatitis B. The numbers of 80 female respondents know HBV is transmitted through contaminated blood, Spot & body fluids and 56 female respondents know through contaminated food and water the second factor. Thirdly, 36 female respondents don't know the source of infection with Hepatitis B. Fourth, 28 female respondents know through sneezing and coughing.

(iii)Summarizing the Level of Women's Knowledge of HBV Infection and Prevention

Table (1) shows the survey results of 150 female participants with a mean age of 38.2 ranging between 16 and 70. In evaluating the women's knowledge of HBV, we asked a series of different questions to female participants from inpatient department (IPD) and outpatient department (OPD) in the herpetology department at 500-Bedded Specialty Hospital Yangon.

Table (1) HBV Knowledge of Women in the Sample

*The numbers of respondents know- the most severe disease affecting the liver		
B & C	104	69 %
A & B	9	6 %
C & E	7	5 %
Don't know	30	20 %
Total	**150**	**100 %**
*The numbers of respondents know- what happens when one is infected with Hepatitis B		
Jaundice will occur	111	74 %
Chronic fever will occur	12	8 %
Drowsiness, dizziness and weakening	4	3 %
Don't Know	23	15 %
Total	**150**	**100 %**
*The numbers of respondents know- people who are infected by HBV show the symptoms and do not show the symptoms		
Yes	102	68 %
No	25	17 %
Don't know	23	15 %
Total	**150**	**100 %**
*The numbers of respondents know- what the diet should be during infected HBV		
Completely vegetarian food	75	50 %
Completely boiled food (without oil and spices)	28	19 %

Glucose, sugarcane juice and fruits	23	15 %
Normal healthy diet (homemade)	24	16 %
Total	**150**	**100 %**
*The numbers of respondents know- healthcare workers, public safety workers, injection drug users, and people treatment for disease with blood transfusion are at anticipated risk of HBV infection		
Yes	100	67 %
No	14	9 %
Less likely	12	8 %
Don't Know	24	16 %
Total	**150**	**100 %**
*The numbers of respondents know- people having sex with someone who have hepatitis B, a baby who can get Hepatitis B passed from the pregnant woman who is infected HBV, and people who live in the same house with a family member who has hepatitis B are at anticipated risk of HBV infection.		
Yes	103	69 %
No	15	10 %
Less likely	11	7 %
Don't Know	21	14 %
Total	**150**	**100 %**
*The numbers of respondents know- people can prevent Hepatitis B infection by abstaining from sharing razor blade, clippers, and needles with another person, and unneeded injection and blood transfusion.		
Yes	83	55 %
No	30	20 %
Less likely	20	14 %
Don't Know	17	11 %
Total	**150**	**100 %**
* The numbers of respondents know- Hepatitis B is prevented		
by isolating the infected person	14	9 %
by avoiding street food	18	12 %
through vaccination and proper advice from doctors	103	69 %
Don't Know	15	10 %
Total	**150**	**100 %**

*The numbers of respondents know- Hepatitis B infection should be vaccinated after the very first testing of people who is HBV infected or not.		
Yes	117	78 %
No	20	13 %
Don't Know	13	9 %
Total	**150**	**100 %**
*The numbers of respondents know- vaccination of Hepatitis B can prevent other diseases from different types of Hepatitis.		
Yes	70	47 %
No	49	33 %
Don't Know	31	20 %
Total	**150**	**100 %**
*The numbers of respondents know- vaccination of Hepatitis B can prevent the liver to stop working and the liver cancer.		
Yes	108	72 %
No	16	11 %
Don't Know	26	17 %
Total	**150**	**100 %**
*The numbers of respondents know- vaccination of Hepatitis B does not have side effect for both adults and children because it will have only a very mild reaction to some children such as paining throat and temporary illness.		
Yes	79	53 %
No	21	14 %
Don't Know	50	33 %
Total	**150**	**100 %**

Source: Survey Data, 2018

9. Conclusion

The survey found that 56 % of respondents are from Yangon division, and 19 % from Ayeyarwaddy in the total of 150 female respondents. Thus the highest prevalence of HBV infection was spreading in Yangon Region and followed by Ayeyarwaddy. We found that most of the respondents didn't know all types of hepatitis but they mostly knew only three types of Hepatitis namely A, B, and C. We found that 95% of female respondents never drink alcohol. The high point of hepatitis B infection was found in married type. Some of the

female respondents lacked the knowledge of HBV infection and they were unvaccinated against HBV. According to the survey, we found that 68 % of the female respondents knew both vertical and horizontal transmissions of HBV by through having sex with someone who has hepatitis B, the pregnant woman who has infected HBV to her baby, and people who live in the same house with a family member who has hepatitis B are at anticipated risk of HBV infection, blood spit and body fluids.

Even though most of female respondents knew the sign and symptoms of HBV, ways of infection, and prevention measure as well as there is a safe and effective vaccine to protect against hepatitis B infection, the challenge is still to reduce the socioeconomic impact of viral Hepatitis at individual, community and population level. Based on the results of 'don't know' answered by some female respondents, there may be at risk for infection because they have never known the ways of HBV infection and prevention. Therefore an ensure inclusive approach to develop a comprehensive public health approach to hepatitis B prevention, care and treatment is needed by collaboration with the local governments, the Ministry of Health, the Ministry of Education, non-profit organizations, NGOs, and INGOs. Moreover the expansion of medical educational programs is also needed to include provider teams from rural communities with a high burden of liver diseases.

Reference

Doganci, T; et al. (2005). Horizontal Transmission of Hepatitis B Virus in Children with Chronic Hepatitis B. *World Journal Gastroenterol*, 11(3): 418-420.

Hakim, S.T., Kazmi, S.U., and Bagasra,O (2008). Seroprevalence of Hepatitis B and C Genotypes among Young Apparently Healthy Females of Karachi-Pakistan. *Libyan Journal of Medicine*, 3:2, 66-70.

Han, Z; et al. (2017). Knowledge of and attitudes towards hepatitis B and its transmission from mother to child among pregnant women in Guangdong Province, China. *PLoS ONE*, 12(6): e0178671.

Horlander, J.C., et al. (1999). Vaccination against hepatitis B in patients with chronic liver disease awaiting liver transplantation. *Journal of Medical Science*, 318, 304–307.

Survey Questionnaire of Women's Knowledge of the Hepatitis B Virus Infection and Prevention of HBV in the 500 -Bedded Specialty Hospital in Yangon, Myanmar from April 9 to April 27, 2018

Taylor, V.M; et al. (2002). Hepatitis B Knowledge and Practices among Cambodian American Women in Settle, Washington. *Journal of Community of Health*, 27 (3), 151-163. Matthew J.

The Union Report (2014). *Myanmar Population and Housing Census, Census Report Volume 2*.

Thompson, M. J; et al. (2003). Hepatitis B Knowledge and Practices among Chinese Canadian Women in Vancouver, British Columbia. *Canadian Journal of Public Health*, 94 (4), 281-286.

WHO (2013). *Global Policy Report on the Prevention and Control of Viral Hepatitis in WHO Member States*. World Health Organization.

Factors Affecting on Community Participation in Household Solid Waste Management

(A Case Study of Selected Townships in Yangon)

Moe Hnin Phyu[1]

Abstract

This study aims to analyze the collaboration process among various stakeholders in waste management practices which can support to extend social, economic and environmental benefits, and thus, effect on long term success of waste management practices for the whole community. This study used field research survey with structured questionnaires to identify some of the influential factors on household waste management among various stakeholders. The study found that the level of public awareness and community participation is taking steps to reduce garbage. It also found that the collaboration between local governments, CBOs and community members in waste management practices can improve in local waste management system.

Keywords: solid waste management, household waste, waste recycling, community participation, stakeholder coordination

Introduction

At the beginning of cities, common problem of urbanization is that the discharge of garbage is increasing significantly day by day. In most developing countries, improper waste disposal creates serious environmental problems that affect health of humans and animals and cause serious economic and other welfare losses. In Myanmar, urban population has grown at a rapid rate over the past few years. However, if infrastructure such as housing, access to safe water and sanitary facilities, energy supply, transportation and communication is under supplied or poorly distributed, urbanization can bring about overcrowding, environmental stress and adverse impacts on human health.

[1] Lecturer, Department of Applied Economics, Yangon University of Economics

At present, Myanmar has a total population of (51.4) million with the population of Yangon is approximately (7.3) million, and the number of private households were (1.5) million in Yangon (2014 census). Currently, the waste collecting system of Yangon is operated mainly by the Yangon City Development Committee (YCDC). Although they collect all of the garbage from the homes, schools, markets, hospitals, industrial zones and all public places within all of Yangon City area, it has still need to fully participate of various stakeholders and the public, in order to be an efficient solid waste management system.

Moreover, considerable migration has taken place in major cities such as Yangon and Mandalay which is likely to increase in future. Yangon has the largest urban population in Myanmar, and its population density comes to approximately 716.3 persons living per square kilometer in the urban area of Yangon, according to 2014 census. But the process of urbanization contributes an increase in urban population rapidly and waste discharged also increased. Among such waste, the amount of household garbage increased significantly. However, the system for collecting garbage, waste disposal and processing is still not simultaneously developed which negatively impact on urban development of the Yangon.

Therefore, those living in urban area suffers waste-related problems, those may be caused by inadequate attention to environmental consequences, a general lack of knowledge and information concerning these waste related problems.

In turn, this results in garbage-ridden streets, block in the drain and dumping in inappropriate areas. Additionally, YCDC also faces financial conditions and a lack of technical knowledge concerning waste disposal and processing, as is the case in many other developing countries. Therefore, insufficient waste management may create negative impact on the health of residents. Moreover, it also creates negative impact on the urbanization and urban infrastructure of Yangon City. In this context, this study analyzes the importance of community participation in waste management system of Yangon by introducing community-based movements.

Problem Statement and Objective of the Study

Generally, there are four main issues concerning of waste management in developing countries, such as health and sanitation, resources, financial and technological issues. Among them, health and sanitation issue concerns how residents act according to perceived waste management procedures. Due to limitation of awareness, they dispose their garbage illegally or improperly, contributing to improper waste disposal and the limitation of participation in waste management within their community. Financial hardships concern to local government or municipalities, and this issue causes insufficient waste collection and poor waste treatment.

Therefore, the objective of the study is to analyze that which factors are influence on community participation in the city's waste management system. Based on the above discussions, following research questions can be simplified to promote community participation and stakeholders' coordination in waste management system;

(1) Is citizen participation important for waste management? What factors influence on their willingness to participate in waste management practices within their community?

(2) How to motivate community-based organizations (NGOs, NPOs and small/ medium enterprises) to participate in waste management? What factors influence on their interests?

(3) Does stakeholder coordination and public participation correlate to improve waste management systems?

Method of Study

This study used descriptive and inferential statistics by using both qualitative and quantitative approach. Primary data is collected from open-ended questionnaires which were distributed to the respondents. Data collection was conducted in January- February 2017 through distribution of structured questionnaire in the five selected townships in Yangon, such as Hlaing, Alone, Thingangyun, Thaketa and Dawpon Townships. The total number of sample household is 96 households which were randomly selected, composing of 21 households from Hlaing, 9 households from Alone, 25 households from Thingangyun, 23 households from Thaketa and 18 households from Dawpon. After data collection, an empirical analysis tested

regression between dependent and independent variables. The analysis has tested by multiple regression analysis by using SPSS. Secondary data was gathered from interviews with city officers, concerned organizations as well as from online sources.

Data Analysis and Findings

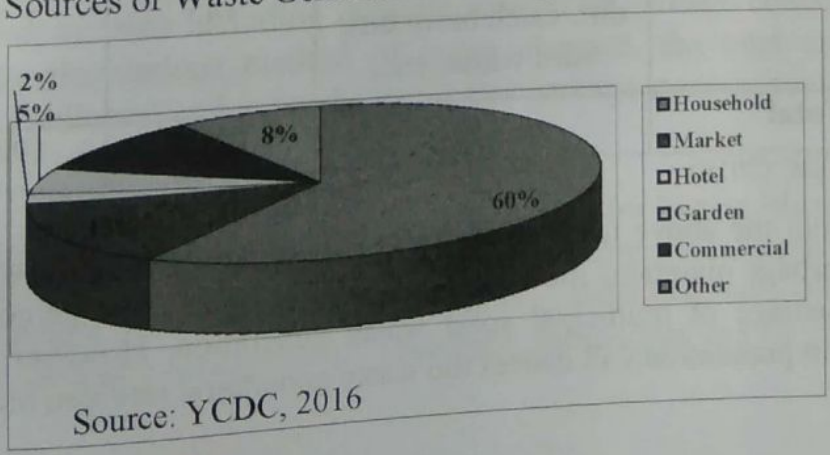
Background Information of Survey Area

Yangon is capital city of Myanmar and which composed of 33 townships. For the estimation of demand for solid waste services, a population figure out between 4.6 million to 5.0 million in metropolitan area. In order to keep the city clean and pleasant, YCDC undertook waste collection with a workforce of about 4000 strong utilizing 300 vehicles (YCDC, 2011), including open trucks. Recently, waste management is a major task for Cleansing and Pollution Control Department of YCDC, but the waste management problem still become severe in Yangon City. This is mainly caused by the changing lifestyle of urban people and consumption patterns of urban residents which also contributed to the waste management problem.

Recently, the household sector of Yangon is fast becoming a major generator of waste. YCDC collects about 2000 tons of solid waste per day but this number is rising day by day. (YCDC, 2016)

Moreover, in order to clarify the sources of waste generation, the household sector contributes to 60 percent of solid waste generation, which is the highest rate among all type of waste discharged. According to data from YCDC, the percentage contribution of the waste generated sources is shown in below figure.

