June 2016
ISSN 2356-9085

Canadian International Journal of Science and Technology

CIJSSE
With Support from Canadian Research Centre for Humanities and Science
www.ocrd-ontario.org
socialscience@crchs.info
Toronto, Canada

About The Journal

The Canadian Research Centre for Humanities and Science encourages Undergraduate students and Post-Graduates Students of Colleges and Universities to submit their papers for publication in the Canadian International Journal of Social Science and Education. In addition, The CRCHS will give letter of acceptance for all papers accepted for publication and a Certificate of publication.

Frequency of Publication

The Canadian International Journal of Science and technology is published twice per year, in January and June.

The Netherlands

Dr Ahmad Aizan Zulkefle

Solar Energy Research Institute, Universiti Kebangsaan Malaysia, Malaysia

Dr Maslan Zainon

2Faculty of Electrical Engineering, Universiti Teknikal Malaysia Melaka, Hang Tuah Jaya, Malaysia

Zaihasraf Zakaria

3Department of Electrical, Electronic and Systems Engineering, Faculty of Engineering and Built Environment, The National University of Malaysia, Malaysia.

Dr Zabihollah zadeh

MahabGhodss Consulting Engineering Company, Tehran, Iran

Dr MasoudYamin pour

hahidChamran University of Ahwaz, Ahwaz, Iran

Dr S Algoul,

University of Tripoli, Libya

Dr Abdalla Hanashi,

University of Zawia, Libya

Dr M S Alam,

University of Dhaka, Bangladsh

Dr M A Hossain,

University of Northubria

Dr M A A Majumder,

University of Bradford

Jayam Naga Sateesh

Department of Chemistry, PRRM College of Pharmacy, Kadapa, Andhra Pradesh, India

Gopireeddy Venkata Subba Reddy

Department of Chemistry, Jawaharlal Nehru Technological University Anantapur College of Engineering, Pulivendula, Andhra Pradesh, India

K.N.Jayaveera

Department of Chemistry, Jawaharlal Nehru Technological University Anantapur, Anantapur, Andhra Pradesh, India

Hossam M Moussa

Associated professer AL-faraby collage for dentistry and nursing ryidh, Saudia Arabia

Faleh T. AL-Hojhouj

Associated professer AL-faraby collage for dentistry and nursing ryidh, Saudia Arabia

Essam Elkhatat

Associated professer AL-faraby collage for dentistry and nursing ryidh, Saudia Arabia

Jose AntonioSilveira

Federal University of Sao Carlos, Brazil

Conrado Planas

Federal University of Sao Carlos, Brazil

CHITTINENI ARUNA

Research Scholar, Acharya Nagarjuna University, Assistant Professor, Department of CSE, KKR & KSR Institute of Technology and Sciences, Guntur, Andhra Pradesh, India

R. SIVA RAM PRASAD

Research Guide, Department of CSE and Head, Department of IBS, Acharya Nagarjuna University, Guntur, Andhra Pradesh, India.

HUANG Zhanbin

School of Chemical and Environmental Engineering, China University of Mining and Technology, China

Dr. Habib ur Rahman

Sarhad University of Science and Information Technology,

University Town, Pakistan

Hong Thi Nguyen, Wendy Warren and Heather Fehring

School of Education, RMIT University, Melbourne, Australia

Mohammed Saleh Altayar

Al Imam Mohammad Ibn Saud Islamic University (IMSIU), Saudi Arabia

T. Ramana

Research Scholar, JNTUA University, Anantapuramu, A.P, India

V. Ganesh

Associate Professor, Department of Electrical and Electronics Engineering, JNTUA University, Anantapuramu, A.P, India

S. Siva Nagaraju

Professor, Department of Electrical and Electronics Engineering, JNTUK University, Kakinada, A.P, India

On the use of analysis of Covariance in Experimental Research involving Alterable and Attribute Variables with respect to Skill Acquisition in Business Mathematics

Dr O.A Adedayo

Federal College of Education (Tech) Akoka (Nigeria)

ABSTRACT

Analysis of covariance has been found to be a useful statistical tool in analyzing data in experimental research especially in social sciences where the desired complete randomization of experimental subject is not feasible. It enables the experimenter to control for individual differences in the dependent variable of the experiment. This study highlights the use of analysis of covariance in exploring how identified alterable and attributes variables could impact on skill acquisition in Business Mathematics by pre-service Business studies teachers.

INTRODUCTION

The use of Analysis of Covariance (ANCOVA) dated back to the earliest part of 20th century when Fisher, the pioneer used this statistical tool in experimental research in in Agriculture (Eden and Fisher, 1927). Since then, this important and useful has become an indispensible statistical tool in experimental research and is used in both pure and applied experiments. According to Cox and McCullggh (1982) one of the great researchers in experimental research named Sanders, used ANCOVA at the suggestion of Fisher in his research work. Since the time of Fisher other experimenters in both pure and applied experimental research have made use of this powerful statistical tool in analyses of treatment effects in research.

The use of ANCOVA in analyzing various research works in Agriculture where experimental designs are constructed and used under varying conditions to improve and increase yield of crops is well documented by researchers.ANCOVA has also found increasing use in various facets of applied experimental research in Nursing, Medicine, Psychology, Education, Business, e.t.c. using various types of experimental designs including the quasi- experimental factorial design.

ANCOVA, which has been described as “delicate instrument” by Elashoff (1969) needs to be used carefully in taking optimal decision in experimental research. Miller and Chapman (2001) cautioned on the need to be careful in its usage since it can be easily misunderstood and misused.

Review of relevant literature shows various ways in which experimenters made use of ANCOVA to analyze carefully constructed experimental designs in research work involving experimental subjects in natural settings. Owen and Froman (1969) successfully used ANCOVA to analyze the data collected through applied experiment in nursing research. In order to find out how to curb the incidence of cervical cancer in the experimental medical research carried out by them, Massad et al (2015) make outstanding contributions to medical research on cervical cancer. Children and adolescents are not left out in experiments where ANCOVA was used in analyzing data. Palacois-Gonzalez et al (2015) used ANCOVA in their research on reducing obesity among school children while Ardoy et al (2014) carried out an experiment to investigate how to improve adolescents’ cognitive performance through increasing time and intensity of physical education activities using a three- group randomized design. Joreskog (1996) used covariance in modeling development of young children in a longitudinal research. In research on Tourism and Travels, Moura, JuergenGnoth and Deans (2015) used ANCOVA when investigating the effects of localizing cultural values in tourism distribution websites on user’s destination, image and willingness to travel. In the Business industry Pukar (2012) used ANCOVA in an experimental design that aimed at exploring the disparity in Business performance in a rural area. Also Roben, Lussier and Sonfield (2012) used an experimental design to measure and compare differences in level of family business successes in seven countries in various continents of the world.

In educational research various experimental designs have being analyzed using ANCOVA. Jacobs (2015) highlights its usage in his presentation of the Causal- Comparative study carried out by him. Also Omoniyi (2014) reported the results of a quasi-experimental design carried out on students of Business Studies. In experimental research in Education reported in literature most of the subjects used were primary and secondary school students. The number of experimental research carried out on students in tertiary institutions, especially in Nigeria, is quite few. The desire to contribute to alleviating the dearth of empirical studies on use of ANCOVA in educational experimental research motivated this study.

It is a well-known fact that mathematics has been the backbone of sciences. However it has found increasing use in social sciences, humanities and other non- science oriented areas. In Business Education it has been acknowledged that modern business needs sound knowledge of mathematics in order to solve a variety of everyday business problems. Hamburger (1972) emphasized the importance of mathematics in business when he commented that "it takes the conquest of mathematics to master each business subjects. Successful operations in any line of business call for the ability to comprehend and solve its particular and specialized problems: problems that invariably involve mathematical concepts". Thus, mathematics and business subject are not mutually exclusive in terms of importance and usability. Unfortunately many students including those in Business Education in tertiary institutions hate mathematics and find it difficult to develop the needed skills in business mathematics. An intervention is therefore needed to enhance the ability to have good skill acquisition in Business Mathematics. This need gave rise to this experimental research work that is reported in this paper.

One way of studying this problem is to focus on the popular instructional strategy used in tertiary institutions and make it an alterable variable. The popular method used is the lecture method which, despite its advantages of time saving and uniform transmission of information, has been criticized as being didactic and teacher- centered. Researchers have been making efforts to find more effective alternatives to the lecture method. For example Hubbard (1990) investigated other teaching alternatives from the normal lecture method with first year undergraduates offering courses in mathematics and emerged with a format involving more active participation by students. His method was refined to create the various treatment groups for this study.

Using various theories involving learning across gender and instructional strategy, the need arises to examine the effects of the use of interactive method with learning materials on group and individual basis (as well as using the lecture method as control group) on skill acquisition in Business mathematics. A 2 x2 quasi - experimental factorial design was then constructed using instructional strategy as alterable variable and gender as attribute variable on skill acquisition in business mathematics. This paper therefore focuses on the use of ANCOVA in analyzing the experimental research design. The paper also gives information about usefulness of research designs in experimental research and how ANCOVA can be used to analyze hypotheses in experimental research design.

EXPERIMENTAL RESEARCH DESIGN

An experimental research design is useful in research involving test of hypotheses. The design is the type that deals with techniques for allocating subjects in experiment to different independent groups. It is a systematic way of conducting empirical research that can give evidence of causality and also lends credence to generalizability of findings, if properly conducted. Furthermore, careful reporting of the process enables the design to be replicated. Key features of experimental research are:

- Establishment of causality through manipulation of variables **(**Treatment)
- Control of extraneous variables both known and unknown. The control group does not receive any experimental treatment but can be given a placebo
- Existence of one or more experimental groups
- Prevention of contamination in the research process
- Random assignment to groups.

In experimental research two key variables are critical namely: the independent or predictor variable (Y) to be manipulated and the dependent or criterion variable(X). Experimental research design therefore involves examining the treatment effects of the independent variable on the dependent variable.

There are different types of experimental research designs among which are the post-test only design; Pre-test/Post-test only, Solomon four-group design, Factorial design, Quasi-experimental design e.t.c. The post- test only design comprises one experimental and one control group with none of the two groups being pre-tested. This design is useful where it is not possible to carry out a pre-test on the experimental subject. The Solomon four-group design is illustrated in table 1 below:

Table1 SOLOMON FOUR-GROUP DESIGN

Group	Pre-test	Treatment	Post-test
Experimental 1	Yes	Yes	Yes
Experimental 2	No	Yes	Yes
Control 1	Yes	No	Yes
Control 2	No	No	Yes

From the above design there are two experimental groups and two control groups. Only Experimental 1 and Control 1 are pretested followed by treatments administered to Experimental group 1 and 2. All the four groups are post-tested. Comparism is then made with respect to the post-test results of the four groups to examine the effects of the independent variable (treatment) on the dependent variable.

In the factorial design, which allows several hypotheses to be tested simultaneously, two or more independent variables called factors are manipulated simultaneously to examine their effects. It is desired that randomization takes place in assignment of subject to groups. However where this is not possible the quasi- experimental design is used. When using experimental design it is highly important for the experimenter to select appropriate design (Shadish, Cook and Campbell, 2002).

Statistical tools are used in analyzing data from experimental research where it is not possible to undertake a pure experimental research in the laboratory. The experimental research work is undertaken as field experiments conducted in natural setting. The laboratory experiment allows higher levels of control than the field setting. When we have a situation where we cannot use the laboratory setting, intact groups are used and causality must be established. There are many statistical tools that help to analyze data from either laboratory or field experiments. In the next session we shall focus basically on analysis of covariance (ANCOVA) which evolves from improvement of the analysis of variance(ANOVA) model.

THE ROLE OF ANALYSIS OF COVARIANCE IN EXPERIMENTAL RESEARCH

One of the popular tools used in experimental research where hypotheses about differences between three or more means of the dependent variables are to be tested is the analysis of variance (ANOVA). It is interesting to note that when using ANCOVA one analyses or tests variances in order to test hypotheses of differences in means, whereby the independent variable can be made to give rise two independent estimates of the population namely, the within group or error variance estimate and the treatment or between group variance estimates.

The F statistic is given as $F = \frac{MSS_B}{MSS_W}$

In experimental research randomization of the experimental subject is highly essential. However there are situations where randomization is not feasible especially in field work and there is need to control for interfering variables that are not of primary interest to the design. In such a case, we use the analysis of covariance (ANCOVA) which is a combination of ANOVA and

covariates and is regarded as a blending of ANOVA and regression (Joreskog 1978). A covariate is a continuous variable that correlates with the dependent variable. One adjusts for covariates through the process of regressing the covariates on the dependent variable. An ANOVA is then carried out on the adjusted dependent variable. Thus, dependent variable= independent variable x covariates. Note that the dependent variable is continuous while the independent is categorical in nature. The factorial design and ANCOVA techniques, when used simultaneously, minimize internal validity threats and improve the power of statistical analysis through regression of error variance. As an illustration, if we wish to examine the effect of dependent variable e.g.(training) on an independent variable e.g (achievement in mathematics) there are other potentially confounding variables like (age, gender) e.t.c that needs to be controlled for. Using ANOVA alone results in errors due to the effects of these confounding variables. Analysis of covariance when used with one or more factors can help to minimize errors in the data. As a general linear model blending ANOVA with regression, ANCOVA can be mathematically express as follows

Y_{ij} = μ +τ_i + [$\beta_i(X_{ij}$ -$\bar{X}_i$)] +$\in_{ij}$, $\sum \in_l$ =0 , $\in \sim N(0, \sigma^2)$ where Y_{ij} = j^{th} observation in the ith dependent variable. μ = grand mean of dependent variable, τ_i= treatment effect of ith level of the independent variable, $\overline{X_i}$ is the mean of ith covariate, X_{ij} is the jth observation on the ith covariate, $\in_{ij}$ = associated covariance error term

The major purpose of analysis of covariance is to increase power of a test as well as adjust for existing initial differences. The analysis of covariance has the following assumptions as identified by Montgomery (2011):

- Independent measurements
- Linearity of regression relation between dependent variable and covariates
- Error term is normally distributed
- Error co-variation matrix is diagonal and hence uncorrelated
- Homogeneity of treatment regression slopes in which regression lines are parallel among groups. When comparing two on more regression lines ANCOVA enables us to know if the regression lines are different from each of the other lines or intersects (McDonald 2015).

In order to conduct an analysis with ANCOVA model one must first verify the following: the parameter assumptions like covariate measurements, reliability of covariate, linearity e.t.c. The collinearity of two or more of the predictor variables must be examined for perfect multicollinearity. The predictor matrix is singular and so is invertible. One should also test for homogeneity for variance and of the regression slopes before running the ANCOVA analysis using the relevant software package. If someone is using SPSS one should add the covariates in the univariate menu and then run the program in identical manner to ANOVA.

At the end of the analysis postulated hypotheses are examined in the output for main and interactive effects. If no significant interactive effect is obtained, Multiple Classification Analysis should be done to determine the magnitude and direction of the effect as well as the amount of variation due to each independent variable. If an interaction is significant a post hoc-test like the Scheffe Multiple range test or LSD will be used to identify the source of the interaction.

METHODOLOGY

In this section, the techniques used in carrying out this research that involves testing of hypotheses using ANCOVA as a tool are hereby presented.

Variables in the study

The key variables used in this study are two independent variables and one dependent variable. The two independent variables comprised an active variable and an attribute variable. Attribute variables are variables that cannot be manipulated, while active variables can be manipulated. The attribute variable is gender which consists of two levels, namely male and female. The alterable independent variable is an active variable that can be manipulated and is the instructional strategy used for teaching Business Mathematics and has three levels. The dependent variable is the skill acquisition in Business mathematics and is measured by student's performance in a carefully constructed and validated objective test in Business mathematics.

Research Design

A 3X2 non- randomized control pre-test/ post-test quasi-experimental factorial design was used for this study. Since the classroom was the formal setting for this research, it was not easy to randomize and disturb existing classroom setting and intact classes had to be used in this study as

suggested by vanDalen (1973). The design was such that the instructional strategy (treatment) was crossed with student's gender (male and female). This design was chosen because it gives opportunity to study the interactive effects of gender and instructional strategy on the dependent variable. It also enhances establishing causal link between each of the independent and the dependent variables. The table below shows the design for the study.

TABLE 2: DESIGN FOR THE STUDY

Group	Pre-test	Treatment	Post-test
Experiment 1	m_{11}	T_1	M_{11}
Experiment 2	m_{21}	T_2	M_{21}
Control	m_{31}	T_3	M_{21}

The m_{11}, $m_{21}$and m_{31} represent the three test scores, while the T_1, $T_2$and T_3 represent the treatments and M_{11}, $M_{21}$and M_{31} represent the post-test scores. In experimental group 1 the subjects in the research were exposed to interactive learning plus individual use of learning material while in experimental 2 the learning materials were used on group basis. In the control group the instructional strategy used was the conventional lecture method. The experiment lasted for ten weeks at the rate of 2 hours per week. The investigator conducted the lessons in all the three groups. This is to enhance a good measure of intra-lecturer reliability which, according to Fricks (1978), could be a potential source of experimental error.

Hypotheses Tested in the Study

Three hypotheses were tested in this study as follows

- There is no significant interactive effects of gender and instructional strategy on skill acquisition in business mathematics
- There is no significant main effect of gender on skill acquisition in business mathematics
- There is no significant main effect of instructional strategy on skill acquisition in business mathematics

Population and Sample

The target population consisted of all students of Business Education in Colleges of Education in Lagos State. The sample used was a total of 165 students, comprising 71 males and 94 females, in first year Business Education Program who were compelled to offer a course in Business Mathematics in two Colleges of Education in Lagos State namely, Federal College of Education (Technical), Akoka and Adeniran Ogunsanya College of Education, Ijanikin Lagos. At Akoka, the Business Education students were admitted into the departments of Accounting Education and Office Management and Technology Education and each set of students received lectures as intact classes on departmental basis. At Ijanikin, division of the students into the two departments was done in their third year during the experimental period. They were therefore taught Business Mathematics as an intact class and they formed the control group. The students of Accounting department at Akoka were randomly assigned to experimental 1 while those in Office Management and Technology Education were assigned into experimental 2. Those at Ijanikin formed the control group.

Instrumentation

The following instruments were used for the study

1. Pre-test: A 30 item test of pre-requisites skills in Business Mathematics based on the syllabus of the course taken during the first semester. This was done to measure the initial ability of the students and to serve as covariates.

2. Post-Test: This is a Business Mathematics achievement test covering the course content of the Business mathematics course taken during the second semester.

3. Structured Learning Materials in the course content of Business Mathematics constructed and validated by the researcher and other experts.

Table 3 shows the psychometric properties of the two achievement tests.

Table 3: PSYCHOMETRIC PROPERTIES OF THE TEST

Psychometric measures	Pre-test	Post-test
Range of discriminating power (D)	0.40 – 0.72	0.40 – 0.64

Item Difficulty Range (P)	0.32 – 0.70	0.30 – 0.70
Coefficient of internal Consistency	0.87	0.88

The high value of 0.87 obtained for the coefficient of internal consistency of the pre-test verifies the reliability of the covariate.

Data Collection

After the construction and validation of the Pre-test and Post- test, the three experimental groups were given the Pre-test in order to measure their initial ability. The time table for the course was arranged in such a way that the Akoka students were taught on Mondays while the Ijanikin students were taught on Wednesdays. Efforts were made to prevent contamination by ensuring that the two experimental groups at Akoka had their lectures one after the other. At the time of the research, the distance between Akoka and Ijanikin could be covered in not less than two hours. Also the students are tested after each lectures. Thus, contamination was minimized. At the end of the ten weeks of treatment a post-test in business mathematics was administered to the students.

Analysis

The scores of individual students form the units of analysis. The Statistical Package for Social sciences (SPSS) was used in carrying out an analysis of covariance on the data with the pre-test results as covariate. The analysis of covariance was expected to correct for any initial differences in the dependent variables and other extraneous factors that could compound treatments effects according to McDonald (2015)

Each of the hypotheses was examined for main interactive effects. In case of no significance interactive effects, Multiple Classification Analysis (MCA) was used to determine the magnitude and direction of the effects as well as the amount of variation attributable to the independent variable. Where an interaction was significant, the Scheffe Multiple Range was used to identify the source of the interaction.

Results

The descriptive statistics of the data are first discussed followed by the testing of the hypotheses. Table 4 shows the group means of post-test scores in the Business Mathematics.

Table 4: Group Means of Post-Test Scores

Gender	Experiment 1	Experimental 2	Control	Grand Total
Male	54.85	63.50	52.23	55.25
Female	56.38	56.18	53.38	55.46
Total	55.43	57.54	52.85	55.37

The students exposed to interactive learning with use of materials in groups (Experimental 2) had the highest scores in the post-test (57.54) while those exposed to only lectures had the lowest score (52.85). Males in experimental 2 had the highest mean score when compared with other males while females in experimental 1 had the highest means scores (56.38) when compared with females in the other groups. Table 5 shows the results of the ANCOVA analysis where the results of the test of hypothesis will be discussed.

Table 5: ANCOVA Output

Sources of Variation	Sum of Squares	DF	Mean Square	F	Significance of F
Covariates (Pre-test)	2587.714	1	2587.714	19.525	.000
Main Effects	1559.522	3	519.841	3.922	.010
Instructional Strategies (v2)	1422.705	2	711.353	5.367	.006
Gender (v3)	.284	1	.284	.002	.963
2- Way Interactions	839.263	2	419.632	3.166	.045
V2 xV3	839.263	2	419.632	3.166	.045

Explained	4986.500	6	831.083	6.271
Residual	20939.949	158	132.531	
Total	25926.448	164	158.088	

From the results we can see that the main effect of treatment was significant while that of gender was not significant. However a significant interactive effect of instructional methods and gender on skill acquisition in Business Mathematics was obtained which renders the main effect redundant. Thus, the alterable variable (Instructional strategy) and the attribute variable (Gender) jointly affect skill acquisition in Business Mathematics. The interaction could be plotted on graph to give more visual impact on the data. Also, further post hoc-test like the Scheffe multiple range comparism test can be perform separately for males and females on the three instructional strategies.

CONCLUSION

This study has attempted to demonstrate the use of ANCOVA in Educational Research and has therefore contributed to empirical studies on importance of ANCOVA in experimental research design. The study revealed that neither the attribute variable (gender) nor the alterable variable (instructional strategy) per se affected the skill acquisition of the students in business mathematics .Instead, the joint effect of both variables affected skill acquisition in the course. While the superiority of the interactive method over the routine lecture method has been demonstrated, it is important to note that males benefited more from the use of materials on group basis while the females benefited from the use of materials on individual basis. The results call for need to consider gender in designing appropriate instructional strategies for males and females.

This study used gender as an attribute variable. Other studies can be carried out using other attribute variables .Also, larger sample can be used from other parts of the country to enhance generalization of the results Intact classes were used in this study so as not to disrupt the administrative practices of the institutions. Complete randomization of the subjects was not done, thereby posing as a limitation to the study. However, ANCOVA has minimized experimental error and confounding effects through the use of covariates.

REFERENCES

Ardoy, D.N et al (2014). A Physical Education Trial Improves

Adolescent's Cognitive Performance and Academic Achievements: The EDUFIT Study. *Scandinavian Journal of Measurement and Sciences in Sports,* 24, (1) 52-61

Cox, D.R and Mc. Cullough P. (1982). Some aspects of ANCOVA.

Biometrics, 38 (3) 541-561

Eden, T and Fisher R.A (1927). Studies in Crops Variation: IV the

Experimental Determination of the value of Top dressing. *Journal of Agricultural science*, 17, 548-562

Elashoff J.D. (1969). Analysis of Covariance: *A delicate Instrument*.

American Educational Research Journal, 6, 383-401

Fricks, T. (1978). Observer Agreements and Reliability of Classroom

Observational Measure. *Review of Educational Research,* 48, (2), 157-184

Hamburger, E. (1972). *Business Mathematics for College Students*.

New York: Macmillan.

Hubbard, R. (1990). Tertiary mathematics without Lectures.

International Journal of Mathematics Education in Science and Technology , 6,(1) 55-62

Jacobs, R.M. (2015). Educational Research: Causal- Comparative Study.

Villanova University

Joreskog, K.G (1978). Structural Analysis of Covariance and Correlation

Matrices. *Psychometrika*, 43, (4), 443-447

Joreskog, K.G (1996). Modeling development Using Covariance

Structure in Longitudinal Research. *European Child and Adolescent Psychology*. 518-

Massad, L.C et al (2015). Changes in Knowledge of Cervical Cancer

Following Introduction of Human Papillomavirus vaccines among Human at High Risks for Cervical Cancer. *Gynecol oncol* Rep. 12, 37-40

McDonald, J.H. (2015). Analysis of Covariance: Handbook of Biological Statistics. *www.bios statistics.com*

Miller G, A. and Chapman J,P.(2001). Misunderstanding ANCOVA. *Journal of Abnormal Psychology*. 110,(1) 40-48

Montgomery, D.C (2012). *Design and Analysis of Experiment* (8th Ed.) John Wiley and Sons

Moura, F.T. JuergenGoth and Deans (2014). Localizing Cultural Values on Tourism Destination Websites: The Effects on User's Willingness to Travel and Destination Image. *Journal of Travel Research,* February 12 2014.

Omoniyi O.J (2014). Effects of Compact Disc- Mediated Instruction and Computer Based Package on Students Achievements in Business Studies. *International Journal of Teaching and Inclusive Education (IJTIE*). (3) 1 June 2014 265-271

Owen, S.B and Froman, R.D. (1998). Focus on Qualitative Methods: Uses and Abuses of ANCOVA. *Research in Nursing and Health,21,557-562*

Palacios- Gonzelez, B. et al (2015). Fighting Obesity. *Obesity*, 23, (4) 729-732

Pukar, K.C. (2012). Assessment of the Performance of Micro Enterprises

in Rural Nepal Over time. *Journal of Case Research in Business and Economics*. Connecticut College, 2007/2008

Roben, N, Lucier, M and Son field (2012). Family Business Successes

Planning: Seven Countries Comparism. *Journal of Small Business and Enterprise,* 19(1) 17-19

Shadish, W.R, Cook, T.D and Campbell D.T (2012). *Experimental and*

Causal Experimental Designs for Generalized Causal Inferences. Boston, Houghton and Mifflin

vanDalen, D.B. (1973). *Understanding Educational Research: an*

Introduction. New York, McGraw hill

INFLUENCE POROSITIES ON THE GUIDED WAVES PROPAGATION IN ELASTIC PLATES

N. Harhad[1*], N. Behloul[2]

[1]Research Center in Industrial Technologies CRTI, P.O.Box 64, Cheraga 16014 Algiers, Algeria
[2]Université des Sciences et de la Technologie Houari Boumediène, Algiers, Algeria

Abstract:

In this paper an aluminum plate that contains porosity on its surface is studied. Guided waves are used to investigate the plate. The studied porosity is an elongated type which its length is greater than its width. Its depth represents 16% of the plate thickness. In this study, the considered geometrical form of the porosity is half-cylindrical of which the ray value is regular along the cavity. The propagation of a single S_0 symmetric and A_0 antisymetric Lamb waves in the plate (Hanhui *et al.*, 2011) is numerically studied with a finite element model (COMSOL, 2013). Interaction of Lamb waves with the porosity gives rise to reflected/converted waves (Alleyne *et al.*, 1992). These phenomena are qualitatively and quantitatively studied.

In the first part of this work, the interaction of the incident Lamb waves at a fixed frequency with a cavity for which three ray values are attributed is studied. In the second part, the interaction of the incident Lamb waves at different frequencies with a cavity of a fixed value ray is studied. The results demonstrate correlation between the reflected/converted waves apparitions and the incident wave frequency. The reflection coefficient is evaluated in the aim to determine the influence of the cavity ray values on the reflected/converted waves amplitude. Sensibility of S_0 symetric and A_0 antisymetric waves was also demonstrated.

Keywords: Plate with porosity, Lamb waves, reflected/converted waves, finite element model.

1. Introduction

The metallic plate elaboration with a small thickness by using a molten metal, let appear sometimes porosities to the surface of the plate. These porosities are due to the clearance of a gas during the metal solidification. In a plate structure, these porosities constitute cavities with various forms, which could be investigated with guided waves. These types of waves are used in the field of nondestructive testing (NDT) and evaluation (NDE) (Lamb, 1917) and in optics (Tamir *et al.*, 1973). In the case of a plate with, Lamb waves have been used since they are sensitive to the surface state (Viktorov, 1967). Their interaction with the porosity gives rise to converted modes.

This work is a simulation study of the propagation of Lamb waves in a plate containing a half-cylindrical elongated cavity on one side only. Two main objectives are pursued: a) the influence of the ray values on the reflection coefficient, b) the influence of the incident Lamb mode frequency on the reflected/concerted Lamb modes.

In this paper, after a brief description of the studied sample, results from numerical simulations are given.

2. Numerical Simulation

2.1. Description of the studied sample

The studied sample is an aluminum plate with a thickness h=3 mm and a total length of 100 mm. Longitudinal and shear velocities in aluminium are respectively C_L = 6320 m/s and C_T = 3115 m/s and its density is 2700 kg/m^3. In the middle part of one side of the plate, a half-cylindrical cavity is considered. The cavity has a ray of 16% of the plate thickness as shown in Figure (1).

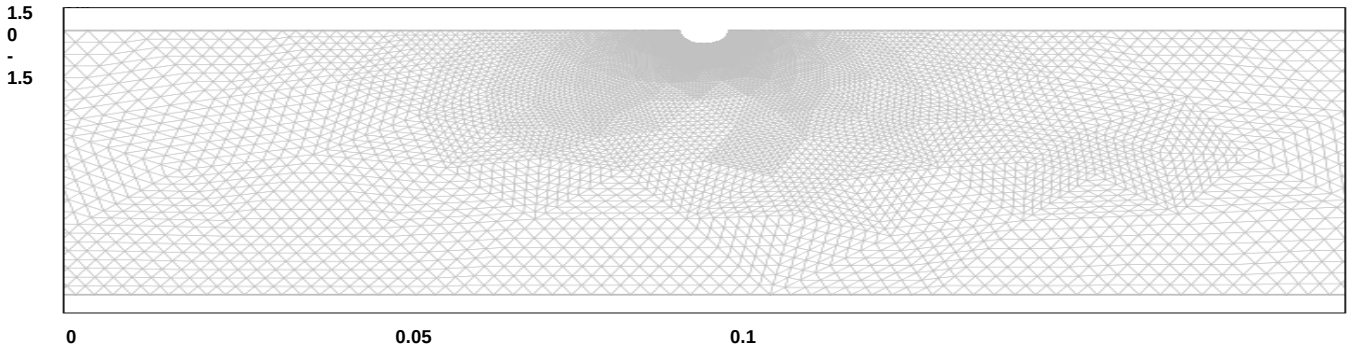


Fig. 1. *Geometry of the studied sample*

2.2. *Numerical Processing*

The interaction of an incident Lamb wave with the cavity involves different Lamb modes in the reflected Lamb waves. In order to study these phenomena, numerical solution is obtained by using the finite elements method for simulation in transient analysis. The plate is considered in vacuum. An analytical expression is used for the displacements applied on the left edge of the plate in order to generate a single Lamb wave at a given frequency. To represent the time-space image of the propagating waves in the plate, the normal surface displacements are recorded on the smooth plane surface of the plate, on the opposite side of the one which contain the cavity. Tree parts of simulations are made:

a) In the first part, the fundamental symmetric S_0 mode, propagating at 500 kHz towards the cavity which its ray value is respectively, 0.2 mm, 0.3 mm and 0.5 mm.

b) In the second, the fundamental symmetric S0 mode propagating towards the cavity with a ray of 0.5 mm at the frequency of 1 MHz.

c) In the third part, the fundamental antisymmetric A_0 mode, propagating at 500 kHz towards the cavity which its ray value is respectively, 0.2 mm, 0.3 mm and 0.5 mm.

In Figure 2(a) a time-space *(x,t)* representation is given for S_0 incident wave at 500 kHz. The part (1) of the signal corresponds to the incident wave and part (2) to the reflection from the cavity.

2.3. Results

In order to separate and to identify the incident and the reflected waves, a two-dimensional Fast Fourier Transform (2D FFT) is performed. In the dual space *(f,k)* the results are superimposed on the theoretical dispersion curves of a free infinite plane plate. The wavenumbers of the incident and the reflected waves are respectively positive and negative. The S_0 incident mode at 500 kHz is identified as shown in Fig.2 (b). While a fraction of the incident S_0 mode energy is converted into reflected A_0 mode (Fig.2 (c)), named the reflected/converted mode due to the inversion of the direction of propagation.