Figure 1, Sources of Waste Generation in Yangon



Source: YCDC, 2016

Regarding to the data in 2016, the percentage and contents of the garbage collected from household sectors within the Yangon City area are shown below:

Table 1, Content of Materials by Kind and Percentage from Household Garbage in Yangon

No	Kind	Components	Total Metric Tons	Percentage (%)
1	Kitchen Waste	Waste from preparation, cooking, and serving of food, peelings of fruits and leftovers	1262	61.0%
2	Plastic	Pieces of plastics and packing plastic for food	238	12.0%
3	Paper	Packing paper, pieces of paper	103	5.0%
4	Glass	Pieces of glasses, broken glasses (not included in glass bottles)	124	6%
5	Metal	Tin, iron	186	9.0%
6	Others	Ashes from fires used for cooking, dirt, catch basin dirt, yard waste, etc.,	145	7.0%
	Total		**2058**	**100%**

Source: YCDC (2016)

From the above table, among the various kinds of solid waste, the kitchen garbage maintains the highest percentage of about 61 percent of the total percentage of municipal solid waste generation. However, gradual increases in population will causes the waste generation rate also increased.

In the case of waste disposal, there were two main final disposal sites, the biggest site is Htainbin, 60 hectares in extent and landfill capacity is over 800 tons per day. The other one is Htwei Chaungn which covers 80 hectares and daily disposal capacity is over 600 tons. Moreover, other dumping sites are located in Kyi Su, Da La, Hlaw Gar and Shwe Pyi Thar.

Questionnaire Design and Sample Size

A total 110 questionnaires were distributed and 96 papers were collected and thus n= 96 for the citizen group. The sampling method for citizen group is served by simple random sampling and stratified random sampling for community-based organization in terms of rank, which conducted by KII, including 9 officers.

As a first group of respondents, community members are intended to residents from selected townships. For this group, the questionnaire includes topics such as socio-economic condition, the level of knowledge about local waste management system, understanding the benefits from waste separation, resource recycling and clean neighborhood, and their interests on participating in composting project.

The second part concerns with community- based organizations, such as private firms/ NPOs/ NGOs (i.e., JICA and other voluneer groups such as Trash Hero Myanmar). The questionnaire for this group includes topics such as the economic benefits to be gained from composting and recycling and inquiries into what kind of social benefits private entity can provide to local residents.

The last part focuses on government body. In this part, secondary data is collected from YCDC and gathers information concerning the city waste management systems including the total amount of garbage collected from households, the various method of waste disposal, the total amount of recyclables collected and expenditure for city garbage management system.

(I) Analyze the Interests of Citizen Participation for Waste Management

In order to promote waste management systems, local people play as the main actors for waste separation, waste reduction and other roles concerned for waste management. Therefore, factors that can be influenced

on their willingness to participate in waste management practices within their community need to be analyzed.

(a) Socio- Economic Condition of the Respondents

Socio-economic conditions were measured mainly by using certain indicators as age, gender, educational attainment and personal income levels. The sample respondent size was 96 within the Yangon City. Table 2 shows the socio-economic condition of the respondents and their willingness to participate in local waste management systems. From the table, about 56percent of the respondents were willing to participate in composting project while 44percent were not.

Table 2, Socio-economic Condition of the Respondents

Gender	*Score*	*willing to participate*	*Not willing to participate*	*Frequency*	*Percentage*
Male	1	23	24	47	48.96
Female	2	31	18	49	51.04
		54	42	96	100
Level of Age	*Score*	*willing to participate*	*Not willing to participate*	*Frequency*	*Percentage*
< 19 years old	1	0	10	10	10.42
20-29 years old	2	5	8	13	13.54
30-39 years old	3	10	6	16	16.67
40-49 years old	4	16	0	16	16.67
50-59 years old	5	13	10	23	23.96
>= 60 years old	6	10	8	18	18.75
		54	42	96	100.00
Educational Attainment	*Score*	*willing to participate*	*Not willing to participate*	*Frequency*	*Percentage*
Primary	1	0	0	0	0
Middle school	2	0	0	0	0
High school	3	24	12	36	37.5
Collage/University	4	30	30	60	62.5
		54	42	96	100
Household Monthly Incom	*Score*	*willing to participate*	*Not willing to participate*	*Frequency*	*Percentage*
less than 250,000	1	9	12	21	21.88
250,001-300,000	2	16	30	46	47.92
300,001- 350,000	3	17	0	17	17.71
350,001-400,000	4	12	0	12	12.50
400,001- and above	5	0	0	0	0.00
		54	42	96	100.00

Source: survey data (2017)

In the above table, the range of the score for gender is from 1 to 2, minimum score was 1 and the maximum was 2. The table shows that 47

respondents were male (49percent) and the remaining 49 respondents were female (51percent). Among the males, 23 respondents (49percent) were willing to participate and 24 respondents (51percent) were not. Among female, 31 respondents (63percent) were willing to participate and 18 (37percent) were not. Therefore, it can be concluded that females are more actively willing to participate in household waste management project rather than males.

According to age levels, the range of the score was from 1 to 6, with the minimum score is being 1 and the maximum score is being 6. The table reveals that 16 respondents were 40-49 years old (30 percent) the largest group and were willing to participate in a household waste management project. The age group consisting of 50-59 years old, who contribute to 13 respondents (24percent) of total respondents, also wanted to participate.

According to educational background, there were no respondents from primary to middle school level. The largest number of respondents' 63 percent attained a college/ university level and those with only high school level consisted of 37 percent of total respondents. The score for educational background is range from 1 to 4 with the minimum score being 1 and the maximum being 4.

Regarding to analyze the influence of socio-economic conditions on the respondents' willingness to participate in local waste management systems, independent variables consists of socio-economic conditions and dependent variable is the willingness to participate tested by using multi regression analysis. Below Table (3) shows the summary results of the regression analysis.

Table 3, Summary of the Result of Multi regression Analysis

R square	Adjusted R square	F	Sig	Variables	t (sig)
0.394	0.367	14.773	0.00	• Gender	3.639 (.000)
				• Age	.171 (.865)
				• Educational attainment	-3.476 (.001)
				• Income level	6.567 (.000)

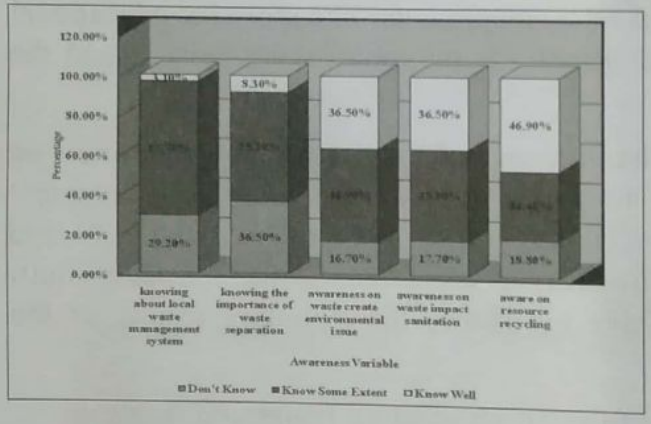
Source: Survey data (2017)

From the summary table, it can be clearly seen that "t= .171" and there is an insignificance p value of "p= .865" (.865>.05) for the age variable. Thus, it should be excluded from analyzing means that age does not influence on a respondents' willingness to participate.

(b) Respondents' Awareness on Local Waste Management System and Waste Related Issues

There are five variables to test the level of awareness on waste related issues in this paper. The number of the respondents who have knowledge of local waste management systems is considerably high for respondents who "know some extent" (67.76 percent) and who "know well" (3.10 percent) Thus, this means that about 71 percent of the respondents know the details of their local waste management system well, such as where the concerned organization brought their household garbage to and how to dispose of it.

Figure 2, Respondents' Awareness on Local Waste Management System and Waste Related Issue



Source: Survey data (2017)

Then, the second variable shows that from the total 96 respondents, about 64percent of the respondents (55.26 percent who "know some extent" and 8.3percent who "know well") have knowledge of the importance of waste separation. Other hand, 36.5percent have limited knowledge of waste separation. It can be concluded that almost 2 out of 3 persons have known about the importance of waste separation for environmental conservation.

The third one concerns the variable of awareness on waste creating environmental issues. For this case, most of the respondents aware for waste can create environmental issue i.e., 83 percent (36.5 percent who "know well" and 46.9 percent who "know some extent"). Additionally, 82 percent (36.5 percent who "know well" and 45.8 percent who "know some extent")

of the respondents were aware that waste impacts sanitation, while 81 percent (46.9 percent who "know well" and 34.4 percent who "know some extent") of the respondents were aware that waste impacts resource recycling.

In addition, the mean value and the standard deviation of each independent variable and dependent variable are shown in Table 4.

Table 4, Descriptive Statistics for Analysis of Awareness Variable

	Variables	Mean	Standard. Dev	Minimum Score	Maximum Score
Dependent Variable	Willing to participate	0.5625	0.49868	0	1
Independent Variable	Knowing about local waste management system	0.7708	0.60662	0	2
	Knowing the importance of waste separation	0.8021	0.81589	0	2
	Aware on waste create environmental issue	1.5625	1.14994	0	2
	Aware on waste impact sanitation issue	1.5521	1.15958	0	2
	Aware on resource recycling	1.7500	1.23117	0	2

(Note: score 0= Don't Know, 1= Know some extent and 2= know well)

Source: Survey data (2017)

The above table shows that the mean value for the awareness of resource recycling is the highest one, at 1.75, which close to highest score of 2. This means that the respondents have a high level of awareness concerning resource recycling compared to other variables.

Then, in order to find the variables that affect the respondents' willingness to participate in local waste management system is tested by using multi-regression analysis. It found that the value of R Square is 0.863 which means that about 86 percent of the variance in the willingness to participate is affected by the knowledge/awareness variable. Then, F value was 112.942 and there is significant p value p= .000 which is less than confident level 0.05. Therefore, it was summarized that there is strong correlation between dependent variable and independent variables.

In addition, in order to examine the correlation of each independent variables and dependent variable, the following model equation could be considered:

$$Y = -0.191 + 0.181X_1 + 0.037X_2 + 0.036X_3 + 0.082X_4 + 0.228X_5$$

t=-5.020 t= 4.256 t= 1.084 t= .669 t=1.577 t= 10.629

p=.000 p= .000 p=.281 p=.505 p=.118 p=.000

(where, Y= willingness to participate, X_1= knowing local waste management system, X_2= knowing the importance of waste separation, X_3= awareness on waste create environmental issue, X_4= awareness on waste impact sanitation issue, X_5= awareness on resource recycling)

The model equation shows that the regression model can be used as a predictor for promoting residents' willingness to participate. Knowledge of local waste management systems, knowledge of the importance of waste separation, awareness on waste creates environmental issue; awareness on waste impact sanitation issues and awareness on resource recycling are positively and significantly correlated with their willingness to participate in local SWM. Among those variables, awareness on resource recycling and knowledge of local waste management systems contribute to high level of influence on their willingness to participate.

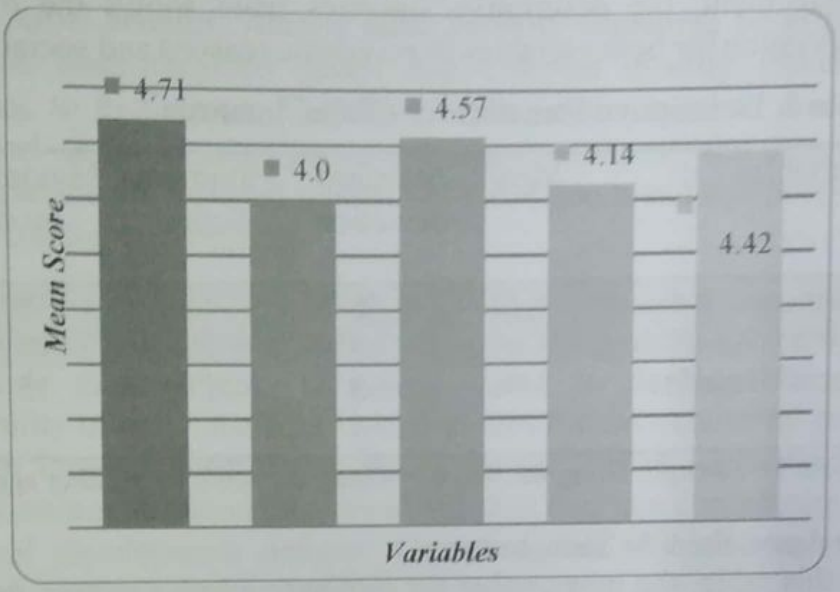
(II) Reasons of CBO's Participation for Solid Waste Management

The participation of community-based organization such as NGOs, NPOs and small and medium private enterprises is essential for the success of waste management systems, also. In this paper, two variables are used to test the interest of CBOs' in this regard.

This case is intended to testing the interest of CBOs' to participate in local waste management systems can be motivated by economic reasons.

The respondents' opinion for economic reasons is shown in figure 3. This figure shows that there are five variables to determine the CBOs' interest of participation is motivated by economic reasons. The mean value for first variable; "community-based composting system can reduce the amount of waste to final disposal" is 4.71 which named as μ_1 (i.e. μ_1= 4.71). Accordingly, the mean value for second, third, fourth and fifth variables are also named as μ_2, μ_3, μ_4 and μ_5, respectively. Then, their values are shown in below figure 3. To analyze this case, the hypothesis should be set as below, as a first step.

Figure 3, Respondents' Opinion for Economic Reasons



Source: survey data (2017)

(μ1= waste separation can reduce the amount of waste disposal to final land fill site, μ2= can reduce the transportation costs to land fill site, μ3= can access market opportunity through increased recyclables, μ4=can create extra earnings from waste separation by means of getting organic compost and recyclables from HH waste, μ5= can get formal job opportunity for former informal workers)

Hypothesis testing for economic reasons for participation

H0: if μ1, μ2, μ3, μ4, μ5 ≤ 3, CBOs participation is not influence by economic reasons.