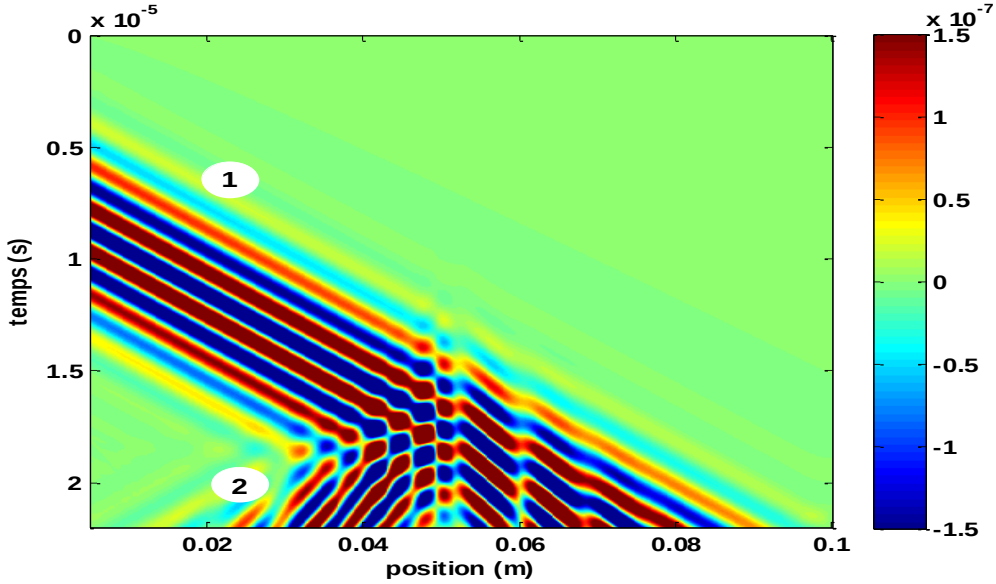
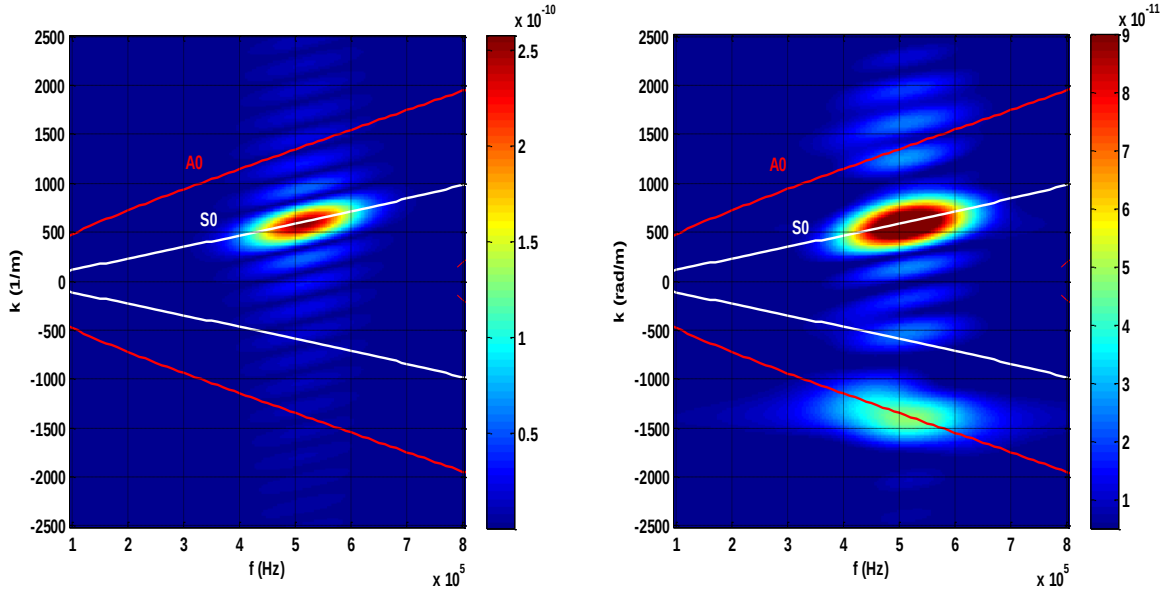


Figure 2 (a) : Time-space (x,t) representation



(b) *(c)*

Figure 2 : Dual space (f,k) representation of : (b) S_0 incident mode and (c) A_0 reflected/converted mode is identified

Dual space *(f,k)* representation of the Lamb mode permit to reach for each frequency its corresponding wavenumber and amplitude. At the frequency for which the reflected/converted A_0 mode amplitude is maximum, reflection coefficient is evaluated with:

$$R = \frac{A_{conv}}{S_{inc}} \quad (1)$$

A_{conv} and S_{inc} are respectively, the amplitude of the reflected/converted and the incident Lamb modes.

Table 1 : Influence of the ray value on the reflection coefficient

Cavity ray (mm)	0.2	0.3	0.5
R	0.035	0.15	0.67

In the second part of this work, an incident S_0 mode at a frequency of 1 MHz is also numericaly studied in the aim to make a comparison with the results on the interaction of S_0 incidence mode at a frequency of 500 KHz with the cavity.

Table 2 : Influence of the incident mode frequency on the reflected/converted and Transmitted modes

Frequency	Incident mode	reflected/converted modes	Transmitted modes
500 kHz	S_0	A_0	S_0
1 MHz	S_0	S_0 A_0 A_1	S_0 A_0

In the third and the last part of this work, an incident A_0 mode at a frequency of 500 KHz is also numericaly studied in the aim to make a comparison of its sensiblity to the cavity with that one of an incident S_0 mode at the same frequency.

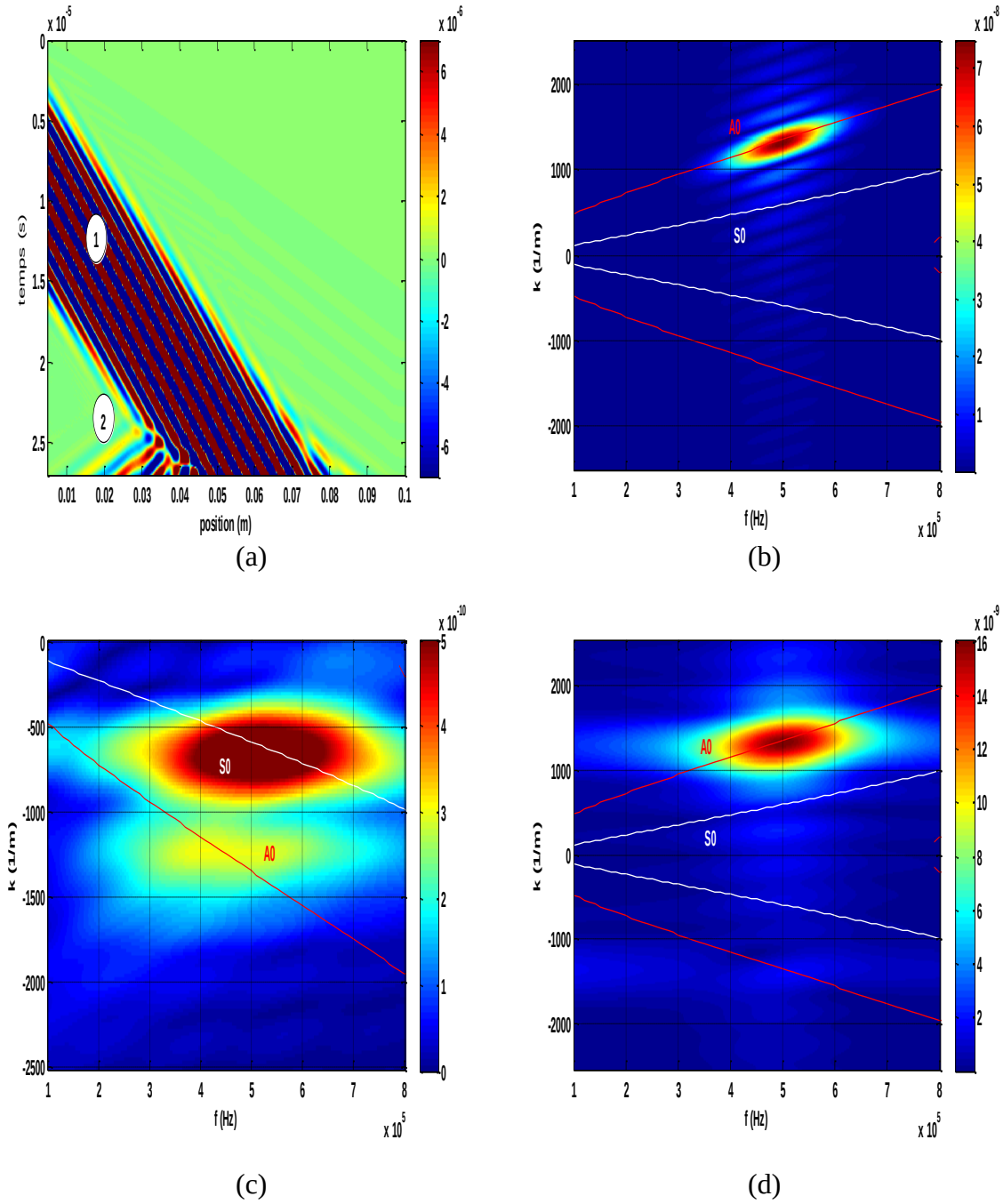


Figure 3 : (a) Time-space (x,t) representation of signal.
Dual space (f,k) representation of signals in: (b) A_0 incident mode is identified. (c) S_0 reflected/converted mode and A_0 reflected mode are identified. (d) A_0 transmitted mode is identified

At an identical value of the incidence frequency which is 500 KHz, S_0 and A_0 Lamb modes are sensitive to the cavity. The reflected waves by the cavity are constitued by one mode in the case of S_0 incident mode (A_0), whereas in the case of A_0 incident mode, two modes are

reflected/converted (S_0 and A_0), and this, for the three ray values, which are : 0,2 mm, 0,3 mm and 0,5 mm.

Conclusion

The first Results demonstrate that the value of the reflection coefficient increases when the ray value of the cavity increases. The second one, demonstrate that the reflected/converted and Transmitted resulting modes of the interaction of the incident Lamb mode with the cavity, depends on the frequency value of incidence. Using the S0 mode to investigate the plate at low frequencies (1,7 MHz.mm) is more adequate, because only A0 mode is reflected/converted which is practice in an experimental study.

References:

Hanhui Xu, Chunguang Xu, Xipeng Li, Lijiu Wang, (2011), Study on Single Mode Lamb Wave Interaction with Defect of Plate by Finite Element Model, Procedia Engineering, 15, 5067–5072.

COMSOL Multiphysics – User Manual, (2013) www.comsol.com,.

Alleyne, D.N. and Cawley, P. (1992), The interaction of Lamb waves with defects, IEEE Trans. Ultrason. Ferroelectr. Freq. Control., 39, 381-397.

Lamb, H. (1917), On Waves in an Elastic Plate, Proc. R. Soc. A. 93, 114-128.

Tamir, T and Bertoni, H.L. (1973), Lateral Displacement of Optical Beams at Multilayered and Periodic Structures, J. Acoust. Soc. Am. 61(10), 1397-1413.

Viktorov, I.A. (1967), Rayleigh and Lamb waves, Plenum Press, New York.

BEAT DIABETES; A WALK FOR LIFE

Jessie James F. Tolero
CoHS – University of Buraimi, Sultanate of Oman

ABSTRACT

Global statistics of diabetic cases of 2015 rose to 415 million, and Middle East & North Africa region had its share of 35.4 million, while Oman's 325,900 population is affected by diabetes with either type 1 or 2 (MENA, 2015) and in the absence of intervention, the statistics is expected to double within the next 10 years. In December 04, 2015 Landmark group-Muscat conducts the annual diabetes walk to increase diabetes-awareness to the public; it was participated by approximately 8,000 from 15 nationalities. This qualitative study looks into the motivations of participants of all age group and regardless of nationality, either affected or not by diabetes and how diabetes

was acquired. Narrative responses were gathered, analyzed and interpreted. Among the 12 random participants, only 3 are affected with diabetes and 9 of them are motivated to join the diabetes walk campaign to show support either to a diabetic friend, a colleague and a family member.

Keywords: walk, diabetes, Landmark group

INTRODUCTION

Diabetes is a common life-long health condition which is described in general as the total lack or less insulin in the body and if the body receives insulin it is not used properly. (Lossow, 2012). Insulin is the hormone produced by the pancreas that allows glucose to enter the body's cells, where it is used as fuel for energy to work and play (Diabetes UK, 2015). Glucose comes from digesting carbohydrate and is also produced by the liver. Diabetes is affecting the 325,900 Omani residents, roughly 1.3% of 415 million global diabetic population (MENA, 2015). World Diabetes Day (WDD) is celebrated every November 14 initiated by the International Diabetes Federation (IDF) and its member associates engaging millions of people worldwide. The campaign draws attention to the growing need for diabetes education (IFD, 2015) and Oman's Landmark group, a private entity whose statement of purpose is "creating exceptional value for all live we touch" (Landmark group, 2010) bench the 2015 walk to promote awareness and healthy family life style, it was participated by approximately 8, 000 people from 15 different nationalities of all ages. Though the objective of the walk is to campaign education and increase awareness in diabetes, I took the opportunity to study on the motivations of those who join the walk.

METHOD

Descriptive-Qualitative approach through unstructured interview was employed in this study. Getting their permission and willingness to answer one leading question which is; what prompt them to join in the walk? From the single question, fallow-up questions were asked and recorded. 12 respondents were randomly taken, all males of different nationalities and age group. The walk was staged on December 04, 2015 in Qurum Park, Muscat. Three of the most significant answers were quoted, analyzed and interpreted.

RESULTS & DISCUSSION

When asked a 11 year old participant what makes him come for the walk, he said" my parents set this date last week and I want to see what is going on, so I came along, and see; I got this shirt from the sponsors". Respondent #1 got curious of what parents are preparing for, join the walk and learn more of diabetes, his motivation is a reflection of a home-atmosphere which is supported by Linda's findings (2010) on how kids behave and reasoned to circumstances & events, it is link to how parents arrived, speak and

execute their decisions, children are the silent witness of what is happening at home and such has a great impact to them.

Respondent #2 is 26 years old who sounds health conscious with years of participation "I am not diabetic but this is an avenue for me to renew my commitment to a healthy life style and by the way this is my 3rd year of consecutive participation" he claimed. Such degree of motivation is described by Santiago in her speech (2008) address to Far Eastern University graduates, she reiterated that; Consistency is a showmanship of dedication, conviction and determination; it is an embedded motivation that calls for direct or indirect action. This is how respondent #2 is motivated.

68 year old having difficulty of walking claimed "I was inform of free sugar test and consultation plus I want to see my group of diabetic enthusiasts" her statement is a practical reality, booths for random blood glucose test (RGT) and endocrinologists are made available after the walk courtesy of the organizers. In today's struggle to maintain health even insurance companies are placing restrictions to coverage, making people think of ways to get health advice and diagnoses the lightest way interns of finances (Mcdoell, 2013). Respondents # 3 finds motivation in the walk not only on practicality but the chance to meet her group of diabetics which was form for therapy, this is a win-win motivation.

CONCLUSION

This study concludes that majority of the taken participants are driven primarily by empathy and to show their all out support & encouragement for diabetic people either of significance or not to them, the motivation of being health conscious placed second.

RECOMMENDATION

1. To carry out similar study in Oman focusing on the psycho-social impact of diabetes.
2. Conduct study in the Philippines on the financial burden of diabetes.
   And present either of the two in the 2017 Dubai OCRD seminar.

REFERENCE

1. Lossow, JF (2013) Structures & function in men, Merriam & Webster bookstore, Inc.
2. Smith, Jeffrey (2008) Introduction to human anatomy & physiology, National bookstore, Inc.
3. Tolentino, Eric (2012) Health practices of down town drivers in relation to diabetes
   Dagupan City.
4. Lubrica, Mercy (2005) Knowledge deficit among OPD patiens in Benguet General Hospital.

5. Lagos, Peter (2013) Motivations of secondary teachers in Mankayan National High School.
6. Santiago, M (2008) Far Eastern University commensment speaker, Mla. Bulletin
7. www.md/diabetes
8. www.healthwise

Management of Growth and Development of Entrepreneurship in Ganjuwa local

Government Area, Bauchi State Nigeria.

By

Musa Kallamu Hassan

Department of Business Administration and Management, School of Management Studies, Abubakar Tatari Ali Polytechnic Bauchi, Bauchi State Nigeria.

Email:- hmusakallamu@yahoo.com

Abstract

The aim of this paper is to investigate the role of Ganjuwa Local Government Authority towards managing the growth and development of entrepreneurship in Ganjuwa Local Governmemt Area Bauchi state, Nigeria. This study employed the use of both primary and secondary data obtained through primary sources as a basis of analysis. The result shows that lack of enabling environment hinder the growth and development of entrepreneurship. The result also found out that the growing needs has inspired entrepreneurial spirit among the teeming unemployed youth in the area, but inadequate finance and financial institution, epileptic power supply, technological backwardness, illiteracy; insecurity are some factors militating against the Growth and development of the entrepreneurship in the area. To this end, it is recommended that the government should create an enabling environment through adequate financing, effective policy to deliberate economic opportunity, encouraging innovation and dynamism; promotion of enterprise culture which will induce self-reliance, risk-taking, and an environment which rewards initiative and effort and also provision of all facilities necessary. This would allow the entrepreneurs to harness their human and material resources for the advancement of their business and a sound economic development of the area in which they operate.

Key words:- Management, innovation, entrepreneurship, growth and development

Introduction

There is no fain saying the fact that entrepreneurship plays a significant role toward establishing a dynamic and efficient economy in both a capitalist and socialist economic environment. That is why it is important to note the role of entrepreneurs in a developing economy so as to keep abreast with the changing

environment. This by implication means that for an entrepreneurs to have any meaningful impact in developing an environment, the emphasis should be places on both innovative and mastery of the innovative ideas. However, the opposite approach in most developing economy makes it all through a lot of technology and ideas exist. The ideas and technology are not put into practices, this by implication means that a large majority of these ideas and technology are purely imitative in nature. This, to a large extend means that the emphasis on all these are not on innovation and mastery of new idea, but on the efficiency of doing that was already innovated and move for long been in practice in the developed countries. It is therefore, pertinent to state that entrepreneurship plays significant role in shaping the economic life of a nation. This is the reason why it is not possible today for any nation to turn around it economy without taking into cognizance the dominant role a well organize entrepreneurship would play towards attaining that goal

One can therefore state without any contradiction that entrepreneurship plays a vital role in the development of nation. In the view of some writers, they attribute risk taking in business as the most important role entrepreneurship plays in shaping the economic life of a nation. This means that for any meaningful entrepreneurship to emerge the entrepreneurship must engages in risk venture. He must be willing to invest not minding the consequences. He therefore, performs the role of producer or distributer of event both in the production of services he offer to his clients. This study intends to examine the following problems.

1. The fact that Ganjuwa Local Government Area is rural area with a peculiar problems of traditional and beliefs. These thereby discourage the development and growth of entrepreneurship.

2. Poor managerial skills constitute very serious obstacles to the efficient running and proper management of entrepreneurship in Ganjuwa Local Government Area.

3. Lack of necessary and essential infrastructural facilities also hamper the growth and development of entrepreneurship in Ganjuwa Local Government Area.

Objectives of the Study: This study also intends to achieve the following objectives:-

i. Provide an insight into both the existing entrepreneurship and the potential ones on how they conduct business and how they can develop their business and environment at large.

ii. They study would also identify the various obstacles against the emergences of efficient entrepreneurship.
iii. The study also aims to ascertain the central role played by entrepreneurs with a view to arriving at a most viable economic ways of doing things.

Significant of the Study: This study would enhance the economic well being of both the Ganjuwa Local Government Area and its populace. This study would help to identify the numerous obstacles that hinder the efficient performance expected of the Ganjuwa Local Government Area entrepreneurs especially compared with their counterparts in other developed areas. The study will help the entrepreneurs in decision making and by extension knowledge of the economic system and make positive plans against unforeseen changes that might occur.

Review of related literature: The term entrepreneurship has to do with relationship of man to business. Thus, Alheridolu Ale E. (1975) However, these earliest contributions were for more concerned with the definition of the term and of its role in the economic system or theory than those particular question which have since became the primary interest of contemporary entrepreneurship studies, for instance what principal force recruits particularly individuals or group into the entrepreneurship role. To begin with the sociologies point of view using its knowhow and innovative ability and accepting the related risk combines the other three. Inputs, land, labor or other natural resources and capital for the purpose of making a return to these input, deduce the fact here that an enterprise does not need to be small or large new or old before it is regarded as an entrepreneurship. Therefore be inform that everyone who can face up to a decisions making can learn to become entrepreneur and behave like that. This therefore means that entrepreneurship is a behavior rather than personality trait and work rest on the theory of economy and the society and doing something different rather than doing better what is already being done by utilizing all available resources that is the land, labor and the capital from the point ever leaf, it could be deduced that entrepreneurship engage in controlling, directing, and decrement of other factor including human resources in a business, the workers that take their cue from the entrepreneurship achieve organizational objective.

2.2 Benefits of Entrepreneurship to Economic: The quickest way of enhancing the economic well being of the populace and indeed the society well being is for one to get attached to other professional entrepreneurs, entrepreneurship is therefore an essential and in separable part of a machinery of any given society

without which neither government nor the commerce and the industry of a nation could function effectively as many consultancy firms and how being created by them. This means that entrepreneurship is an integral part of any meaningful economy experience.

2.3 Sources of Funding of an Entrepreneur: Changing Peter C. (1977) enumerated some of following as sources of funds available to the entrepreneur. An entrepreneur gets of his finance either through friends or relatives. He further mentioned that unless the entrepreneur has money of his own, the above service is the most realistic services from which he can raise money for a start up as well as a portion if not all his working capital.

2.4 Why Entrepreneurship Fails: It is pertinent to note that since the competence management is itself seen as being dependent upon the quality of entrepreneurial services available to the firm, the theory actually revolves itself into a decisive emphasis on one single factor that is the equality of entrepreneurship services. It is necessary to state that apart from few failures caused by Fraud, neglect, and disaster. The major reasons why some entrepreneurs fail to attain maximum proficiency in their enterprise as maintained by Drucker Peter F (1985) are as follows:

1. **Managerial incapability**: managerial incapability means the inability of entrepreneurs to manage the small scale business properly. This happens if entrepreneurs do not possess leadership qualities. Such as hard work, risk taking ability, linking challenges and innovativeness. Lack of these attributes can lead to managerial incapability such that managers might not be able to utilize their resources efficiently and give proper attention to numerous managerial functions such as organizing, planning, directing, coordinating, controlling and decision making. If all the points raised above are properly taking care of by the entrepreneurs there would be little or no problem of managerial in capability in running small business.
2. **Commercial bank loan**: an entrepreneur can start his enterprises by raising capital through loans obtained from commercial bank in other words, commercial bank provide them with long and short term loans. They in addition provide working capital more especially to partnership entrepreneur and limited liability entrepreneurs to the average small business operator for example, commercial bank lending-facility generally involves the temporary substitution of something already has. It is therefore important to note that

there are many ways in which banks can supply these funds to the interested entrepreneur as to both the collateral required and the time or length of payment. Therefore, entrepreneurs may likely fail in case of any in ability to have access to a commercial bank loan.

3. **Lack of initial working capital:** Working capital in its literal term means that the fund used in running the day to day activities of a business in other words, it refers to the firm's investment in current assets, the entrepreneur requires strong working capital to start his business. This is based on the fact that the reproduction sales and cash to purchase the raw materials and pay for all the expenses incurred in the course of paying the goods obtained and the services rendered by the human factor. This therefore advances the more reason why an entrepreneur should have adequate capital to run an efficient business. Lack of this quality is dangerous from the business points of view and makes it impossible for the business. It also makes it difficult to implement operating plants and achieve the business profit target.
4. **Intensity of competition:** Some entrepreneurs fail if the intensity of business competition is high, if the businesses of some kind exist, competition may increase entrepreneurs can efficiently manage and foresight survival and those which lack the first to fail.
5. **Lack of business connection:** Lack of business connection due to either entrepreneurs in ability to faster fruitful relationship or that some non business considerations dominants the selection and sustenance of good customers. Avoiding those human errors would make the business function effectively at reasonable profit. The gains derived from this proficiency will then be used to further expand the business.
6. **Lack of prior business experience coupled with insufficient preparations:** this is the most important reason why an entrepreneur fails. Business experiences are challenges an entrepreneur meets in the course of carrying out business. The experiences acquired are used to modify ones behavior if any future business pursuit. It is the pertinent to add here that entrepreneurs lack good business experience coupled with insufficient preparations and this is a turn leads to less of business interest and by extension the business ventures. It is therefore necessary to state that experience is not the time to spend but time to maximally utilized the experience acquired judiciously. An entrepreneur therefore need experience from field of business to enable him manage efficiently.

7. **Location:** The output of any enterprises located in a rural area cannot match the one to cited an urban areas. The one in the metropolis would no doubt have an edge over the one in the rural area in term of accessibility to customers. Alack of suitable location therefore is chosen without carefully study to the targeted market planning and adequate investigation to limit the number of his customers due to wrong location of the business.

Methodology of the Study

The researcher uses four methods of data collections on this research that is questionnaires, participant, observation, and oral interview. The researcher produce questionnaires and distributes them to the member of the public whose views are needed while few people residing in the affected areas of Ganjuwa Local Government, the government official i.e. Commercial Bank manager, the small business administrator (SBA) in order to get their views.

The most effective instrument were the questionnaire issues to these entrepreneurs and their reaction towards it's, the community, government agencies and public. Some of the sample questions are giving below:-

1- From what source did you obtain your working and fixed capital

(a) Personal saving
(b) Borrowing from the bank
(c) Government grant
(d) Borrowing from friend

2- What other ways do you think the government could assist to promote the indigenous investors to innovate and invest?
3- How do you cope with the activities of competitors in the same field of business?

Presentation and Analysis of Data

The issue of entrepreneurship in Ganjuwa local government area and the nation at large is something that needs to study and find out the cause of entrepreneurship in the area. i.e. Ganjuwa local government. The data analyses described in this chapter are based on the four method of collecting information they are:-

(a) Questionnaires
(b) Oral interview

(c) Participant observation
(d) Content analysis or reference materials.

Below are the results of completed questionnaire by 25 respondents. The calculation was made using percentage scores that is twenty five over hundred 25/100 = 4% in which everyone respondent stand for twenty five percent 25%. The ages of respondents ranges from eighteen upward with fifteen male and ten females.

Table one (1): This show the number of people who are involved in services or buying and selling business.

Variable	Respondents	Percentage
Yes	25	100%
No	0	0%
I don't think	0	0%

This table shows that all the respondents are aware of the services of buying and selling business in town which means that is something very common 25 = 100%. (Source questionnaire distributed)

Table two (2): shows the majority of our entrepreneur sources their capital from statement their own personal savings.

No. of respondent	Variable	Respondents	percentage
25	Personal saving	13	52%
25	Bank loan	8	32%
25	Friend/relative	4	16%

(Source questionnaire distributed)

The table shows that a place where the personal saving 13-52% respondent saying they are indigenes of either the town or state while 8-32% saying are from other state and 4-16% saying they are foreigners. This shows that the sources are from friend which accounts for finally sources from government and banking loan facilities which accounts respectively.

Table three (3): what are the reactions of entrepreneur's in solving their business problems, statement shows it was discovered that majority of the entrepreneurs' with government Aid

No. of respondent	Variable	Respondents	Percentage
25	Government Aid	13	52%
	Business Promotion	8	32%
	Free Trade tax	0	0%
	All of the above	4	16%

(Source questionnaire distributed)

The table above shows that with government Aid 13 respondents representing 52% saying there is need for business promotion. While, 8 respondent representing 32% saying with influences of some groups. The four respondents representing 15% saying trying to save the situation from the above, we can said that aid business promotion and free trade tax are to solve the problems of their business.

Table four (4): shows the respondent view on what should be able to plan entrepreneurs for shorter term. This short term plan may be due to frequent changes in the environment.

No. of respondent	Variable	Respondents	Percentage
25	Long term	5	20%
	Short term	17	68%
	All of the above	3	12%

(Source questionnaire distributed)

The table above shows that 5 respondent represent 20 are saying that long term are to be detained, which 17 respondent represent 68% are saying that they should be separated from the deprived stake to short term and 3 respondent represent the 12% are saying to get them and all of the above

Conclusion

Despite a number of fundamental problems militating against the development/establishment of an efficient entrepreneurship in Ganjuwa local government area of Bauchi state Nigeria. The enterprise has a very bright future. As a matter of fact, it is not possible to appreciate the economic advancement of Ganjuwa without making reference to the positive contribution of entrepreneurship has been playing towards the economic and social development of the area. It is in the light of the vital role played by the entrepreneurs that it been playing towards the economic and social development of the area.

First, the entrepreneurship in this local government area have been encountering a number of problems in the operation of their various business and this lead to number of failures in their attempt to attain maximum proficiency. Some of these problems are financial and decision making. It should be borne in mind that Ganjuwa is a rural area with few financial institutions. It is to be noted once more that entrepreneurs obtained from such sources as friends and relatives, commercial banks, small business administration. Bearing in mind that the harsh political and economic realities of our time. One can equally say that the task of laying a solid economic base in our areas lies with the inhabitants. Government cannot salvage the situation along. So far, we have seen that our economy tends to be a dominating individual who seeks a sense of achievement and independence and this required a sense of cooperation since foreign expatriates blinded every body's vision without caring to utilize other resources.

Summary of Findings

It has been discovered through this study that organizational demands, technological innovations, group norms, communication media, family and events are but some of the key factors capable of exerting considerable influence on the entrepreneurial personality, such influences to be noted work on the entrepreneurship which in turn may produce and effective entrepreneur. The result also shows that inadequate finance and financial institution, poor enabling environment hinder the growth and development of entrepreneurship. The result equally found out that the growing needs has inspired entrepreneurial spirit among the teeming unemployed youth in the area, epileptic power supply, technological backwardness, illiteracy; insecurity are some factors militating against the Growth and development of the entrepreneurship in the area

Recommendations

To attain an efficient and dynamic entrepreneurship capable of enhancing the economic development of Ganjuwa local Government area as well as the economic well being of its people, the following recommendation are hereby:

(a) Choice of location: location of any business must take into account especially its accessibility to the market and indeed to most of its customers. It is very essential if only to attain maximum profit and sustain the producers/customer relationship. In addition and entrepreneur must taken into account the proximity of his enterprise to his source of raw material for production, efficiency and other inputs plus easy accessibility to infrastructure facilities as well as skilled personal.

(b) Secondly, an enabling environment is also essential towards the establishment of available enterprise in these areas. A stable political environment for instance, is very necessary as this would enable entrepreneurs to make their plans. It would indeed be very difficult for entrepreneurs to plan ahead if they did not know what lies ahead.

(c) Fixed assets and equipment: it is imperative to note if one really want to remedy the problem of entrepreneurship, knowledge of alternative types and characteristics, their costs, capabilities/facilitates where equipment are to necessarily be imported, their total installed cost must be carefully determine. In addition, relevant customers and parts cost must be a larger extent enhance the emergence of available entrepreneurship in this area.

(d) Concentration of effort: one other recommendation for the improved performance it the concentration of effort, particularly in the provision of all facilities necessary. This would allow the entrepreneurs to harness their human and material resources for a sound economic development of the area in which they operate and also for the advancement of their business.

(e) Effective policy formulation: Government through a deliberate economic opportunity is opened to indigenous rather than foreign entrepreneurs. Much would be achieved in the bid to increase the role of local entrepreneurship like the increase in employment opportunities and retention of profits, literature, sent out other place for the economic development of all. In addition, the government in an attempt to improve entrepreneurial performance should educate the entrepreneurs extensively, especially on the adoption of the local raw material in the industries and its products. This should be followed by the establishment of exhibition/demonstration canters.

In a bit to motivate them into patronizing the local investors to attain their optimum level of proficiency.

(f) Finally government and financial institution should bear in mind that none of our enterprises, especially those with rural setting can exist by itself. A substantial amount of what is required for quick and formidable enterprises, therefore can only be justified except by moral and financial support from the society especially the government.

REFERENCES

Alheredolu Ale E.O (1975) "The under Development of indigenous Entrepreneurship" Ibadan University press. Nigeria.

Channing Peter C. (1977) “The career Alternative practice-Hill.

Drucker Peter F. (1985) “Innovation and performance” Heinemann

Parish F.W: (1978) “Business Finance” Pitman publisher company.

Ganner Manties J: (1970) "Organizational Behavior" Little Brown and Company

Geoffery White: (1982) Economic Made Simple Heinemann London.

Onochie Loe C: (1079) "Financial Management & Practice" Emeka Adiche Publishers.

Parish F:: (1978) "Business Finance" Pitman Publishing Company.

Dominating Countries in Export Network

Lakshmi Prabha S, National Institute of Technology, Tiruchirappalli, India

Gopalan N.P., National Institute of Technology, Tiruchirappalli, India

Abstract: In literature, top export network is constructed and some of its structural properties are analyzed. In this paper, some more structural properties of the top export network are analyzed. A dominating set of countries in export network is obtained using an existing algorithm in graph theory. The set discovers more interesting and significant results in comparison with the earlier studies. Then, a polynomial-time approximation algorithm is proposed for the construction of a dominating network in top export network. A dominating network is actually a sub network of the top export network, revealing some more structural properties of the top export network. It gives information about which countries play a crucial role in the International trade market and how crucial they are.

Keywords: International trade, approximation algorithm, globalization, social networks and dominating set.

Introduction

In general, a country which exports in large volume or which exports to a maximum number of countries is considered as a core (central) country. But, in this paper, a set of countries is obtained, in which every country plays an equally important role in the International trade, irrespective of whether it is developed or not.

The International trade is represented as a network through cross border trade flows. Network analysis of international trade had not been studied for a long time [1]. Sociologists began it around 1970's. Using various forms of block modeling, they identified a three-tiered structure (core, semi-periphery, and periphery) within the world economy and classified countries into three positions [2-8]. But topological properties of the network had not been concentrated.

With the recent rise of "the new science of networks" across many disciplines [9, 10], more scholars in economics, mathematics, and even physics have started adopting the network perspective on economic activities [1, 11-13]. This new approach has been proved fruitful and shed new light on international trade [14-28]. These studies find that the international trade network possesses typical properties of complex networks, including the "small-world" property, a scale-free degree distribution, a high clustering coefficient, and the presence of degree correlation between countries.

All existing studies construct their trade networks using either binary networks (whether there is trade between two countries or whether the volume of bilateral trade reaches a designated threshold) [2-8, 19, 20, 24] or weighted networks (in which each trade tie is weighted by some proxy of the trade intensity it carries) [15-17, 21, 22]. But the differential importance of trade relations had been neglected till 2015.

Recently, Zhou et.al. [36] have given the construction of top export and import networks from top trade relations. Such a top export network is used to construct a dominating network in this study.

Not all bilateral trade relations are equally important to a country. For a single country, its distribution of trade volume across trade partners is not uniform, but approximates a power-law distribution [17, 20, 24]. A country's top trade partners are particularly influential in shaping its involvement in international trade. Till date, network studies are focused on position and role analysis [2-8], the degree distribution (the number of trade relations of a country), average nearest-neighbor degree(the average number of partners of the neighbors of a given country), clustering coefficient (the fraction of a country's partners who are themselves partners), degree–degree correlation (the correlation between the degree of a country with that of its neighbors) [14-28], and network centrality (the reachability of a country from every other country) [16, 29-35]. Such analysis of the International trade is done using the graph theory parameter, dominating set, newly in this paper.

The rest of the paper can be divided into three parts. In the first part, a set of dominating countries is first obtained using an existing algorithm in graph theory. In the second part, a dominating network is described and then a polynomial time approximation algorithm is proposed to construct a dominating network from any top export network. Further, some properties of the dominating network are analyzed, which proves the correctness of the algorithm. Also, its performance ratio is analyzed for one parameter. In the third part, performance ratio of the proposed algorithm is analyzed based on two parameters, which theoretically proves the applicability of the algorithm. The results of the proposed algorithm are then compared with that of the basic algorithm, which validates the applicability of the algorithm.

The dominating network is actually a sub network of the top export network, revealing some more structural properties of the top export network. It gives information about which countries play a crucial role in the International trade market. On the other hand, the dominating set concept is not related to any centrality concepts. The dominating countries may or may not be central.

Dominating Set in Graph Theory

In network studies of international trade, countries are represented by nodes (or vertices) and trade relation between countries are denoted by ties (or edges) connecting nodes. All data come from the ITC database. This data covers more than 221 countries.

A set $D \subseteq V(G)$ is called a dominating set if every node v in V is either an element of D or is adjacent to an element of D. A dominating set D is a minimal dominating set if $D-\{v\}$ is not a dominating set for any $v \in D$. The concept of domination was introduced by Ore [37]. Readers are also directed to refer Haynes et al. [38], for detailed study of the topic.

In terms of International trade, a set of countries, say, D is said to be dominating if every country is either in D or is importing from at least one country in D. For example, in Fig. 1, the minimum dominating set is {C, A, E}.

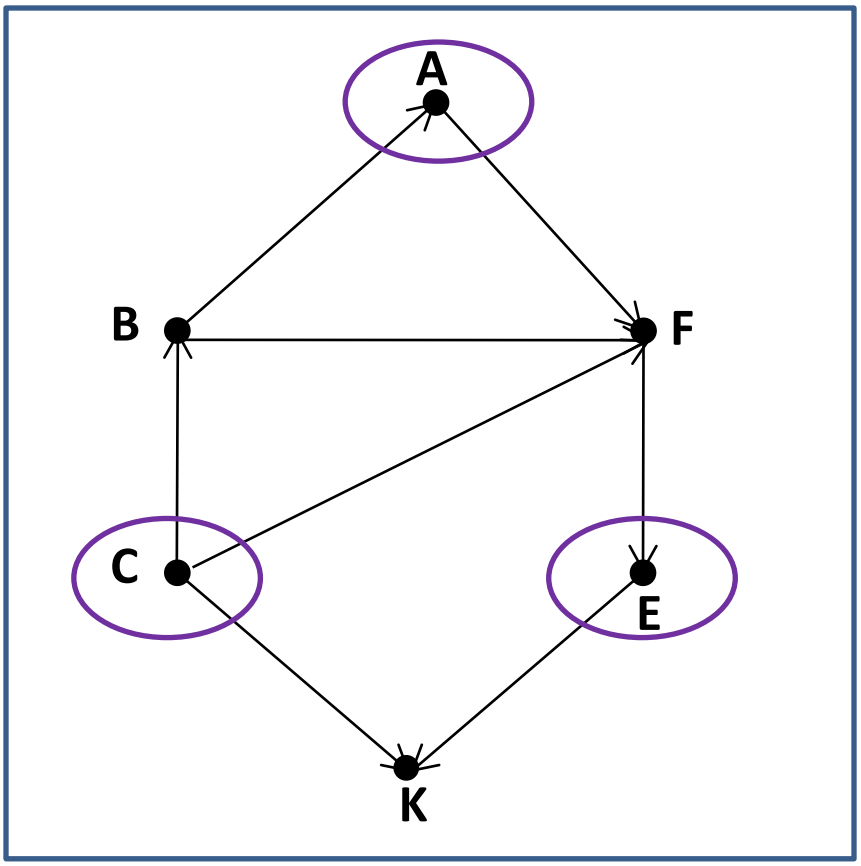


Fig. 1: Dominating Set

Minimum dominating set problem is an NP-complete problem. There are many polynomial-time approximation algorithms for finding a minimal dominating set, in literature. The main aim of this paper is to give a polynomial-time approximation algorithm for finding *dominating countries* with a better performance ratio and better results. First, an existing algorithm is employed to find a dominating set of countries.

Dominating Countries in Threshold Network using an Existing Algorithm

A dominating set of countries is obtained using an existing algorithm, in a network constructed based on threshold. A threshold is set on the volume of the bilateral trade and keep only those trade relations above this threshold. Also, the network should be constructed for a particular product, because while finding dominating set, the product has to be homogeneous.

Existing Algorithm [39]:

Input: Any threshold network

Output: A dominating set of countries

This algorithm is a coloring algorithm. Initially remove all the isolated nodes (nodes with zero indegree and zero outdegree) and color the remaining nodes with white color.

Step 1: Find a node (country) with maximum outdegree. Color it black and all the countries to which it exports, brown.

Step 2: Find a maximum white outdegree node, which is not black.

Step 3: Repeat this process until no white node exists.
Step 4: Print black nodes.

Note 1: It is to be noted that the algorithm does not choose a dominating set based on the outdegree of a node *as such given* in the input network, but it depends on the changing white outdegree at each iteration of the algorithm.

Time complexity of the algorithm is O(n ln n), where n is the number of nodes in the given graph. Performance ratio of the algorithm is O(ln Δ), where Δ is the maximum degree of the given graph.

Illustration: Consider coffee export in 2014 and set the threshold value to be *10,000 USD.*

First form a threshold network with threshold volume above **10,000 USD**.

Brazil is the starting country with maximum outdegree 34, (since Brazil exports to 34 countries). Color all these 34 countries with brown color. At the end of the first iteration, white outdegree of every node will be changed. In the second iteration, Italy comes up with maximum white outdegree 14. Color all those 14 countries with brown color. Repeating this process, it can be observed that Indonesia then comes up with maximum white outdegree 8, then India with 3, Poland, China, Switzerland, Rwanda and Nicaragua, each with 2 and finally Honduras, UK, Germany, Ecuador, Uganda and Finland, each with one. So, the output dominating set consists of ***Brazil, Italy, Indonesia, India, Poland, China, Switzerland, Rwanda, Nicaragua, Honduras, UK, Germany, Ecuador, Uganda and Finland.***

<u>Observations for 2014:</u>

- If any one country is removed from the set, then the set will no longer be dominating (by definition).
- On the other hand, Chile, Cuba, Lebanon, Montenegro, Syria, Tunisia and Turkey import only from Brazil (above 10,000 USD). If Brazil is removed from the set, then **not only one of these countries, but also some of their importers may suffer.**
- Similar case may happen for every country in the dominating set. For example,
  - Albania, Croatia and Serbia import only from Italy.
  - Egypt, Georgia, Morocco, Thailand and Vietnam import only from Indonesia;
  - Kuwait and Libya import only from India and so on.
- So, the removal of any such country from the dominating set will affect either an importing country or minimality of the set. Thus, every country in a dominating set is equally significant in the International trade.

From the above observations, it is clear that any one country cannot be removed from the dominating set. There is an obvious question at this point: Whether replacement of a country is possible in the dominating set? Answer seems to be yes, but subject to some conditions. If a country (in the dominating set) does not export exclusively to a particular country, then a country can be replaced by another country, but not more than one country. Otherwise, minimality condition will be lost.

Results for Twelve Years: The algorithm is applied for each year from 2003-2014 and a dominating set is obtained in each case.

Consistently three countries have been in the first three places for ten years from 2003-2012.

- Brazil is always in the top position every year;
- Viet Nam had been in the second position for 7 years;
- Germany had been in the second place for two years and in the third place for 8 years.

Rarely, say, for one or two years, Viet Nam and Germany occupied other ranks.

Indonesia and Italy occupied next higher places for most of the years from 2003-2012. But there are some changes in recent two years. In 2014, Italy occupied second place and Indonesia occupied third place and vice-versa in 2013. This shows that Indonesia and Italy have been growing since 2013. However, all these five countries have been occurring in any dominating set for twelve years. Number of dominating countries is increased in 2013 and 2014. Switzerland has entered the dominating set in 2009.

On the other hand, as discussed in the illustration, some countries have been importing consistently only from a particular country above the threshold of 10,000 USD, for twelve years. For example, Kuwait and Libya consistently import only from India. Similarly, Ireland import only from UKG; Colombia from Ecuador (from Peru in recent years); Belarus from Russia; Cyprus from Poland; Tanzania and Uganda from Rwanda; Sudan (both North and South) from Ethiopia (or Uganda) and so on.

Thus, every country in the dominating set plays an equally important role in the International trade for twelve years.

Prediction of Future Trends: From the above results, the following predictions are made. In case of coffee export, the output dominating set in future is supposed to consist

- all of Brazil, Viet Nam, Indonesia, Germany, Italy, India, Russia, UKG and Poland and
- some of Ecuador, Peru, Rwanda, Uganda, Switzerland, Finland, Ethiopia, Lao, Lithuania, Netherlands, Honduras and Nicaragua in worst case.

It can be noticed that some of the important countries are not included in the dominating set. There are some drawbacks when the basic algorithm is applied for finding dominating countries.

Drawbacks of the Existing Algorithm:

The trade volume has been neglected. This is due to the algorithm. In the algorithm, if two countries export to the same country, then only one of them is included first in the dominating set and the other may or may not be included in the set. For example, both Brazil and USA export to Canada; In fact, USA exports to Canada in large volume (above 500,000 USD) than Brazil does (less than 150,000 USD). But the algorithm has forced to include Brazil and missed USA in the set.

So, some countries, which have abundant production (of the product), may not be included in the dominating set, (in the case of coffee, USA, France, etc. are missed).

In order to overcome the above mentioned drawbacks, a polynomial-time approximation algorithm is proposed, based on volume, with a better performance ratio. Before that, a dominating network is described below.

Description of a Dominating Network in Export Network

Two kinds of network can be formed with respect to a dominating set:

(i) a network only among the nodes of a dominating set and
(ii) a network connecting the nodes in a dominating set and the nodes outside the dominating set.

The first network is named as a dom-relationship network and the second is named as a dominating network. Both the networks are sub graphs of the export network.

Dom-relationship Network: The induced subgraph <*D*>, induced by the dominating set, is always the dom-relationship network. This network is about the relationship *among* the dominating countries and hence it is named as a dom-relationship network. dom-relationship network always consists of lesser number of nodes as well as ties than in the export network.

Dominating Network: This network has no particular structure. Any network which connects the nodes inside and outside the dominating set can be called as a dominating network. It has ties among the nodes also. Dominating network is a supergraph of the dom-relationship network.

For example, the dominating network formed by the dominating set obtained from the basic algorithm takes the form of the entire export network. But that network does not give importance to trade volume as discussed in the previous section. So, a polynomial-time approximation algorithm is proposed for the construction of a dominating network based on volume.

Construction of a Dominating Network in Top Export Network

The following algorithm is proposed to find a dominating set of countries, a dominating network and a dom-relationship network.

Notation:

$\text{indeg}_G(v)$ → indegree of a node v in the graph G (number of countries from which v imports).

$\text{outdeg}_G(v)$ → outdegree of the node v in the graph G (number of countries to which v exports).

volume (e) → export volume (in USD) of the tie $e = uv$ (between the countries u and v).

Algorithm (Pseudocode):

Input: Top export network G, export volume between the countries.

Output: A dominating set, a dominating network and a dom-relationship network.

```
Construct (G, tie volume)
Set H = G.
for each node v in G
{
        if indeg_G(v) > 1
        {
                maximum = maximum of {volumes of all ties e = uv in G}
                for each tie e =uv in H,
                {
                        if volume (e) ≠ maximum
                                H = H – {e}.
                }
```

```
        }
        for the tie e = uv in H
                D = D ∪ {u}.
}
for each node v in H,
{
        if indeg_H(v) = 0 and outdeg_H(v) = 0,
                then H = H-{v}.
}
Print  D, H and  <D>.
```

The set of all tail nodes of all the ties in H is the output dominating set of the algorithm. The resulting network H is the dominating network of the top export network and <D> is the dom-relationship network.

The algorithm can be applied in any top export network, say, top 1, top 2, top 3 and so on, to construct a dominating network.

Some properties of the dominating network in any top export network are mentioned below, which will be used in proving the correctness of the algorithm. Zhou et.al. [36] have mentioned that the top export network has a tree-like structure. As dominating network is a subgraph of the export network, it too has a tree-like structure. Other mentioned properties can be easily observed from the algorithm.

Properties:

1) Dominating network H is a subgraph of the top export network G with same number of nodes as in G, but with lesser number of ties than in G. Such a subgraph is called as an edge-deleted subgraph.
2) Dominating network H has a tree-like structure.
3) Every node of the dominating network has indegree equal to one. This means that every country in the dominating network imports from only one country.
4) Every node of the dominating network in top 1 export network has outdegree exactly equal to one (since every node in top 1 export network has outdegree exactly equal to one). This means that every country in the dominating network of the top 1 export network exports to only one country.
5) Every node of the dominating network in other top export networks has outdegree at least one (because of the structure of the top export networks).

Remark 1: As discussed in Property 1**,** H is an edge deleted subgraph of G with same number of nodes but with lesser number of ties than in G. But H is constructed in such a way that each tie of H has the highest export volume of the input export network. As the maximum export volume is the concerned criteria, there is no necessity of including other ties in H from G. Thus, H is the only possible (edge deleted) subgraph of G representing the highest export volume.

Correctness of the Algorithm

In order to prove the correctness of the algorithm, it is to be proved that D is a minimal dominating set of the input export network.

Theorem: D is a minimal dominating set of G.

Proof: The proof consists of three parts, as follows.

D is a dominating set of G: Every node (country) in G (also in H) is either an element of D or is adjacent to some element (country) of D. So, by definition, D is a dominating set of G.

D is a minimal dominating set of H: It is to be proved that D-{v} is not a dominating set of H for any $v \in D$. It is already discussed that D represents the set of tail nodes of all the ties $e = uv$ in H. That is, D represents the set of dominating exporting countries. Also, by Property (3), every node in H has indegree exactly equal to one. So, removal of any one tail node from D will make at least one country in H - D without import, that is, D-{v} is not a dominating set of H for any $v \in D$. Thus, D is a minimal dominating set of H.

D is a minimal dominating set of G: As discussed in Property 1**,** H is an edge deleted subgraph of G with same number of nodes but with lesser number of ties than in G. A minimal dominating set of an edge deleted subgraph need not be a minimal dominating set of its supergraph. But as discussed in Remark 1, H is the ***only possible subgraph*** of G representing the highest export volume of the input export network. This makes clear that D is a minimal dominating set of G also. □

Time Complexity of the Algorithm: The time complexity of the algorithm depends on sorting the export volume of the ties at each iteration of the algorithm. Let n be the number of nodes and m be the number of ties of the input network. The worst case time complexity of sorting algorithm is O(log m) for one iteration. As this process is repeated for every node of the input graph, the total time complexity of the algorithm is O(n log m) in worst case. As $m \leq n^2$, the total worst case time complexity of the algorithm is O(n log n^2), which is O(n log n). Thus, the total worst case time complexity of the proposed algorithm is O(n log n). □

Performance analysis of the proposed Algorithm: A dominating network is a subgraph of the export network and it can be constructed in any way. But, as discussed in Remark 1, H is the only possible subgraph of the top export network, representing the **highest export volume** of the input export network**.** This shows that the algorithm yields the best possible output *as far as the concerned criteria is export volume only*. □

A point has to be noted here is that if the criteria is changed, a better approximate output may be possible, because this is an NP-complete problem and the algorithm is an approximation algorithm.

Dominating Network: Testing the Algorithm for two parameters

In the previous section, the performance ratio of the proposed algorithm is tested based on only one parameter, export volume. A question has to be raised here is that whether every importing country, (not in the dominating set), is satisfied with its exporting country (in the dominating set). The answer : not every time.

Though the dominating network H represents the highest export volume of each exporting country in the input export network, that highest export volume may or may not be the top 1 import volume for its importing country. For example, Tanzania ***exports in top 1 volume*** (nearly 27,000 USD) to Japan (in 2014). But, Japan imports for more than 400,000 USD from Brazil (top 1 import of Japan is Brazil in 2014). This means that Japan's demands are more and they are satisfied by Brazil. Though Brazil is included in the dominating set, the tie from Brazil to Japan is not included in the dominating network if it is constructed from the top 1 export network. Similar situation may occur for other countries also. That is, the dominating network

constructed from the top 1 export network does not contain top 1 import tie of some importing countries. Similarly, the dominating network constructed from the top 2 export network does not contain top 1 import tie of some importing countries and so on.

So, in order to fill these gaps, a dominating set (network) has to be obtained based on ***both export as well as import volume***. At this point, the problem has to be analyzed in two dimensions (based on two parameters), that is, the performance ratio of the approximation algorithm has to be analyzed based on two parameters, export volume of an exporting country and import volume of the its importing country.

Recall the above mentioned example: Japan happens to be the top 4 exporting country for Brazil (in 2014). So, Japan gets its top 1 import tie from the dominating network if it is constructed from the top 4 export network.

The dominating network of

- Top 1 export network gives information about top 1 import of nearly ten countries.
- Top 5 export network: nearly thirty countries
- Top 10 export network: nearly forty eight countries
- Top 21 export network: about 50% of countries.
- Top 50 export network: about 75% of countries.

This graph increases rapidly from the beginning until 75%, then it increases slowly and at last reaches 100% above Top 150. This result has been true for twelve years from 2003-2014. Fig. 2 illustrates this graph for the years 2005, 2010 and 2014.

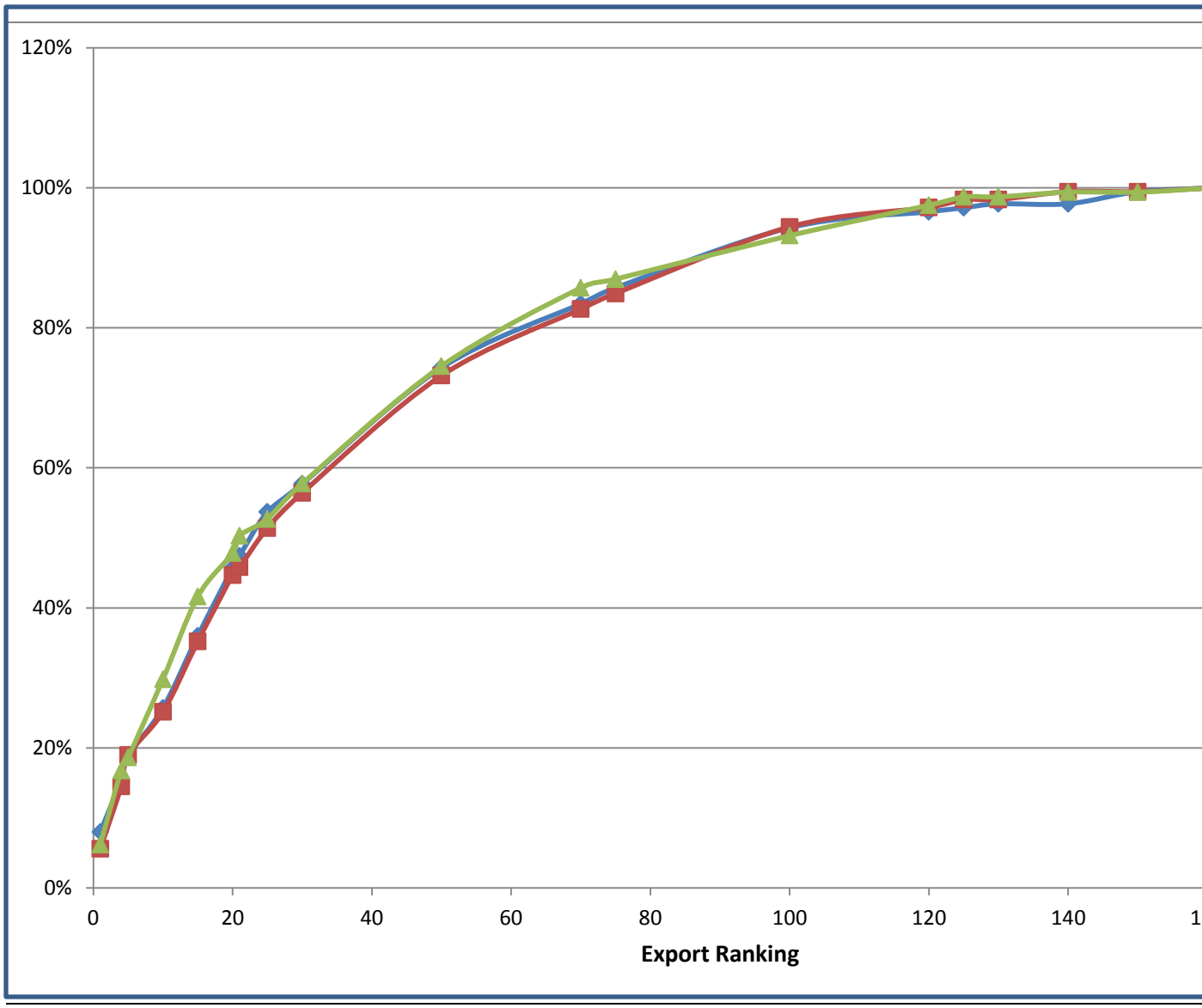


Fig. 2: Performance Ratio

From the above results, it seems to be reasonable if one constructs the dominating network from top 50 export network, because it gives information about top 1 import of nearly 75% of the importing countries. In this case, the performance ratio for

- export volume: 22.7% or approximately 23% (50 among 220) and
- import volume: 75%

The performance ratio is reasonable: The above ratios mean that 75% of countries achieve their top 1 import at an *earlier stage*. There is an obvious question: Can one achieve 100% for import volume?

If 100% has to be achieved for import volume, one has to construct the dominating network above top 150 export network (that is, top 151, 152, …). Then the algorithm again becomes weak from exporting point of view as well as time complexity.

So, in order to get better approximation, the performance ratio based on import volume has to be as higher as possible and at the same time, the performance ratio based on export volume has to be as lower as possible. As 50% is achieved at top 21 and 75% is achieved at top 50, the dominating network constructed from top 21 to top 50 will yield better approximate results. In this paper, preference is given to construct a dominating network from the top 50 export network using the proposed algorithm to get better approximate results.

Dominating Network in Top 50 Export Network

The proposed algorithm is applied in top 50 export network for coffee export in 2014. Fig. 3 represents a dominating network in top 50 export network for coffee in 2014. UCINET software is used to visualize the network.

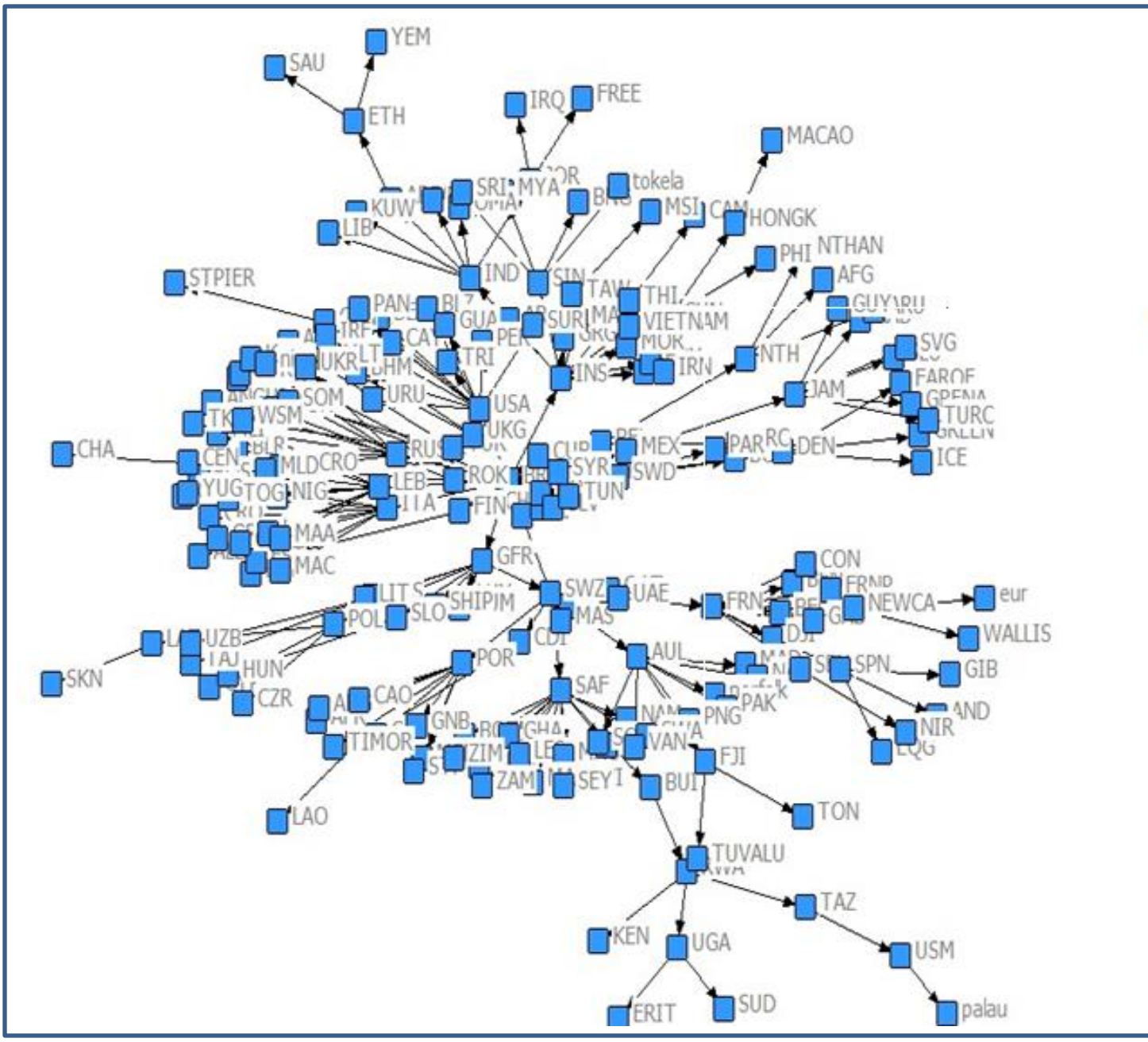


Fig. 3: Dominating Network in Top 50 Export network

Results for Twelve Years: The output dominating set of the proposed algorithm consists of all the countries which were predicted by the basic algorithm. The set also contains some more countries, missed by the basic algorithm, thereby overcoming the drawbacks of the basic algorithm. This validates the applicability of the algorithm. Also, the above analysis gives equal importance to outdegree, export volume and import volume at a time.

Table 1: Dominating Countries and their Consistency for Twelve Years

Dominating Countries	Consistent Outdegree
Brazil, Viet Nam, USA	**Above 9**
FRN, SWZ, SAF, INS, GFR, ITALY, LEB, RUS, AUL	**5 – 9**
NTH, POR, INDIA, JAM, SIN, SPN, RWA, ARG, DEN, NIC, NEW ZEALAND, JOR, PERU	**3-7**
DOM, ETH, FJI , GUA, HON, MAL, MEX, POL, TUR, UGA, UKG, AREA, AUS, BEL, CAN, CAO, CDI, FIN, GHA, HONGK, KYR, LAO, LIT, NEWCA, NOR, ROK, SAL, SAU, SEN, SLO, SWD, TAW, TAZ, USM, YEM, ZAM	**1-3**

Prediction of Future Trend: Dominating countries in the coffee export in future is supposed to consist of the countries mentioned in Table 1, in worst case.

Further discussion

In this study, only a typical example is considered. Using the proposed algorithm, the dominating network can be constructed for other products also. The main aim of this study is to give a polynomial-time approximation algorithm for constructing a dominating network with a better performance ratio. The basic algorithm is used only for comparing the results.

Further analysis is going on

- to find a dominating set of countries similarly for other products also using the proposed algorithm
- to improve the performance ratio of the algorithm
- to point out the importance of the currencies of the countries and their possibility to be included in the IMF.
- to study dom-relationship network.

Conclusion

A polynomial time approximation algorithm is proposed to construct a dominating network from any top export network. The performance ratio of the algorithm is analyzed based on two factors and is proved to be a better, reasonable value. The results are then compared with those of an existing algorithm and the applicability of the algorithm is validated.

Acknowledgement

The first author is thankful to the funding agency, National Board of Higher Mathematics (NBHM) of Department of Atomic Energy (DAE), Govt. of India, for her post-doctoral fellowship.

References

[1] Goyal, S., 2007. Connections: An Introduction to the Economics of Networks. Princeton University Press, Princeton, NJ.

[2] Breiger, R.L., 1981. Structures of economic interdependence among nations. In: Blau,P., Merton, R. (Eds.), Continuities in Structural Inquiry. Sage, Beverly Hills, CA, pp. 353–380.

[3] Clark, R., Beckfield, J., 2009. A new trichotomous measure of world-system position using the international trade network. Int. J. Comp. Sociol. 50, 5–38.

[4] Kim, S., Shin, E.-H., 2002. A longitudinal analysis of globalization and regionalization in international trade: a social network approach. Soc. Forces 81, 445–468.

[5] Mahutga, M.C., 2006. The persistence of structural inequality? A network analysis of international trade, 1965–2000. Soc. Forces 84, 1863–1889.

[6] Smith, D.A., White, D.R., 1992. Structure and dynamics of the global economy: network analysis of international trade 1965–1980. Soc. Forces 70,857–893.

[7] Snyder, D., Kick, E.L., 1979. Structural position in the world system and economic growth, 1955–1970: a multiple-network analysis of transnational interactions. Am. J. Sociol. 84, 1096–1126.

[8] Van Rossem, R., 1996. The world system paradigm as general theory of development: a cross-national test. Am. Sociol. Rev. 61 (3), 508–527.

[9] Barabási, A.-L., 2002. Linked: The New Science of Networks. Perseus Publishing, Cambridge, MA.

[10] Watts, D.J., 2004. The ‘new’ science of networks. Annu. Rev. Sociol. 30 (1),243–270.

[11] Easley, D., Kleinberg, J., 2010. Networks Crowds and Markets: Reasoning about a Highly Connected World. Cambridge University Press, New York.

[12] Jackson, M.O., 2008. Social and Economic Networks. Princeton University Press, Princeton, NJ.

[13] Schweitzer, F., Fagiolo, G., Sornette, D., Vega-Redondo, F., Vespignani, A., Douglas,R.W., 2009. Economic networks: the new challenges. Science 325, 22–425.

[14] Baskaran, T., Florian B., Tilman B., Fabian, J.T., 2011. The Heckscher–Ohlin model and the network structure of international trade. Int. Rev. Econ. Financ. 20 (2),135–145.

[15] Bhattacharya, K., Mukherjee, G., Sarämaki, J., Kaski, K., Manna, S., 2008. The international trade network: weighted network analysis and modeling. J. Stat. Mech.Theory Exp., P02002, http://dx.doi.org/10.1088/1742-5468/2008/02/P02002

[16] Fagiolo, G., Reyes, J.A., Schiavo, S., 2008. On the topological properties of the World Trade Web: a weighted network analysis. Physica A 387 (15), 3868–3873.

[17] Fagiolo, G., Reyes, J., Schiavo, S., 2009. World-Trade Web: topological properties, dynamics, and evolution. Phys. Rev. E 79 (3), 036115.

[18] Fagiolo, G., 2010. The international-trade network: gravity equations and topological properties. J. Econ. Interact. Coord. 5 (1), 1–25.

[19] Garlaschelli, D., Loffredo, M.I., 2004. Fitness-dependent topological properties of the World Trade Web. Phys. Rev. Lett. 93 (18), 188701, http://dx.doi.org/10.1103/PhysRevLett.93.188701

[20] Garlaschelli, D., Loffredo, M.I., 2005. Structure and evolution of the World Trade Network. Physica A 355 (1), 138–144.

[21] Garlaschelli, D., Di Matteo, T., Aste, T., Caldarelli, G., Loffredo, M., 2007. Interplay between topology and dynamics in the World Trade Web. Eur. Phys. J. B 57,159–164.

[22] Li, X., Jin, Y.Y., Chen, G., 2003. Complexity and synchronization of the World Trade Web. Physica A 328 (1–2), 287–296.

[23] Picciolo, F., Squartini, T., Ruzzenenti, F., Basosi, R., Garlaschelli, D., 2012. The Role of Distances in the World Trade Web., http://dx.doi.org/10.1109/SITIS. 2012.118arxiv:1210.3269.

[24] Serrano, M.A., Boguna, M., 2003. Topology of the World Trade Web. Phys. Rev. E 68,015101(R), http://dx.doi.org/10.1103/PhysRevE.68.015101

[25] Serrano, M.A., Marian, B., Vespignani, A., 2007. Patterns of dominant flows in the World Trade Web. J. Econ. Interact. Coord. 2 (2), 111–124.

[26] Squartini, T., Fagiolo, G., Garlaschelli, D., 2011a. Randomizing world trade, a binary network analysis. Phys. Rev. E 84, 046117, http://dx.doi.org/10.1103/PhysRevE.84.046117

[27] Squartini, T., Fagiolo, G., Garlaschelli, D., 2011b. Randomizing world trade II: a weighted network analysis. Phys. Rev. E 84, 046118, http://dx.doi.org/10.1103/PhysRevE.84.046118

[28] Wilhite, A., 2001. Bilateral trade and 'small-world' networks. Comput. Econ. 18 (1),49–64.

[29] Blochl, F., Fabian, J.T., Vega-Redondo, F., Fisher, E.O'N., 2011. Vertex centralities in input–output networks reveal the structure of modern economies. Phys. Rev. E83, 046127.