H1: if μ1, μ2, μ3, μ4, μ5 > 3, CBOs participation is influence by economic reasons.

Figure 3 shows clearly that μ1= 4.71, μ2= 4, μ3= 4.57, μ4= 4.14, μ5= 4.42 > 3. Hence, H0 is rejected and accept H1. Therefore, it can conclude that CBOs' participation for community-based waste management can be motivated by economic incentives.

Moreover, one-sample test shows that there is significance p value (.000<.05) and greater "t" value for each variable for contributing economic reasons. Therefore, it can be concluded that economic reasons can be used as a predictor for promotion of CBOs' participation.

In order to summarize the CBOs' interest for participating in local waste management, the descriptive statistics table shows the mean and standard deviation for both variables of economic reasons and social benefits.

Table 5, Descriptive Statistics for CBOs' Interests

Variables	Mean	Standard deviation	Minimum Score	Maximum score
Economic Reasons	4.37	0.65	1	5
Social Benefits	3.94	0.68	1	5

(Note: Score 1= Strongly Disagree, Score2= Disagree, Score 3= Neither agree nor disagree,
Score 4= Agree, Score 5= Strongly Agree)

In this table, the mean value for motivating by economic reasons is 4.37 and its standard deviation is 0.65. Then, the mean value for providing social benefits is 3.94 with a standard deviation of 0.68. Therefore, the summary finding can conclude that CBOs' participation can be motivated by both factors of economics incentives and social benefits. Among them, economic reasons variable is more strongly influence on participation rather than social benefits.

Findings and Conclusion

In case the of local residents' participation, the summary findings reveal that members of the community will be interested in taking part in local waste management systems if they can see or be aware that the waste related issue can affect them. This means that the awareness factor can strongly influence on their participation. Therefore, it is necessary to distribute information on the present situation of local waste management systems in order to improve personal knowledge. According to analysis, information requirements can broadly be classified into two categories for acquiring knowledge: (1) waste separation can strongly impact on waste reduction and resource recycling and (2) waste treatment and disposal options and their potential impacts on environment and public health risks.

Moreover, participation by the third sector (i.e., NGOs, NPOs and CBOs) has played an important role for comprehensive and sustainable solid waste management. The results summarized that the interests of CBOs in

participating is not only influenced by economic reasons but also by the expected social benefits. Among those benefits, economic benefits that can be derived from recycled goods and compost directly influences the willingness to participate. Therefore, these entities need to create and/or extend markets for recycled goods and organic compost, and then, they also have to upgrade the required standard of those goods and compost over time as a key to enhance recycling.

Finally, local authorities (YCDC) can promote community participation and stakeholder coordination by introducing community-based solid waste management. This will intend to develop the sense of responsibility of individuals and social groups for environmental protection. Moreover, local authorities can reduce the burdens of waste management through community-based movement and thus they can concentrate more on other local development options. Therefore, this will also contribute to sustainable regional development, in the long term.

In order to conclude that, as a first step for Myanmar would be to promote community-based movement. The rational for this is because the concept of community and CBOs' participation in solid waste management and community-based solid waste management are increasingly being advocated as a means of responding to inadequate response from local governments. Hence, Myanmar should set up community-based waste management system or community-based kitchen waste separation and reduction project. This system should be initially introduced to urban residents in Yangon. In addition, creating and extending the markets for recyclables and organic compost should be also implemented. Moreover, it needs to provides subsidies for waste recycling and tax systems imposed on waste generators can support to reduce polluting or resource intensive activities however author cannot study that the polluters pay principle (i.e., paid garbage bag system) affect the waste management systems in this paper because of time limitation.

References

K. Puttaswamaiah (2002). *Cost – Benefit Analysis: Environmental and Ecological Perspectives,* Transaction Publisher, New Brunswick (U.S.A), New Jersey (U.K)

Olle Hage, Patrik Soderholm, Christer Berglund. "Norms and Economic Motivation in Household Recycling: Empirical Evidence from Sweden", *Resource, Conservation and Recycling,* Vol.53 (2009), pp.155-165

Rene Van Berkel, Toyoshi Fujita, Shizuka Hashimoto, Yong Geng. "Industrial and Urban Symbiosis in Japan: Analysis of the Eco-Town Program 1997- 2006". *The Journal of Environmental Management,* Vol.90 (2009), pp.1544-1556

S. Sakai, T. Ikematsu, Y. Hirai, H. Yoshida. "Unit-charging Programs for Municipal Solid Waste in Japan". *Journal of Waste Management,* Vol.28 (2008), pp.2815-2825

Samonporn Suttibak, Vilas Nitivattananon. "Assessment of Factors Influencing the Performance of solid Waste Recycling Programs", *Resource, Conservation and Recycling,* Vol.53 (2008), pp.45-56

Ulrich Glawe, C. Visvanathan, M. Alamgir, 2005, *Solid Waste Management in Least Developed Asian Countries* – A Comparative Analysis.

Monomial Orders and Gröbner Bases in Multivariate Polynomial Division

Dr. Phyu Phyu Khin[1]

Abstract

In this paper, the importance of the choice of monomial ordering is emphasized. Moreover, an algorithm is explained and illustrated some examples together with Gröbner bases of non-zero polynomial ideal.

Introduction

In the multivariate polynomial ring there is no natural linear ordering for univariate polynomial division. Therefore, there is no explicit division algorithm in the ring of polynomials with many variables F [x_1 , … , x_n]. It is not enough to compare the (total) degree of multivariate monomials, for instance, [$x^3 y^2 z < x^3 y z^2$ or $x^3 y^2 z > x^3 y z^2$] is uncertain. Hence, ordering of multivariate polynomial is essential. Generally, for $x_1^{\alpha_1} x_2^{\alpha_2} \dots x_n^{\alpha_n}$ and $x_1^{\beta_1} x_2^{\beta_2} \dots x_n^{\beta_n}$ we cannot determine their position without a specific monomial ordering.

Monomial orders and multivariate division with remainder

Definition : A **monomial order** in R = F [x_1 , … , x_n] is a relation $\prec$ on □ (the set of non-negative integer) such that

1. $\prec$ is a total order, (this means that every two elements are comparable),

2. $\alpha \prec \beta \Rightarrow \alpha+\gamma \prec \beta+\gamma$ *for all* $\alpha,\beta,r \in \mathbb{Z}^n$ (the additive property),

3. $\prec$ is a well-order (every nonempty subset of □ has a smallest element under $\prec$).

Three standard examples of Monomial Orders:

(i). Lexicographic Order

Let $\alpha=(\alpha_1,\alpha_2,\dots,\alpha_n)$ and $\beta=(\beta_1,\beta_2,\dots,\beta_n) \in$ □

$\alpha \prec$ ___ › the leftmost nonzero entry in $\alpha-\beta$ is negative.

Particularly if $n=3$, $\alpha_1=(0,4,0)$, $\alpha_2=(1,1,2)$, $\alpha_3=(1,2,1)$, $\alpha_4=(3,0,0)$,

Then $\alpha_1 \prec$ ___ $\prec$ ___ $\prec$ ___ .

---

[1]Associate Professor, Department of Mathematics, Yangon University of Economics

(ii).Graded Lexicographic Order

$$\alpha \prec_{grlex} \beta \Leftrightarrow \sum_{1\le i\le n} \alpha_i < \sum_{1\le i\le n} \beta_i \text{ or } \left[\sum_{1\le i\le n} \alpha_i = \sum_{1\le i\le n} \beta_i \text{ and } \alpha \prec_{lex} \beta\right].$$

With $\alpha_1, \ldots, \alpha_4$ as above, we have $\alpha_4 \prec_{grlex} \alpha_1 \prec_{grlex} \alpha_2 \prec_{grlex} \alpha_3$.

(iii).Graded Reverse Lexicographic Order

$$\alpha \prec_{grevlex} \beta \Leftrightarrow \sum_{1\le i\le n} \alpha_i < \sum_{1\le i\le n} \beta_i \text{ or}$$

$$\left[\sum_{1\le i\le n} \alpha_i = \sum_{1\le i\le n} \beta_i \text{ and the rightmost nonzero entry in } \alpha-\beta \in \mathbb{Z}^n \text{ is positive}\right]$$

Then $\alpha_4 \prec_{grevlex} \alpha_2 \prec_{grevlex} \alpha_3 \prec_{grevlex} \alpha_1$, with $\alpha_1,\ldots,\alpha_4$ as before.

Example 1. Let $f = 4xyz^2 + 4x^3 - 5y^4 + 7xy^2z \in \mathbb{Z}[x,y,z]$

(i) Then $\alpha_1 = (1,1,2)$, $\alpha_2 = (3,0,0)$, $\alpha_3 = (0,4,0)$, $\alpha_4 = (1,2,1)$

Consider $\alpha_1 - \alpha_2 = (-2,1,2)$, $\alpha_1 \prec_{lex} \alpha_2$ and $\alpha_1 - \alpha_4 = (0,-1,1)$, $\alpha_1 \prec_{lex} \alpha_4$

$\alpha_4 - \alpha_2 = (-2,2,1)$, $\alpha_4 \prec_{lex} \alpha_2$ and $\alpha_3 \prec_{lex} \alpha_1$, $\alpha_3 \prec_{lex} \alpha_2$ and $\alpha_3 \prec_{lex} \alpha_4$

Then $\alpha_3 \prec_{lex} \alpha_1 \prec_{lex} \alpha_4 \prec_{lex} \alpha_2$.

The order of f with respect to $\prec_{lex}$, $4x^3 + 7xy^2z + 4xyz^2 - 5y^4$.

(ii) Since $\alpha_1 \prec_{lex} \alpha_4$ and $\alpha_3 \prec_{lex} \alpha_1$.So $\alpha_3 \prec_{lex} \alpha_1 \prec_{lex} \alpha_4$.Then $\alpha_2 \prec_{grlex} \alpha_3 \prec_{grlex} \alpha_1 \prec_{grlex} \alpha_4$.

The order of f with respect to $\prec_{grlex}$, $7xy^2z + 4xyz^2 - 5y^4 + 4x^3$.

(iii) $\alpha_1 - \alpha_3 = (1,-3,2)$ and $\alpha_1 \prec_{grevlex} \alpha_3$, $\alpha_1 - \alpha_4 = (0,-1,1)$ and $\alpha_1 \prec_{grevlex} \alpha_4$

$\alpha_4 - \alpha_3 = (1,-2,1)$ and $\alpha_4 \prec_{grevlex} \alpha_3$. Then $\alpha_2 \prec_{grevlex} \alpha_1 \prec_{grevlex} \alpha_4 \prec_{grevlex} \alpha_3$

The order of f with respect to $\prec_{grevlex}$, $-5y^4 + 7xy^2z + 4xyz^2 + 4x^3$.

Proposition The element $0 = (0,\ldots,0) \in \mathbb{Z}^n$ is necessarily the smallest element in $\mathbb{Z}^n$ under any such ordering.

Proof : If $\alpha \prec 0$ then, since $\alpha \in \mathbb{Z}^n$,

By additive properties, $\alpha + \alpha \prec 0 + \alpha$ or $2\alpha \prec \alpha$. Repeatedly this argument,

$0 \succ \alpha \succ 2\alpha \succ 3\alpha \succ \ldots$. But then the set $\{0, \alpha, 2\alpha, \ldots\}$ does not have a smallest element and the ordering is not a well-ordering.

Definition Let $f = \sum_{\alpha \in \mathbb{N}^n} c_\alpha x^\alpha \in R$ be a nonzero polynomial with all $c_\alpha \in F$ (only finitely many nonzero) and $\prec$ a monomial order.

(i) Each $c_\alpha x^\alpha$ with $c_\alpha \neq 0$ is a **term** of f.

(ii) The **multidegree** of f is $\text{mdeg}(f) = \max\{\alpha \in \mathbb{N}^n : c_\alpha \neq 0\}$.

(iii) The **leading coefficient** of f is $lc(f) = c_{\text{mdeg}(f)} \in F \setminus \{0\}$.

(iv) The **leading monomial** of f is $lm(f) = x^{\text{mdeg}(f)} \in R$.

(v) The **leading term** of f is $lt(f) = lc(f) \cdot lm(f) \in R$.

Example 2. In order to illustrate these notions, let us see below.

Let $f = 4xyz^2 + 4x^3 - 5y^4 + 7xy^2z \in \mathbb{Q}[x,y,z]$.

	$<_{Lex}$	$<_{Grlex}$	$<_{grevlex}$
mdeg (f)	(3,0,0)	(1,2,1)	(0,4,0)
lc (f)	4	7	-5
lm (f)	x^3	xy^2z	y^4
lt (f)	$4x^3$	$7xy^2z$	$-5y^4$

LemmaLet $\prec$ be a monomial order on R, and $f, g \in R \setminus \{0\}$.

(i) $\text{mdeg}(f\,g) = \text{mdeg}(f) + \text{mdeg}(g)$

(ii) If $f + g \neq 0$ then $\text{mdeg}(f+g) \leq \max\{\text{mdeg}(f), \text{mdeg}(g)\}$, with equality if $\text{mdeg}(f) \neq \text{mdeg}(g)$

Proof: We say that a monomial x^α occurs in a polynomial h if its coefficient in h is nonzero.