[30] Grassi, R., Stefani, S., Torriero, A., 2007. Some new results on the eigenvector centrality. J. Math. Sociol. 31, 237–248.

[31] Grassi, R., Stefani, S., Torriero, A., 2010. Centrality in organizational networks. Int. J. Intell. Syst. 25, 253–265.

[32] Grassi, R., 2010. Vertex centrality as a measure of information flow in Italian corporate board networks. Physica A 389, 2455–2464.

[33] Kali, R., Reyes, J., 2007. The architecture of globalization: a network approach to international economic integration. J. Int. Bus. Stud. 38 (4), 595–620.

[34] Newman, M., 2005. A measure of betweenness centrality based on random walks. Soc. Netw. 27 (1), 39–54.

[35] Noh, J.D., Rieger, H., 2004. Random walks on complex networks. Phys. Rev. Lett. 92 (11), 118701.

[36] Zhou, M., Wu, G., Xu, H., 2016. Structure and formation of top networks in International Trade, 2001-2010. Social Networks (44), 9-21.

[37] Ore, O., 1962, "Theory of Graphs", Amer. Soc. Colloq. Publ. vol. 38. Amer. Math. Soc., Providence, RI.

[38] Haynes, T.W., Hedetniemi, S. T., and Slater P. J., 1998, "Fundamentals of domination in graphs", Marcel Dekker, New York.

[39] Johnson, D. S., 1974. Approximation Algorithms for Combinatorial Problems. Journal of Computer and System Sciences, 9, 256-278.

Remote sensing of evapotranspiration in a southern Mediterranean forest. Application to Bissa Forest, Algeria.

Adda Ababou[1,*], Mohammed Chouieb[2], Djamel Saidi[1], Abdelkader Bouthiba [3], Khalladi Mederbal [4]

[1]Biology Department, Faculty of Sciences, University Hassiba Ben Bouali, Chlef, Algeria.
[2]Faculty of Science and engineering, University Ibn Badis, Mostaganem, Algeria.
[3]Institute of Agronomical Sciences, University Hassiba Ben Bouali, Chlef, Algeria.
[4]Faculty of Nature and Life Sciences, University Ibn Khaldoun, Tiaret, Algeria.
[*]Corresponding author. E-mail: ab_adda@yahoo.fr

Abstract: The Simplified Surface Energy Balance Index (S-SEBI) algorithm was used in this study with four Landsat-5 Thematic Mapper images to assess the evapotranspiration (ET) in Bissa forest, one of the healthiest Algerian forests located south of the Mediterranean Sea. Results showed that ET varies over the different seasons, the highest ET values were reached during the spring due to water availability, whereas, the lowest values were recorded during the summer. The relationship between normalized difference vegetation index (NDVI) and ET showed that the highest ET values coincide always with the highest NDVI except for January where even the lowest NDVI values correspond to higher ET. The intensity of ET was closely related to aspects, southeastern exposures showed the highest ET, whereas, northwestern exposures showed the lowest ET.

Keywords: *Evapotranspiration, S-SEBI, Aspects, NDVI, Bissa, Algeria.*

Introduction

Evapotranspiration (ET), referred to as a latent heat flux, is the most important mechanism of energy and mass exchange between hydrosphere, biosphere and atmosphere (Sobrino et al., 2007; Nouri et al., 2013). Evapotranspiration is controlled by several factors such as solar radiation, water availability, wind speed, soil characteristics and stomatal resistance (Roberts, 2000; Immerzeel et al., 2006). Approximately 75% of the total precipitation are evapotranspired by the system soil-vegetation (Immerzeel et al., 2006). Reliable estimation of temporal and spatial distribution of ET is at the basis of irrigation planning, land use and ecosystem management, especially in arid and semi-arid areas (Farias et al., 2009; Liang et al., 2010). In this context several classical approaches have been developed and used for decades to estimate ET, including temperature methods (Blaney & Criddle, 1950), radiation methods (Priestley & Taylor, 1972) and combination methods (Penman, 1948). Over the last decade, several remote sensing algorithms were developed (Bastiaanssen et al., 1998) and applied to satellite imagery to solve the energy balance equation in order to estimate ET. The main advantage of this important technological trend is that it can provide an estimation of ET at each point within a given area and provides its geographical distribution. Several energy balance algorithms using the thermal, visible bands and the formulation of the energy balance of the surface are available for calculating ET. In light of this, the Surface Energy Balance Algorithm for Land (SEBAL) (Bastiaanssen et al., 1998) and the Simplified Surface Energy Balance Index (S-SEBI) (Roerink et al., 2000) are among the most common remote sensing algorithms used to estimate the surface energy balance. The main difference between SEBAL and S-SEBI is that SEBAL needs the solution of a complex iterative process, while the S-SEBI algorithm, based on the latent heat flux and available energy to estimate the evapotranspiration; free it from all additional meteorological data. In this context the main purpose of this study was the use of the S-SEBI model combined

with four Landsat images, to estimate the daily evapotranspiration (ET_d) according to the seasonal and topographical variation in a southern Mediterranean area characterized by its harsh climatic adversities.

Material and methods

Study area

Located in northwestern Algeria, the study area (Fig. 1) extends from 1°19′35″ to 1°34′14″ E, and from 36°22′29″ to 36°30′ 59″ N, at 10 km away from the Mediterranean Sea and covers approximately 300 km^2 and. With a variable altitude ranging from 100 to 1120 m above the sea level, it's a typical Mediterranean area in terms of landscape structure, composition and climate, characterized by hot and dry summers, with a dry period of 4 months (May to September) and relatively rainy winters with an average annual rainfall of 500 mm. In terms of vegetation, the landscape is covered with natural sclerophyllous and sparse vegetation alternating with bare soils.

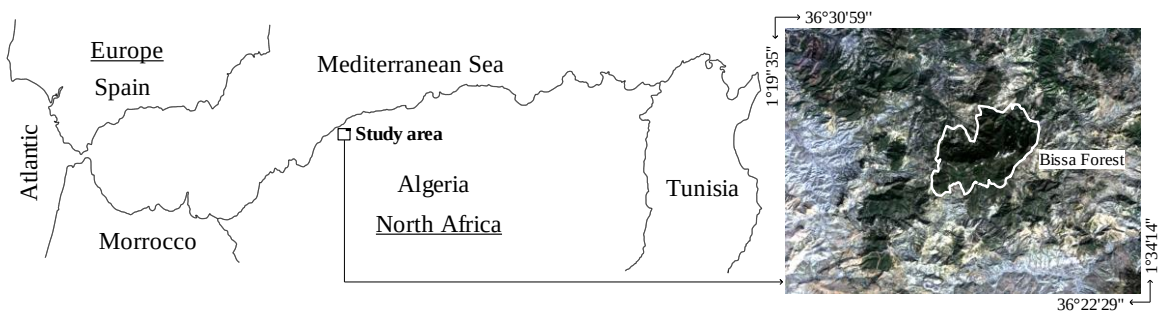


Fig. 1. Location of the study area.

S-SEBI algorithm

Considering a natural surface the energy balance flux at the soil surface can be expressed according to Carson, (1987) as:

$$R_n = G + H + \lambda ET \quad (1)$$

Where: where λET is the latent heat flux with λ as the latent heat of vaporization, R_n is the net radiation, G is the ground heat flux and H is the sensible heat flux.

To solve the surface energy balance flux (Eq. 1), the S-SEBI model (Roerink et al., 2000) uses the evaporative fraction (Λ) (Eq. 2) (Roerink et al., 2000) (Table 1) based on the relationship between surface temperature (Eq. 3, Eq. 4 (NASA, 2009) and Eq. 5 (Kosa, 2011)) and surface albedo (Eq. 6 (Liang et al., 2003) (Fig. 2). The instantaneous soil heat flux (G) was derived from an empirical equation proposed by Bastiaanssen (2000) and based on the relationship between normalized difference vegetation index (NDVI) and surface characteristics (Eq. 7) (Rouse et al., 1974) and Eq. 8 (Tong et al., 2007), whereas the net radiation flux (R_n) was derived from Eq. 9 (Kosa, 2009) and Eq. 10 (Waters et al., 2002) . The sensible (H) and latent heat flux (λET) were calculated using Λ according to Eq. 11 and Eq. 12 (Roerink et al., 2000). Finaly, Eq. 13 and Eq. 14 (Kosa, 2011; Namsik, 2010) were used to estimate the daily (24 hours) evaporatranspiration.

Table 1. Equations used to estimate the evapotranspiration from Landsat images.

Evaporative Fraction (Λ)	$\Lambda = (T_H - T_S)/(T_H - T_{\lambda E})$ (2)
Surface temperature (°K)	1-Conversion of Digital numbers (DN) to radiance

	$L_\lambda = ((L_{max\lambda} - L_{min\lambda})/(QCAL_{max} - QCAL_{min})) \times (QCAL - QCAL_{min}) + L_{min\lambda}$ (3)
	2- Conversion of Landsat Thermal band 6 to effective at satellite temperature $T_{bb} = K_2 / Ln(K_1 / L_6 + 1)$ (4)
	3- Conversion of effective at satellite temperature to surface temperature $T_S = T_{bb}/\varepsilon_0^{0.25}$ (5)
Albedo (α)	$\alpha_{Landsat} = 0.356 \times \rho_1 + 0.13 \times \rho_3 + 0.373 \times \rho_4 + 0.085 \times \rho_5 + 0.072 \times \rho_7 - 0.0018$ (6)
Soil Heat Flux (G) (W/m^2)	$NDVI = \rho_4 - \rho_3/\rho_4 + \rho_3$ (7)
	$G/R_n = (T_s/\alpha) \times (0.0038 \times \alpha + 0.0074 \times \alpha^2) \times (1 - 0.98 \times NDVI^4)$ (8)
Net Radiation Flux (Rn)(W/m^2)	$\varepsilon_0 = 1.009 + 0.047 \times \ln(NDVI)$ (9)
	$R_n = (1 - \alpha) \times R_s\downarrow + R_l\downarrow - R_l\uparrow - (1 - \varepsilon_0) \times R_l$ (10)
Sensible Heat flux (H) (W/m^2)	$H = (1 - \Lambda) \times (R_n - G)$ (11)
Latent Heat flux (λET) (W/m^2)	$\lambda ET = \Lambda \times (R_n - G)$ (12)
Daily evapotranspiration ET_d (mm/24h)	$\Lambda_i = \Lambda_d = \lambda ET/(R_{ni} - G_i) = \lambda ET_d/(R_{nd} - G_d)$ (13)
	$ET_d = \lambda ET_i \times R_{nd}/\lambda R_{ni}$ (14)

Where: T_s= Land surface temperature; T_H and $T_{\lambda E}$ = Temperature of maximum sensible and latent heat flux; L_λ = Spectral radiance; QCAL = quantized calibrated pixel value in DN; T_{bb} = Effective at satellite temperature; K_1 and K_2 are calibration constants = 666.09 and 1282.71 respectively; L6 = spectral radiance for band 6; Tbb = Effective at satellite temperature; $\rho_{1,3,4,5,7}$ = Landsat reflectance bands; ε_0 = Surface emissivity; Rs↓ = Incoming shortwave radiation; Rl↓= Incoming longwave radiation; Rl↑= Outgoing longwave radiation; G_d = Daily soil heat flux, it is approximately equal to zero (Allen et al., 1998; Allen et al., 2006).

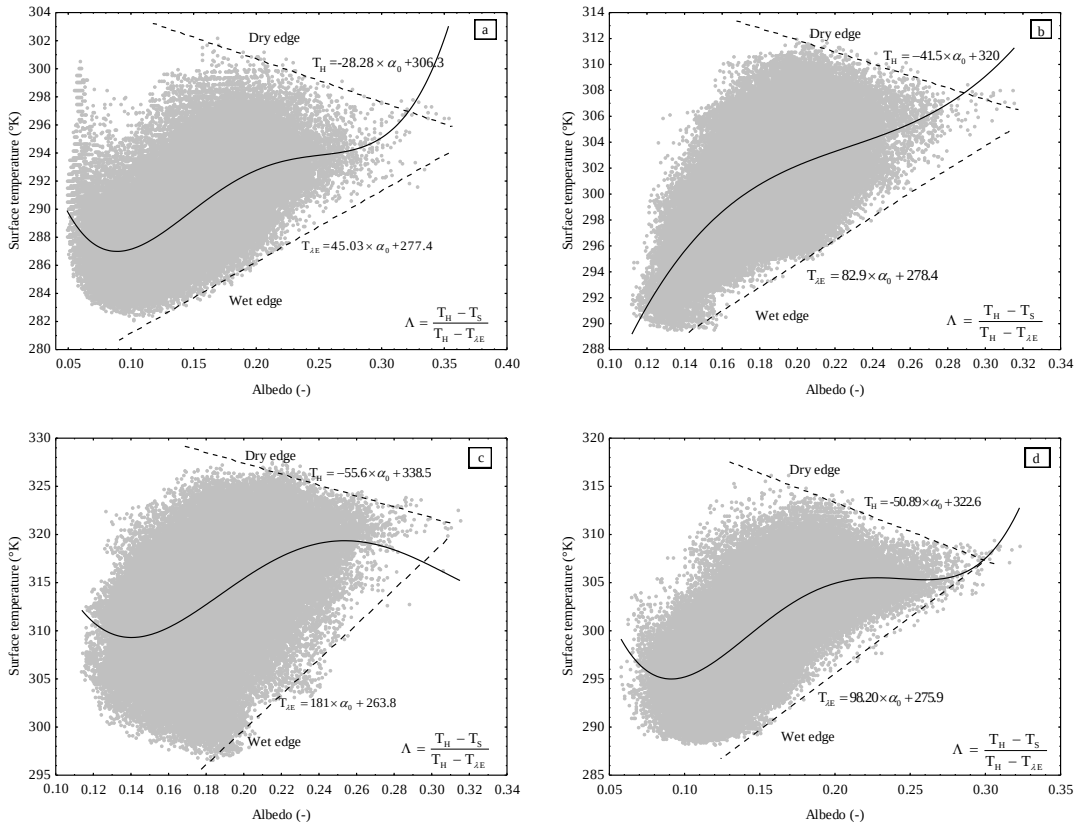


Fig. 2. Surface temperature vs surface albedo (a) January, (b) April, (c) July, (d) October.

Aspects

Aspects of the study area were derived from a digital elevation model in a GIS. To underline the impact of aspects on ET_d, aspects were considered as circular form, with 8 directions, north-facing (0-45°, 45-90°, 90-135°, 135-180°) and south-facing (180-225°, 225-270°, 270-315°, 315-360°)

Results and discussions

Spatiotemporal variation of ET_D

Unlike all the empirical and recent remote sensing models which require a lot of local meteorological data, the S-SEBI model used in this study was based on relatively low information input, just visible, near infrared, thermal bands (used to extract surface temperature and reflectance (albedo)) and incoming radiation on the ground, it showed an easy applicability and high accuracy for the retrieval of ET_d using remotely sensed information, according to Sobrino et al., (2005) the accuracy for the ET_d estimated using the S-SEBI model was found to be less than 1 mm/d compared to the measured ET. As a result, the spatial distribution of ET_d in Bissa forest using Landsat images showed that there was a wide spatial variation in ET, the maps generated through the S-SEBI algorithm (Fig. 3) revealed that ET_d was highly variable according to season and land vegetation cover, these observations were consistent with those reported by Dolan et al.(1985), Courault & Monestiez (1999), Aleina et al. (2013). Throughout the study area, according to land vegetation cover, the highest ET_d was observed over dense forest canopy and the lowest was recorded over bare soils.

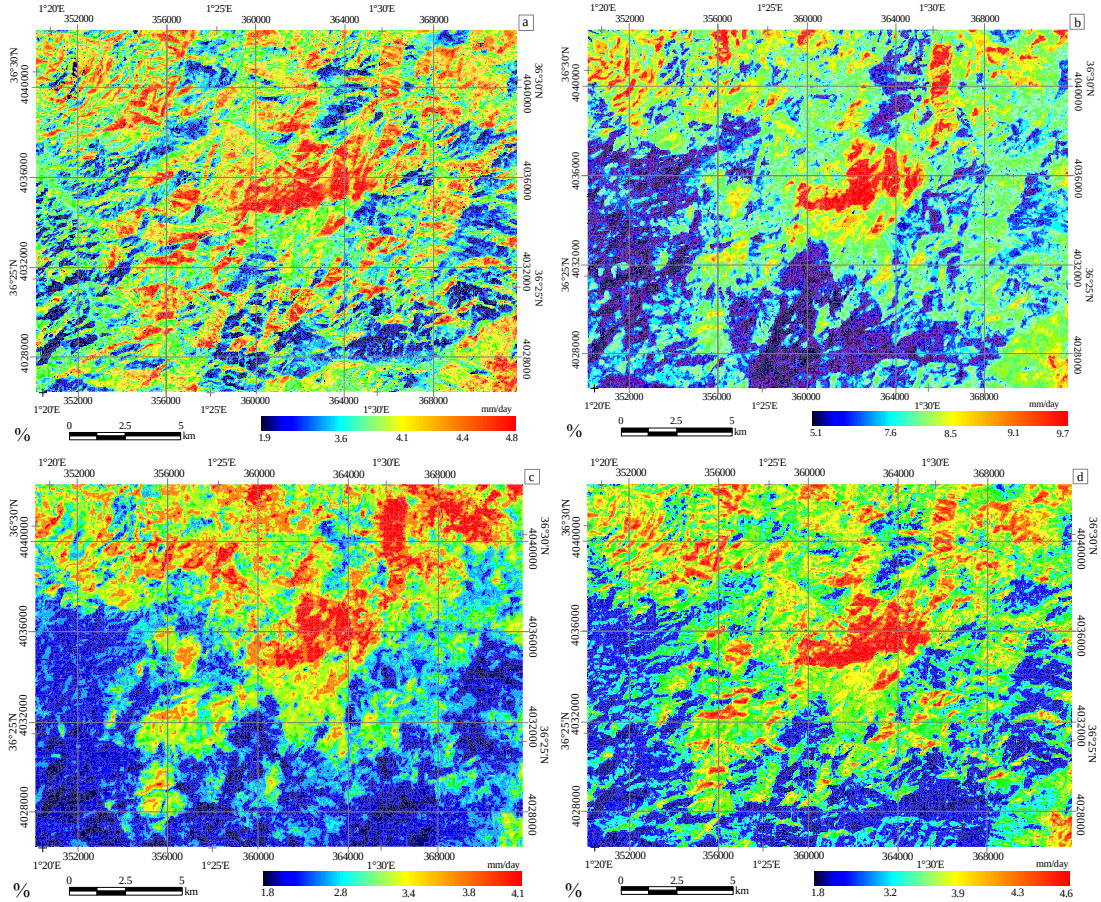


Fig. 3. Spatial distribution of ET_d (a) January, (b) April, (c) July, (d) October.

Whereas, according to season, due to water availability, spring (Fig. 3b) showed the highest mean ET_d (7.97 mm), the widest spatial variation within a range from 5.1 to 9.7 mm and the highest standard deviation (0.624) (Table 2). As Mediterranean summers are very hot and strongly dry (Mean Temperature = 41 °C ± 5.6 °C during image capture), the lowest mean ET_d (3.17 mm), the narrowest range (1.8 to 4.1 mm) and the weakest standard deviation (0.36) were observed during July (Fig. 3c) due to vegetation resistance to drought and water scarcity. Winter and autumn (Fig. 3a and Fig. 3d) were comparable in term of daily mean ET, spatial variation and standard deviation (Table 2).

Table 2. Summary of descriptive statistics of ET_d during the four months

	January	April	July	October
Minimum	1.873	5.102	1.835	1.848
Maximum	4.839	9.671	4.108	4.639
1st Quartile	3.582	7.543	2.905	3.331
3rd Quartile	4.213	8.389	3.447	3.859
Mean	3.885	7.969	3.171	3.589
Standard deviation (σ)	0.427	0.624	0.362	0.387

Relationship between ETd and NDVI

In general, it was remarked that the highest ET values coincide always with the highest NDVI, except winter (January) where even the lowest NDVI values correspond to higher ET_d, with a weak coefficient of determination (R^2) equal to 0.05, this behaviour was closely related to the existence of intense bare soil evaporation beside vegetation transpiration, which reflects the

availability of water during this season, indeed the total rainfall accounted during the 60 days preceding the image capture was more than 150 mm. The strongest ET-NDVI correlation was observed during summer (July) with a coefficient of determination (R^2) equal to 0.65 (Fig. 4c) suggesting that 65% of the ET_d variability was explained by the NDVI, moreover, during this season was recorded the lowest root mean square error (RMSE) (0.228), which reflects the fact that the evaptranspiration process was strictly limited to vegetation transpiration, and almost a total absence of soil evaporation due to the scarcity of rainfall during this season, the amount of rainfall recorded during the 2 months preceding the image capture was less than 15 mm, this July relationship (NDVI-ET) was also reported by Krishnan et al. (2012), thus, in contrary to Nicholson et al. (1996) and Szilagyi et al. (1998) who pointed out that the NDVI-ET relationship is strong, mainly, in humid environments, our results showed an increasing relationship (NDVI-ET) with the growing aridity of the environment. This difference is probably due to the nature of local climate and vegetation. Our findings were very concordant with the Mediterranean climate, as reported by many authors (Sumner et al., 2001; Blumler, 2005; Li et al., 2006) the Mediterranean climate is characterized by its strong seasonal contrast, with hot dry summers and cool rainy winters.

Compared to summer, spring (April) and autumn (October) (Fig. 5b and 5d) showed a relatively low R^2 equal to almost 0.4 for both seasons, nevertheless this 40% of ET_d variability explained by NDVI was highly significant ($P < .001$) according to the linear regression analysis.

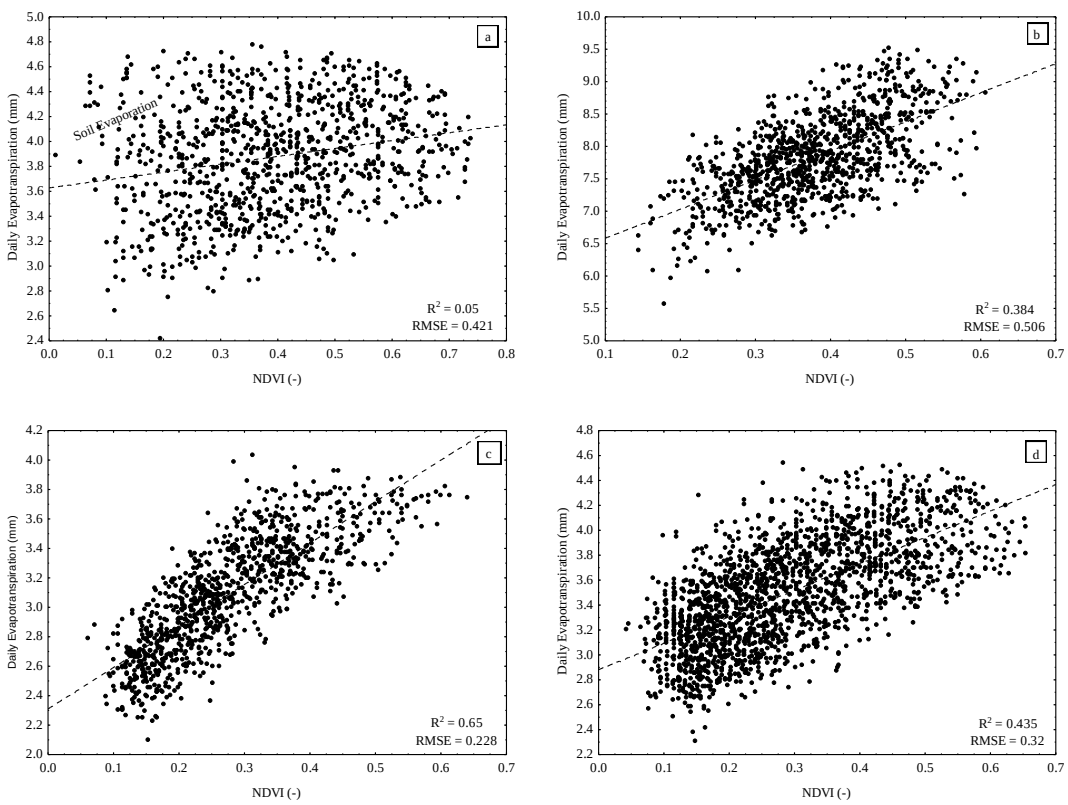


Fig. 4. ET_d (mm) vs NDVI (a) January, (b) April, (c) July, (d) October

Variations of ET_d according to aspects

As ET depend on many aspects of the local geographical and physiographical conditions, which need to be accounted in ET estimation, results showed that the intensity of ET_d was closely related to aspects and consequently negatively related to shade (Fig. 5), this finding was also reported by Tong et al. (2007). Winter and autumn (Fig. 5a and 5d) showed almost the same behaviour according to aspects, the lowest ET_d (3.40 and 3.26 mm, respectively) was

observed in the direction 135-180°, whereas the highest ET_d (4.33 and 3.90 mm, respectively) was shown by the opposite side, i.e., 315 - 360°. The highest negative correlation between ET_d and shade was recorded during these two seasons with a coefficient of correlation (R) equal to - 0.65 ($P < .001$) during winter and - 0.53 ($P < .001$) during autumn (Table 3). Throughout spring period (April) the ET-shade correlation was slightly low (R = - 0.4), over this season ET_d was the highest at the direction 270 - 360°, whereas the lowest ET_d was recorded at the opposite exposure 90 - 180° (Fig. 5b), with a slightly large sector of circle of 90° compared to winter and autumn (45°). Finally, the lowest ET-shade correlation (R = - 0.29) was recorded during the dry season (summer), regarding ET_d the lowest and the highest values were recorded at the respective directions 90 -225° and 270 -45°, with the largest sector of circle of 135°.

This high variability of ET_d according to aspects was related to the amount of sunshine received by each aspect at the moment of image capture (10 H: 20 MN), southerly aspects tends to be more sunny than on northerly aspects, this fact was confirmed by the inverse relationship observed between ET_d and shade, where, it was also noted that this negative correlation increases when the sector of circle width's decreases and vice versa. Therefore, ET_d calculation at different hours of the day is necessary in order to accurately assess ET_d throughout the different seasons, unfortunately we note the unavailability of satellite imagery captured throughout the different times of the day.

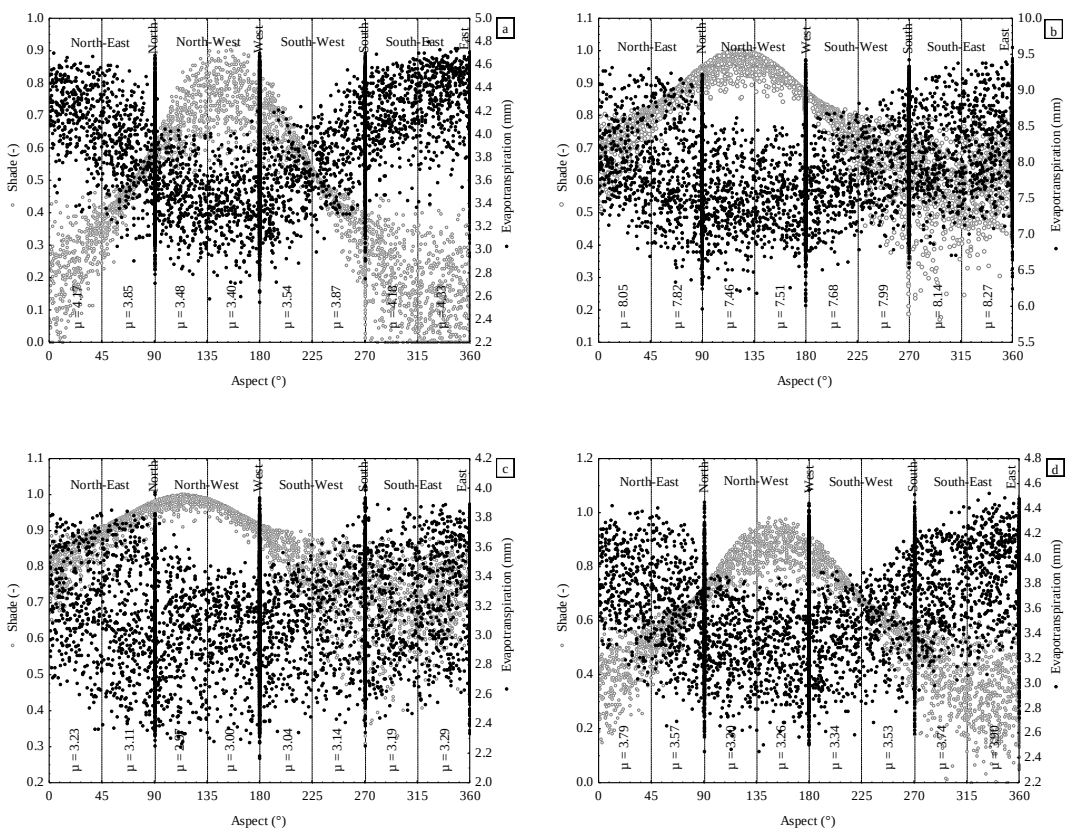


Fig. 5. ET (mm) vs aspects and shade (a) January, (b) April, (c) July, (d) October

Table 3. Results of regression analysis between ET_d (mm) and shade (-)

	January	April	July	October
R	-0.65	-0.4	-0.290	-0.530
R^2	0.423	0.16	0.082	0.277
RMSE	0.334	0.573	0.341	0.333

P	< .001	< .001	< .001	< .001

Comparing the mean ET_d recorded at the different range of aspects during the four seasons, analysis of variance (ANOVA), resulted in different groups of ET_d highly significantly different ($P < .001$) according to aspects (Table 4), which reflects the high influence of the local geographic and physiographic conditions on evapotranspiration, concurring with the findings reported by many authors (Jackson, 1967; Stephenson, 1998, Jin et al., 2008).

Table 4. Different groups of ET_d related to aspects according to ANOVA and Tukey (HSD) (a) January, (b) April, (c) July, (d) October.

Aspect (°)	January Groups					April Groups						July Groups				October Groups				
	G 1	G 2	G 3	G 4	G 5	G 1	G 2	G 3	G 4	G 5	G 6	G 1	G 2	G 3	G 4	G 1	G 2	G 3	G 4	G 5
0-45		B					B	C				A	B				B			
45-90			C						D					C				C		
90-135				D							F				D				D	E
135-180					E						F				D					E
180-225				D						E					D				D	
225-270			C					C						C				C		
270-315		B					B						B	C			B			
315-360	A					A						A				A				

*G = group

Conclusion

As ET is at the basis of irrigation planning, land use and ecosystem management, quantification of ET has been for decades a constant concern of farmers and researchers. Among several approaches, this study focused on the estimation of ET through remote sensing. Despite the simplicity and the low input data required by this technique, it was possible to accurately estimate the daily evapotranspiration with its spatiotemporal distribution in a southern Mediterranean forest, the highest ET_d were reached during the spring due to water availability, whereas, the lowest values were recorded during the summer. Regarding the influence of vegetation, the highest ET_d were always related to the highest NDVI, except for January where even the lowest NDVI corresponded to higher ET_d. It was also found that the intensity of ET_d was closely related to the local topographical and physiographical conditions, south-eastern exposures showed the highest ET_d, whereas, north-western exposures were characterized by the lowest ET_d. Finally, the outcomes of this study confirm the promising possibilities of remote sensing in solving the energy balance equation and accurately asses the spatio temporal variation of ET.

References

Aleina FC, Baudena M, Andrea F, Provenzale A. 2013. Multiple equilibria on planet Dune: Climate-vegetation dynamics on a sandy planet. Tellus B. 65:17662.

Allen RG, Pereira LS, Raes D, Smith M. 1998. Crop evapotranspiration: guidelines for computing crop water requirements FAO Irrigation and drainage paper 56. Rome-Italy.

Allen RG, Trezza R, Tasumi, M. 2006. Analytical integrated functions for daily solar radiation on slopes. Agric. For. Meteorol. 139:55-73.

Bastiaanssen WGM, Menenti M, Feddes RA, Holtslag AAM. 1998. A remote sensing surface energy balance algorithm for land (SEBAL): 1. Formulation. J. Hydrol. 212(213):198-212.

Bastiaanssen WGM. 2000. SEBAL-based sensible and latent heat fluxes in the irrigated Gediz Basin, Turkey. J. Hydrol. 229:87-100.

Blaney HF, Criddle WD.1950. Determining water requirements in irrigated areas from climatological irrigation data. USDA, Soil Conservation Service, Technical Paper N° 96, Washington, D.C.

Blumler MA. 2005. Three conflated definitions of Mediterranean climates. Middle States Geographer. 38:52-60.

Carson DJ. 1987. An introduction to the parameterization of land surface processes: Part 1. Radiation and Turbulence. Meteorol. Mag. 116:229-242.

Courault D, Monestiez P. 1999. Spatial interpolation of air temperature according to atmospheric circulation patterns in the south-east of France. Int. J. Climatol. 19:365-378.

Dolan TJ, Hermann AJ, Bayley S, Zoltek J. 1984. Evapotranspiration of a Florida, U.S.A., freshwater wetland. J. Hydrol. 74:355-371.

Farias OS, Irmak S, Cuenca RH. 2009. Special issue on evapotranspiration measurement and modeling. Irrigation Sci. 28:1-3.

Immerzeel WW, Droogers P, Gieske A. 2006. Remote sensing and evapotranspiration mapping: State of the art. Future Water report 55. Research paper N°1, Wageningen, Netherlands.

Jackson RJ. 1967. The effect of slope, aspect and albedo on potential evapotranspiration from hill- slopes and catchments. NZ journal of Hydrology. 6:60-69.

Jin X, Zhang YK, Schaepman ME, Clevers JGPW, Su Z. 2008. Impact of elevation and aspect on the spatial distribution of vegetation in the Qilian Mountain Area with remote sensing data. The Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences (ISPRS), Beijing, 3 - 11 July. 37(7):1385-1390.

Kosa P. 2009. Air temperature and actual evapotranspiration correlation using landsat 5 tm satellite imagery. Kasetsart J. (Nat. Sci.). 43:605-611.