(i)Every monomial occurring in f g is of the form $x^{\alpha+\beta}$ such that x^α and x^β occur in f and g, respectively. This implies that $\text{mdeg}(fg) \leq \text{mdeg}(f) + \text{mdeg}(g)$. On the other hand,if either $\alpha \prec \text{mdeg}(f)$ or $\beta \prec \text{mdeg}(g)$,then $\alpha + \beta \prec \text{mdeg}(f) + \text{mdeg}(g)$. Thus the coefficient of $x^{\text{mdeg}(f)+\text{mdeg}(g)}$ is $lc(f)lc(g) \neq 0$ and hence $\text{mdeg}(fg) = \text{mdeg}(f) + \text{mdeg}(g)$

(ii)Every nonzero term of f + g is of the form $(c+d)x^\alpha$ for a coefficient c of f and a coefficient d of g. Since $c + d \neq 0$, at least one of c and d is nonzero, which implies that $\alpha \leq \text{mdeg}(f)$ or $\alpha \leq \text{mdeg}(g)$, and hence $\text{mdeg}(f+g) \leq \max\{\text{mdeg}(f), \text{mdeg}(g)\}$. If $\text{mdeg}(f) \prec \text{mdeg}(g)$, then the coefficient of $x^{\text{mdeg}(g)}$ in $f + g$ is $lc(g)$, and hence $\text{mdeg}(f+g) = \text{mdeg}(g) = \max\{\text{mdeg}(f), \text{mdeg}(g)\}$

Definition Let $f = \sum_{\alpha \in \square^n} c_\alpha x^\alpha \in R$ be a nonzero polynomial with all $c_\alpha \in F$ (only finitely many nonzero) and $\prec$ a monomial order.

(i) Each $c_\alpha x^\alpha$ with $c_\alpha \neq 0$ is a **term** of f.

(ii) The **multidegree** of f is $\text{mdeg}(f) = \max\{\alpha \in \square^n ; c_\alpha \neq 0\}$.

(iii) The **leading coefficient** of f is $lc(f) = c_{\text{mdeg}(f)} \in F \setminus \{0\}$.

(iv) The **leading monomial** of f is $lm(f) = x^{\text{mdeg}(f)} \in R$.

(v) The **leading term** of f is $lt(f) = lc(f) \cdot lm(f) \in R$.

Example 2. In order to illustrate these notions, let us see below.

Let $f = 4xyz^2 + 4x^3 - 5y^4 + 7xy^2z \in \square[x, y, z]$.

	$<_{Lex}$	$<_{Relex}$	$<_{grevlex}$
mdeg (f)	(3,0,0)	(1,2,1)	(0,4,0)
lc (f)	4	7	-5
lm (f)	x^3	xy^2z	y^4
lt (f)	$4x^3$	$7xy^2z$	$-5y^4$

LemmaLet $\prec$ be a monomial order on R, and $f, g \in R \setminus \{0\}$.

(i) $\text{mdeg}(fg) = \text{mdeg}(f) + \text{mdeg}(g)$

(ii) If $f + g \neq 0$ then $\text{mdeg}(f+g) \leq \max\{\text{mdeg}(f), \text{mdeg}(g)\}$, with equality if $\text{mdeg}(f) \neq \text{mdeg}(g)$

Proof: We say that a monomial x^α occurs in a polynomial h if its coefficient in h is nonzero.

(i)Every monomial occurring in f g is of the form $x^{\alpha+\beta}$ such that x^α and x^β occur in f and g, respectively. This implies that $\text{mdeg}(fg) \leq \text{mdeg}(f) + \text{mdeg}(g)$. On the other hand,if either $\alpha \prec \text{mdeg}(f)$ or $\beta \prec \text{mdeg}(g)$,then $\alpha + \beta \prec \text{mdeg}(f) + \text{mdeg}(g)$. Thus the coefficient of $x^{\text{mdeg}(f)+\text{mdeg}(g)}$ is $lc(f)lc(g) \neq 0$ and hence $\text{mdeg}(fg) = \text{mdeg}(f) + \text{mdeg}(g)$

(ii)Every nonzero term of f + g is of the form $(c+d)x^\alpha$ for a coefficient c of f and a coefficient d of g. Since $c + d \neq 0$, at least one of c and d is nonzero, which implies that $\alpha \leq \text{mdeg}(f)$ or $\alpha \leq \text{mdeg}(g)$, and hence $\text{mdeg}(f+g) \leq \max\{\text{mdeg}(f), \text{mdeg}(g)\}$. If $\text{mdeg}(f) \prec \text{mdeg}(g)$, then the coefficient of $x^{\text{mdeg}(g)}$ in $f + g$ is $lc(g)$, and hence $\text{mdeg}(f+g) = \text{mdeg}(g) = \max\{\text{mdeg}(f), \text{mdeg}(g)\}$

Example. 3 Given polynomials $f_1, f_2, \ldots, f_s \in R$, we want to write $f = q_1 f_1 + \ldots + q_s f_s + r$.

Let $\prec = \prec_{lex}$, $f = x^2y + xy^2 + y^2$, $f_1 = xy - 1$, $f_2 = y^2 - 1$

	$xy-1$	y^2-1	remainder
$x^2y + xy^2 + y^2$	x		
$-(x^2y - x)$			
$xy^2 + x + y^2$	y		
$-(xy^2 - y)$			
$x + y^2 + y$			x
$-x$			
$y^2 + y$		1	
$-(y^2 - 1)$			
$y + 1$			

$f = (x+y) \cdot f_1 + 1 \cdot f_2 + (x+y+1)$

Here, position of monomials are considered according to lexicographic order. One of them has been described in order to see vividly. For $xy^2 + y^2 + x$, let

$\alpha_1 = (1, 2), \alpha_2 = (0, 2), \alpha_3 = (1, 0)$

Then $\alpha_2 - \alpha_3 = (-1, 2), \alpha_2 \prec_{lex} \alpha_3$ and $\alpha_2 - \alpha_1 = (-1, 0), \alpha_2 \prec_{lex} \alpha_1$

$\alpha_3 - \alpha_1 = (0, -2), \alpha_3 \prec_{lex} \alpha_1$ so $\alpha_2 \prec_{lex} \alpha_3 \prec_{lex} \alpha_1$. The orders with respect to $\prec_{lex}$, $xy^2 + x + y^2$.

If we choose f_2 instead of f_1 in the second step of Example. 3, we get

$$f = x \cdot f_1 + (x+1) \cdot f_2 + (2x+1)$$

ALGORITHM: Multivariate division with remainder

Input : Nonzero polynomials $f, f_1, f_2, \ldots, f_s \in R = F[x_1, \ldots, x_n]$, where F is a field and a monomial order $\prec$ on R.

Output : $q_1, \ldots, q_s, r \in R$ such that $f = q_1 f_1 + \ldots + q_s f_s + r$ and no monomial in r is divisible by any of $lt(f_1), \ldots, lt(f_s)$.

1. $r \leftarrow 0$, $p \leftarrow f$, **for** $i = 1, \ldots, s$ **do** $q_i \leftarrow 0$
2. **While** $p \neq 0$ **do**
3. **if** $lt(f_i)$ divides $lt(p)$ for some $i \in \{1, \ldots, s\}$

   then choose some such i, $q_i \leftarrow q_i + \frac{lt(p)}{lt(f_i)}$, $p \leftarrow p - \frac{lt(p)}{lt(f_i)} f_i$

   else $r \leftarrow r + lt(p)$, $p \leftarrow p - lt(p)$
4. **return** $q_1, \ldots, q_s, r$.

Theorem Each time the algorithm passes through step 3, the following invariants hold

(i) $\text{mdeg}(p) \le \text{mdeg}(f)$ and $f = p + q_1 f_1 + \ldots + q_s f_s + r$

(ii) $q_i \neq 0 \Rightarrow \text{mdeg}(q_i f_i) \le \text{mdeg}(f)$ for $1 \le i \le s$.

(iii) no term in r is divisible by any $lt(f_i)$.

Proof : It is clear that the invariants hold after step 1.Assume that they hold at the beginning of step 3 and show that they hold again at the end of step 3.

Let the new values of $p, r, q_1, \ldots, q_s$ be $p^*, r^*, q_1^*, \ldots, q_s^*$ when the condition in step3 is false,then

$\text{mdeg}(p^*) = \text{mdeg}(p - lt(p)) < \text{mdeg}(p) \le \text{mdeg}(f)$, $p^* + r^* = p - lt(p) + r + lt(p) = p + r$

$\text{mdeg}(q_i^* f_i) = \text{mdeg}(q_i f_i) = \text{mdeg}(p) \le \text{mdeg}(f)$ and since $q_i^* = q_i$ for all i.

By induction and since the condition in step 3 is false, the last invariant also hold for r^*.

Now, we assume that the condition in step 3 is true.

Then $r^* = r$, and the last invariant holds for r^* by induction

$\text{mdeg}(p^*) = \text{mdeg}\left(p - \frac{lt(p)}{lt(f_i)} f_i\right) \prec \text{mdeg}(p) \le \text{mdeg}(f)$, since both polynomials in the difference have degree $\text{mdeg}(p)$ and their leading coefficients coincide.

$p^* + q_i^* f_i = p - \frac{lt(p)}{lt(f_i)} f_i + \left(q_i + \frac{lt(p)}{lt(f_i)}\right) f_i = p + q_i f_i$, and since $r^* = r$ and $q_i^* = q_j$ for $j \neq i$.

Finally, if $q_i = 0$ then $\text{mdeg}(q_i^* f_i) = \text{mdeg}\left(\frac{lt(p)}{lt(f_i)} f_i\right) = \text{mdeg}(p) \le \text{mdeg}(f)$,

$\text{mdeg}(q_i^* f_i) = \text{mdeg}\left(q_i f_i + \frac{lt(p)}{lt(f_i)} f_i\right) \le \max\{\text{mdeg}(q_i f_i), \text{mdeg}(p)\} \le \text{mdeg}(f)$ if both q_i, q_i^* are nonzero.

Example 4. Let $f_1 = x^2y - 2x$, $f_2 = y^3 + 4$ we will use lex order with $y \prec$. Let $f = x^2y^3 - 2xy^2$ The first case will be $f = (f_1, f_2)$. Then, by procedure described above we obtain $x^2y^3 - 2xy^2 = y^2(x^2y - 2x) + 0(y^3 + 4) + 0$. If, however, we take $f = (f_2, f_1)$ in the second case, then we obtain $x^2y^3 - 2xy^2 = x^2(y^3 + 4) + 0(x^2y - 2x) - 2xy^2 - 4x^2$. So we can see that the two cases in the example produce two different remainders, 0 and $-2xy^2 - 4x^2$, respectively, due to a switch in the order of polynomials in f.

Our goal is now to find a special basis of an arbitrary ideal such that the remainder on division by that basis is unique.

Monomial ideal

Definition A **monomial ideal** $I \subseteq R$ is an ideal generated by monomials in R, so that there exists a subset $A \subseteq \square^n$ with $I = \langle x^A \rangle = \langle \{x^\alpha : \alpha \in A\} \rangle$

Lemma Let $I = \langle x^A \rangle \subseteq R$ be a monomial ideal, and $\beta \in \square^n$. Then $x^\beta \in I \Leftrightarrow \exists \alpha \in A \; x^\alpha \mid x^\beta$.

Proof : "$\Leftarrow$" is clear. Conversely, let $\alpha_1, \ldots, \alpha_s \in A$ and $q_1, \ldots, q_s \in R$ such that $x^\beta = \sum_i q_i x^{\alpha_i}$. There is at least one term $q_i x^{\alpha_i}$ in which x^β occurs, and then $x^{\alpha_i} \mid x^\beta$.

Example 5. Let $g = x^3 - 2xy$, $h = x^2y - 2y^2 + x \in \square[x, y]$, $\prec = \prec_{grlex}$, $G = \{g, h\}$, and $I = \langle G \rangle$

Then $x^2 = -y \cdot g + x \cdot h$ and $x^2 \in \langle lt(I) \rangle$ but $x^2 \notin \langle lt(G) \rangle = \langle x^3, x^2y \rangle$.

Lemma Let I be an ideal in $R = F[x_1, \ldots, x_n]$. If $G \subseteq I$ is a finite subset such that $\langle lt(G) \rangle = \langle lt(I) \rangle$ then $\langle G \rangle = I$.

Proof : Let $G = \{g_1, \ldots, g_s\}$. If f is an arbitrary polynomial in I, then division with remainder yields $f = q_1g_1 + q_2g_2 + \cdots + q_sg_s + r$, with $q_1, \ldots, q_s, r \in R$, such that either r = 0 or no term of r is divisible by the leading term of any g_i. But $r = f - q_1g_1 - \cdots - q_sg_s \in I$, and hence $lt(r) \in lt(I) \subseteq \langle lt(g_1), \ldots, lt(g_s) \rangle$. This together with lemma implies that r = 0.Thus $f \in \langle g_1, \ldots, g_s \rangle = \langle G \rangle$.

Theorem Every ideal I in $R = F[x_1, \ldots x_n]$ is finitely generated. More precisely, there exists a finite subset $G \subseteq I$ such that $\langle G \rangle = I$ and $\langle lt(G) \rangle = \langle lt(I) \rangle$.

Gröbner bases and S- polynomials

Definition Let $\prec$ be a monomial order and $I \subseteq R$ an ideal. A finite set $G \subseteq I$ is a **Gröbner basis** for I with respect to $\prec$ if $\langle lt(G) \rangle = \langle lt(I) \rangle$.

Theorem Let G be a Gröbner basis for the ideal $I \subseteq R$ with respect to a monomial order $\prec$, and $f \in R$. Then $f \in I$ if and only if $f \; rem \; G = 0$.

Definition Let $g, h \in R$ be nonzero, $\alpha = (\alpha_1, ..., \alpha_n) = m\deg(g)$, $\beta = (\beta_1, ..., \beta_n) = m\deg(h)$, and $r = \left(\max\{\alpha_1, \beta_1\}, ..., \max\{\alpha_n, \beta_n\}\right)$. The **S-polynomial** of g and h is

$S(g,h) = \frac{x^r}{lt(g)} g - \frac{x^r}{lt(h)} h \in R$. Clearly $S(h,g) = -S(g,h)$, and since $x^r / lt(g), x^r / lt(h) \in R$, we have $S(g,h) \in \langle g, h \rangle$.

Definition A Gröbner basis $\{g_1, g_2 \cdots, g_s\}$ is **minimal** if (1)For all $i = 1, ..., s$, $\mathrm{LC}(g_i) = 1$

(2) For all $i \neq j$, $\mathrm{LT}(g_i)$ not divisible by $\mathrm{LT}(g_j)$.

Definition A Gröbner basis $G = \{g_1, g_2, ..., g_s\}$ is **reduced** if (1) For all $i = 1, ..., s$, $\mathrm{LC}(g_i) = 1$

(2) For all $i = 1, ..., s$, g_i is reduced with respect to $G \setminus \{g_i\}$.

Theorem A finite set $G = \{g_1, ..., g_s\} \subseteq R$ is a Gröbner basis of the ideal $\langle G \rangle$ if and only if $S(g_i, g_j) \; rem \; (g_1, ..., g_s) = 0$ for $1 \leq i \leq j \leq s$.

Theorem (Buchberger's algorithm) Let $f_1, ..., f_s \in R = F[x_1, ..., x_n]$ be a list of the polynomials defining I. For each pair of polynomials f_i, f_j in F calculate their S-polynomial S, and divide it by the polynomials $f_1, ..., f_s$ in F obtaining S^F. If $S^F \neq 0$, add S^F to F and start again with $F = F \cup \{S^F\}$. Repeat the process until all S- polynomials of polynomials in F have remainder 0 after division by F. This process ends after a finite number of steps.

Example 6.(i) Computing a Gröbner basis for the ideal $I = \langle x^2 + y - 1, \; xy - x \rangle \subseteq \mathbb{Q}[x, y]$ with respect to $\prec = \prec_{lex}$ and $x \succ y$, will be as follows. $\alpha = (2,0)$, $\beta = (1,1)$ and $\gamma = (2,1)$.

$S(x^2 + y - 1, \; xy - x) = \frac{x^2 y}{x^2}(x^2 + y - 1) - \frac{x^2 y}{xy}(xy - x) = x^2 + y^2 - y$. Then

$x^2 + y^2 - y = -x(xy - x) + y(x^2 + y - 1) + 0$ and $x^2 + y^2 - y = 1(x^2 + y - 1) + 0(xy - x) + (y^2 - 2y + 1)$

The reduced Gröbner basis is $G = \{x^2 + y - 1, \; xy - x, \; y^2 - 2y + 1\}$.

(ii) Consider $f_1 = x^2 + y^2 - y$ and $f_2 = 3xy^2 - 4xy + x + 1$, we have f_1 rem $G = 0$ and f_2 rem $G = 1$, and hence $f_1 \in I$ and $f_2 \notin I$.

Example 7.Consider with respect to $\prec = \prec_{lex}$, (i) $\{x + y, y^2 - 1\}$ for $x \succ y$. This is a Gröbner basis since $S(x + y, y^2 - 1) = y^3 + x$ and $y^3 + x$ rem $(x + y, y^2 - 1) = 0$.

(ii) $\{y+x, y^2-1\}$ for $y \succ$ This is not a Gröbner basis since the leading term xy of $S(y+x, y^2-1) = xy+1$ is neither divisible by $y = lt(y+x)$ nor by $y^2 = lt(y^2-1)$.

(iii) $\{xyz-1, x-y, y^2z-1\}$ for $x \succ \succ$ This is a Gröbner basis, but not a minimal one $xyz = lt(xyz-1)$ is divisible by $x = lt(x-y)$.

Example 8. Let $\prec = \prec_{grlex}$ with $y \prec x$, $f_1 = x^3 - 2xy$ and $f_2 = x^2y - 2y^2 + x \in \square[x, y]$.

$G = \{f_1, f_2\}$ is not a Gröbner basis since $S(f_1, f_2) = -x^2$ and

$lt(S(f_1, f_2)) = -x^2 \notin \langle x^3, x^2y \rangle = \langle lt(G) \rangle$.

Now including $f_3 = S(f_1, f_2)\ rem\ (f_1, f_2) = -x^2$ in our basis,and $S(f_1, f_2)\ rem\ (f_1, f_2, f_3) = 0$

Next $S(f_1, f_3) = 1 \square f_1 - (-x) \square f_3 = -2xy$, $S(f_1, f_3)\ rem\ (f_1, f_2, f_3) = -2xy = f_4$, which is adjoined to our basics, so that $S(f_1, f_3)\ rem\ (f_1, ..., f_4) = 0$.

Now $S(f_1, f_4) = y \square f_1 - \left(-\frac{1}{2}x^2\right) \square f_4 = -2xy^2 = y \square f_4$ so that $S(f_1, f_4)\ rem\ (f_1, ..., f_4) = 0$,

and $S(f_2, f_3) = 1 \square f_2 - (-y) \square f_3 = -2y^2 + x$.

After adjoining $f_5 = S(f_2, f_3) rem (f_1, ..., f_4) = -2y^2 + x$.

$S(f_i, f_j)\ rem\ (f_1, ..., f_5) = 0$ for $1 \le i \le j \le 5$ and $\{f_1, \ ... \ , f_5\}$ is a Gröbner basis.

Conclusion

We have presented order of monomial is a vital role in division of multivariate polynomials. Then we have created an algorithm how to divide multivariate polynomials with remainder. For the remainder is zero, Gröbner basis would help us.

References

[1] Roche.D "Introduction to Symbolic Computation" M.Giesbrecht,Script 11, 2009, CS 487

[2] Lipkovski A.T &Zeada.S "A Note on Multivariate Polynomial Division and Gröbner Bases"Publications DE L' Institut Mathematique Nouvelle serie, tome 97 (111)(2015), 43-48.

[3] Zeda.S "Polynomial Division and Gröbner Bases" The Teaching of Mathematics 2013, Vol. XVI, 1, pp. 22-28.

Acknowledgements

In preparing this paper, I am indebted to Dr.Khin Naing Oo, Rector of Yangon University of Economics for her kind guidance. I am particularly grateful to Dr.Tun Aung, Pro-rector of Yangon University of Economics for his kind support. My thanks also continue to Dr. Myint Wai, Head of Mathematics Department, Yangon University of Economics for his kind advice and encouragement.

Geographical Point of View on Transformation from Waste Disposal Site to Housing in Yangon City

Dr. Nant Mu Aye
Professor and Head
Geography Department
Yangon University of Economics

Introduction

Brownfields are generally defined as abandoned or underused industrial or commercial properties where redevelopment is complicated by actual or perceived environmental contamination. Brownfields vary in size, location, age and past use. They can range from a small, abandoned corner gas station to a large, multi-acre former manufacturing plant that has been closed for years. (Environmental Protection Agency,)

Some waste disposal sites suffer from the mistaken perception that they are contaminated, when in fact, they just need to be cleared of debris. There may be soil and groundwater contamination caused by discharges or dumping of organic and inorganic chemicals. Redevelopment of waste disposal sites benefits communities through urban regeneration, reduced sprawl, an increase in tax revenues and job and an improved living environment. Therefore, transformation of waste disposal site to housing area is important for sustainable development of the urban area. Brownfield redevelopment is important because it

- restores urban property to productive use, thus increasing property values
- increases job opportunities and local tax revenues
- improves public health and the environment
- utilizes existing public infrastructure.
- eliminates neighbourhood blight, thus improving a community's image and long-term sustainability.

Brownfields can be redeveloped for a wide variety of purposes. Successful redevelopment efforts have turned brownfields into retail sites, light industrial facilities, office parks, waterfront promenades, parks, schools, low–income housing, stadiums and transit centres. Strategic Brownfield redevelopment can clean up environmental hazards, remove neighbourhood eyesore, create jobs, provide housing and promote general economic health in local communities of all sizes. (Brownfield Basics, EPA)Transformation from brownfields to urban housing relates with smart growth urbanization. Smart growth is an urban planning and transportation theory that concentrates growth in the centre of a city to avoid urban sprawl; and advocates compact, transit-oriented, walkable, bicycle-friendly landuse, including neighborhood schools, complete streets, mixed-use development with a range of housing choices.

Aim

- to develop the urban environment through transformation from terminated waste disposal site to housing area.

Objectives

- to investigate the distribution of waste disposal sites within Yangon City
- to analyze the role of site and situation for transformation from terminated waste disposal site to housing area
- to analyze the environmental changes due to transformation from the former waste disposal site to housing

Geographic Environment of Yangon City

The geographic environment of Yangon City includes physical environment, human, social and cultural environments and economic environment.

Location and boundaries, relief, drainage, geology including earthquake risk, soils and natural vegetation form the physical environment of Yangon City. Yangon City is situated at the eastern part of Ayeyarwaddy Delta between Hlaing River, Panhlaing River and Bago River, and it is about 21 miles away from the sea. The Yangon City lies between north latitudes 16° 44' and 17° 5' and east longitudes 96° 0' and 96° 20'. Yangon City area was 265 square miles in 1996 but it has extended to 292 square miles as a result of the recent establishment of new towns in the east and west. In general, Yangon ridge lies parallel to the Hlaing River within the City's area. The average elevation of the ridge is between 40 feet and 80 feet above sea level, with some places over 100 feet. The northern part of the central ridge is higher than the southern part.

Due to the situation of topography, the main drainage direction is from central low ridge to either side. All of the streams in the west drain into Hlaing River and those in the east drain into Ngamoyeik Creek. The Hlaing River is flowing from north to south. Panhlaing River joins the Hlaing River. Then it flows south as Yangon River, meets Bago River in the southeast and continues south to enter the sea.Within the Yangon City area, the central low Ridge and the surrounding flatlands of deltaic character are the main geological features. The central Low Ridge or Yangon ridge is an asymmetrical, long narrow anticline which trends in a north-south direction.

There are variations in soil types within Yangon City area. The major soil types are as follows: (1) Yellow brown forest soils, (2) Lateritic yellow brown forest soils,(3) Lateritic soils, and (4) Gleyey soils.