Kosa P. 2011. The effect of temperature on actual evapotranspiration based on Landsat-5 TM Satellite Imagery, Chapter 9, In: Labedzki L, editor, Evapotranspiration.

Krishnan P, Meyers TP, Scott RL, Kennedy L, Heuer M. 2012. Energy exchange and evapotranspiration over two temperate semi-arid grasslands in North America. Agr. Forest. Meteorol. 153:31-44.

Li L, Bozec A, Somot S, Beranger K, Bouruet-Aubertot P, Sevault F, Crepon M. 2006. Regional atmospheric, marine processes and climate modeling. In: Lionello P, Malanotte-Rizzoli P, Boscolo R, editors, Mediterranean Climate Variability, Developments in Earth and Environmental Sciences. 4:373–397.

Liang L, Li L, Liu Q. 2010. Spatial distribution of reference evapotranspiration considering topography in the Taoer river basin of Northeast China. Hydrol. Res. 41: 424-437.

Liang S, Shuey CJ, Russ AL, Fang H, Chen M, Walthall CL, Daughtry CST, Hunt Jr R. 2003. Narrowband to broadband conversions of land surface albedo: II. Validation. Remote Sens. Environ. 84:25-41.

Namsik P. 2010. Advances in Geosciences, Volume 17: Hydrological Science (Hs), World Scientific Publishing Company, Incorporated.

NASA. 2009. Landsat 7 Science Data User's Handbook is a living document prepared by the Landsat Project Science Office at NASA's Goddard Space Flight Center in Greenbelt, Maryland. Accessed 12 January 2015. Available: http://landsathandbook.gsfc.nasa.gov/pdfs/Landsat7_Handbook.pdf

Nicholson SE, Lare AR, Marengo JA, Santos P. 1996. A revised version of Lettaus evapoclimatonomy model. J. Appl. Meteorol. 35:549-561.

Nouri H, Beecham S, Kazemi F, Hassanli AM, Anderson S. 2013. Remote sensing techniques for predicting evapotranspiration from mixed vegetated surfaces. Hydrol. Earth syst. Sc. 10:3897-3925.

Penman HL. 1948. Natural evaporation from open water, bare soil and grass. Proceedings of the Royal Society A, London. 193:120-145.

Priestley CHB, Taylor RJ. 1972. On the assessment of the surface heat flux and evaporation using large-scale parameters. Mon. Weather Rev. 100:81-92.

Roberts J. 2000. The influence of physical and physiological characteristics of vegetation on their hydrological response. Hydrol. Process. 14:2885-2901.

Roerink GJ, Su Z, Menenti M. 2000. S-SEBI: a simple remote sensing algorithm to estimate the surface energy balance. Phys. Chem. Earth pt. B. 25:147–157.

Rouse JW, Haas RH, Schell JA, Deering DW. 1974. Monitoring vegetation systems in the Great Plains with ERTS. In: Fraden SC, Marcanti EP, Becker MA, editors, Third ERTS-1 Symposium, Washington DC, NASA.

Sobrino JA, Gomez M, Jimenez-Munoz JC, Olioso A. 2007. Application of a simple algorithm to estimate daily evapotranspiration from NOAA–AVHRR images for the Iberian Peninsula. Remote Sens. Environ. 110:139–148.

Sobrino JA, Gómez M, Jimenez-Munoz JC, Oliosob A, Chehbouni G. 2005. A simple algorithm to estimate evapotranspiration from DAIS data: Application to the DAISEX campaigns. J. Hydrol. 315:117-125.

Stephenson N. 1998. Actual evapotranspiration and deficit: biologically meaningful correlates of vegetation distribution across spatial scales. J. Biogeogr. 25:855–870.

Sumner G, Homar V, Ramis C. 2001. Precipitation seasonality in eastern and southern coastal Spain, int. J. Climatol. 21:219-247.

Szilagyi J, Rundquist DC, Gosselin DC, Parlange MB. 1998. NDVI relationship to monthly evaporation. Geophys. Res. Lett. 25:1753-1756.

Tong L, Kang SZ, Zhang L. 2007. Temporal and spatial variations of evapotranspiration for spring wheat in the Shiyang river basin in northwest China. Agr. Water. Manage. 87:241–250.

Waters R, Allen R, Bastiaanssen W. 2002. SEBAL.Surface Energy Balance Algorithms for Land.Idaho Implementation.Advanced Training and User's Manual. Idaho, USA.

EXPLORING CUSTOMER'S PERCEPTIONS OF SERVICE QUALITY OF PUBLIC WATER SUPPLY IN CALABAR

BASSEY BENJAMIN ESU, Ph.D
DEPARTMENT OF MARKETING
UNIVERSITY OF CALABAR, NIGERIA
Basseyesu1964@gmail.com

ABSTRACT

An understanding of customers' perceptions of service delivery is significant in designing effective marketing strategies that will make a utility services provider competitive in the water market and also viable. The study seeks to determine customers' perception of the service quality of a public water supply system in a developing country. The study took place in Calabar. Exploratory research design was used for the study. Four sections of focus group discussions with customers and stakeholders were carried out. The results show the following: consumers of public water supply system were aware of the presence of the water utility provider in the locality and the major actor in the water business in the city; the customers related the importance of water to good health; they show adequate knowledge of good quality of drinking water; they observed that availability of water differs from one location to the other in the city; that the customers' perception of the quality of water supplied by the utility provider varied across the various locations; adequacy of communication with customers was low, the customer relationship was also perceived to be low; majority of the customers perceived the water tariff to be high especially when water supply was irregular; and the level of satisfaction was adjudged to be very low. It was therefore recommended that the water utility company should increase customers access to the product by extending the water distribution network to areas in the city that have not be reached, the utility services provider should conduct regular quality control checks of the water released to consumers to ensure that the quality attributes of their water meet globally acceptable standards and meets public expectations. The utility service provider should use social marketing to positively influence the behavior of their customers.

Key Words: customer perception, water market, utility service provider, service quality, customer satisfaction, public water supply.

EXPLORING CUSTOMER'S PERCEPTIONS OF SERVICE QUALITY OF PUBLIC WATER SUPPLY IN CALABAR

ABSTRACT

An understanding of customers' perceptions of service delivery is significant in designing effective marketing strategies that will make a utility services provider competitive in the water market and also viable. The study seeks to determine customers' perception of the service quality of a public water supply system in a developing country. The study took place in Calabar. Exploratory research design was used for the study. Four sections of focus group discussions with customers and stakeholders were carried out. The results show the following: consumers of public water supply system were aware of the presence of the water utility provider in the locality and the major actor in the water business in the city; the customers related the importance of water to good health; they show adequate knowledge of good quality of drinking water; they observed that availability of water differs from one location to the other in the city; that the customers' perception of the quality of water supplied by the utility provider varied across the various locations; adequacy of communication with customers was low, the customer relationship was also perceived to be low; majority of the customers perceived the water tariff to be high especially when water supply was irregular; and the level of satisfaction was adjudged to be very low. It was therefore recommended that the water utility company should increase customers access to the product by extending the water distribution network to areas in the city that have not be reached, the utility services provider should conduct regular quality control checks of the water released to consumers to ensure that the quality attributes of their water meet globally acceptable standards and meets public expectations. The utility service provider should use social marketing to positively influence the behavior of their customers.

Key Words: customer perception, water market, utility service provider, service quality, customer satisfaction, public water supply.

Introduction

Water management and consumption has attracted `academic and industry attention in the 21st century. This is because of its socio-economic importance. Public water supply falls under the domain of what is referred to as services management and marketing. Service is a central or supplemental act performed by one party for the benefit of another in consideration for monetary or non-monetary gains (Nwokah, 2008). The service and good content mix of water supply is remarkable. The service continuum indicates that water supply services is a mix of good (water product) with service support (technical and marketing services). The technical and marketing services are measured by the level of service quality. Unlike tangible goods, service quality cannot easily be measure with indicators such as durability and absence of defects; service quality indicators measurement is an evaluative perception of the performance of the employees of the organization in a service milieu. Services are characterized by intangibility, heterogeneity of service providers, simultaneous production and consumption and perishability of service. From our understanding of market entities of water supply and the existing axiom that, "the greater the weight of intangible elements in a market entity, the greater will be the divergence from product marketing" (Shostack 1977), we are comfortable to classify water supply as a service, since the intangibles are greater.

The earliest studies in the social dynamics of water supply began at the dawn of the nineteen sixties and seventies (Bruvold, 1968). Research concerns in this area started gathering momentum in the eighties and nineties studies (Curry 1983; Tyler 1980, pliner & Pelchat 1991; AWWA 1993). Most of these studies were focus on different types of water, water resources management (Bruvold 1968 and 1977; AWWA 1993). Later, research interest was extended to water quality as an important component of water production and socioeconomic development (Curry, 1983; Jardine, Gibbson & Hrudey 1999; Warren 1996; Grondin, Levallois, Gingras & Moret 1995). Some of the studies dealt with the issues such as water quality attributes and effect on consumer perception and satisfaction. The service quality element of water supply especially for drinking water is a recent development in the lexicon of water managers and practitioners. This is because the concept of serve quality emerged in the late nineties in the seminal work of Parasuraman, Zeithaml & Berry, 1985 & 1988 and Parasuraman, Berry & Zeithaml, 1993; Zeithaml, Berry & Parasuramann , 1996. The prepositions presented by the progenitors of the concept of service quality and studies that followed at the time were focused on sectors other than water.

The literature available on water quality shows that water experts are in agreement on the dimensions of water quality attributes and effect on the wellbeing of consumers (Doria 2010). What is not generally known however is the diffusion of this knowledge among water managers and consumers. Secondly, there is a dearth of information on the service quality component of public water supply systems, especially in the developing countries. As noted, most of the earlier studies were focused on water quality. These studies were initiated by water engineers and environmental conservation expert. It is in the light of this facts, that we seek to explore consumers' perceived service quality of public water supply services.

This study was therefore designed to investigate through exploratory approach the perceived service quality of a water utility in one of the towns in the South-South of Nigeria. The water supply scheme is supported by the National Urban Water Sector Reform Project (NUWSRP). NUWSRP was established to enable urban water utilities form strategic partnerships with private companies to improve quality and coverage of water services in selected urban cities of the state. The water utility commenced the project in 2009 with financial assistant from the African Development Bank (ADB). The philosophy of the reform project is to provide water infrastructure to meet the water needs of target communities; build service providers' capacity to deliver superior service quality, create structures for financial and environmental sustainability. This was to be done by running the scheme as a service industry that responds to customer demand.

This research seeks to provide answers to the following research questions:

1. Do consumers have sufficient knowledge of public water supply trends in Calabar?

2. Does the water supply utility firm possess the service quality attributes of a well performing water supply utility firm?

3. Are consumers satisfied with the services of the water supply firm?

It is expected that the results of this study will provide managerial insight into the various consumers' concerns that have the propensity to affect their attitude and behavior. This understanding will provide content for the firm's strategic water management and marketing plan.

Literature review

Components of water product quality perception

Water perception is the consumer's evaluation of how he/she perceives or views the product attributes of available supply of drinking water. Studies such as Warren (1996) and Jardine, Gibbson & Hrudey (1999) identified organoleptic as critical perceptual factor in water consumption. Organoleptics refers to the sensorial information a consumer has about water consumed. These include: taste, odour, colour and turbity. Warren (1996) reported that in the western countries, water taste is rated more important than odor or appearance of water. A study by Grondin, Levallois, Gingras & Moret (1995) reveal is a relationship between organoleptic of water and customer satisfaction on absolute terms. Most of the respondents reported that, tap water was safe, healthy and were satisfied with its overall quality. From another study it was found that those who were dissatisfied made reference to the taste as the primary source of discontentment and reason for switching from tap water to bottle water (Mackey, 2004).

Apart from organoleptics, perceived risk is another factor in water perception (Anadu & Harding (2000). In the study published by AWWA (1993) and MORI (2002), it was found that drinking water safety and risk was consistent and tap water generally safe. It was also found that

most people linked organoleptics to health risk (Jardine, Gibbson & Hrudey, 1999; and Doria, 2010) suggested some cognative- emotive factors that may influence customer perceived risk of drinking water: trust in institution supplying water, external information source, familiarity, heuristics and bias and risk characteristics (such as voluntary exposure, fairness) and personal/societal level of exposure. Water chemicals and microbial parameters are perceived by consumers as important factors in the quality of drinking water. Falahee & MacRae (1955) in a consumer panel study, compared consumer perception of water chemical composition of different waters (distilled water, tap water, filtered tap water) and found that, waters with high mineral content were generally preferred over those with low mineral content. It was also identified that there a linear relationship between the intensity of water taste (Wright, Young, Rivett, & Gundry, 2012) and the level of mineral content (Bruvold, 1968). In a review of consumer perception of taste and odour in drinking water concluded it was found that when the amount of total dissolved solids (TDS) in drinking water increases, consumers evaluate the water quality more negatively. Drinking water with more than 500 milligrams per litre of TDS is considered unacceptable. Contu, Carlini, Maccioni, Meloni, & Schintu (2004) assert the chemical content of drinking water is an important influence on whether the consumer is satisfied or dissatisfied with the quality of water.

Prior experience are schemas the consumers have formed over time. Schemas are also important in the understanding of water perception. It was found that people from a region where drinking water is typically yellowish may consider a bluish water to be strange and unacceptable (Doria 2010). People generally known that people easily accept products and brands that are familiar, while rejecting unfamiliar one (Pliner & Pelechat, 1991). Another factor is the effect of impersonal and interpersonal information. Impersonal source of information are non-personal sources of information that the consumer gets water information. People obtain information about water from both direct experience and by information from the experience of others (Bandura, 1977). Doria (2010) asserts that quality information received by the individual may lead to a change in knowledge and emotion and eventually effect the way drinking water quality and risk are perceived. Tyler (1980) reported that, information from mass media (impersonal) influence perception at societal level, but not at the personal level. Similarly, interpersonal information affect perception at the personal level, but not at the societal level. Doria (2010) identified consumer trust in the Water Supply Company and institution as capable of influencing perception of water quality. It is also known that trust in service provider influence perceived product quality and consumer satisfaction (Pidgeon, Kasperson, Slovic, 2003).

Water knowledge

Noga & Wolbring (2013) in their study on perception of water ownership and responsibility of providing clean water identified the following themes using an exploratory approach: responsibility for water supply, nature of resource base, water consumption pattern, cost of water, price of water and water conservation. On responsibility for water supply, 78.6% indicated that it is the responsibility of the local government and 71.4% indicated that it was the responsibility of federal government. On the resource base of water, majority indicated that water is a natural resource (67.9%) and a human right (51.4%). On knowledge of consumption

pattern of drinking water, it was found that most people did not know the water consumption, but an amount that was far below the average normal consumption. On the cost of water, the study revealed that majority perceived the cost of water to a human right, a commodity, a public resource and a natural resource. Most respondents in the study said water should have a price based on supply and demand force. All the respondents indicated that water consumption is an important sustainability factor.

Customer perception of service quality

Zeithaml, Berry & Bitner (2000: 75) describe service quality as "a focus evaluation that reflects the customer perception of specific dimensions of service". In service quality measurement, the criteria used by customers to evaluate quality attributes are have been widely studied. Historically, the concern for how perceived service quality was to be measure started with the parasuramannics (Esu 2014), who held that services quality can be measured on the basis of five dimensions among which are reliability, responsiveness, assurance, empathy, tangible (Parasuraman, Zeithaml & Berry, 1985 & 1988; Parasuraman, Berry & Zeithaml, 1993; Zeithaml, Berry & Parasuramann , 1996)) . Perceived service quality from the parasuramannics was measure using SERVQUAL. It is underpinned on subjective disconfirmation theory which measures the gap between respondent's expectation scores and the perception scores on each of the five domains (Parasuraman et al, 1988).

Another perspective of the dimensionality of the construct was from the cromptonnics perspective (Esu 2014) who used PERFQUAL to measure perceived service quality. PERFQUAL is a measure of customer's perception of performance quality directly against a consumer's expectations and the evaluation scores recorded with a single score and not perception minus expectation (Crompton & Love, (1995) and Baker & Crompton, 2000). The Cromptonnics conceptualized service quality from two angles, namely: the technical and functional. Based on this understanding the group developed a model with six criteria, namely: professionalism and skills, attitudes and behaviour, accessibility and flexibility, reliability and trustworthiness, reputation and credibility, and recovery.

Satisfaction and Dissatisfaction with water quality.

Satisfaction is the consumer evaluation of the performance of a product or service. When service meets consumer expectation, the consumer is said to be satisfied, otherwise is dissatisfied. Curry (1983) found that the specific reasons of dissatisfaction with drinking water are in three types: dissatisfaction generated by a concern for health, dissatisfaction resulting from consumer concern for the aesthetics reasons and dissatisfaction induced by a lack of confidence in the competence and trustworthiness of those people responsible for supplying drinking water. Curry (1983) observed that many individuals exhibit a lack of knowledge about those responsible for the treatment and distribution of public drinking water. Some water consumers were unable to say if the staff of the water utility firm were competent at their job and that large majority of respondents said "no and I don't "when asked whether suppliers always tell the truth about the quality of the public drinking water. It was concluded that misinformation and lack of understanding of both water resources problems and management strategies contribute to consumer dissatisfaction.

Research methodology

The study area

The study took place in one of the cities in the south-south of Nigeria. The public water utility firm is owned by the State Government and managed by a foreign companycalled Ophtech (under PPP arrangement). The Water scheme is assisted by the National water programme called "The Second National Urban Water Sector Reform Project" (NUWSRP) and sponsored by the African Development Bank. The scheme was design to supply quality and affordable drinking water to residents of Calabar Metropolis and adjoining communities of Akpubuyo, Odukpanic and Akamkpa. Calabar is the administrative and political headquarters of the State and the commercial hub.

Research design

The qualitative research design was used in the study to get preliminary insights, into the research problem relevant in obtaining information that will be useful in developing effective and sustainable public water supply and delivery policy and strategy. Specifically, focus group discussion was used. This research design gave the researcher and ultimately decision markers as much information as possible about the perception of stakeholders of the product and several issues related to quality of water delivery by CRSWBL. It revealed consumers' hidden water needs, wants, attitudes, feelings, behaviour, and perceptions, motives regarding services, products uses, or practices of public water supply.

Target population and sample size

The target population for the qualitative design comprised all customers and stakeholders of the water utility firm. The stakeholders are categorized as customers, policy makers, community leaders, media, private sector water resource managers, civil society, NGOs, etc. A purposive sampling design was used for selecting subjects for the FGDs. The sample size for the focus group discussion was 75 persons (15 at each location). A screening form that specifies the characteristics of respondents was used to ascertain qualification for group membership and recruitment into each category of stakeholders FGD sessions in all the FGD sessions.

Four Focus Group Discussions were carried out (Four FGDs for customers and stakeholders and one for staff of Cross River State Water Board Limited). Area The study area is made up of two political entities; Calabar South and Calabar Municipality. The locations in Calabar South were Mbukpa/Ekpo Abasi and Uwanse/Goldie. In Calabar Municipality the locations were Diamond/Marian and 8 *Miles/Ikot Ansa* .

Description of focus groups:

FGD 1: Mbukpa Area/Ekpo Abasi

Fourteen persons (14) participated in this FGD. The participants represented the following areas; Oron street, Inyang street, Eyoma Street, Atabong Street, Fuller, Ishie Street and Abasi Okure. The composition of participants was as follows; Business People, competitor-1; women leaders-1; community leaders-3; religious leaders-2; teachers-2; civil/public servants-3. All the participants had a minimum of secondary education. Majority of the participant were within 25 - 50 years of age. There was good representation from communities and streets in the neighbourhood.

FGD 2: Uwanse/Goldie Area

A total of fourteen (14) persons participated in the FGD. The following streets/communities were represented; Mount Zion, Ekpo Eyo, Akpanim, Uduak Orok, Goldie,Orok Orok, Okon Ekpo, and Edet Essien. The participants' composition was; Business People -1, women leaders-2; community leaders-3; religious leaders-2; teachers-3; civil/public servants-2; students-1. The participants' minimum educational qualification was secondary education. Eleven (11) of the participants are within 25-50 years of age, while three (3) were within 50-75 years.

FGD 3 : Diamond/Marian Area

A total of thirteen (13) persons were involved in the FGD in this area. The following streets/communities were represented: Obutong, Satellite Town, Diamond Hill, Archibong Eso, MCC Road. The participants' composition was: private sector-2; competitor-1; women leaders-2; community leaders-3; religious leaders-2; teachers-2; civil/public servants-2.Eleven (11) of the participants were within the age bracket of 25-50 years, while 3 were between 60-75 years. The minimum educational qualification was secondary education.

FGD 4: 8 Miles/Ikot Omin Area

A total of ten (10) persons took part in this FGD. The participants represented the following areas: Ikot Ekpo, Ikot Eneobong, Aso Adim, Ikot Omin, Ikot Effanga. The participants' composition was: Business people-2, women leaders-1; community leaders-3; religious leaders-1; teachers-1; civil/public servants-2. Majority of the participants were between 25-50 years of age. The minimum educational qualification was secondary education.

Data collection instruments

FGD moderator's guide was used for the study. The moderators guide has three parts: (i) introduction and warm up *(*general discussion to gauge participants' knowledge about trends in the water supply sector and changes in the ownership and financing of public water supply). (ii) main section (moderator probed to find out participants' opinion, feeling about the following operational issues: product attributes, service offering and attributes, motivation for subscribing for public water supply , employee relationship with customers and other stakeholders, community sustainability, stakeholders' understanding and support, customer satisfaction, operational optimization, operation resiliency , infrastructural stability, water resource adequacy (information provides to customers about water). (iii) the closing section contain: summarization of the points raised in the session.

Pretesting of research instruments

The moderator's guide was tested for validity and reliability by using experts in the water sector from the utility firm and the University of Calabar. This was necessary to obtain a good content validity. Trite words and irrelevant questions were removed. This helped to improve the quality of the instrument.

Administration of data collection instruments

Community mobilization, selection of participants and invitation of participants

For a successful stakeholders' perception study of the water consumers, we decided to undertake mobilization visits to the paramount rulers to sensitize them on the study. The visits to the community leaders had three advantages: (i) it created opportunity for the purpose of the

study and benefit to the community to be explained to the community leaders. (i) the assistance of the Paramount Chiefs was solicited in the area of hosting the meeting and facilitating contacts (name and address) with prospective participants. (iii) a consensus on the venue, date and time were reached at with Paramount Chiefs who willingly accepted to host the Focus Group Discussions (group meetings). (iv) the Paramount Chiefs helped in facilitating distribution of the Screening Forms for FGDs participants' eligibility and Invitation Forms. To obtain maximum co-operation and the willingness of prospective participants, personalized invitations were sent to eligible participants. On the morning of each FGD session, phone calls were made to remind eligible participants of the date, time and venue of the meeting.

Location and time

The FGD sessions took place in locations fixed by the Paramount Chiefs in consultation with the research. Each FGD session lasted between 90 minutes to 2 hours. At the end of each session, participants were entertained with snacks. This was a way of showing appreciation to them for leaving their busy programmes to attend the meeting and for staying to the end of the meeting. The Focus Group Discussions were moderated by two moderators in a friendly atmosphere. The questions were asked by the moderator and assistant who did the scripting down of the responses. The proceeding of each FGD session was audio- taped and video-taped to enhance detail information collection and storage. Participant granted permission for the use of audio and video tapes during the FGDs.

Data analysis techniques

The voice recording from the FGDs were transcribed. The analysis of the statements followed the qualitative data guidelines prescribed by Lincoln and Guba (1985). The data was categorized and sorted into themes based on 'look-alikes'.

Results and discussions of findings of focus group discussions

P*articipants' general knowledge of drinking water in Calabar and current trends in water supply*

The focus group discussions began with general questions regarding the participants' general knowledge and awareness of drinking water and trends in the industry. Participants generally recognized the water supply systems availability in their locality. Participants identified public water supply and private wells as major systems of water supply in Calabar. Cross River State Water Board (CRSWBL) was named as the major public water supply system. Other sources of water mentioned were: river, streams and rain. The majority of participants opined that water from private holes was not comparable to treated water from CRSWBL. The participants showed a high preference for Public Water supplied from CRSWBL because of health reasons. However, a few others feel otherwise because of their experiences with CRSWBL public water supply system.

On the importance of water to the community compare to other community infrastructure, across all the locations, participants expressed their concern for water as a necessity than other community infrastructure such as roads, communication, electricity, health, etc. One participant said: "Water is life, we cannot do without water".

Awareness of water facilities and good drinking water attributes

There was adequate awareness among participants about the attributes of good drinking water. Participants in Mbukpa axis were of the opinion that good drinking water should have no odour, no particles. Those in Uwanse and Akpanim feel that good drinking water should be portable, odourless and clean. Those in Obutong area expect good water to be clean, tasteless, colourless and odourless. Those at Ikot Omin expect good drinking water to be water that meets acceptable standard.

Availability of CRSWBL public water system differs from one location to the other. Participants expressed desire to be urgently connected to the public water supply, in most cases the distribution of the water has not reached them. Mbukpa area, Oron Street, Fuller, Inyang, etc. have no main distribution pipes. The participants in Mbukpa complained that some people have visited their houses asking them to fill some kind of form, but unfortunately water has not been given to them until now. According to one of the participants at Mbukpa Location: "*The new project is here, but not in every place", one participant said, "I need tap to be connected to my compound" and another, "I hope your team's visit will help us have access to water from Water Board".*

In Uwanse, Akpanim area, places such as Okon Ekpo, Mount Zion, Uwanse, Orok Orok and Eastern Highway have no main supply artery to draw from the public water system. Some factors were advanced by participants for the lack of public water supply in some of these areas:

a) There is a suspicion that borehole owners colluded with government
b) Political reasons (poor funding)
c) Poor attitude of community members toward staff of Water Board.
d) Government inability to complete projects
e) Administrative bureaucracy
f) Absence of a point man to champion the course in the community

One participant at Akpanim has this to say: *"We hear the water; we watch it on the television, sometimes when we go visiting those friends and relations, we see this water, test it in people's houses. That is the truth about it".* Another participant, said:*"The big pipes pass through my compound, but there is no distributing line. I went to Water Board to complain and I was told that the work in Calabar South will commence this year".*

A participant, who resides at Eastern Highway, said that, on parking into his present residence, he was told that the main pipe stopped at Orok Orok/Goldie Roundabout Junction and that he goes to his office with jerricanes where he fetches Water Board water. The distribution of public water supply to the Obutong, Marian, Diamond, Ikot Ansa and 8 miles axis was much better as participants from the neighbouring communities said they have access to the distribution. Although not all the household have been connected to the network. One participant observed that *"Distance between major pipes and homes prevent people from taping the water".* This is in view of the cost of lying the pipes to reach such distant prospective consumers.

Participants are aware of the availability of two metering menus; conventional and prepaid meters. Most participants preferred prepaid meters because of instant supply of water after recharging ones account. There were several complaints against Conventional meter:

1. Staff reading meters sometimes inflated bills
2. Long process of payment of bills (spend long hours at the bank)
3. High charge for installation.
4. Some also complained of the time it takes CRSWBL to move a customer from the initial convention meter to prepaid, even after paying the cost for such installation.

Perception of the service quality of public water supply in calabar- water attributes

It was observed that participants in the focus discussions in Mbukpa and Uwanse /Akpanim (by extension Calabar South) had poor appreciation of water facilities and service quality than those in Calabar Municipality. According to them it is difficult to talk about something that one does not experience. This is true because, perception is the process of organising and interpreting the stimuli an individual is exposed to from the environment to form a world view for that individual. It was the view of the participants in Calabar South that the services of the water company will be better evaluated when they are given access to the water supply system in their communities. According to a participant in Akpanim location: "*It is difficult to score services not receive,* w*hen government has not extended water to the community.* For those who have used CRSWBL water supply, they have their feelings. A participant said: *"the water contained dirt, especially after stoppages lasting some days by CRSWBL, water is dirty due to rusted pipes and me and my household do not consume it*".

Participants in focus group discussion held at 8 miles location observed that the supply of water by the public water company is reducing in recent times. That the consumption of borehole water is increasing because, the supply of water from the public water company is not regular, boreholes are always available. They also reported of having sand particles and saltiness in public water. Because of these, the water is used for washing, while borehole water is used for drinking. One said he boils the public water before drinking because it is perceived as unsafe. Another participant observed that the water has odour, but acknowledged the quality of the water over borehole water. Another said the water is gummy, hard and the taste varies with the season; rainy season require more chlorine than dry season. Some of the participants gave reasons for the presence of sand and saltiness of the public water:

a) *"why they have particles is because of poor maintenance –water enters through broken pipes".*
b) *"No sufficient time given to chemical before it is passed out in the water distribution".*
c) *"Pipes/reservoirs not regularly washed contribute to colour of water".*
d) *"good water leaving the reservoir may be contaminated through the broken pipes."*
e) *"Reduce the level of chemical is in excess."*

In Obutong location, participants were asked whether they were satisfied with services of CRSWL. The responses showed that they were not quite satisfied. The following reasons were given by participants from Diamond Hill for their dissatisfaction: water was usually stopped without notice, eventually when it is given, it becomes salty, starchy. One participant said;

> *"we are not happy, some days they can take water without saying anything to us and when they give, it is very dirty. If you fetch it and keep it in white basin the following day, you see very rusty, very salty. You cannot use it to wash white cloths".*

Another participant from Satellite Town area said the water has high chlorine content and generally ok. Another participant from Obutong area said: *"CRSWBL water has dirt because of the dirt and high chlorine, some of us drink borehole and use water from CRSWBL to do our washing.*

Participant from Archibong Eso also observed that CRSWBL water was salty and has excess chlorine. The participant describes his experience with CRSWBL water thus: *"when you store waters from borehole and Water Board; result after 4 days showed that, the quality of water from CRSWBL detonates more than that of boreholes. Borehole water still remains clean but not so with CRSWBL water".*

Participants in Mbukpa area who have access to CRSWBL complained of water stoppages without any prior information or explanation by the Management of CRSWBL, and that, bills are over bloated in some cases. One participant in Obutong location observed that customers were made to pay exorbitantly before they are connected to CRSWBL pipes, "paid N86, 000 for 100 metres by the contractors handling the pipeline distribution in the town. Participants suggested that CRSWBL should handle installation directly to reduce cost, rather than using agents who charge exorbitantly to perform the task. Participants at 8 miles also observed that more people are consuming boreholes because CRSWBL water is not always available. This has led to a boom in borehole business in the area. One participant suggested that, "*we need to inform customers when there is breakdown".*

Relationship between staff of the water company and customers

The perception of the attitudes of staff of CRSWBL varied from one location to the other, depending on the degree of participants' experience with service providers. In Calabar South it was difficult for participants to comment on the attitude of staff to customers, since majority said they do not see nor have business contact with staff of the water company. A participant who is connected complained of very limited personal interaction with staff and suggested the use of professionals: *"water board should use professionals to render its services".* In Uwanse and Akpanim area, participants had very bad impression about the staff of CRSWB. One participant said, "*They are mischievous staff*"

Participants from Obutong location said: "*for them, contact with staff of water comapny was only possible at the office. And even when a report is made, the response time is prolong"*. One participant complained that once, he called a staff to effect repairs, it took about 5 days for the staff to response. Another participant from Archibong Eso, reported that he complained of a burst water pipe 6 days ago at the Water Board office and nothing has been done about it. He pointed out that; "*staff do not wear uniform to identify themselves and that the only form of identity for customers is usually the presence of old and dirty vehicle*". He suggested the need for a uniform and identity cards for them for easy identification from quacks and imposters. It was generally suggested that staff of the water company should interact with the customers to find out their problems and proffer solutions. A code of conduct was suggested by some participants at Obutong location.

- Marketing persons to show identification during calls at customers.
- Dress professionally, preferably with apron.
- Vigorous attempt should be made to increase coverage of distribution network of CRSWBL supply system.
- The response time by staff to calls from customers should be shorten.
- Bills should be sent on time to customers.
- CRSWBL should provide toll free customers lines to enhance effective communication and reduce response time.

Participants at the 8 Miles location also complained of late/delay response to customer complaints by staff. One participant said, he uses the staff telephone line to call. Another said the staff who attends to his household is not hostile and his response rate is reasonably swift. One Mr. James was commended for prompt response to customer calls for service. Another complained of technical incompetence of some staff. He gave an instance where a technical staff buried a meter in the ground and customer found it difficult to read the meter. Generally, the staff were perceived as fairly friendly. It was suggested that the staff should be trained on customer relationship management.

Adequacy of communication with target market

Communication with a firm's market is an imperative. It is the means through which the firm and its offerings are known in the market place and by the publics (internal and external). Participants from Mbukpa centres were fast to say that CRSWBL has no feed-back mechanism. According to one participant:

> *" Water Board has not sold itself to the public. I will score them 25%".*
> *"You don't even hear them on radio; you don't even see them on television making an advert that something is going on. You only see that some people breaking the road causing a lot of damage*"

Participants suggested that the water company should have a proper way of reaching out to customers". Another participant suggested that the need for a community liaison officer to bridge the information gap: "the water company *should have Liaison Officers in the community whom we should hold responsible and lay our complaints to and should provide community complaint centre.."*

At Akpanim area, the situation was the same. However, participants preferred information from fliers, radios, television, public enlightenment and village square interaction. Participants from Obutong areas observed that the water information from CRSWBL through television and radio was grossly adequate. They however showed preference for television, text messages, direct mails, radios and jingles and consumer education (Water Board sub offices in the communities. Participants at 8 miles were of the view that CRSWBL communication with target market was low. A participant from Ikot Omin said that: *"Water Board has not given enough information to customers. The Board needs to do more in consumer education, advertisement, through radio, and jingles".*

Financial and market viability

Participants generally have a positive attitude toward the payment of bills. They expressed willingness to pay bills. However, participants are of the view that the propensity to pay bills is predicated on the availability of water supply to households. According to one participant in Obutong location, customers are willing to pay if the supply is regular and the water is clean:

> "The *cost of consumption is high when there is no regular supply";*
> *"Ok with the value we have for the services"*
> *"*CRSWBL *is cheaper than boreholes, everybody wants water board water"*
> *" Give justification for increases in the price regime".*
> *"If the water from water Board is more expensive than borehole, I will discontinue from Water Board" (Participant-Mbukpa location).*
> *" Water Board should give us water and reduce the tariff" (Mbukpa centre)*.