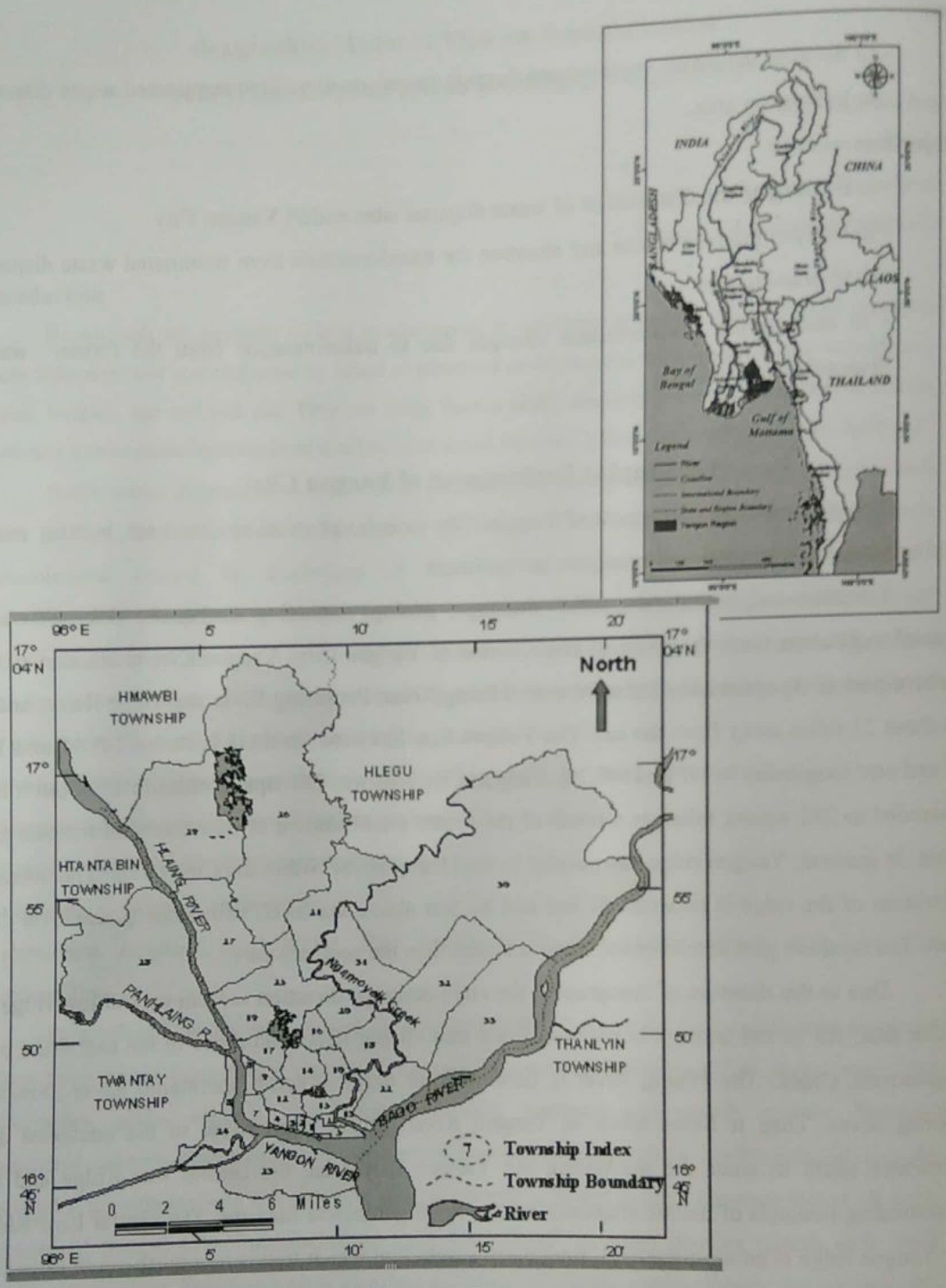


Figure (1) Location of Yangon City

Source: Based on Myanmar Survey Department

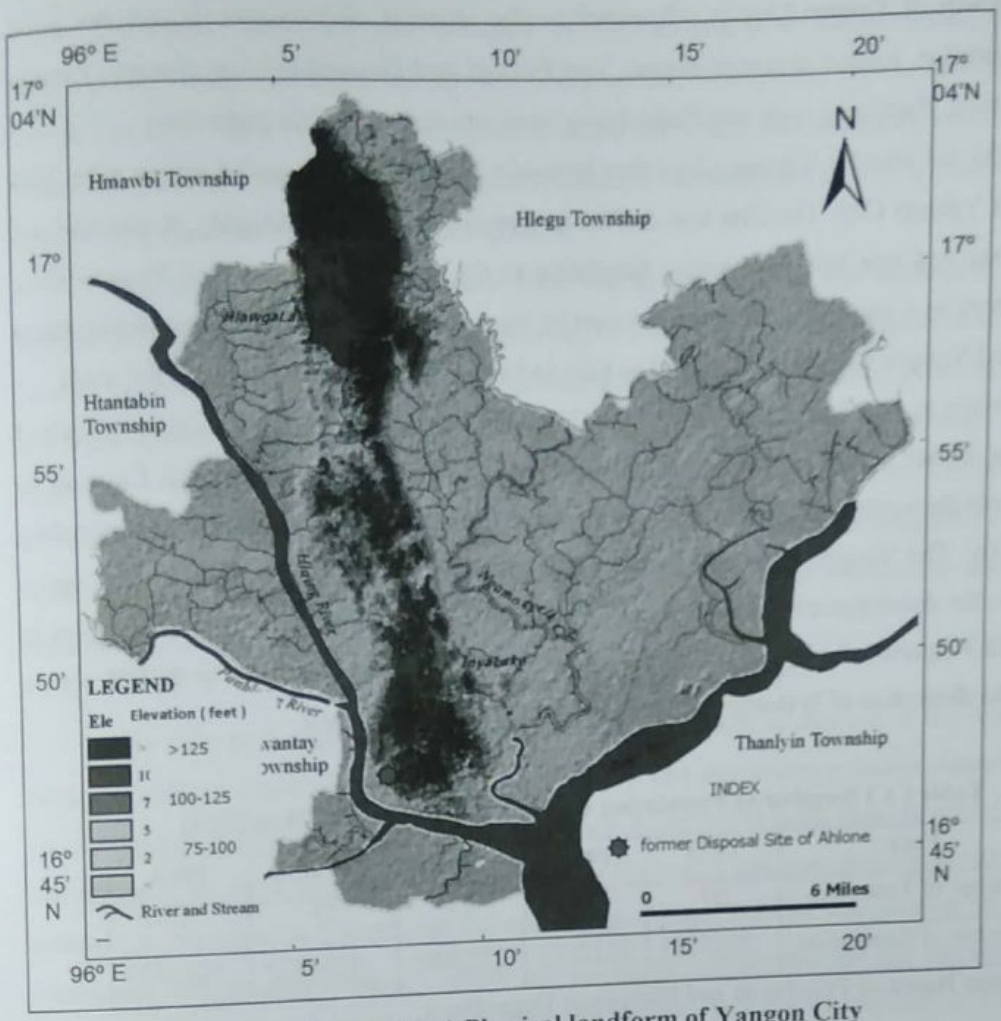


Figure (2) Physical landform of Yangon City

Source: Based on Topographic Map of Yangon City

Yangon is the Capital of Myanmar. According to Koppen Classification of climate, Yangon has tropical monsoon climate (Am). In general, the climate of Yangon City is a tropical monsoon type with well-defined wet and dry seasons. It has definite wet period during late May to October which is followed by a dry period from November to early May. The normal rainfall of Yangon is 7.35 inches and the mean annual temperature is 27.7°C. Temperature and rainfall are the two most important climate elements. Mean monthly temperature is 27.7°C. The average monthly temperature maximum temperature is 33.68°C. The average monthly minimum temperature is 21.73°C. April is the hottest month and Max temperature is 38.5°C, Minimum temperature is 30.1 and Mean temperature is 34.3°C. December is coldest month, 25.3°C. The range of temperature is 11.95° C. Due to its location near the Andaman Sea and Gulf of Mottama, Yangon City experiences slightly moderate temperature condition

In the northern part of Yangon City area, where temperature are high and average rainfall is between 80 and 120 inches, deciduous and tropical monsoon forests were occurred in there. The

origin and growth of Yangon City is influenced by the physical environment. It includes good geological condition, natural drainage system, low flatland and favourable local climate. Yangon river, Hlaing river, Panhlaing river and Pazundaung creek are also navigable waterways.

In 1853, the plan for Yangon City (then Rangoon) was laid down on 0.8 square mile. This plan had built Yangon City. The City was drafted as a rectangular shape. Roughly, it was one and ahalf mile long and one half mile wide. According to the geographic setting of Yangon City, growth had been in a northward direction because of Ngamoeyeik Creek in the east, Hlaing River in the west and Yangon River in the south. The City had expanded particularly toward the north.

According to new "Municipal law" in 1922, the city had extended to 30.8 square miles and then the area further extended to 63.54 square miles in 1965. The area of Yangon City has to expand towards the north because of population increase. To ease the congestion and overcrowding within the City, The Yangon City Development Committee carried out the extension of Yangon City through, the development of new towns. The area of Yangon City was 77.73 square miles in 1973 and 128.9 square mile in 1983. The Yangon City Development area grew to 262.08 square miles with the absorption of Webargi and Shwepaukkan in North Okkalapa.

Table (1) Number of Population within Yangon City (1973 to 2014)

Year	1973	1983	1994	2005	2014
Number of Township	27	27	27	33	33
Number of Population	2055365	2513023	2720699	4111633	5211431

Source: Based on Population and Manpower Department

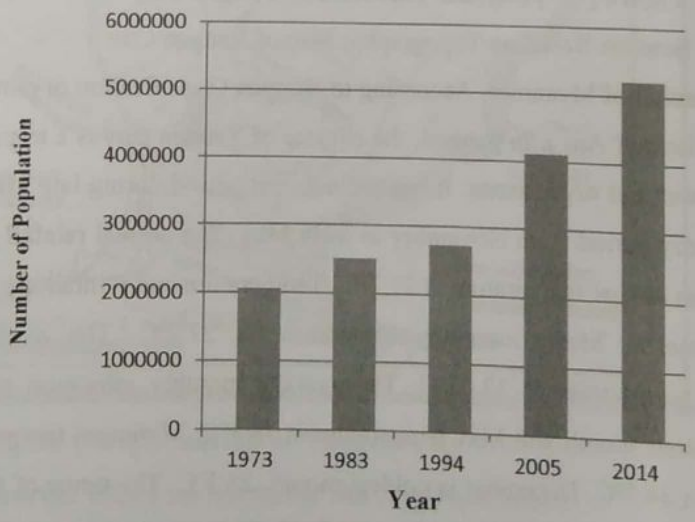


Figure (3) Number of Population within Yangon City (1973 to 2014)

Source: Based on Table 1.

Economic factor is also included in the geographical environment. The Economic development relate with the urban growth. Many economic activities are concentrated in Yangon, which had been, until recently, the capital but also the social and economic centre of Myanmar. Economic policies, flows of foreign capital, industrial development as well as trade are the major determining factors for economic development.

Myanmar regained independence from the British in 1948 and adopted a parliamentary system. The Revolutionary Council took power in 1962. The Socialist Republic of the Union of Burma came into being under a new constitution in 1974. The socialist economic system was practiced until the later period of 1988. The State Law and Order Restoration Council took over the State Power in September 1988 and introduced the market-oriented economy. The market-oriented economy had major impact on the growth of Yangon City. With the introduction of the market-oriented policy, many joint venture, companies and foreign capital investments also appeared in Myanmar.

Areal Growth of Yangon City

The City of Yangon, known as Dagon in ancient times is situated in the southern part of Myanmar and is twenty-one miles away from the sea. The city lies on a dagger shaped peninsula at the confluence of Hlaing River on the west, Yangon River on the south Bago River on the southeast and Pazundaung creek on the east. Yangon is now the largest and most prominent city in Myanmar although it originated as a small and humble fishing village. The city was planned for about 36000 inhabitants with the area about 0.8 square mile (2 sq-km) .Since then the city has been designated as the capital of Myanmar and known to the world formerly as Rangoon and later as Yangon.

It had twice suffered great damage during the War and after being bombed for three years by the Allied Forces during the Japanese occupation, most of its building had collapsed and it roads and drainage destroyed. In addition, its administrative machinery had stopped. As a result, Yangon which had enjoyed fame as the cleanest city in Southeast- Asia was a mess, and covered with garbage and rubble. In 1920 the city was extended northwards and the area became 33.38 square miles (86.45 square kilometers) with the population of 300,000. There were 16 townships, Kyeemyindine, Kyauktada, Sanchaung, Seikkyi-Khanaungto, Tamwe, Dala, Dagon, Dawbone, Pazaundaung, Pabedan, Bahan, Botahtaung, Lanmadaw, Latha, Mingalartaungnyunt, and Ahlone within Yangon Municipal area in 1922. The municipal committee at the time had administered the city and exercised its authority in accordance with the Municipal Act of 1922. By the 1922 act, the Yangon Municipal Committee became an autonomous body with its own administration and possessing wide powers to determine the fate of City.

In 1959-1960, three new satellite towns were built and City area covers about 78 square miles. After the Revolutionary Council had assumed power in 1962, the Yangon Municipal area

was considered too small, so urgent arrangements were made to extend the city limits. Administrative reforms were instituted in 1972. Local administrative bodies and departments were all dissolved and replaced by township Departments and all Municipal bodies came under the authority of the General Administration Department. In 1974 Yangon City composed 27 townships and the total area was about 80.55 square miles. With the implementation of site and services scheme physical boundary of the city has expanded substantially from around 133.64 square miles in 1980 to 233.22 square miles in 1991. At present, the city area covers about 292.426 square miles.

Table (2) Areal extension of Yangon City Area (1901 – 2005)

Year	Area (square miles)
1901	28.00
1920	33.38
1940	40.00
1953	47.57
1965	63.54
1974	80.55
1980	133.64
1991	223.22
1996	265.00
2000	288.00
2005	292.00
2015	292.43

Source: Survey Department, Yangon

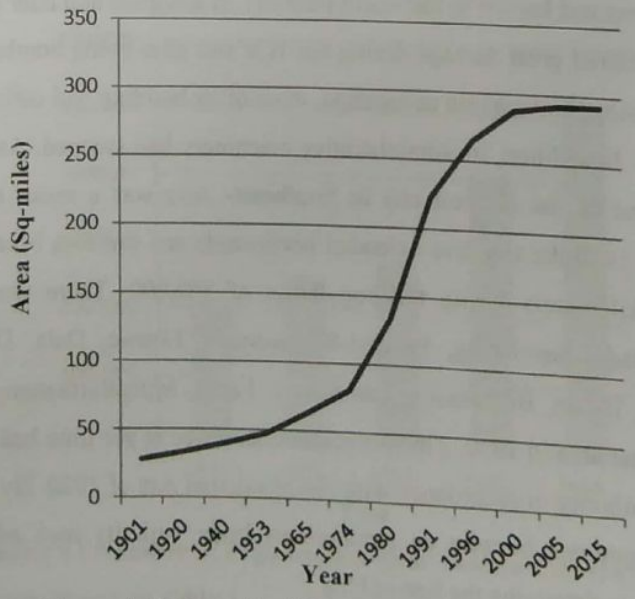


Figure (4) Growth of Yangon City Area (1901–2005)

Source: Based on table (2).

Spatial Distribution of Waste Disposal Sites in Yangon City

Yangon City with the highest population, financial, economic and education facilities is the biggest urban centre in Myanmar. It is playing a crucial role in the transformation process of Myanmar's economy from a socialist into a market-oriented economy. With rapid growth in population and industrial development, Yangon City is now facing with significant urban sanitation problems such as solid waste collection and disposal, sewerage etc. Especially, solid waste management has become a serious problem. This problem is compounded by the rapidly increasing amount of wastes of complex nature and composition, which result from the growth in urban population and the changes in their consumption patterns.

Distribution of Waste Disposal Sites in Yangon City

Solidwaste management is essential for public health and sanitation. The responsibility for providing the service is entrusted to Yangon City Development Committee (YCDC). Thus YCDC undertakes the task of solid waste service delivery, with its own staff, equipment and funds.

The collection and disposal of solid waste is one of the pressing problems of city life, which has assumed great importance in the recent past. The proper disposal of urban waste is not only absolutely necessary for the preservation and improvement of public health but it has an immense potential for resource recovery.

Waste disposal creates a problem primarily in highly populated areas. The more concentrated the population, the greater the problem becomes. When solid waste is disposed off on land in open dumps, it causes the following impact on the environment.

- ground water contamination by the leachate material generated by the waste dump,
- surface water contamination by the runoff from the waste dump,
- bad odor, pests, rodents and windblown litter in and around the waste dump,
- generation of inflammable gas within the waste dump,
- fire within the waste dump,
- erosion and stability problems relating to slopes of the waste dump,
- acidity to surrounding soils and
- bird menace above the waste dump which affects flight of aircraft (not get inMyanmar)

An effective system of solid waste management must be both environmentally and economically sustainable

- to be **environmentally sustainable**: it must reduce the environmental impacts as much as possible.

In 1940, the area of Yangon City (Rangoon) was only 42 square miles. There were only two garbage dump sites, one at Ahlone and the other at Ma-U-Gone. Ahlone dump site lies in Ahlone Township. Ahlone dumping site is meant for dumping garbage collected from Latha, Pabedan, Kyeemyindine, Ahlone, Kamayut, Hlaing, Sanchaung Townships and Kieghley Market. The Ma-U-

Gone dump site is for dumping of garbage from Kyautada, Botataung, Pazundaung, Mingalartaungntunt, Tamwe, Bahan, Dagon and Yankin Townships.

In the year1980, Yangon City was extended to 133.64 square miles. The site of the two garbage dumping grounds came to be within the extended city which is an ugly sight and inconsistent with the features of a modern city. So, waste disposal at these two dumping grounds was terminated. Ahlone disposal site was terminated in 1980, while Ma-U-Gone site was terminated in 1983.

New disposal sites appeared in Dawbone, Thabuttaw, Ngamoeyeik and Le Ywar. **Dawbon disposal site** was at the corner of Min Nandar and Ayeyarwon road in Dawbon Township. It appeared in 1982 and was terminated in 1999. **Thabottaw disposal site** was in KhineShweWa Street in Hlaing Township. It was started in 1989 and terminated in 1994. **Ngamoeyeik disposal site** was in Dagon Myothit(north) Township. Its use began in 2001 and was terminated in 2005. **Le Ywar disposal site** was in Thaketa Township. It appeared in 2001 and its use as dumpsite was terminated in 2005.

Current final disposal sites are at **Htain Pin, Dawei Gyaung, Dala, Hsateto and Mingalardon.**. The **Htain Pin disposal site** is in Hlaingtharyar Township and serves for dumping of garbage collected from Townships of West District, **Dawei Gyaung** serve for East District, **Dala** serve for South District and **Mingalardon** serve at North District of Yangon City.

These dump sites usually serve for a period of four or five years. After this four or five year period of garbage dumping, at least 12 inches of soil layer is formed on the site. When these dump sites have served their purpose and terminated, vegetable gardens, play grounds and other facilities cropped up in their place.

As for Ahlone and Ma-U-Gone Dumpsite, Housing projects have taken their places. The former Ahlone dumpsite has developed into River View Housing and Ma-U-Gone site has turned into Mingalar Garden City Housing Project area. The choice of these dump sites for housing project areas is due to their favourable site and situation.

Table (3) Spatial Distribution of Waste Disposal Sites within Yangon City

No.	Disposal Site	Location (township)	Area (acre)	Start of Waste Disposal site (year)	Termination (year)
1.	Ahlone	Ahlone	6.40	1940	1980
2.	Ma-U-Gone	Mingalartaungnyunt	64.00	1940	1983
3.	Dawbon	Dawbon	-	1982	1999
4.	Thabottaw	Hlaing	7.00	1989	1994
5.	Le Ywar	Thaketa	13.80	2001	2005
6.	Ngamoeyeik	Dagon Myothit (north)	3.40	2001	2005
7.	**Current Sites**				
	1. Htain Pin	Hlaingtharyar	18.10	2003	
	2.Dawei Gyaung	Dagon Myothit (north)	56.00	2003	
	3. Dala	Dala Township	-	2010	
	4. Seikkyikhanaungto	Seikkyikhanaungto Township	-	2010	
	5. Mingalardon	Mingalardon Tsp.	-	2010	

Source: Pollution Control and Cleansing Department, YCDC

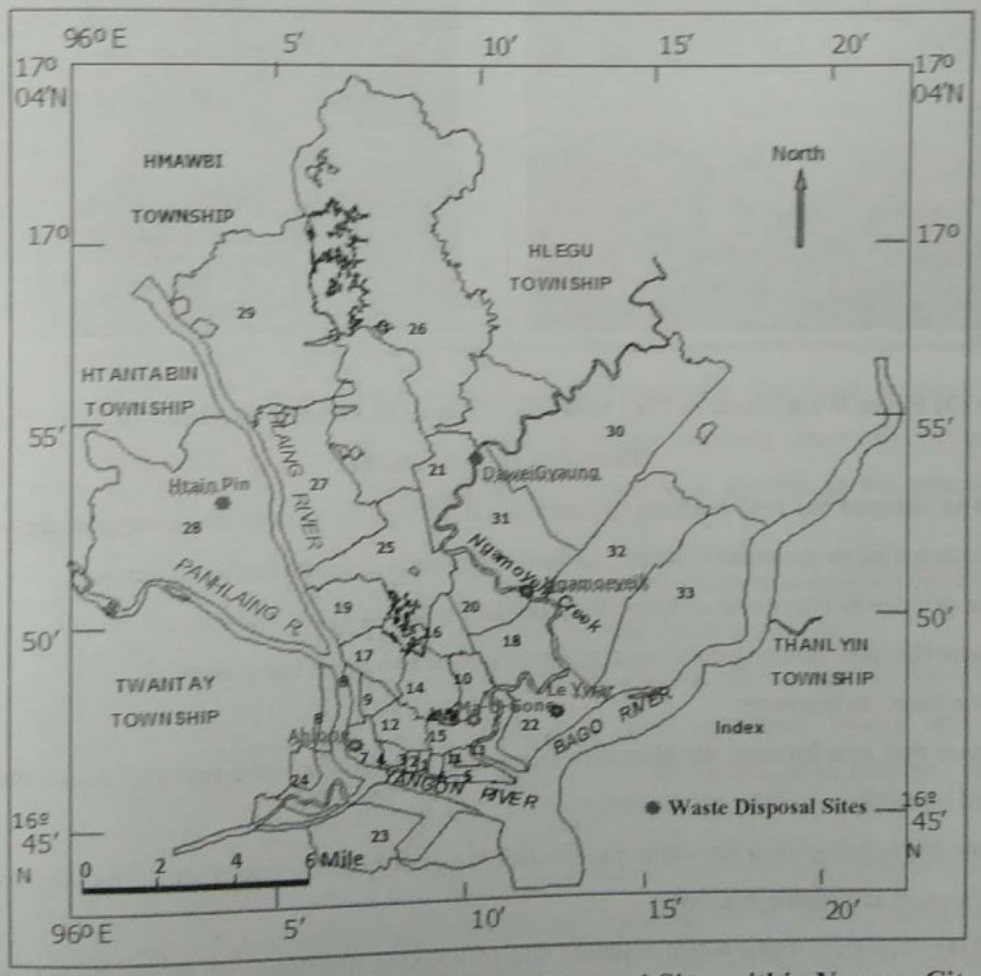


Figure (5) Spatial Distribution of Waste Disposal Sites within Yangon City

Source: Based on PCCD, YCDC.

Plate (1)Nga-Moe-Yeik Disposal Site

Plate (2) Le Ywar Disposal Site

Some terminated disposal sites ---- vegetatable cultivation, teak plantation, playgrounds etc.

Waste disposal site-away from the Downtown area

Plate (3) From Waste land to Play Ground

Plate (4) From Wasteland to Teak Plantation

Housing Development

The demand for new housing brought about economic growth and changing demography. For achieving a more sustainable pattern of development of housing it should aim to:

- give priority to the re-use of brownfield contaminated land for housing
- ensure that new housing development maintains or enhances the quality of the built environment
- ensure that new housing development is located so as to conserve energy, reduce the need to travel and be easily served by public transport
- create the opportunities for satisfying the full range of housing needs, enabling where justified, the provision of affordable housing.

Transformation from waste disposal site to housing development should be balanced with environmental, amenity and infrastructure considerations.

Site Requirements for Housing Development

An appropriate site should conform to the basic requirements such as site location, site standard and site density.

Site Location

Multi-family Housing sites must be located in areas that are appropriate for residential housing. To meet this requirement, the area where the site is located must be a residential area that provides adequate services and facilities.

A "residential area" as an area where at least half of the neighbouring properties are developed with inhabited residential structures. A project may be located in a downtown business area only if the project is part of a comprehensive strategy for meeting a community's development and housing needs. It should be community development and housing plan that addresses neighbourhood revitalization, housing, and economic development. Site must have adequate necessary facilities and services to support the needs of the residents.

- necessary facilities include schools, hospitals, and water and sewer systems
- necessary services include shopping, medical, and pharmaceutical services

Desirable areas are those where residents are more likely to find satisfactory living conditions. Sites in industrial area or declining neighborhoods or sites that are adjacent to high-volume train tracks, gas stations, and other such locations, that are likely to affect the value of the property or the quality of life of the residents, may not be acceptable.

Site Standard

Planning for development must take into consideration factors such as topography, soils, climate, adjacent land use, environmental impacts, energy efficiency, aesthetic and cultural values, public and private services, and housing and social conditions. Technical services, such as architectural, engineering, land survey, or site planning services, must be performed by professionals who are qualified and authorized to provide such services in the area where the project is developed.

Appropriateness for residential development should take into consideration conditions such as accessibility, adequate infrastructure, and absence of undesirable situations.

Sites must have infrastructure and utilities that are adequate for the needs of the site and that meet all local requirements. The facilities must be safe, economic, energy efficient, and dependable. The site must be accessible by a public road. There should be adequate availability electrical service to meet the needs of the proposed site.

The site must have water and wastewater disposal systems. Soil and geological conditions must be suitable for the type of construction proposed. Grading will promote drainage of surface water away from buildings and foundations, minimize earth settlement and erosion, and ensure that

drainage from adjacent properties does not create problems on the site. All slopes must be protected from erosion by planting or other means.

The Size and Shape of a site determines if there is enough room for the proposed units, as well as walks, parking, any on-site septic system, and other improvements. Sites must not have undesirable physical conditions that create hazards or unnecessary development costs. Examples of such conditions include:

-Poor soil conditions that increase development costs,

-Noise from nearby road, airports or factories that create unacceptable residential conditions, and

-Pollution from nearby facilities or crop spraying that creates hazardous health conditions.

Site Density

Acceptable density standard will vary by area and local preferences. It must be based on compatibility consistency with the community. Site density must be similar to other developments in the community. The Multi-Family Housing project should not look more crowded than the surrounding area nor should it look more spacious. Each site must be large enough to support the housing units as well as adequate public space, walkway, parking, and other site amenities. The quality of groundwater resources is important in the transformation of waste disposal site to Housing site.

Transformation from Ahlone Waste Disposal Site to Housing

Study Area: River View Garden Housing on former Ahlone Waste Disposal Site

It is located on Strand road, parallel with Yangon River, in Ahlone Township. It is at an average elevation of about 40 feet above sea level. It is bounded by Ahlone road in the north, Nguwa road in the east, Strand road in the north, and Forest road in the south. Over 10 YBS bus lines are running on the Strand road.

Ahlone disposal site covers an area of 6.4 acres and lies at the corner of Ahlone road and Strand road. It is the earliest dump site of Yangon City. The boundaries of Ahlone disposal site are Strand road in the west, Nguwa road in the east, Ahlone road in the north and No.(0262) Petroleum Filling Station, 8 storyed apartment building, waste collector trucks compound (Ahlone Township) with Forest road in the south. Various bus lines ply to and from Strand road which is important as the road connecting two townships of Lanmadaw and Kyeemyindine. Ahlone road leads to Dagon Township. Ahlone Dump Site was about 60 feet high which higher than its surroundings areas. In the neighbourhood are single unit housings, Sinmin Market, Myanmar Timber Enterprise, a Primary School and AungZayYa Housing Premises.

Former Thiri-Mingalar Fruit and Vegetable Market, which is important to the whole country, began functioning in 1992. All kinds of fruit and vegetables come from many parts of country, mostly by road. Since the time the vegetable market started to function, Ahlone Strand

Road became one of the important and busy roads within Yangon City. There were only ten bus lines plying on Ahlone Strand road prior to 1988. Since then, the bus lines plying on the strand road increased to twenty five lines. Today, there are buses to Insein, Hlaingtharyar and ShwepyitharMyothits plying on this road. Buses to Thaketa, Thanlyin and Kyauktan townships are also in service on this road.

Though the disposal of garbage on Ahlone Dumping Site was terminated in 1980, the River View Garden Housing Project commenced only in year 1997. During the seventeen year period between 1980 and 1997, the site was utilized as a bus terminal stop. The long standing decomposed garbage was sold as humus, and the site became a selling centre for humus. The Timber depot also piled its logs in store at this site. Above factors are the reasons for transformation of the former disposal site.

Accessibility of River View Housing Area is main cause of transformation to housing. Ahlone Township is one of the thirty-three townships within Yangon City. Ahlone Township is surrounded by Sanchaung, Dagon, Lanmadaw, Seikkan and Kyeemyindine Townships. The Yangon River serves as borderline for Seikkan Township. The junction of Ahlone road and Strand road is the place for consideration (study area). Strand road is one of the most important roads in Ahlone Township. Keighley Market, since 1992, is a centre for distribution of green vegetables and fruits merchandise to all over the country.

The Strand road begins from where; Bayintnaung road and Hledan road meet at the border of Kyeemyindine Township. There are now 25 bus lines plying on Strand road. As a result of the many road connections to this housing area (study area) it will take a few minutes only to the downtown area, and approximately one hour to other parts of Yangon City.