Evidence from the field showed that prospective and actual consumers appreciate the economic value of water and are willing to pay for services consumed.

Public private participation

Participants were asked the current ways their communities or organizations are partnering with CRSWBL in delivering water to the populace and to suggest how they intend to partner with government in water supply. Participants expressed their desire to partner with the water company. The participants listed some reasons why the company failed: non-involvement of the community was highlighted as one reason why water projects/businesses failed: *"poor patronage of the community caused water project to fail. The community should be empowered*

to handle such projects"(Mbukpa). In Akpanim area, participants were of the opinion that the community could partner by protecting the water board installations through youth vigilante groups. At Obutong it was suggested that communities can partner with the water company in the following ways:

- community monitoring of CRSWBL facilities
- community members can provide office space for sub offices
- Community members to monitor and work with contractors
- Community mobilization to create awareness (community support for town hall meeting to discuss water issues
- The revitalization of the water board commercial water points by ensuring regular supply of water.

At the 8 miles location, participants also indicated how they have been partnering with CRSWBL; giving right of way for the laying of pipes and reporting of broken pipes. Participants suggested that community can be empowered through the commercialization of the water, but regretted that high charges discourage people from showing interest. Generally, communities show willingness to partner with government.

Project sustainability

Participants at the various locations were well informed of the factors that could weaken the performance of the water project in Calabar. A participant at the Mbukpa area pointed out that a situation where CRSWBL break the roads during lying of pipes without repairs could affect project acceptance by community. The establishment of community liaison point to be manned by a community was suggested by participants at the Akpanim and Mbukpa areas as sustainability drivers. It was argued that it would also facilitate the prompt payment of water bills.

It was also suggested that the youths of the communities should be considered for engagement as ad hoc workers when pipe extension/distribution work is to take place in the community. Others think that, the use of infrastructural master plan will help to reduce the level of vandalization of other public infrastructure and facilities in the same communities.

Concerning environmental impact, Obutong participants were worried about the negative impact of the water project in the community. That the reckless way the pipes were being laid was interfering with the drainage system in the community and spoilage of roads. It was suggested that, when roads are broken by CRSWBL, the roads should be repaired immediately. Secondly, pipes should not be buried in the road to avoid damaging the road.

On social impact, another participant opined that non employment of the youths of the community in the organization could jeopardize the project. The gross inadequate distribution network of the public water system is also worrisome to some participants. Those in 8 miles location suggested that organization of regular town hall meetings to know about the problems of the customers and the development of more effective machinery to monitor payment by customers would help sustain the project. It was also pointed out that, there should be a programme that will accredit private plumbers to compliment the few CRSWBL technical staff to handle pipe burst in the communities.

Economically, the commercial water cubicles of the company are not working because of the irregular water supply and the high cost of doing the business in the face of the fierce competition from boreholes owners. Some identified some negative effects of the water to livestock, that the water is harmful to poultry birds because of the high chlorine level.

Customer satisfaction with services of water company

Participants in the Uwanse /Akpanim and Mbukpa areas scored the CRSWBL between zero percent to 10% performance. This is not unconnected with the poor water supply system in the environs. The picture was different in the case of participants from communities in Calabar Municipality. Participants from 8 miles area score CRSWBL 60-80% on staff relationship with customers, 40% on maintenance and 40 % on regularity of water supply to the environs. Participant also agreed that they can recommend the public water supply to those who are not yet connected.

Conclusion

Customers of public water supply in Calabar are knowledgeable about the water supply systems in the locality and were able to identify the water utility agency. Customers showed a high level of interest and desire in the public water supply system. Water was rated very important and indispensable for community development than other community infrastructure.

Community members were quite aware of the basic indicators /attributes of water supply systems - tasteless, odourless, colourless, regular, safe, etc. Customers were aware of the new water project in the state, but most places are yet to be reached for no fault of their own, other than that, the main lines have not reached some homes, especially in Calabar South-Oron Street, Akpanim Street, Eastern Highway, Uduak Orok, Okon Ekpo, etc. Participants preferred the pre-paid meters because of the accuracy in billing, but frowned at the rigour of securing one. Appreciation of service quality of public water supply system in Calabar is a function of the level of exposure and/ interactions individuals or groups have had with service provider(s). Customers in Calabar South rated the service quality of the water company very low, while those in Calabar Municipality rated the services a little above average (taste, purity, colour, safety, odour, regularity, etc.).

The attitudes of Staff of the water company toward customers was rated very low in Calabar South, while in Calabar Municipality it was rated a little above average. Customers have expectations of the role technical/sales staff should play in delivery of public water supply in Calabar. And therefore expect professionalism in the conduct of business. Customers were willing to be bills promptly as long as the services of the water company matches the tariffs charged. The levels of customers' satisfaction differ with the locations in Calabar. Participants in the FGDs in Calabar South could hardly expressed their level of satisfaction with the services of the water company, while those in locations in Calabar municipality scored their level of satisfaction as high as 60-80 percent in staff relation, but below average in response to complaints and maintenance..

There is obvious inadequacy in the quantity and quality communication with customers and other stakeholders. Customers showed more interest in the following communication channels: community consultation, customer education through mass media such as television, radio and the use of telephone. The public communication machinery of the water company was perceived to be uncoordinated and inefficient. Information available to the customers about the PPP options was very little. Customers were of the view that community involvement in water governance is an imperative. Stakeholders appear to have little or no information about the internal running of the water company. However, some of the participants felt that the problems is connected with leadership transparency

Prospective and actual consumers appreciate the economic value of water and were willing to pay for services consumed; but not willing to pay for services not consumed or bad services. There was high customer willingness to collaborate with the company and government in public water supply in Calabar.

The water company has no strategic corporate plan that stipulates the future direction of the organization, especially in the areas of community relations and social responsibility and no regulatory framework for the industry in Cross River State and the country as a whole. Most of the practices of the water company have the potential to negatively affect project sustainability, e.g. haphazard breaking of roads, obvious absence of social responsibility, supply of salty water, inadequate communication with stakeholders, waste of water as sludge, etc. The company has no effective measures to reduce negative impact of its activities on host communities.

Policy implication

The following recommendations have been suggested for the management and improvement of customers' perception of the water utility company:

a) *Increase customers' access to the product.*

Most of the participants complained that the distributing lines have not reached their homes, making it difficult for them to be connected, especially in Calabar South. Intensive distribution of water lines will enhance easy connection to homes and at a minimum cost of N2000. This will also solve the problem where desperate customers are made to pay for the cost of drawing water from very long distance away from their homes. This usually leads to the misconception about the cost of getting water from the company.

b) *Meeting customers' expectations on water attributes*

Since most of the participants who are currently using public water complained of the presence of sand and dirt in water, rusty colour, saltiness and odour; there is need to investigate this claim by doing quality control at different points of water distribution and take necessary intervention to improve on the quality of the attributes that fall below standard.

c) *Improvement on the service quality of public water supply by the water company*

The water company should improve on its service quality. This is because the service quality of was rated very low on most of the dimensions. Special attention should be focused on regularity of water supply and customer relationship Management.

d) *Improvement on communication with target market and publics*

Communication with target markets and relevant publics was inadequate. CRSWBL should effectively communicate with market and publics. The suggested media types are:

a) Community mobilization
b) Establishment of a community reference group to assist with liaison between the authority and the community
c) Establishment of service clubs in the community (Safe water clubs), especially in post primary schools.
d) Establishment of water information centre in the community
e) Complementary media; television, radio, flyers, etc.
f) Participation in national and international water days/weeks

e) *Establishment of effective bills payment system*

The current system where customers go to the commercial bank to spend many hours just to pay bills was frowned at. It is suggested that payment points should be

created at catchment areas across the city. This will enhance ease of payment and prompt payment of bills. Banks located at this catchment areas could be used as payment points.

f) Establishment of an independent tariff regulator.

The regulator would determine proper tariff rates for the industry. This has enormous advantages; to avoid political intervention, determine tariff objectively based on guidelines, to secure technical expertise on rate setting and to provide confidence to the private sector and consumers. The regulator will protect the consumers, the contracting firms, and the state water agency.

g) Community consultation.

Giving consumers a role in decision making process could generate greater political acceptance of raising tariff rate. Women and other community groups may prove to be useful focal points for consumer representation and information dissemination.

h) Establishment of the "Hardship Policy".

The policy would encourage customers who are very poor to inform the revenue officers of the water company about their personal circumstances surrounding non-payment of accounts. The officers will then discuss the range of payment options available to the individual customer and assist them in working out the best option for their situation.

i) *Establishment of sustainability principles in water governance*

Sustainability principles should be implemented in water governance. This will ameliorate or reduce the negative effects of its operations. Important elements here include:

i) Involvement of communities in water governance in Calabar

ii) The provision of infrastructural master plan that would show the mapping of water pipes for current consuming areas and new developing satellite towns in Calabar. The current water distribution effort should ensure that main pipes and distributing pipes are taken to these new areas to avoid the breaking of roads when the places eventually become habited.

iii) The problem of water source for production and treatment should be looked into. The encroachment of sea water into the main intake leading to saltiness of water is a serious threat to the quality of water produced by CRSWBL. The possibility of damming the Kwa River should be considered. This will create an all-year pool of treated water for production.

iv) Absence of recycling technology. At the moment, unwanted water is discarded as slush by the current water treatment plant. This is a colossal lost. This water should be recycled and distributed since it cost some naira worth to draw in the raw water for treatment.

j) Promotion of public private participation

The following PPP strategies or actions are hereby suggested:

i) Community involvement in protection of water facilities

ii) Community liaison office for dissemination of information

iii) Community members can serve as water retailers in the downstream sector, if the white and blue water cubicles are allocated to willing business people.

iv) Establishment of appropriate legislation and regulatory framework to support the current reform in the urban water sector or review the existing PPP policy of the water company in such a way that it will optimally benefit all parties; customers, private investors, government and staff of the water company. It will remove the current feeling of

satisfaction in the PPP process as expressed by some stakeholders. This will help attract private operators.

v) Because of the PPP concept unawareness among the stakeholders, there is need for private sector education on the PPP strategies

vi) Stakeholder forum should be organized to agree on the best PPP option to be adopted by CRSWBL. This is because the one size-fits-all approach has been condemned by NWSSP (2000).

References

Anadu, E. & Harding, A. (2000). Risk perception and bottle water use. *Journal of the American Water Works Association*. 92(11), 82-92.

AWWA (American Water Works Association)(1993). *Consumer attitude survey on water quality issues prepared by Robert EHurd*. Denver (CO): AWWA Research Foundation,

Bandura, A. (1977). Social Learning Theory. Englewood Cliffs: Prentice Hall.

Bruvold, W. H. (1968). Scales for the tasting of water. *Journal of Applied Psychology*, 32, 245–253.

Contu, A., Carlini, M., Maccioni, A., Meloni, P. & Schintu, M. (2004). Evaluating citizens concern about the quality of their drinking water. Proceedings of the 4th IWA World Water Conference, paper 116628. International Water Association, London.

Curry, L. L. (1983). Consumer attitude toward public water supply quality: A dissertation on alternative water sources in Southern Illinois Univeristy, Department of Energy and Natural Resources.

Doria, M. F. (2010). Factor affecting public perception of drinking water quality. *Water policy*, 12, 1-19.

Falahee, M., & MacRae, A. W. (1995). Consumer appraisal of drinking water: Multidimensional scaling analysis. *Food Quality and Preference*, 6, 327-332.

Grondin, J., Levallois, P., Gingras, S. & Moret, S. (1995). La Consommatim d'EAU potable provenant du saint -Laurent dons la Region de Quebe Cente de Sante: Publique de Quebe.

Jardine, C., Gibbson, N. & Hrudey, S. E. (1999). Detection of odour and health risk perception of drinking water. *Water Sciences and Technology*, 40 (6). 91-98.

Lincoln, Y. S. & Guba, E. G. (1985). *Naturalistic enquiry*. Newbury, C.A: Sage

Mackey, E. (2004). Influence of taste and odour on consumer perception of water quality and safety. In J. Noga and G.Wolbring (Eds). Comprehensive list of water attitude surveys: a bibliography of surveys on people's perceptions of water quality, water use and willingness to pay. *Water*, 5, 1865-1889. Retrieved from www.mdpi.com/journal/water/ISSN2073-4441.

Noga, J. & Wolbring, G. (2013). Perception of water ownership, water management and the responsibility of providing clean water. Water, 5, 1865-1889. Retrieved from www.mdpi.com/journal/water/ISSN2073-4441.

Nwokah , N.G. (2008). General overview of services marketing. In A. Anyanwu & N. G. Nwokah (eds). Contemporary Book on Services Marketing. P.1-7. Owerri: Avan Global Publications.

MORI (2002). The 2004 Periodic Review: Research into Customers' Views. London: MORI.

Parasuraman, A., Zeithaml, V. A., & Berry, L. L. (1985). A conceptual model of service quality and its implication for future research. *Journal of Marketing*, 49, 41-50.

Parasuraman, A. Zeithaml, V. A. Berry, L. L. (1988). SERVQUAL: A multiple item for measuring customer perceptions of service quality. *Journal of retailing*, 64, 12-40.

Parasuraman, A., Berry, L. L., & Zeithaml, V. A. (1993). More on improving service quality measurement. *Journal of Retailing*, 69, 150-147.

Pidgeon, N. F., Kasperson, R. K., & Slovic, P. (2003). The Social Amplification of Risk. Cambridge: Cambridge University Press.

Pliner, P., & Pelchat, M. L. (1991). Neophobia in humans and the special status of foods of animal origin. Appetite, 16, 205–218.

Shostack, G. L. (1977) Breaking free from product marketing . *Journal of Marketing*, 41 (April), 73-80.

Tyler, T. R. (1980). Impact of directly and indirectly experienced events: the origin of crime related judgements and behaviours. *Journal of Personality and Social Psychology*, 39, 13–28.

Warren, L. (1996). *Linking customer satisfaction to performance measures. Proceedings of the Annual Conference:Water Management & Regulations. Vol. A. Denver*, CO: American Water Works Association..

Wright, J. A., Young, H., Rivett, U., & Gundry, S. W. (2012). Public perception of drinking water safety in South Africa, 2002 – 2009. A repeated cross sectional study In BMC

publication. In J. Noga and G.Wolbring (Eds). Comprehensive list of water attitude surveys: a bibliography of surveys on people's perceptions of water quality, water use and willingness to pay. *Water*, 5, 1865-1889. Retrieved from www.mdpi.com/journal/water/ISSN2073-4441.

Zeithaml, V.A., Berry, L. L. & Parasuramann, A. (1996). The behavioural consequences of service quality. *Journal of Marketing*, 60, 31-46.

Zeithaml, V.A., & Bitner, M. J. (2000). *Services marketing: Integrating customer focus across the firm* (2nd edn.). Boston: McGraw Hill.

This study was part of a larger study sponsored by the Cross River State Water Board. The paper was presented at the International Conference on Business, Healthcare , Applied Science and Engineering organized by the Ontario College for Reseach & Development Held in New York 2016.

EXPLORING CUSTOMER'S PERCEPTIONS OF SERVICE QUALITY OF PUBLIC WATER SUPPLY IN CALABAR

BASSEY BENJAMIN ESU, Ph.D
DEPARTMENT OF MARKETING
UNIVERSITY OF CALABAR, NIGERIA
Basseyesu1964@gmail.com

ABSTRACT

An understanding of customers' perceptions of service delivery is significant in designing effective marketing strategies that will make a utility services provider competitive in the water market and also viable. The study seeks to determine customers' perception of the service quality of a public water supply system in a developing country. The study area was Calabar. Exploratory research design was adopted for the study. In-depth interviews were conducted on a random sample of 40 key informant and five sections of focus group discussions were carried out. The results show the following: consumers of public water supply system were aware of the presence of the water utility provider in the locality and the major actor in the water business in the city; the customers related the importance of water to good health; they show adequate knowledge of good quality of drinking water; they observed that availability of water differs from one location to the other in the city; that the customers' perception of the quality of water supplied by the utility provider varied across the various locations; adequacy of communication with customers was low, the customer relationship was also perceived to be low; majority of the customers perceived the water tariff to be high especially when water supply was irregular; and the level of satisfaction was adjudged to be very low. It was therefore recommended that the water utility company should increase customers access to the product by extending the water distribution network to areas in the city that have not be reached, the utility services provider should conduct regular quality control checks of the water released to consumers to ensure that the quality attributes of their water meet

globally acceptable standards and meets public expectations. The utility service provider should use social marketing to positively influence the behavior of their customers.

Key Words: customer perception, water market, utility service provider, service quality, customer satisfaction, public water supply.

Introduction

Water management and consumption has attracted `academic and industry attention in the 21st century. This is because of its socio-economic importance. Public water supply falls under the domain of what is referred to as services management and marketing. Service is a central or supplemental act performed by one party for the benefit of another in consideration for monetary or non-monetary gains (Nwokah, 2008). The service and good content mix of water supply is remarkable. The service continuum indicates that water supply services is a mix of good (water product) with service support (technical and marketing services). The technical and marketing services are measured by the level of service quality. Unlike tangible goods, service quality cannot easily be measure with indicators such as durability and absence of defects; service quality indicators measurement is an evaluative perception of the performance of the employees of the organization in a service milieu. Services are characterized by intangibility, heterogeneity of service providers, simultaneous production and consumption and perishability of service. From our understanding of market entities of water supply and the existing axiom that, "the greater the weight of intangible elements in a market entity, the greater will be the divergence from product marketing" (Shostack 1977), we are comfortable to classify water supply as a service, since the intangibles are greater.

The earliest studies in the social dynamics of water supply began at the dawn of the nineteen sixties and seventies (Bruvold, 1968). Research concerns in this area started gathering momentum in the eighties and nineties studies (Curry 1983; Tyler 1980, pliner & Pelchat 1991; AWWA 1993). Most of these studies were focus on different types of water, water resources management (Bruvold 1968 and 1977; AWWA 1993). Later, research interest was extended to water quality as an important component of water production and socioeconomic development (Curry, 1983; Jardine, Gibbson & Hrudey 1999; Warren 1996; Grondin, Levallois, Gingras & Moret 1995). Some of the studies dealt with the issues such as water quality attributes and effect on consumer perception and satisfaction. The service quality element of water supply especially for drinking water is a recent development in the lexicon of water managers and practitioners. This is because the concept of serve quality emerged in the late nineties in the seminal work of Parasuraman, Zeithaml & Berry, 1985 & 1988 and Parasuraman, Berry & Zeithaml, 1993; Zeithaml, Berry & Parasuramann , 1996. The prepositions presented by the progenitors of the concept of service quality and studies that followed at the time were focused on sectors other than water.

The literature available on water quality shows that water experts are in agreement on the dimensions of water quality attributes and effect on the wellbeing of consumers (Doria 2010). What is not generally known however is the diffusion of this knowledge among water managers and consumers. Secondly, there is a dearth of information on the service quality component of public water supply systems, especially in the developing countries. As noted, most of the earlier studies were focused on water quality. These studies were initiated by water engineers and environmental conservation expert. It is in the light of this facts, that we seek to explore consumers' perceived service quality of public water supply services.

This study was therefore designed to investigate through exploratory approach the perceived service quality of a water utility in one of the towns in the South-South of Nigeria. The water supply scheme is supported by the National Urban Water Sector Reform Project (NUWSRP). NUWSRP was established to enable urban water utilities form strategic partnerships with private companies to improve quality and coverage of water services in selected urban cities of the state. The water utility commenced the project in 2009 with financial assistant from the African Development Bank (ADB). The philosophy of the reform project is to provide water infrastructure to meet the water needs of target communities; build service providers' capacity to deliver superior service quality, create structures for financial and environmental sustainability. This was to be done by running the scheme as a service industry that responds to customer demand.

This research seeks to provide answers to the following research questions:

4. Do consumers have sufficient knowledge of public water supply trends in Calabar?

5. Does CRSWBL possess attributes of a well performing water supply and delivery utility?

6. Are consumers satisfied with the CRSWBL services?

7. Are customers aware of the Public-Private Partnership arrangement?

Literature review

Components of water perception

Water perception is the consumer's evaluation of how he/she perceives or views the product attributes of available supply of drinking water. Studies such as Warren (1996) and Jardine, Gibbson & Hrudey (1999) identified organoleptic as critical perceptual factor in water consumption. Organoleptics refers to the sensorial information a consumer has about water consumed. These include: taste, odour, colour and turbity. Warren (1996) reported that in the western countries, water taste is rated more important than odor or appearance of water. A study by Grondin, Levallois, Gingras & Moret (1995) reveal is a relationship between organoleptic of water and customer satisfaction on absolute terms. Most of the respondents reported that, tap water was safe, healthy and were satisfied

with its overall quality. From another study it was found that those who were dissatisfied made reference to the taste as the primary source of discontentment and reason for switching from tap water to bottle water (Mackey, 2004).

Apart from organoleptics, perceived risk is another factor in water perception (Anadu & Harding (2000). In the study published by AWWA (1993) and MORI (2002), it was found that drinking water safety and risk was consistent and tap water generally safe. It was also found that most people linked organoleptics to health risk (Jardine, Gibbson & Hrudey, 1999; and Doria, 2010) suggested some cognative- emotive factors that may influence customer perceived risk of drinking water: trust in institution supplying water, external information source, familiarity, heuristics and bias and risk characteristics (such as voluntary exposure, fairness) and personal/societal level of exposure. Water chemicals and microbial parameters are perceived by consumers as important factors in the quality of drinking water. Falahee & MacRae (1955) in a consumer panel study, compared consumer perception of water chemical composition of different waters (distilled water, tap water, filtered tap water) and found that, waters with high mineral content were generally preferred over those with low mineral content. It was also identified that there a linear relationship between the intensity of water taste (Wright, Young, Rivett, & Gundry, 2012) and the level of mineral content (Bruvold, 1968). In a review of consumer perception of taste and odour in drinking water concluded it was found that when the amount of total dissolved solids (TDS) in drinking water increases, consumers evaluate the water quality more negatively. Drinking water with more than 500 milligrams per litre of TDS is considered unacceptable. Contu, Carlini, Maccioni, Meloni, & Schintu (2004) assert the chemical content of drinking water is an important influence on whether the consumer is satisfied or dissatisfied with the quality of water.

Prior experience are schemas the consumers have formed over time. Schemas are also important in the understanding of water perception. It was found that people from a region where drinking water is typically yellowish may consider a bluish water to be strange and unacceptable (Doria 2010). People generally known that people easily accept products and brands that are familiar, while rejecting unfamiliar one (Pliner & Pelechat, 1991). Another factor is the effect of impersonal and interpersonal information. Impersonal source of information are non-personal sources of information that the consumer gets water information. People obtain information about water from both direct experience and by information from the experience of others (Bandura, 1977). Doria (2010) asserts that quality information received by the individual may lead to a change in knowledge and emotion and eventually effect the way drinking water quality and risk are perceived. Tyler (1980) reported that, information from mass media (impersonal) influence perception at societal level, but not at the personal level. Similarly, interpersonal information affect perception at the personal level, but not at the societal level. Doria (2010) identified consumer trust in the Water Supply Company and institution as capable of influencing perception of water quality. It is also known that

trust in service provider influence perceived product quality and consumer satisfaction (Pidgeon, Kasperson, Slovic, 2003).

Satisfaction and Dissatisfaction with water quality.

Satisfaction is the consumer evaluation of the performance of a product or service. When service meets consumer expectation, the consumer is said to be satisfied, otherwise is dissatisfied. Curry (1983) found that the specific reasons of dissatisfaction with drinking water are in three types: dissatisfaction generated by a concern for health, dissatisfaction resulting from consumer concern for the aesthetics reasons and dissatisfaction induced by a lack of confidence in the competence and trustworthiness of those people responsible for supplying drinking water. Curry (1983) observed that many individuals exhibit a lack of knowledge about those responsible for the treatment and distribution of public drinking water. Some water consumers were unable to say if the staff of the water utility firm were competent at their job and that large majority of respondents said "no and I don't "when asked whether suppliers always tell the truth about the quality of the public drinking water. It was concluded that misinformation and lack of understanding of both water resources problems and management strategies contribute to consumer dissatisfaction.

Water knowledge

Noga & Wolbring (2013) in their study on perception of water ownership and responsibility of providing clean water identified the following themes using an exploratory approach: responsibility for water supply, nature of resource base, water consumption pattern, cost of water, price of water and water conservation. On responsibility for water supply, 78.6% indicated that it is the responsibility of the local government and 71.4% indicated that it was the responsibility of federal government. On the resource base of water, majority indicated that water is a natural resource (67.9%) and a human right (51.4%). On knowledge of consumption pattern of drinking water, it was found that most people did not know the water consumption, but an amount that was far below the average normal consumption. On the cost of water, the study revealed that majority perceived the cost of water to a human right, a commodity, a public resource and a natural resource. Most respondents in the study said water should have a price based on supply and demand force. All the respondents indicated that water consumption is an important sustainability factor.

Customer perception of service quality

Zeithaml, Berry & Bitner (2000: 75) describe service quality as "a focus evaluation that reflects the customer perception of specific dimensions of service". In service quality measurement, the criteria used by customers to evaluate quality attributes are have been widely studied. Historically, the concern for how perceived service quality was to be measure started with the parasuramannics (Esu 2014), who held that services quality can be measured on the basis of five dimensions among which are reliability, responsiveness, assurance, empathy, tangible (Parasuraman, Zeithaml & Berry, 1985 & 1988; Parasuraman, Berry & Zeithaml, 1993; Zeithaml, Berry & Parasuramann , 1996)) . Perceived service quality from the parasuramannics was measure using SERVQUAL.

It is underpinned on subjective disconfirmation theory which measures the gap between respondent's expectation scores and the perception scores on each of the five domains (Parasuraman et al, 1988).

Another perspective of the dimensionality of the construct was from the cromptonnics perspective (Esu 2014) who used PERFQUAL to measure perceived service quality. PERFQUAL is a measure of customer's perception of performance quality directly against a consumer's expectations and the evaluation scores recorded with a single score and not perception minus expectation (Crompton & Love, (1995) and Baker & Crompton, 2000). The Cromptonnics conceptualized service quality from two angles, namely: the technical and functional. Based on this understanding the group developed a model with six criteria, namely: professionalism and skills, attitudes and behaviour, accessibility and flexibility, reliability and trustworthiness, reputation and credibility, and recovery.

Research methodology

The study area

The study took place in one of the cities in the south-south of Nigeria. The public water utility firm is owned by the State Government and managed by a foreign companycalled Ophtech (under PPP arrangement). The Water scheme is assisted by the National water programme called "The Second National Urban Water Sector Reform Project" (NUWSRP) and sponsored by the African Development Bank. The scheme was design to supply quality and affordable drinking water to residents of Calabar Metropolis and adjoining communities of Akpubuyo, Odukpanic and Akamkpa. Calabar is the administrative and political headquarters of the State and the commercial hub.

Research design

The qualitative research design was used in the study to get preliminary insights, into the research problem relevant in obtaining information that will be useful in developing effective and sustainable public water supply and delivery policy and strategy. Specifically, focus group discussion was used. This research design gave the researcher and ultimately decision markers as much information as possible about the perception of stakeholders of the product and several issues related to quality of water delivery by CRSWBL. It revealed consumers' hidden water needs, wants, attitudes, feelings, behaviour, and perceptions, motives regarding services, products uses, or practices of public water supply.

Target population and sample size

The target population for the qualitative design comprised all customers and stakeholders of the water utility firm. The stakeholders are categorized as customers, policy makers, community leaders, media, private sector water resource managers, civil society, NGOs, etc. A purposive sampling design was used for selecting subjects for the FGDs. The sample size for the focus group discussion was 75 persons (15 at each location). A screening form that specifies the characteristics of respondents was used to ascertain qualification for group membership and recruitment into each category of stakeholders FGD sessions in all the FGD sessions.

Four Focus Group Discussions were carried out (Four FGDs for customers and stakeholders and one for staff of Cross River State Water Board Limited). Area The study area is made up of two political entities; Calabar South and Calabar Municipality. The locations in Calabar South were Mbukpa/Ekpo Abasi and Uwanse/Goldie. In Calabar Municipality the locations were Diamond/Marian and 8 *Miles/Ikot Ansa* .

Description of focus groups:

FGD 1: Mbukpa Area/Ekpo Abasi

Fourteen persons (14) participated in this FGD. The participants represented the following areas; Oron street, Inyang street, Eyoma Street, Atabong Street, Fuller, Ishie Street and Abasi Okure. The composition of participants was as follows; Business People, competitor-1; women leaders-1; community leaders-3; religious leaders-2; teachers-2; civil/public servants-3. All the participants had a minimum of secondary education. Majority of the participant were within 25 - 50 years of age. There was good representation from communities and streets in the neighbourhood.

FGD 2: Uwanse/Goldie Area

A total of fourteen (14) persons participated in the FGD. The following streets/communities were represented; Mount Zion, Ekpo Eyo, Akpanim, Uduak Orok, Goldie,Orok Orok, Okon Ekpo, and Edet Essien. The participants' composition was; Business People -1, women leaders-2; community leaders-3; religious leaders-2; teachers-3; civil/public servants-2; students-1. The participants' minimum educational qualification was secondary education. Eleven (11) of the participants are within 25-50 years of age, while three (3) were within 50-75 years.

FGD 3 : Diamond/Marian Area

A total of thirteen (13) persons were involved in the FGD in this area. The following streets/communities were represented: Obutong, Satellite Town, Diamond Hill, Archibong Eso, MCC Road. The participants' composition was: private sector-2; competitor-1; women leaders-2; community leaders-3; religious leaders-2; teachers-2; civil/public servants-2.Eleven (11) of the participants were within the age bracket of 25-50 years, while 3 were between 60-75 years. The minimum educational qualification was secondary education.

FGD 4: 8 Miles/Ikot Omin Area

A total of ten (10) persons took part in this FGD. The participants represented the following areas: Ikot Ekpo, Ikot Eneobong, Aso Adim, Ikot Omin, Ikot Effanga. The participants' composition was: Business people-2, women leaders-1; community leaders-3; religious leaders-1; teachers-1; civil/public servants-2. Majority of the participants were between 25-50 years of age. The minimum educational qualification was secondary education.

Data collection instruments

FGD moderator's guide was used for the study. The moderators guide has three parts: (i) introduction and warm up *(*general discussion to gauge participants' knowledge about trends in the water supply sector and changes in the ownership and financing of public water supply). (ii) main section (moderator probed to find out participants' opinion, feeling about the following operational issues: product attributes, service offering and

attributes, motivation for subscribing for public water supply , employee relationship with customers and other stakeholders, community sustainability, stakeholders' understanding and support, customer satisfaction, operational optimization, operation resiliency , infrastructural stability, water resource adequacy (information provides to customers about water). (iii) the closing section contain: summarization of the points raised in the session.

Pretesting of research instruments

The moderator's guide was tested for validity and reliability by using experts in the water sector from the utility firm and the University of Calabar. This was necessary to obtain a good content validity. Trite words and irrelevant questions were removed. This helped to improve the quality of the instrument.

Administration of data collection instruments

Community mobilization, selection of participants and invitation of participants

For a successful stakeholders' perception study of the water consumers, we decided to undertake mobilization visits to the paramount rulers to sensitize them on the study. The visits to the community leaders had three advantages: (i) it created opportunity for the purpose of the study and benefit to the community to be explained to the community leaders. (i) the assistance of the Paramount Chiefs was solicited in the area of hosting the meeting and facilitating contacts (name and address) with prospective participants. (iii) a consensus on the venue, date and time were reached at with Paramount Chiefs who willingly accepted to host the Focus Group Discussions (group meetings). (iv) the Paramount Chiefs helped in facilitating distribution of the Screening Forms for FGDs participants' eligibility and Invitation Forms. To obtain maximum co-operation and the willingness of prospective participants, personalized invitations were sent to eligible participants. On the morning of each FGD session, phone calls were made to remind eligible participants of the date, time and venue of the meeting.

Location and time

The FGD sessions took place in locations fixed by the Paramount Chiefs in consultation with the research. Each FGD session lasted between 90 minutes to 2 hours. At the end of each session, participants were entertained with snacks. This was a way of showing appreciation to them for leaving their busy programmes to attend the meeting and for staying to the end of the meeting. The Focus Group Discussions were moderated by two moderators in a friendly atmosphere. The questions were asked by the moderator and assistant who did the scripting down of the responses. The proceeding of each FGD session was audio- taped and video-taped to enhance detail information collection and storage. Participant granted permission for the use of audio and video tapes during the FGDs.

Data analysis techniques

The voice recording from the FGDs were transcribed. The analysis of the statements followed the qualitative data guidelines prescribed by Lincoln and Guba (1985). The data was categorized and sorted into themes based on 'look-alikes'.

Results and discussions of findings of focus group discussions

P*articipants' general knowledge of drinking water in Calabar and current trends in water supply*

The focus group discussions began with general questions regarding the participants' general knowledge and awareness of drinking water and trends in the industry. Participants generally recognized the water supply systems availability in their locality. Participants identified public water supply and private wells as major systems of water supply in Calabar. Cross River State Water Board (CRSWBL) was named as the major public water supply system. Other sources of water mentioned were: river, streams and rain. The majority of participants opined that water from private holes was not comparable to treated water from CRSWBL. The participants showed a high preference for Public Water supplied from CRSWBL because of health reasons. However, a few others feel otherwise because of their experiences with CRSWBL public water supply system.

On the importance of water to the community compare to other community infrastructure, across all the locations, participants expressed their concern for water as a necessity than other community infrastructure such as roads, communication, electricity, health, etc. One participant said: "Water is life, we cannot do without water".