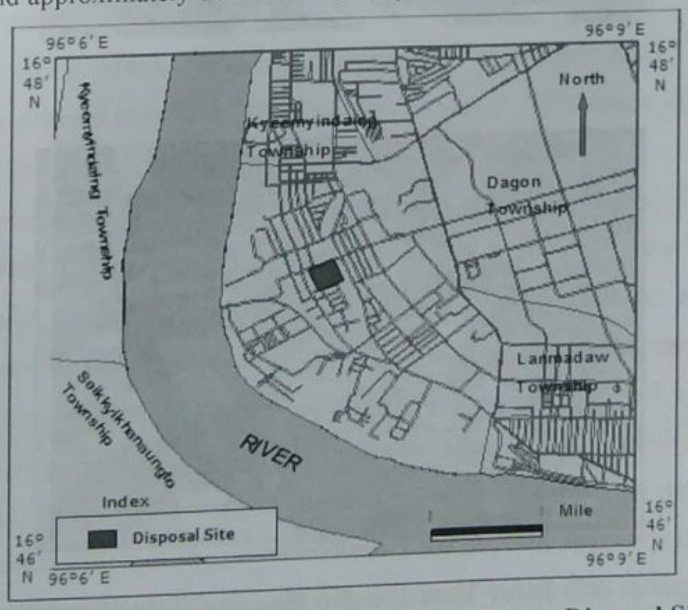


Figure (6) Location of the former Ahlone Waste Disposal Site

Source: Based on PCCD, YCDC

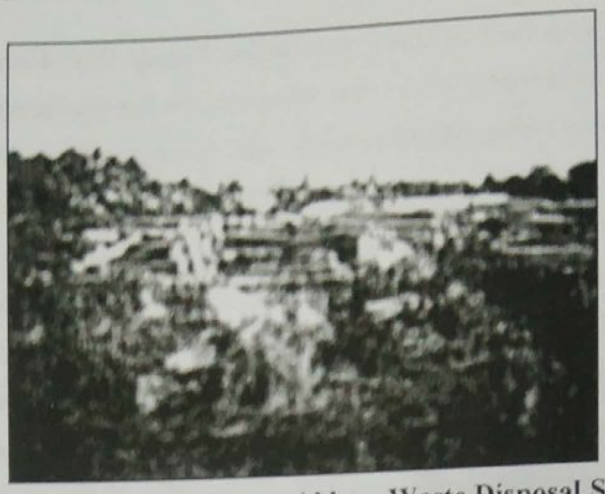
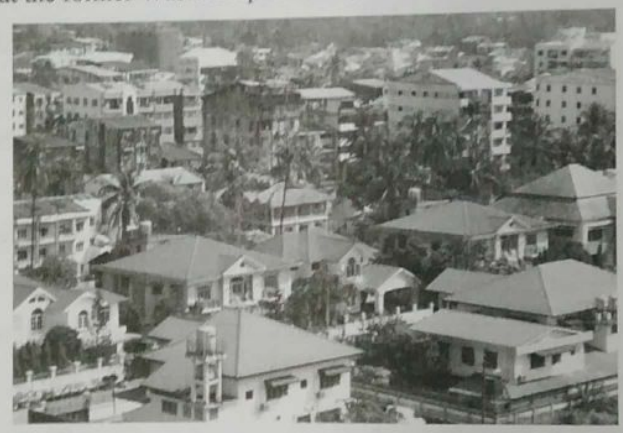


Plate (5) The former Ahlone Waste Disposal Site

Source: Olympic Company, January 2006

Field Note: This photo shows the storage of logs belonging to the timber depot at the former Waste Disposal Site, Ahlone Township.



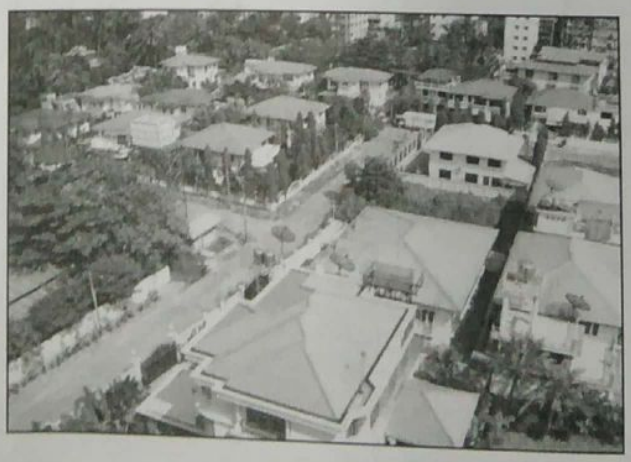


Plate (6 &7) River View Garden Housing, Transformation from former Waste Disposal Site to Housing as Smart Growth

Field Note: these photos show the single unit houses, viewed from the Ahlone Tower, Ahlone Township

CONCLUSION

This Research paper is the distribution of waste disposal sites within Yangon City and the role of site and situation for transformation of waste disposal site to housing area.

Yangon City is the biggest urban centre in the country with the highest population, financial, economic and educational facilities. It is playing a crucial role in the transformation process of Myanmar's economy from a socialist into a market-oriented economy. With rapid growth in population and industrialization, YangonCity is now facing urban sanitation problems such as solid waste collection and disposal, sewerage, etc. Solid Waste Management is a part of public health and sanitation. The waste disposal creates a problem primarily in highly populated areas. The more concentrated the population, the greater the problem becomes.

Yangon City was only 42 square miles in the year 1940. There were only two garbage dump sites, one at Ahlone and the other at Ma-U-Gone. Ahlone dump site lies in Ahlone Township. The purpose was for dumping garbage collected from Latha, Pabedan, Kyeemyindine, Ahlone, Kamayut, Hlaing, Sanchaung townships and Kieghley Market.

In 1980, Yangon City was extended to 133.64 square miles. The existence of these garbage dumping ground within the centre of the extended city is inconsistent with the features of a modern city. The disposal of waste at Ahlone disposal site was terminated in the year 1980.

Disposal sites usually serve for a period of four or five years. Within four or five years of garbage dumping, at least 12 inches of soil layer is formed on the site. When these dump sites have served their purpose and terminated, vegetable gardens or play grounds or other facilities usually cropped up in their place.

At the terminated Ahlone, housing projects have taken their place. The former Ahlone Disposal site has developed into River View Garden Housing . The choice of these dump site for housing area is due to their favourable site and situation.

Ahlone Site had been used since 1940 when Yangon City was only 42.59 square miles in size. In the year 1980, YangonCity grew to the size of 133.64 square miles. Waste disposal sites affect the city feature. As such, disposal of wastes at these sites had to be terminated. With the extension of Yangon City, modernization of urban area and shortages in housing, the situation has become ripe for this waste disposal site to be transformed into housing complex areas.

The perception of residents actually living in the housing area as well as the neighbouring residents is also analysed. Neighbouring residents have been unhappy with the waste disposal site due to unfavorable side effects of the waste matters. They are now happier with the change in the environment. The environment of the city has become more pleasant as a result of the transformation of waste disposal site to a housing complex area.

The residents in the housing units on the former waste disposal sites have prior knowledge of these sites and are living without any misgivings. Among those who have moved in to the housing units; include those from other parts of YangonCity as well as those from other towns. Good site and situation are the main attractions of the housing areas.

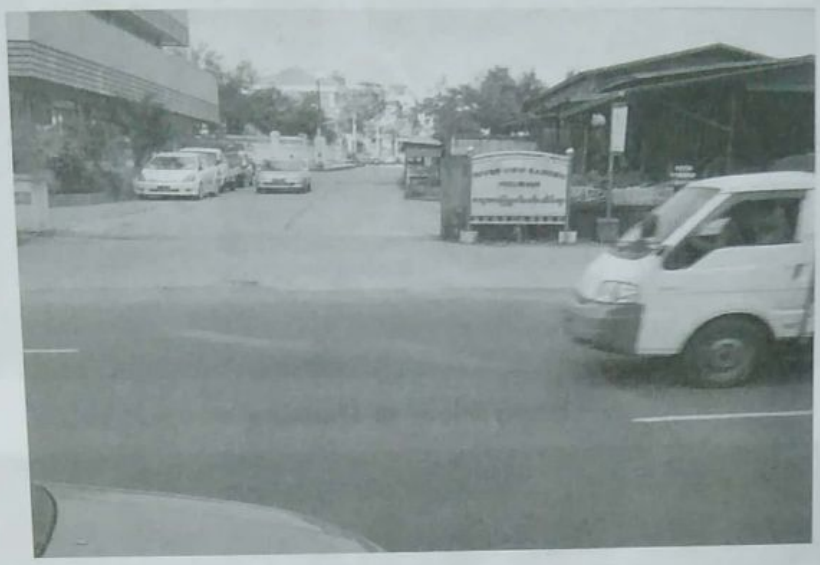
Waste disposal site are naturally poor in earthquake resistance. The earlier established townships in YangonCity on Anticline, with sufficient hard rock strata of peak Ground Acceleration (P.G.A) rating (0.1g) to (0.2g) value are not of danger from earthquake shocks. New Towns are developed on alluvial soil strata of Peak Ground Acceleration (PGA) ratings 0.2g to 0.3g values are vulnerabler to earthquake shocks. As such, multi-storeyed high rise, structures should not be constructed in these areas.

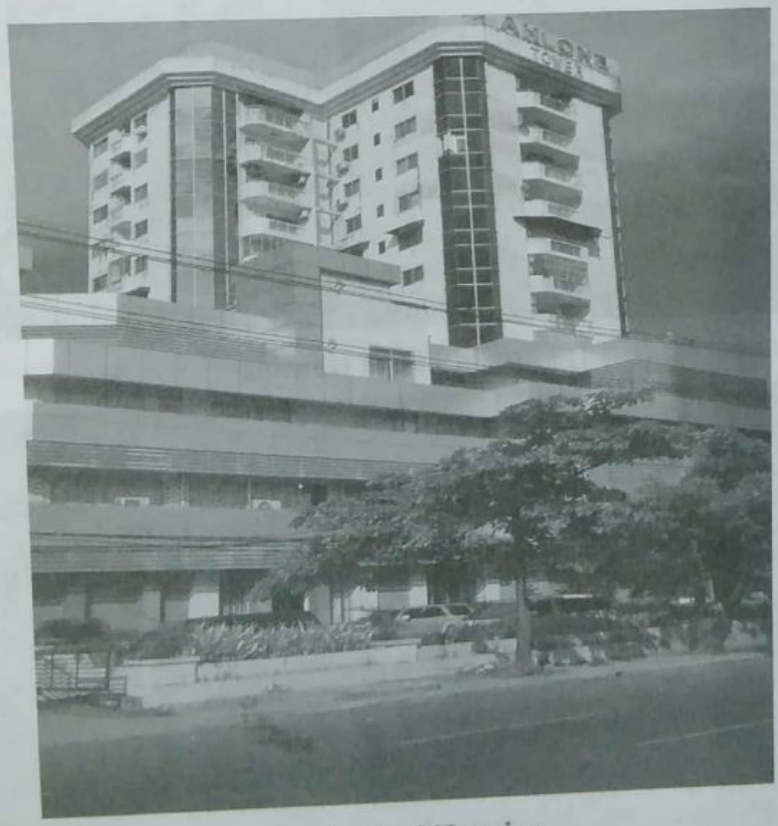
Ahlone waste disposal site is fortunate in that during their functioning time, there were no plastic waste materials. Plastic materials fail to decay. It is only by intense heat that they can be decomposed. Plastic materials form loose soil strata.

Ahlone site has been developed as housing areas. The remaining waste disposal site is Dawbon, Thabottow, Le Ywar and Ngamoeyeik. Dawbon and Thabottaw are merely filling land area, and not sizable enough to be transformed to other uses. Le Ywar and Ngamoeyeik are measured by parameters. Le Ywar is of poor accessibility and Ngamoeyeik is of moderate accessibility. Although Ngamoeyeik waste disposal site is quite favourable with respect to accessibility, its area size of only three acres does not quality for development into on housing area. Rather, as smart, it should be developed into a playground or a super market.

Appendix

River View Garden Housing Environmental Changes



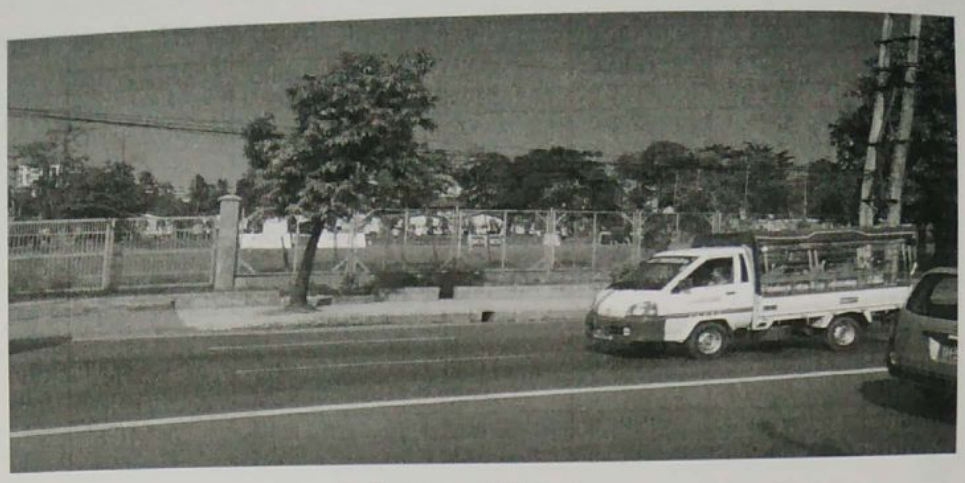


In front of Housing

Right View of Housing

Right Side of Housing

Left view of Housing



Left View of Housing

References:

B.R.PEARN(1939):**History of Rangoon,** American Baptist Mission Press, Rangoon,1939.

Edward A.Keller (1988): **Environmental Geology Fifth Edition, Page 153-191**

Filion.P and McSpurren.K (2007): **Smart Growth and Development Reality: The Difficult Co-Ordination of Land Use and Transport Objectives,** Urban Studies,Vol.44, No.3, 501-523, March 2007.

Hla Tun Aung (2003): **Myanmar: The Study of Processes and Patterns**, National Centre for Human Resource Development Publishing Committee, Ministry of Education, Yangon, Myanmar, May 2003.

Maung Thein (2004):**The State of the Environment in Myanmar,** A Brief Overview, Myanmar Geosciences Society Presidential Address, December 2004.

Mie Mie Tin (2005): **New Opportunity for Housing in Yangon Mega City,** Workshop on "Sustainability and Urban Developments in Mega City Yangon" Department of Geography, Yangon University, Myanmar, July 2005.

Nant Mu Aye (2009): **Transformation of Waste Disposal Site to Housing: the case of former Ahlone and Ma-U-Gone Disposal Sites,** unpublished PhD (Thesis), Department of Geography, University of Yangon.

Zaw Lat Tun (2006): **The Spatial Distribution of Circular Rail Network in Yangon City,** Journal of Myanmar Academy of Arts and Science, Vol.IV, No.6, 2006.

Yangon University of Economics Research Journal

Vol. 6, No . 1
November, 2019

CONTENTS