Awareness of attributes of good drinking water

There was adequate awareness among participants about the attributes of good drinking water. Participants in Mbukpa axis were of the opinion that good drinking water should have no odour, no particles. Those in Uwanse and Akpanim feel that good drinking water should be portable, odourless and clean. Those in Obutong area expect good water to be clean, tasteless, colourless and odourless. Those at Ikot Omin expect good drinking water to be water that meets acceptable standard.

Awareness of water facilities

Availability of CRSWBL public water system differs from one location to the other. Participants expressed desire to be urgently connected to the public water supply, in most cases the distribution of the water has not reached them. Mbukpa area, Oron Street, Fuller, Inyang, etc. have no main distribution pipes. The participants in Mbukpa complained that some people have visited their houses asking them to fill some kind of form, but unfortunately water has not been given to them until now. According to one of the participants at Mbukpa Location: "*The new project is here, but not in every place", one participant said, "I need tap to be connected to my compound" and another, "I hope your team's visit will help us have access to water from Water Board".*

In Uwanse, Akpanim area, places such as Okon Ekpo, Mount Zion, Uwanse, Orok Orok and Eastern Highway have no main supply artery to draw from the public water system. Some factors were advanced by participants for the lack of public water supply in some of these areas:

g) There is a suspicion that borehole owners colluded with government
h) Political reasons (poor funding)
i) Poor attitude of community members toward staff of Water Board.
j) Government inability to complete projects
k) Administrative bureaucracy

l) Absence of a point man to champion the course in the community

One participant at Akpanim has this to say: *"We hear the water; we watch it on the television, sometimes when we go visiting those friends and relations, we see this water, test it in people's houses. That is the truth about it".* Another participant, said:*"The big pipes pass through my compound, but there is no distributing line. I went to Water Board to complain and I was told that the work in Calabar South will commence this year".*

A participant, who resides at Eastern Highway, said that, on parking into his present residence, he was told that the main pipe stopped at Orok Orok/Goldie Roundabout Junction and that he goes to his office with jerricanes where he fetches Water Board water. The distribution of public water supply to the Obutong, Marian, Diamond, Ikot Ansa and 8 miles axis was much better as participants from the neighbouring communities said they have access to the distribution. Although not all the household have been connected to the network. One participant observed that *"Distance between major pipes and homes prevent people from taping the water".* This is in view of the cost of lying the pipes to reach such distant prospective consumers.

Participants are aware of the availability of two metering menus; conventional and prepaid meters. Most participants preferred prepaid meters because of instant supply of water after recharging ones account. There were several complaints against Conventional meter:

5. Staff reading meters sometimes inflated bills
6. Long process of payment of bills (spend long hours at the bank)
7. High charge for installation.
8. Some also complained of the time it takes CRSWBL to move a customer from the initial convention meter to prepaid, even after paying the cost for such installation.

Perception of the service quality of public water supply in calabar- water attributes

It was observed that participants in the focus discussions in Mbukpa and Uwanse /Akpanim (by extension Calabar South) had poor appreciation of water facilities and service quality than those in Calabar Municipality. According to them it is difficult to talk about something that one does not experience. This is true because, perception is the process of organising and interpreting the stimuli an individual is exposed to from the environment to form a world view for that individual. It was the view of the participants in Calabar South that the services of the water company will be better evaluated when they are given access to the water supply system in their communities. According to a participant in Akpanim location: "*It is difficult to score services not receive,* w*hen government has not extended water to the community.* For those who have used CRSWBL water supply, they have their feelings. A participant said: *"the water contained dirt, especially after stoppages lasting some days by CRSWBL, water is dirty due to rusted pipes and me and my household do not consume it*".

Participants in focus group discussion held at 8 miles location observed that the supply of water by the public water company is reducing in recent times. That the consumption of borehole water is increasing because, the supply of water from the public water company is not regular, boreholes are always available. They also reported of having sand particles and saltiness in public water. Because of these, the water is used for washing, while borehole water is used for drinking. One said he boils the public water

before drinking because it is perceived as unsafe. Another participant observed that the water has odour, but acknowledged the quality of the water over borehole water. Another said the water is gummy, hard and the taste varies with the season; rainy season require more chlorine than dry season. Some of the participants gave reasons for the presence of sand and saltiness of the public water:

f) *"why they have particles is because of poor maintenance –water enters through broken pipes".*
g) *"No sufficient time given to chemical before it is passed out in the water distribution".*
h) *"Pipes/reservoirs not regularly washed contribute to colour of water".*
i) *"good water leaving the reservoir may be contaminated through the broken pipes."*
j) *"Reduce the level of chemical is in excess."*

In Obutong location, participants were asked whether they were satisfied with services of CRSWL. The responses showed that they were not quite satisfied. The following reasons were given by participants from Diamond Hill for their dissatisfaction: water was usually stopped without notice, eventually when it is given, it becomes salty, starchy. One participant said;

"we are not happy, some days they can take water without saying anything to us and when they give, it is very dirty. If you fetch it and keep it in white basin the following day, you see very rusty, very salty. You cannot use it to wash white cloths".

Another participant from Satellite Town area said the water has high chlorine content and generally ok. Another participant from Obutong area said: *"CRSWBL water has dirt because of the dirt and high chlorine, some of us drink borehole and use water from CRSWBL to do our washing.*

Participant from Archibong Eso also observed that CRSWBL water was salty and has excess chlorine. The participant describes his experience with CRSWBL water thus: *"when you store waters from borehole and Water Board; result after 4 days showed that, the quality of water from CRSWBL detonates more than that of boreholes. Borehole water still remains clean but not so with CRSWBL water".*

Participants in Mbukpa area who have access to CRSWBL complained of water stoppages without any prior information or explanation by the Management of CRSWBL, and that, bills are over bloated in some cases. One participant in Obutong location observed that customers were made to pay exorbitantly before they are connected to CRSWBL pipes, "paid N86, 000 for 100 metres by the contractors handling the pipeline distribution in the town. Participants suggested that CRSWBL should handle installation directly to reduce cost, rather than using agents who charge exorbitantly to perform the task. Participants at 8 miles also observed that more people are consuming boreholes because CRSWBL water is not always available. This has led to a boom in borehole business in the area. One participant suggested that, "*we need to inform customers when there is breakdown".*

Relationship between staff of the water company and customers

The perception of the attitudes of staff of CRSWBL varied from one location to the other, depending on the degree of participants' experience with service providers. In Calabar South it was difficult for participants to comment on the attitude of staff to customers, since majority said they do not see nor have business contact with staff of the water company. A participant who is connected complained of very limited personal interaction with staff and suggested the use of professionals: *"water board should use professionals to render its services".* In Uwanse and Akpanim area, participants had

very bad impression about the staff of CRSWB. One participant said, "*They are mischievous staff*"

Participants from Obutong location said: "*for them, contact with staff of water comapny was only possible at the office. And even when a report is made, the response time is prolong"*. One participant complained that once, he called a staff to effect repairs, it took about 5 days for the staff to response. Another participant from Archibong Eso, reported that he complained of a burst water pipe 6 days ago at the Water Board office and nothing has been done about it. He pointed out that; "*staff do not wear uniform to identify themselves and that the only form of identity for customers is usually the presence of old and dirty vehicle*". He suggested the need for a uniform and identity cards for them for easy identification from quacks and imposters. It was generally suggested that staff of the water company should interact with the customers to find out their problems and proffer solutions. A code of conduct was suggested by some participants at Obutong location.

- Marketing persons to show identification during calls at customers.
- Dress professionally, preferably with apron.
- Vigorous attempt should be made to increase coverage of distribution network of CRSWBL supply system.
- The response time by staff to calls from customers should be shorten.
- Bills should be sent on time to customers.
- CRSWBL should provide toll free customers lines to enhance effective communication and reduce response time.

Participants at the 8 Miles location also complained of late/delay response to customer complaints by staff. One participant said, he uses the staff telephone line to call. Another said the staff who attends to his household is not hostile and his response rate is reasonably swift. One Mr. James was commended for prompt response to customer calls for service. Another complained of technical incompetence of some staff. He gave an instance where a technical staff buried a meter in the ground and customer found it difficult to read the meter. Generally, the staff were perceived as fairly friendly. It was suggested that the staff should be trained on customer relationship management.

Customer satisfaction with services of water company

Participants in the Uwanse /Akpanim and Mbukpa areas scored the CRSWBL between zero percent to 10% performance. This is not unconnected with the poor water supply system in the environs. The picture was different in the case of participants from communities in Calabar Municipality. Participants from 8 miles area score CRSWBL 60-80% on staff relationship with customers, 40% on maintenance and 40 % on regularity of water supply to the environs. Participant also agreed that they can recommend the public water supply to those who are not yet connected.

Adequacy of communication with target market

Communication with a firm's market is an imperative. It is the means through which the firm and its offerings are known in the market place and by the publics (internal and external). Participants from Mbukpa centres were fast to say that CRSWBL has no feed-back mechanism. According to one participant:

" Water Board has not sold itself to the public. I will score them 25%".

"You don't even hear them on radio; you don't even see them on television making an advert that something is going on. You only see that some people breaking the road causing a lot of damage"

Participants suggested that the water company should have a proper way of reaching out to customers". Another participant suggested that the need for a community liaison officer to bridge the information gap: *"*the water company *should have Liaison Officers in the community whom we should hold responsible and lay our complaints to and should provide community complaint centre.."*

At Akpanim area, the situation was the same. However, participants preferred information from fliers, radios, television, public enlightenment and village square interaction. Participants from Obutong areas observed that the water information from CRSWBL through television and radio was grossly adequate. They however showed preference for television, text messages, direct mails, radios and jingles and consumer education (Water Board sub offices in the communities. Participants at 8 miles were of the view that CRSWBL communication with target market was low. A participant from Ikot Omin said that: *"Water Board has not given enough information to customers. The Board needs to do more in consumer education, advertisement, through radio, and jingles".*

Financial and market viability

Participants generally have a positive attitude toward the payment of bills. They expressed willingness to pay bills. However, participants are of the view that the propensity to pay bills is predicated on the availability of water supply to households. According to one participant in Obutong location, customers are willing to pay if the supply is regular and the water is clean:

"The *cost of consumption is high when there is no regular supply";*

"Ok with the value we have for the services"

*"*CRSWBL *is cheaper than boreholes, everybody wants water board water"*

" Give justification for increases in the price regime".

"If the water from water Board is more expensive than borehole, I will discontinue from Water Board" (Participant-Mbukpa location).

" Water Board should give us water and reduce the tariff" (Mbukpa centre).

Evidence from the field showed that prospective and actual consumers appreciate the economic value of water and are willing to pay for services consumed.

Public private participation

Participants were asked the current ways their communities or organizations are partnering with CRSWBL in delivering water to the populace and to suggest how they intend to partner with government in water supply. Participants expressed their desire to partner with the water company. The participants listed some reasons why the company failed: non-involvement of the community was highlighted as one reason why water projects/businesses failed: *"poor patronage of the community caused water project to fail. The community should be empowered to handle such projects"*(Mbukpa). In Akpanim area, participants were of the opinion that the community could partner by protecting the water board installations through youth vigilante groups. At Obutong it was suggested that communities can partner with the water company in the following ways:

- community monitoring of CRSWBL facilities
- community members can provide office space for sub offices
- Community members to monitor and work with contractors

- Community mobilization to create awareness (community support for town hall meeting to discuss water issues
- The revitalization of the water board commercial water points by ensuring regular supply of water.

At the 8 miles location, participants also indicated how they have been partnering with CRSWBL; giving right of way for the laying of pipes and reporting of broken pipes. Participants suggested that community can be empowered through the commercialization of the water, but regretted that high charges discourage people from showing interest. Generally, communities show willingness to partner with government.

Project sustainability

Participants at the various locations were well informed of the factors that could weaken the performance of the water project in Calabar. A participant at the Mbukpa area pointed out that a situation where CRSWBL break the roads during lying of pipes without repairs could affect project acceptance by community. The establishment of community liaison point to be manned by a community was suggested by participants at the Akpanim and Mbukpa areas as sustainability drivers. It was argued that it would also facilitate the prompt payment of water bills.

It was also suggested that the youths of the communities should be considered for engagement as ad hoc workers when pipe extension/distribution work is to take place in the community. Others think that, the use of infrastructural master plan will help to reduce the level of vandalization of other public infrastructure and facilities in the same communities.

Concerning environmental impact, Obutong participants were worried about the negative impact of the water project in the community. That the reckless way the pipes were being laid was interfering with the drainage system in the community and spoilage of roads. It was suggested that, when roads are broken by CRSWBL, the roads should be repaired immediately. Secondly, pipes should not be buried in the road to avoid damaging the road.

On social impact, another participant opined that non employment of the youths of the community in the organization could jeopardize the project. The gross inadequate distribution network of the public water system is also worrisome to some participants. Those in 8 miles location suggested that organization of regular town hall meetings to know about the problems of the customers and the development of more effective machinery to monitor payment by customers would help sustain the project. It was also pointed out that, there should be a programme that will accredit private plumbers to compliment the few CRSWBL technical staff to handle pipe burst in the communities.

Economically, the commercial water cubicles of the company are not working because of the irregular water supply and the high cost of doing the business in the face of the fierce competition from boreholes owners. Some identified some negative effects of the water to livestock, that the water is harmful to poultry birds because of the high chlorine level.

Conclusion

Customers of public water supply in Calabar are knowledgeable about the water supply systems in the locality and were able to identify the water utility agency. Customers showed a high level of interest and desire in the public water supply system. Water was rated very important and indispensable for community development than other community infrastructure.

Community members were quite aware of the basic indicators /attributes of water supply systems - tasteless, odourless, colourless, regular, safe, etc. Customers were aware of the new water project in the state, but most places are yet to be reached for no fault of their own, other than that, the main lines have not reached some homes, especially in Calabar South-Oron Street, Akpanim Street, Eastern Highway, Uduak Orok, Okon Ekpo, etc. Participants preferred the pre-paid meters because of the accuracy in billing, but frowned at the rigour of securing one. Appreciation of service quality of public water supply system in Calabar is a function of the level of exposure and/ interactions individuals or groups have had with service provider(s). Customers in Calabar South rated the service quality of the water company very low, while those in Calabar Municipality rated the services a little above average (taste, purity, colour, safety, odour, regularity, etc.).

The attitudes of Staff of the water company toward customers was rated very low in Calabar South, while in Calabar Municipality it was rated a little above average. Customers have expectations of the role technical/sales staff should play in delivery of public water supply in Calabar. And therefore expect professionalism in the conduct of business. Customers were willing to be bills promptly as long as the services of the water company matches the tariffs charged. The levels of customers' satisfaction differ with the locations in Calabar. Participants in the FGDs in Calabar South could hardly expressed their level of satisfaction with the services of the water company, while those in locations in Calabar municipality scored their level of satisfaction as high as 60-80 percent.

There is obvious inadequacy in the quantity and quality communication with customers and other stakeholders. Customers showed more interest in the following communication channels: community consultation, customer education through mass media such as television, radio and the use of telephone. The public communication machinery of the water company was perceived to be uncoordinated and inefficient. Information available to the customers about the PPP options was very little. Customers were of the view that community involvement in water governance is an imperative. Stakeholders appear to have little or no information about the internal running of the water company. However, some of the participants felt that the problems is connected with leadership transparency

Prospective and actual consumers appreciate the economic value of water and were willing to pay for services consumed; but not willing to pay for services not consumed or bad services. There was high customer willingness to collaborate with the company and government in public water supply in Calabar.

The water company has no strategic corporate plan that stipulates the future direction of the organization, especially in the areas of community relations and social responsibility and no regulatory framework for the industry in Cross River State and the country as a whole. Most of the practices of the water company have the potential to negatively affect project sustainability, e.g. haphazard breaking of roads, obvious absence of social responsibility, supply of salty water, inadequate communication with stakeholders, waste of water as sludge, etc. The company has no effective measures to reduce negative impact of its activities on host communities.

Policy implication

The following recommendations have been suggested for the management and improvement of customers' perception of the water utility company:

k) Increase customers' access to the product.

Most of the participants complained that the distributing lines have not reached their homes, making it difficult for them to be connected, especially in Calabar South. Intensive distribution of water lines will enhance easy connection to homes and at a minimum cost of N2000. This will also solve the problem where desperate customers are made to pay for the cost of drawing water from very long distance away from their homes. This usually leads to the misconception about the cost of getting water from the company.

l) Meeting customers' expectations on water attributes

Since most of the participants who are currently using public water complained of the presence of sand and dirt in water, rusty colour, saltiness and odour; there is need to investigate this claim by doing quality control at different points of water distribution and take necessary intervention to improve on the quality of the attributes that fall below standard.

m) Improvement on the service quality of public water supply by the water company

The water company should improve on its service quality. This is because the service quality of was rated very low on most of the dimensions. Special attention should be focused on regularity of water supply and customer relationship Management.

n) Improvement on communication with target market and publics

Communication with target markets and relevant publics was inadequate. CRSWBL should effectively communicate with market and publics. The suggested media types are:

g) Community mobilization
h) Establishment of a community reference group to assist with liaison between the authority and the community
i) Establishment of service clubs in the community (Safe water clubs), especially in post primary schools.
j) Establishment of water information centre in the community
k) Complementary media; television, radio, flyers, etc.
l) Participation in national and international water days/weeks

o) Establishment of effective bills payment system

The current system where customers go to the commercial bank to spend many hours just to pay bills was frowned at. It is suggested that payment points should be created at catchment areas across the city. This will enhance ease of payment and prompt payment of bills. Banks located at this catchment areas could be used as payment points.

p) Establishment of an independent tariff regulator.

The regulator would determine proper tariff rates for the industry. This has enormous advantages; to avoid political intervention, determine tariff objectively based on guidelines, to secure technical expertise on rate setting and to provide confidence to the private sector and consumers. The regulator will protect the consumers, the contracting firms, and the state water agency.

q) Community consultation.

Giving consumers a role in decision making process could generate greater political acceptance of raising tariff rate. Women and other community groups may prove to be useful focal points for consumer representation and information dissemination.

r) Establishment of the "Hardship Policy".

The policy would encourage customers who are very poor to inform the revenue officers of the water company about their personal circumstances surrounding non-payment of accounts. The officers will then discuss the range of payment options available to the individual customer and assist them in working out the best option for their situation.

s) *Establishment of sustainability principles in water governance*

Sustainability principles should be implemented in water governance. This will ameliorate or reduce the negative effects of its operations. Important elements here include:

v) Involvement of communities in water governance in Calabar

vi) The provision of infrastructural master plan that would show the mapping of water pipes for current consuming areas and new developing satellite towns in Calabar. The current water distribution effort should ensure that main pipes and distributing pipes are taken to these new areas to avoid the breaking of roads when the places eventually become habited.

vii) The problem of water source for production and treatment should be looked into. The encroachment of sea water into the main intake leading to saltiness of water is a serious threat to the quality of water produced by CRSWBL. The possibility of damming the Kwa River should be considered. This will create an all-year pool of treated water for production.

viii) Absence of recycling technology. At the moment, unwanted water is discarded as slush by the current water treatment plant. This is a colossal lost. This water should be recycled and distributed since it cost some naira worth to draw in the raw water for treatment.

t) Promotion of public private participation

The following PPP strategies or actions are hereby suggested:

vii) Community involvement in protection of water facilities

viii) Community liaison office for dissemination of information

ix) Community members can serve as water retailers in the downstream sector, if the white and blue water cubicles are allocated to willing business people.

x) Establishment of appropriate legislation and regulatory framework to support the current reform in the urban water sector or review the existing PPP policy of the water company in such a way that it will optimally benefit all parties; customers, private investors, government and staff of the water company. It will remove the current feeling of satisfaction in the PPP process as expressed by some stakeholders. This will help attract private operators.

xi) Because of the PPP concept unawareness among the stakeholders, there is need for private sector education on the PPP strategies

xii) Stakeholder forum should be organized to agree on the best PPP option to be adopted by CRSWBL. This is because the one size-fits-all approach has been condemned by NWSSP (2000).

References

Anadu, E. & Harding, A. (2000). Risk perception and bottle water use. *Journal of the American Water Works Association*. 92(11), 82-92.

AWWA (American Water Works Association)(1993). *Consumer attitude survey on water quality issues prepared by Robert EHurd*. Denver (CO): AWWA Research Foundation,

Bandura, A. (1977). Social Learning Theory. Englewood Cliffs: Prentice Hall.

Bruvold, W. H. (1968). Scales for the tasting of water. *Journal of Applied Psychology*, 32, 245–253.

Contu, A., Carlini, M., Maccioni, A., Meloni, P. & Schintu, M. (2004). Evaluating citizens concern about the quality of their drinking water. Proceedings of the 4th IWA World Water Conference, paper 116628. International Water Association, London.

Curry, L. L. (1983). Consumer attitude toward public water supply quality: A dissertation on alternative water sources in Southern Illinois Univeristy, Department of Energy and Natural Resources.

Doria, M. F. (2010). Factor affecting public perception of drinking water quality. *Water policy*, 12, 1-19.

Falahee, M., & MacRae, A. W. (1995). Consumer appraisal of drinking water: Multidimensional scaling analysis. *Food Quality and Preference*, 6, 327-332.

Grondin, J., Levallois, P., Gingras, S. & Moret, S. (1995). La Consommatim d'EAU potable provenant du saint -Laurent dons la Region de Quebe Cente de Sante: Publique de Quebe.

Jardine, C., Gibbson, N. & Hrudey, S. E. (1999). Detection of odour and health risk perception of drinking water. *Water Sciences and Technology*, 40 (6). 91-98.

Lincoln, Y. S. & Guba, E. G. (1985). *Naturalistic enquiry*. Newbury, C.A: Sage

Mackey, E. (2004). Influence of taste and odour on consumer perception of water quality and safety. In J. Noga and G.Wolbring (Eds). Comprehensive list of water attitude surveys: a bibliography of surveys on people's perceptions of water quality, water use and willingness to pay. *Water*, 5, 1865-1889. Retrieved from www.mdpi.com/journal/water/ISSN2073-4441.

Noga, J. & Wolbring, G. (2013). Perception of water ownership, water management and the responsibility of providing clean water. Water, 5, 1865-1889. Retrieved from www.mdpi.com/journal/water/ISSN2073-4441.

Nwokah , N.G. (2008). General overview of services marketing. In A. Anyanwu & N. G. Nwokah (eds). Contemporary Book on Services Marketing. P.1-7. Owerri: Avan Global Publications.

MORI (2002). The 2004 Periodic Review: Research into Customers' Views. London: MORI.

Parasuraman, A., Zeithaml, V. A., & Berry, L. L. (1985). A conceptual model of service quality and its implication for future research. *Journal of Marketing*, 49, 41-50.

Parasuraman, A. Zeithaml, V. A. Berry, L. L. (1988). SERVQUAL: A multiple item for measuring customer perceptions of service quality. *Journal of retailing*, 64, 12-40.

Parasuraman, A., Berry, L. L., & Zeithaml, V. A. (1993). More on improving service quality measurement. *Journal of Retailing*, 69, 150-147.

Pidgeon, N. F., Kasperson, R. K., & Slovic, P. (2003). The Social Amplification of Risk. Cambridge: Cambridge University Press.

Pliner, P., & Pelchat, M. L. (1991). Neophobia in humans and the special status of foods of animal origin. Appetite, 16, 205–218.

Shostack, G. L. (1977) Breaking free from product marketing . *Journal of Marketing*, 41 (April), 73-80.

Tyler, T. R. (1980). Impact of directly and indirectly experienced events: the origin of crime related judgements and behaviours. *Journal of Personality and Social Psychology*, 39, 13–28.

Warren, L. (1996). *Linking customer satisfaction to performance measures. Proceedings of the Annual Conference:Water Management & Regulations. Vol. A. Denver*, CO: American Water Works Association..

Wright, J. A., Young, H., Rivett, U., & Gundry, S. W. (2012). Public perception of drinking water safety in South Africa, 2002 – 2009. A repeated cross sectional study In BMC publication. In J. Noga and G.Wolbring (Eds). Comprehensive list of water attitude surveys: a bibliography of surveys on people's perceptions of water quality, water use and willingness to pay. *Water*, 5, 1865-1889. Retrieved from www.mdpi.com/journal/water/ISSN2073-4441.

Zeithaml, V.A., Berry, L. L. & Parasuramann, A. (1996). The behavioural consequences of service quality. *Journal of Marketing*, 60, 31-46.

Zeithaml, V.A., & Bitner, M. J. (2000). *Services marketing: Integrating customer focus across the firm* (2nd edn.). Boston: McGraw Hill.

A Co-integration Analysis of External Debt, Private Investment and Economic Growth in Ethiopia

Author name: Mr. Agernew Tilahun Eshetie

Institute of Development Policy and Management (IOB)

University of Antwerp, Antwerp, Belgium

Email: agernewt@yahoo.com

Abstract

As the development efforts in most of the poor countries involve investments that are greater than their domestic savings, foreign finance in the form of external debt becomes absolutely necessary. Ethiopia like other developing countries, has been borrowing foreign funds in order to increase capital stock and fasten its economic growth. Public external debt problem which began in 1970s in most LDCs including Ethiopia contributed to the country's overall poor economic performance. In particular, the external debt burden has grown to an impossible level, claiming twice what the country earns from its exports of goods and services. If Ethiopia were a company rather than a sovereign country, it would have been declared bankrupt and would have ceased to exist long ago (Befekadu, 2001). This study focuses on the Co integration analysis of External debt, Private investment and Economic growth by employing the Johansen co integration technique using "time-series" data for Ethiopia over the period 1974/75-2010/11 to reveal the short run and long relationship among these variables. In doing so, the study therefore tries to check the existence of the debt overhang and crowding out effect in Ethiopia. The study found the existence of one cointegrating vector in all the three specified models, indicating a valid long run economic relationship among the variables under consideration in each of the equations specified. The empirical evidence provided by the models result indicated that external debt

accumulation has a negative impact on economic growth but not in private investment. The results offer a confirmation of the debt overhang hypothesis for Ethiopia in the long run and short run though the magnitude of the coefficients is quite small in the Vector Error Correction model, via its effect in real gross domestic product (GDP). However, the results also indicated that debt servicing does not appear to affect private investment and growth adversely, implying the absence of crowding out effects on private investment and economic growth. Moreover, the results suggest that trade deficit and appreciations of real exchange rate are the fundamental variables responsible for debt accumulation in Ethiopia. In view of these results I recommend more and more debt relief to Ethiopia and several policy implications emerge from the study. A cautious macroeconomic policy in general and policies aimed at reducing trade deficit and one that will not unnecessarily appreciate exchange rate should be adopted in particular is helpful.

Key words: Investment, External debt, Economic Growth

Introduction

The debates over the effects of debts to economic growth are fascinating as many studies provide different outcomes. Foreign debt crisis in the1980s left people with an impression that external debt retards economic growth. However, in the 1970s, the borrowing countries of external debt enjoyed a larger capital stock and did not experience slower growth immediately. These relationships between external debt and growth are largely unexplained. Arguments suggesting that foreign indebtedness promotes growth usually involve a complementary role that foreign aid plays to domestic savings and thus to resource mobilization, capital accumulation, and industrialization (Chowdhury, 2001).On the other hand, external debt can bring negative impacts to the economic growth as well through several contributors such as the interest payment of the debt and the debt overhang situation. The rate of debt accumulation and increase in debt servicing are major factors affecting the growth rate of output (Siddiqui and Malik, 2001). Lin and Sosin (2001) argue that it is the interest payment of the debt that retards the economic growth. The authors mentioned that in order to pay the principle and interest, more future tax revenues must be raised or the given tax revenue must be diverted from other productive uses, which may hurt economic growth and Investment. IMF (2004) adds that greater reliance on foreign-currency debt is associated with a higher frequency of debt crises.

Given these facts,one of the greatest problems facing many Sub-Saharan African countries today in general and Ethiopia in particular is therefore, the amount of their external indebtedness. The external debt problem is becoming more acute for a number of reasons. First, the size of the debt relative to the size of the economy is enormous and can lead not only to capital flight but also may discourage private investment. Secondly, debt servicing payments form a significant proportion of the annual export earnings. Meeting debt servicing obligations eats significantly in to whatever other services can be provided to improve the welfare of the citizens and therefore has macroeconomic implications. High debt service payments may result to crowding out of important government spending such as development projects, health, education and water (Lora & Olivera, 2007). There is already a concern that debt service is crowding out government spending on important services. This raises the question of whether a country can grow fast enough to maintain debt obligations and adequate domestic investment. Thirdly, the burden of debt for a large number of Sub-Saharan African countries threatens not only the execution but also the prospects of success of adjustment programs being embarked up on.

Moreover the external debt for Ethiopia is expected to increase significantly in the immediate future because of the need to secure finance from external sources to undertake big infrastructure projects. This external debt will have to be repaid in the future against depreciating Birr and devaluation of domestic currency or appreciation of foreign currency means an increase in the real value of debt-service repayments. Therefore, the problem is how economic growth will be affected by the repayment of the external debt in the long run. Since, the external debt may be expected to affect economic growth in two ways: (1) the required debt service payment may create the crowding out effect on investment by transferring resources out of the country in the form of interest and principal repayment: and (2) large debt may overhang and discourage investment especially private investment in that the private sector in the anticipation of increased taxes

The increasing debt to GDP and debt to export ratios in addition to interest and principal arrears showed an unprecedented increase in the level of the country's external debt. And those indicators listed above revealed that the total debt is approaching the nation's GDP and around 3 fold of total export in 2010/11 implying that the debt burden, as compared to the country's capacity, is too heavy to take care of itself (see table below).

Table A: External debt burden indicators for Ethiopia for some selected years (in percentage).

	1974/75	1982/83	1990/91	1991/92	1999/00	2010/11
Debt Service to Export ratio	21.42	511.02	127.44	263.01	56.29	8.73
Debt to GDP ratio	2.07	6.37	15.61	14.55	66.99	78.72
Debt Service to GDP ratio	0.28	5.74	1.64	1.86	3.34	2.25
Debt to Export ratio	160	568	1216	2058	1128	305

Source: Own Computation based on data from MoFED and EEA Statistical Data Base 2010.

In Ethiopia both the debt stock and the debt to GDP ratio increased steadily since 1980s and the 1990s. This makes Ethiopia one of the Sub-Saharan, which have a total debt that exceeds their GDP, having a debt to GDP and debt to export ratios of 108.2 and 642.4 % in 1980s and 150 and 980 % in 1990s, respectively . The comparable figure of debt to GDP ratio for East and South Africa and North Africa is 129.5 percent and 77.8 percent in the1990s, respectively [Alemayehu, 1997]. This causes a severe debt servicing ratio in the country.

There have been several attempts to empirically assess the External debt-Economic growth link-the debt overhang and crowding out effects-mainly by using OLS. Samson, (2002) analyzed the public external debt problem in Morocco and Nigeria between 1980 and 2001 and identified factors such as fiscal policy inefficiency (e.g. over-ambition to speed up development process in the absence of adequate domestic funds) and low level of domestic savings. External factors include oil price shocks, deterioration in terms of trade, rising interest rate in the international capital market, and collapse in commodity prices in world market. He found both domestic and

external factors to have significant influence on the accumulation of foreign debt, but relative contribution of domestic factors (mainly growth of fiscal expenditure and domestic savings) was higher compared to those of external factors (mainly balance of payment and interest payments).

Anoruo, et al. (2006) also analyzed external debt of 29 highly indebted poor countries in Sub-Saharan Africa from 1984 to 2000. By applying panel data regression analysis, they found that there is strong relationship between growth of external debt to GDP and factors such as real exchange rate, economic slowdown, interest payments and non-interest current account balance They found that all the variables were statistically significant, although at different levels.

Maureen Were (2001) examines the impact of external debt on economic growth and private investment in Kenya. The author observes the structure, magnitude, composition and determinants of Kenya's external debt. The study finds that debt accumulation and current debt flows discourage growth. But, current debt flows stimulate investment and debt accumulation deters investment.

Regarding the effect of external factors on private investment it can be viewed from two angles: First, a raise in international interest rates on debt will increase the burden of debt and thus, reduce the import capacity, which may have a direct negative effect on the level of private investment (Alemayehu, 1997). Second, the domestic private sector itself holds foreign assets and if the burden of future debt is viewed as a heavy tax burden, this can lead to capital flight.

Many studies relating to the above-mentioned issues have been carried out. In the case of Ethiopia, Befekadu (1992) used a method of eye-balling to test the debt overhang effect on investment. In his conclusion, the debt overhang hypothesis does not seem to hold in Ethiopian case. Indeed, Dawit and Yemisirach (2001) using Engel-Granger ECM regression also found that there is no evidence of debt overhang effect and a crowding out effect of debt on investment in Ethiopia.

Despite all these facts as it may be ,external debt can have positive impact on economic growth. This is the case when an expansion of public debt leads to an increase in public expenditure and an increase in economic growth through the government expenditure multiplier. Therefore, the impact of external debt cannot be determined a priori, and hence it is vital to have a critical empirical analysis to investigate/explore the Co-integration analysis of External Debt, private investment and Economic growth and the validity of debt overhang hypothesis and crowding out effect in Ethiopia.

Significance of the study

The study is aimed to contribute to the existing knowledge on external debt and how best the country can ensure sustainability of external debt and reduce its adverse effects on Private investment and Economic growth. Hence, based on the findings of the paper result, it is indispensable for policy makers to take in to account the circumstancec in which foreign indebtedness has an impact on the performance of the home economy with its proper measure /remedybefore a given External debt is incured.

Material and Methods

Data Types and Sources

This research uses secondary data. The time series data which covers the period from 1974/75 to 2010/11 is collected from various sources including Ministry of Finance and Economic Development, Ethiopian Economic Association, National Bank of Ethiopia, World Bank and International Monetary fund data base (2010-2012)

Methods of Data Analysis and Estimation Techniques

Unit root and Co-Integration analysis

Among the methods of testing the presence of unit roots in the variables, Augmented Dickey-Fuller (ADF) test is used in this study. The ADF test is identical to the standard DF test but it is constructed within the regression model of the form:

$$\Delta Y_t = \alpha Y_{t-1} + \sum \gamma_j \Delta Y_{t-j} + \mathrm{U}_t$$

The Johanson method that is used here is established as the standard for vector auto regression systems [Harris, 1995**].** Hence, given n potentially endogenous variables, it is possible to model $X_t$as unrestricted vector auto regression (VAR) with p lags of X_t as:

$$X_t = A_1 X_{t-1} + A_2 X_{t-2} + \ldots\ldots\ldots\ldots\ldots + A_P X_{t-P} + \mathrm{U}_t$$

Where; $X_t = (n \times 1)$ matrix,
$A_i = (n \times n)$matrix of parameters and
U_t =Independently and identically distributed (IID) n dimensional vector with vector mean 0 and variance Ω, i. e, $\mathrm{U}_t \sim \mathrm{IN}\ (0,\Omega)$

Since an important issue in econometrics is the need to integrate short-run dynamics with long-run equilibria, the Error correction model (ECM) for VAR model can be derived and become:

$$\Delta X_t = \sum \Pi_i \Delta X_{t-i} + \gamma_t D_t + \Pi X_{t-p} + \mathcal{E}_t$$

Where $\Pi = -(I - \sum A_{i_j})$,
$\Pi_i = -(I - \sum A_j)$
and D = vector of dummies, intercepts and predetermined exogenous variables.

The number of co-integrating vectors can be obtained by checking the significance of the characteristic roots of Π . It is believed that the rank of a matrix (r) is equal to the number of its characteristic roots that differ from zero. Thus, if Π has a full rank (i.e., there are $r = n$ linearly independent columns), then all the variables in X_t are I (0). While if the rank of Π is zero, then there are no co-integration relationships. If there is reduced rank (that is, there are $r \leq (n - 1)$ co-integration vectors), it is possible to represent Π as $\alpha\beta'$ where β is $(n \times r)$ vector of long run parameters and α matrix represents speed of adjustment to disequilibrium [Harris, 1995].

The test for the number of characteristic roots that are significantly different from unity can be conducted using the following two test statistics where λ_i is the estimated values of the characteristic roots (also called eigen values) obtained from the estimated Π matrix and T = the number of usable observations

$$\lambda_{trace}\ (r) = -T \sum \text{In}\,(1 - \lambda_i)$$
$$\lambda_{max}(r, r+1) = -T\ \text{In}\ (1 - \lambda_{r+1})$$

Model Specification

To this study, the model adopted is based on Elbadawi et al's (1996) and Chowdhury (1994) model specification, with minor adjustment and theoretical justification.

Real GDP Model

The regression equation is specified as:

$$LRGDP = a_0 + a_1 LEDTGDP_t + a_2 LDSR_t + a_3 FDGDP_t + a_4 LPINVGDP_t + a_5 LTOT_t + a_6 LRER_t + a_7 LHCDSP_t + a_8 INFL_t + \text{U}_{1t}$$

Where $LGDPGR$ = Log Real GDP;$LEDTGDP_t$ = Log Stock of external debt to GDP ratio that captures the debt overhang effect ($\pm$); $LDSR_t$ = Log debt service as a ratio of export earnings which reflect the 'crowding out' effect ($-$); $FDGDP_t$=Fiscal deficit to GDP ratio($-$); $LPINVGDP_t$= Log Current real private investment as a ratio of GDP that captures the accelerator principle ($+$); $LTOT_t$ = Log Terms of trade (captures external shocks) at time t ($\pm$); $LHCDSP_t$ = Log Human capital development at time t, which is proxied by government spending on education($+$); $INFL_t$ =Rate of inflation, which is proxied by changes in consumer price index ($-$); $LRER_t$ = Log Movements in real exchange rate (reflects incredibility of policies) ($\pm$); U_{1t}israndom error term at time t. The sign under each bracket is the expected signs of the given variable.

When we see the effect of the debt overhang variable, total stock of *external debt to GDP ratio*, on real GDP, one can expect a both way relationship. First, the higher the level of indebtedness,

ceteris paribus, the more it indirectly depresses the level of GDP by encouraging capital flight due to tax increase expectations. However, if a significant portion of external borrowing is directed toward financing efficient investments in productive capital, positive correlation between the countries's GDP level and its external debt can be anticipated.

The effect of *inflation* is expected to be negative as it is a kind of tax that pays for the deficit by taking real purchasing power away from those who hold money and fixed claims on money (Beim, 2002). The impact of government fiscal deficit is expected to be negative if deficit crowds-out public saving and resource inflow encourages corruption and resource outflow.

Sawada (1994) and Rockerbie (1994) found that there is a statistically significant inverse relationship between debt burden and economic growth show that external debt obligations have a significant negative effect on real GDP.

The growth rate of investment of a country is obviously expected to have a positive impact on the growth of output. Because output is directly affected by the growth rate of investment. This is becouse aaccording to the accelerator principle, growth in investment facilitates faster output.

Real exchange rate is included in the output equation as a proxy for policy reform. Thus, on the one hand, devaluation of real exchange rate is expected to encourage exports and discourage imports, thus improve balance of payments, on the other hand, as domestic currency devalued the value of import increased and as the result cost of production (especially cost of imported input materials) will raise which affect output negatively.

In the output equation also we incorporate the effects of changes in the country's terms of trade (TOT). On the one hand, it is expected that an increase in TOT increase the level of income (improve balance of payments). On the other hand, TOT is expected to have a negative effect on income through the price effect. That means, when the price of import increase relative to exports through the price effect the demand for imports will fall. This affects the level of output negatively especially when the country depends highly on imported input in the production process.

Gungor (1997) notes that human capital which describes the knowledge and skills embodied in individuals are an important source of realGDP. Human capital accumulation (the acquisition of knowledge and skills that improves the ability of individuals to solve problems and to think critically) is believed to promote higher growth by improving labour force which will be more productive on the job by requiring less supervision and possessing greater initiative in handling job-related problems. In contrast to Elbadawi, *et al*. (1996) and Chowdhury (1994), this study assumes that the role of human capital development is more important in explaining growth than just population growth.

External debt accumulation Model

$$LEDTGDP = \gamma_0 + \gamma_1 LRGDP_t + \gamma_2 LDSR_t + \gamma_3 TDTGDP_t + \gamma_4 LPINVGDP_t + \gamma_5 FDTGDP_t + \gamma_6 LRER_t + \gamma_7 RINT_t + U_{2t}$$

Where$TDTGDP_t$= Trade balance (deficit) as proportion of GDP(+); $RINT_t$=Real interestrate; andU_{2t}israndom error term at time t.

Based on empirical literature on external debt, we propose the following relationships to hold true in our analysis, i.e., the expected signs of the coefficients for the External Debt model are as shown below:

$$\gamma_1 = (-)\,, \gamma_2 = (-),\ \gamma_3 = (+), \gamma_4 = \ (\pm), \gamma_5 = (+),\ \gamma_6 = (+)$$

Economic theory suggests that an increasing level of investment, ceteris paribus, would reduce external borrowing by providing more investible funds through the financial sector of the domestic economy, Samson (2002). By analogue, a decreasing level of investment would mean a country has to borrow more to complement low investment. However, increasing level of investment may also increase borrowing in a situation where a country becomes ambitious of growth prospects, hence more borrowing.

Private Investment Model

$$LPINVGDP\ = \beta_0 + \ \beta_1 LEDTGDP_t + \ \ \beta_2 LRGDP_t + \beta_3 LDSR_t + \beta_4 LTOT_t \ \ + \beta_5\, INFL_t + \beta_6 RINT_t + \beta_7 LRER_t + \ \mathrm{U}_{3t}$$

The expected signs of the coefficients for the private investment model are as shown below:

$$\beta_1 = (\pm),\ \beta_2 = (+),\quad \beta_3 = (-),\ \beta_5 = (\pm)\ , \beta_6 = (-)$$

Note that all variables but real interest rate, inflation rate, and trade balance are in natural logarism.

Real GDPis also included in the investment equation since it is expected to capture the "investment accelerator" effect (Iyoha, 2000). This is because higher income means higher saving which leads to higher investment. As a result, higher income is expected to accelerate investment level. Inflation may affect investment independently from its effect through the real interest rate. Theoretically, the effect of inflation on private investment is ambiguous. An uncertainty about future asset values could either discourage investment because of the substitution effect of the lower real rate of return or encourage investment for precautionary motives .The real rate of interest is included in the investment equation in light of Keynesian theory of investment. According to this theory, an increase in interest rate results in increase in the cost of borrowing, or more specifically the rental price of capital.

Results and Discussion

The test for Stationarity of variables

An augmented Dickey-Fuller (ADF) was carried out on the time-series levels and difference forms. The results are given in table B-1 in Table 1 and show; virtually all the variables but few have a unit root in their levels and are stationary in their first difference. Thus most variables are integrated of order one I (1) except RINT, LTOT, and INFL which is I (0).

Co-integration test and Error correction model

Results of Real GDP Model

Table C: Johansen's test for multiple cointegration vectors (for Real GDP model).

Cointegration test among [LRGDP, LEDTGDP, LDSR, LRER , FDTGDP ,LHCDSP and LPINVGDP]				
H0:	H1:	Tests statistics	95% Critical values	99% Critical values
λ trace		λ trace		
r=0	r ≥ 1	156.219*	124.24	133.57
r ≤1	r ≥ 2	100.326	94.15	103.18
r≤2	r ≥ 3	59.802	68.52	76.07
λ max value		λ max value		
r=0	r = 1	55.893*	45.28	51.57
r ≤1	r = 2	40.524	39.37	45.10
r≤2	r = 3	24.106	33.46	38.77

Note: Critical values obtained from Osterwald-Lenum (1992). *Rejection at 1% level of significance.

Diagnostic Test: Vector Portmanteau (5): 258.765, Vector AR 1-2 test: F (98, 53) = 1.3265 [0.1301], Vector Normality test: Chi^2(14) = 50.307 [0.0000] **, Vector hetero test: Chi^2(392) = 392.73 [0.4802]. The standardized β -coefficient matrices and the standardized α-coefficient matrices for Real GDP model is given in **Table 2**. In this case, the cointegrating vectors estimated by the Johansen's method provides the reduced form of long-run relationship. Since the variables in the model expressed below are specified in logarithmic form, except FDTGDP the coefficients indicate reduced form of long run elasticities. Hence, the reduced form long-run relationship for this model is expressed as follows:

$$\text{LRGDP} = -\mathbf{56.2}\text{LEDGDP} - \mathbf{65.1}\text{LDSR} + 3.79\text{LHCDS} - \mathbf{2.1}\ \text{RER} + \mathbf{78.88}\text{PINVGDP} + \mathbf{0.147}\ \text{FDGDP}$$

But, the reduced form of long run relationship may not coincide with the structural relationship. Therefore, to obtain economically valid structural relationship, we have to impose and test zero restrictions on the standardized α and β coefficients which enable us to modify the cointegrating relationship with respect to its results (Harris 1995).

A test of weak exogenity on each of the explanatory variables entering to the long run equations is carried out. This is done by imposing a zero restriction on α coefficient to determine whether the explanatory variables in the model are weakly exogenous or endogenous, by using the likelihood ratio tests (LR) statistics that has X^2 distribution with one degree of freedom. In this case, the null hypothesis states that the variables taken as explanatory variable are weakly exogenous against the alternative of endogenous.

The test for zero restriction of α-coefficient in **table 3** shows that most variables are weakly exogenous to Real GDP models. In this case, the importance of testing weak exogenity is that, if all the variables in the cointegrating vectors are not weakly exogenous, then it is not valid to move to a single equation approach when estimating the short run model. However, private investment and fiscal deficit as a ratio of GDP are found to be endogenous to Real GDP model.

The long run coefficients of the variables should also be tested for "significance'' to determine which variables are uniquely constituting the cointegrating vectors. Again, a zero restriction is imposed on each coefficients and the result for LR test statistics is summarized in table below.

Table D: Real GDP Model

	LEDGDP	LDSR	LHCDSP	LRER	LPINVGDP	FDGDP
β-coefficient	56. 197	6. 5914	-3.7804	2.1005	-78. 874	-0.1470
LR-test: $\mathbf{X^2}(\approx \mathbf{1})$	6.148	0.00044	0.11839	12.221	14.952	7.2982
P-Value	0.0132 *	0.9831	0.7308	0.0005**	0.0001**	0.0069**

** and * Rejection at 1% and 5% level of significance.

The issue of weak exogenity of the explanatory variables is important in estimating the Error Correction model. If all the dependent variables are exogenous, we can directly estimate with the single equation otherwise, if one of the independent variable is endogenous, Engle- Granger causality test must be undertaken in order to check whether the independent variables really granger causes the dependent variable. For Real GDP equation, private investment and fiscal deficit (both as a ratio of GDP) are found to be endogenous to the Real GDP equation. However, when Engle-Granger test is undertaken, it is concluded that these variables can be taken as weakly exogenous (see table 7 at the end). Once a case of one co-integrating vector is supported and all the variables are weakly exogenous, the short run dynamics is estimated using the general to specific modeling approach based on Ordinary Least Square (OLS) techniques.

Table D: Results of the Parsimonious-dynamic VECM for Real GDP Model

Modeling DLRGDP by OLS (using data.xls)			
Variables	Coefficients	t-prob.	
DLRGDP_1	0.4295	0.046	AR 1-2 test: F(2,12) = 1.1335 [0.3541]
DLEDGDP	-0.0983	0.027	ARCH 1-1 test: F(1,12) = 0.0068451 [0.9354]
VLRGDP_1	-1.2323	0.003	Normality test: Chi^2(2) = 1.3776 [0.5022]
R^2 = 0.816393 F(20,13) = 3.458 [0.011]* DW = 2.03			RESET test: F(1,13) = 4.4655 [0.0545]

The results reveal that external debt to GDP ratio have significant negative impacts on Real GDP at 5% significance level. The long run and short run elasticity from the coefficients LEDTGDP suggests that a 1 percent increase of the LEDTGDP yield 56 % and 0.09% decrease in LRGDP respectively. This implies that current debt flows deter economic growth. The results offer a confirmation of the debt overhang hypothesis for Ethiopia in the long run and short run though the magnitude of the coefficients is quite small in the VECM result. The debt overhang variable, proxied by the ratio of external debt to GNP, is negative and highly significant.

Moreover, the researcher has not found a statistically significant negative relationship between total debt services ratio and growth of real GDP, though this variable always bears the expected sign, implying that there is no crowding out effect as a result of servicing a relatively large amount of external debt to different creditors. The results also indicate that Private investment and fiscal deficits as a ratio of GDP have exerted significant positive impacts on the Real GDP at 1% significance level.

Several diagnostic tests are conducted to check for the validity of the assumption of the regression model. At the 5 percent significant level, these tests do not reject the null hypotheses of normality (Nor), no serial autocorrelation, no ARCH effects, and no heteroscedasticity and the

RESET test of functional form did not detect any statistical problems. The coefficient of the vector error correction term is significant at 5% with expected sign and reasonable magnitude [VLRGDP_1= -1.23]. The large sizes of coefficient of error correction figures indicate that the speed of adjustment is rather fast for the equation to return to their equilibrium level once it has been shocked. Thus, it takes quite less a year to adjust fully.

Results of External Debt Accumulation equation.

Looking both at the maximum eigen value and the trace statistics show that there is a one cointegrating relationship.

Table E: Johansen's test for multiple cointegration vectors (for external debt model).

Cointegration test among [LEDTGDP , LRGDP, LDSR, LRER , FDTGDP , LPINVGDP ,TDTGDP]				
H0:	H1:	Tests statistics	95% Critical values	99% Critical values
λ trace		λ trace		
r=0	r ≥ 1	170.385*	124.24	133.57
r ≤1	r ≥ 2	110.823	94.15	111.01
r≤2	r ≥ 3	69.441	68.52	76.07
λ max value		λ max value		
r=0	r = 1	59.562*	45.28	51.57
r ≤1	r = 2	41.382	39.37	45.10
r≤2	r = 3	24.563	33.46	38.77

*Rejection at 1% level of significance.

Diagnostic Test: Vector Portmanteau (5): 239.187, Vector AR 1-2 test: F (98, 53) = 1.3978 [0.0910], Vector Normality test: Chi^2(14) = 61.398 [0.0000] **, Vector hetero test: Chi^2(392) = 419.74 [0.1606]. The standardized β -coefficient matrices and the standardized α-coefficient matrices for External debt model is given in **Table 5**. Hence, the reduced form long-run relationship for this model is expressed as follows:

$$\text{LEDGDP}=0.08\text{LRGDP}-\mathbf{0.82}\ \text{LPINVGDP}+\mathbf{54.83}\ \text{LRER}+\mathbf{0.013}\text{LDSR}+\mathbf{2.6}\text{TDTGDP}+0.006\ \text{FDGDP}$$

For this particular analysis, a test for weak exogenity is conducted by imposing a zero restriction on the α-coefficient using LR-test. The results are indicated in **table 6**. The result shows that private investment is endogenous to External Debt model.

The significance of these long run coefficients should be tested to determine which variables uniquely constitute the co-integrating vector. Accordingly, again a zero-restriction is imposed on each β- coefficient and the result for the LR-statistics is given below in table F.

Table F: External Debt Model

	LRGDP	LPINVTGDP	LRER	LDSR	TDTGDP	FDTGDP

β-coefficient	-0.082	0.821	-5. 483	-0.0125	-2.6577	-0.0059
LR-test: $\mathbf{X^2}(\approx \mathbf{1})$	0.854	16.508	11.482	0.26113	16.508	3.7941
P-Value	0.355	0.0000**	0.0007 **	0.6093	0.0000 **	0.0514

**Rejection at 1% level of significance.

Private investment as a ratio of GDP is endogenous to this model. However when Granger causality test is under taken, the result is that Granger causality test for private investment as a ratio of GDP to external debt fails to reject the null hypothesis that private investment as a ratio of GDP doesn't granger cause external debt (see also table 7). The VECM results are summarized in Table G.

Table G: Results of the Parsimonious-dynamic VECM for External Debt Accumulation

Modeling DLEDGDP by OLS (using data.xls)			
Variables	**Coefficients**	**t-prob.**	**AR 1-2 test: F(2,14) = 0.86767 [0.4413]**
Constant	**0.2206**	**0.089**	**ARCH 1-1 test: F(1,14) = 0.13009 [0.7237]**
DLRGDP_1	**-2.43548**	**0.025**	**Normality test: Chi^2(2) = 12.250 [0.0022]******
DLRER	**0.894219**	**0.095**	**RESET test: F(1,15) = 0.16803 [0.6877]**
DLPINVGDP	**0.379491**	**0.073**	
DLPINVGDP_1	**0.3585**	**0.068**	
VLEDGDP_1	**-0.213556**	**0.0058**	
R^2 =	0.606363		
F(16,16) =	1.54 [0.004]*		
DW =	2.19		

Various model diagnostic tests showed that the model is well specified except the residual which fails to pass the normality assumption with no omitted variables (Ramsey RESET test) as performed. The error correction term lagged once (VLEDGDP_1), which is the short-run adjustment, has the expected sign and significant at 5%.

Results of Private Investment model

Both λ max and λ trace tests in table H shows that it is possible to reject the null for no co-integration at 99% Critical values.

Table H: Johansen's test for multiple cointegration vectors (for private investment model).

Cointegration test among [LPINVGDP, LRGDP, LEDTGDP, LDSR, LRER]				
H0:	H1:	Tests statistics	95% Critical values	99% Critical values
λ trace		λ trace		
r=0	r ≥ 1	100.272*	68.52	76.07
r ≤1	r ≥ 2	53.43	47.21	54.46
r≤2	r ≥ 3	27.697	29.68	35.65
λ max value		λ max value		

r=0	r = 1	46.842*	33.46	38.77
r ≤1	r = 2	25.733	27.07	32.24
r≤2	r = 3	17.023	20.97	25.52

*Rejection at 1% level of significance.

Diagnostic Test: Vector Portmanteau (5): 135.836, Vector AR 1-2 test: F (50, 71) = 1.3533 [0.1196], Vector Normality test: Chi^2(10) = 61.978 [0.0000] **, Vector hetero test: F (150, 51) = 0.54382 [0.9975], Vector hetero-X test: Chi^2(300) = 285.63 [0.7154].

The standardized β -coefficient matrices and the standardized α-coefficient matrices for this model is given in **table 6**. The tests for zero restriction on α-coefficient do not reject the null that all the variables are weakly exogenous. Therefore, the single equation model with estimates of long run coefficients can be written as:

LPINVGDP= 0.05 LRGDP $-\mathbf{1.84}$ LRER $-\mathbf{0.92}$ LDSR$-\mathbf{0.25}$ LEDTGDP

Similarly, a zero-restriction is imposed on each long run parameters to test their significance using LR-test. The result of this test is given in table I below:

Table I: Private Investment Model

	LRGDP	LRER	LDSR	LEDTGDP
β-coefficient	-0.0498	1.8371	0.9186	0.2484
LR-test: $\mathbf{X^2}(\approx \mathbf{1})$	9.2274	9.4547	0.20336	3.8293
P-Value	0.0024 **	0.0021 **	0.6520	0.0504

**Rejection at 1% level of significance.

For private investment model since it is evidenced that the variables are weakly exogenous and the existence of one cointegrating vector is supported, the short run dynamics is estimated using the usual OLS method of estimation.

Table J: Results of the Parsimonious-dynamic VECM for Private investment model

Modeling DLPINVGDP by OLS (using data.xls)			
Variables	Coefficients	t-prob.	
Constant	2.1292	0.456	AR 1-2 test: F(2,14) = 0.72210 [0.5030]
DLPINVGDP_1	0.3959	0.048	ARCH 1-1 test: F(1,14) = 2.1818 [0.1618]
INFL_1	0.0273	0.054	Normality test: Chi^2(2) = 4.4949 [0.1057]
VLPINVGDP_1	-0.8112	0.033	RESET test: F(1,15) = 0.752280.3994]
R^2 = 0.832784			
F(16,16) = 4.98 [0.001]**			
DW = 1.78			

In the long run, growth rate of output has positive impact on the growth of investment and statistically significant at 1%. This indicates that the higher the growth of output the more the growth of private investment.

The growth of debt overhang variable (LEDTGDP) is insignificant at 1% level of significance though it holds the expected negative sign. This clearly indicates that in Ethiopian case external debt does not discourage growth rate in private investment. This result contradicts with many studies, specifically the study by Iyoha, (2000), which concluded that in Sub-Saharan African countries the debt overhang variables (LEDTGDP), is highly significant and its sign is negative. Movements in real exchange rate in the long run (LRER) have negative and significant effect on private investment. A 1% increase in real exchange rate appears to decrease private investment by about 1.84 %.This is not surprising as the bulk of the capital assets as well as the intermediate inputs are imported. The implication therefore is that, devaluation of the exchange rate that increases the cost of imported capital assets and intermediate inputs will hence affect the level of private investment through the resultant decline in the demand for both imported capital and intermediate inputs.

Growth rate of total debt service ratio (LDSR) is statistically insignificant though its sign is negative, which suggests that there is no evidence of the crowding out effect of debt service payment on investment. This is in line with Ajayi (1997) suggestion that this variable can be positive or negative while negative coefficient signifies a crowding out effect and the study by Dawit and Yemisirach (2001). The coefficient of the error correction term has the correct sign (negative) and is statistically significant at 5 percent. Meaning, not only that the ECM is valid but also that there is a significant conservative force tendency to bring the model back into equilibrium whenever it strays too far. The model reports a speed of adjustment of around 81.1%, which is relatively high. All deviations from the steady state (equilibrium) will be corrected less than one year and three month.

Conclusions and Policy Implication

Conclusions

The estimation results from both the long run and the Error Correction Model (ECM) reveal that:

- In view of the long run model and the error correction formulation, the estimation results showed a debt overhang problem in the Real GDP but not in the investment equation, which is again evidence of debt overhang hypothesis for Ethiopia, verifying the fact that the country is on the wrong side of the debt Laffer curve. Thus, debt appears to affect output via its effect on the efficiency of resource use, rather than through its depressing effect on private investment .These results support the cases for more debt relief to Ethiopia.

- A rise in real exchange rate and low level of private investment (as a proportion of GDP) have been found to be vital (significant) factors influencing the growth rate (accumulation) of External Debt in Ethiopia in the long run and short run and but trade deficit (as a proportion of GDP) affects in the long run .

- There is no ‘crowding out’ effect on Real GDP and Private investment as a result of debt servicing as debt servicing does not appear to have a direct significant negative impact on Real GDP and Private investment in both the long run and short run. This is surprising

as such, since debt service ratios for Ethiopia are relatively higher compared to other low income highly indebted poor countries. This is probably because external debt servicing in the Ethiopians is not high enough for crowding out to occur Therefore, debt servicing is not yet a threat in output growth and private investment and thus, the Ethiopians should not fear of experiencing crowding out effect in the near future.

Policy Implication

A cautious macroeconomic policy that will not unnecessarily appreciate exchange rate should be adopted. Exchange rate Stabilization policy ought to be put in place as a mechanism to remedy the adverse effect of exchange rate appreciation on private investment and external debt. The introduction of such an exchange rate stabilization policy also will help in maintaining the prices of imported capital as well as intermediate inputs in local currency terms.

Moreover, policies to reduce debt accumulation or stabilize debt to GDP ratio for sustainability should focus on reducing trade deficit by increasing exports and reducing imports. This is because trade deficit has more impact on debt to GDP ratio next to real exchange rate, while low level of private investment has the least effect; at least in this econometric analysis.

Indeed, strengthening the need to pay off indebtedness since servicing of External debt has been found to have no crowding out effect on Real GDP and Private investment. Paying off present debt to the extent that it does not affect output and investment is important due to the fact that individuals interested to invest may develop some sort of confidence that their return will not be taken away in the form of tax. Besides, on account of the result of the Cointegration analysis, external debt contributes negatively and significantly to real GDP in Ethiopia. In the same vein, private investment which has a positive accelerator effect to output is also shown to be a very significant factor for reducing the size of external debt. Thus the government in general and the Ethiopian investment Agency in particular need to articulate creative strategies for bringing about investment friendly environment, for dual purpose of achieving higher output and reducing the adverse effect that external debt has in the performance of the home economy. Ethiopia still has a chance of overcoming her external debt problems by cultivating the right policies and, through the debt relief/reduction support.

References

1. Befekadu Degefe (1992), "Growth and Foreign Debt: The Ethiopian Experience: 1964-1986," African Economic Research Consortium Research Papers, No 13, English press Limited, Kenya.
2. Chowdhury AR (2001). External debt and growth in developing countries: a sensitivity and causal analysis. World Institute for Dev. Econ. Res. (WIDER), 2001/95.
3. Siddiqui R and Malik A (2001). Debt and economic growth in South Asia.Pak. Dev. Rev., 40(4): 677-688.
4. Lin SL, Sosin K (2001). Foreign debt and economic growth. Econ.Trans., 9(3): 635-655.

5. IMF (2004) "Debt relief under the Heavily Indebted Poor Countries (HIPC) Initiative." A fact sheet. April. Washington, D. C: International Monetary Fund.
6. Lora, E & Olivera, M (2007): Public Debt & Social Expenditure; Friends or Foes? Emerging Market Review, 8: 299-310.
7. Alemayehu Geda, (1997): The Historical Origin of African Debt and Financial Crisis, ISS Working Paper, 62, The Hague.
8. Anoruo, E Dimkpah, Y and Ahmad, Y (2006): Dynamics of External Debts among HIPC Countries, Journal of International Business Research; 5 (1): 41-52; ABI/INFORM Global.

9. Maureen Were (2001): A paper to be presented at the Wider Development Conference on Debt Relief, 17-18 August, Helsinki

10. Dawit Walelegne and Yemisirach Asefa, (2001), The Impact of Foreign Financing on Economic Performance in Ethiopia, Paper Presented for the 11th Annual Conference on the Ethiopian Economy at Rift Valley Hotel, Adama, Ethiopia.
11. Harris Richard (1995) Cointegration analysis in Econometric modeling, Prentice Hall, 1995.
12. Elbadawi, A. I., et al., (1996), "Debt overhang and economic growth in Sub-Saharan Africa". A paper presented to the IMF/World Bank conference on External Financing for Low Income Countries in December.
13. Chowdhury AR (1994). “Structural Analysis of External Debt and Economic Growth: Some Evidence from Selected Countries in Asia and Pacific.” Applied Economics, Vol. 26.
14. Beim DO (2002). Japan’s internal debt. Center on Japanese Economy and Business Working Paper, 208.169-210.
15. Sawada, Y. (1994) Are the heavily indebted countries solvent? Tests of inter temporal borrowing constraints, Journal of Development Economics, 45, pp. 325-337.
16. Rockerbie, D.W. (1994): did debt crisis cause the investment crisis? Further evidence, Applied Economics, 26, pp. 731-738.
17. Gungor, N.D. (1997): “Education and Economic Growth in Turkey 1980-1990 . A Panel Study,” Metu Studiesin Development, 24(2),185-214.
18. Sawada, Y. (1994) Are the heavily indebted countries solvent? Tests of inter temporal borrowing constraints, Journal of Development Economics, 45, pp. 325-337.
19. Iyoha, M. A. (2000), "An Econometric Analysis of External Debt and Economic Growth on Sub-Saharan African countries," IMF publication.
20. Osterwald-Lenum, M. (1992). “A Note with Quantiles of the Asymptotic Distribution of the Maximum Likelihood Cointegration Rank Test Statistics”, Oxford Bulletin of Economics and Statistics, vol. 54, pp. 461-471.
21. Osterwald-Lenum, M. (1992). “A Note with Quantiles of the Asymptotic Distribution of the Maximum Likelihood Cointegration Rank Test Statistics”, Oxford Bulletin of Economics and Statistics, vol. 54, pp. 461-471.

Tables

Table 1: Test of the unit root hypothesis

Variable	Augmented Dickey-Fuller Test					
	Level			**First Difference**		
	Test statistics	**Critical value**		**Test statistics**	**Critical value**	
		5%	**1%**		**5%**	**1%**
LRGDP	**-0.148**	**-2.95**	**-3.635**	**-6.356****	**-2.953**	**-3.642**
LEDTGDP	**-2.011**	**-2.95**	**-3.635**	**-3.047***	**-2.953**	**-3.642**
LDSR	**-2.423**	**-2.95**	**-3.635**	**-5.052****	**-2.953**	**-3.642**
LPINVTGDP	**-2.625**	**-2.95**	**-3.635**	**-6.104****	**-2.953**	**-3.642**
FDTGDP	**-2.592**	**-2.95**	**-3.635**	**-6.708****	**-2.953**	**-3.642**
TDTGDP	**0.03412**	**-2.95**	**-3.635**	**-6.376****	**-2.953**	**-3.642**
LHCDSP	**0.1935**	**-2.95**	**-3.635**	**-3.773****	**-2.953**	**-3.642**
RINT	**-3.255***	**-2.95**	**-3.635**	**-6.401****	**-2.953**	**-3.642**
LRER	**-1.515**	**-2.95**	**-3.635**	**-3.055***	**-2.953**	**-3.642**
LTOT	**-3.423****	**-2.95**	**-3.635**	**-8.511****	**-2.953**	**-3.642**
INFL	**-3.769****	**-2.95**	**-3.635**	**-7.206****	**-2.953**	**-3.642**

*: The reported critical values are obtained from PC-Give 8 version and correspond to 34 observations. For calculated (Test statistics) values of levels and first difference intercept and trend are included in the ADF equations. ** and * denotes rejection at 1% and 5% level of significance respectively.

Table 2: Results of Co-integration analysis (Give Win Results): Real GDP Model

(a) Standardized β Eigenvectors

(b) Standardized α coefficients

LRGDP	-0.0247	-0.0094	-0.0017	-0.0126	-0.0156	0.00006	0.0560
LEDGDP	-0.1658	0.0055	-0.0075	-0.0621	0.1258	0.0077	-1.8023
LDSR	-0.5202	-0.0221	-0.0110	-0.19135	0.5356	-0.0064	0.9225
LHCDSP	-0.0150	-0.0071	0.0043	-0.0650	-0.0416	-0.00078	-0.5968
LRER	0.1572	0.0100	-0.0133	-0.0799	-0.0489	-0.0008	-0.3193
LPINVGDP	1.3628	-0.0199	0.0145	0.0133	0.1816	0.0073	-0.0486
FDGDP	-0.0044	0.00005	-0.0004	0.0137	0.0014	-0.0006	-0.0401

Table 3: Results of Co-integration analysis (Give Win Results): External Debt Accumulation Model

(a) Standardized β Eigenvectors

LEDGDP	**LRGDP**	**LPINVGDP**	**LRER**	**LDSR**	**TDTGDP**	**FDGDP**
1.0000	-0.0826	0.8218	-54.833	-0.0125	-2.6577	-0.0059
2.9880	1.0000	-21.658	64.263	-2.5487	-2.5810	-0.1863
-4.5503	-0.1038	1.0000	38.695	-0.0183	0.2739	0.0182
-2.5919	-0.1349	-2.2642	1.0000	-0.4070	-8.8413	-0.0204
-0.13791	0.0659	0.7089	14.671	1.0000	0.2645	-0.0156
-2.4554	2.2484	-66.780	2.3196	-9.4719	1.0000	-0.0368
-16.717	-1.3490	-62.166	923.74	11.304	-84.856	1.0000

(b) Standardized α coefficients

LEDGDP	-0.0372	0.2799	0.0178	0.0007	-0.0297	-0.0283	-1.3355
LRGDP	0.0043	-0.5175	0.0016	0.0001	-0.0155	0.0026	-0.0354

LPINVGDP	0.2623	-0.6915	-0.0108	-0.0020	-0.0007	-0.0340	0.0094
LRER	0.0199	0.6258	0.0280	0.0017	-0.0270	0.0051	-0.2135
LDSR	-0.0894	-0.5567	-0.0226	0.0005	-0.3921	-0.0423	0.9778
TDTGDP	0.0003	-0.0062	0.0055	-0.0002	0.0055	-0.0020	0.0611
FDGDP	-0.0018	0.0532	-0.0004	-0.0002	-0.0050	0.0015	-0.0286

Table 4: Lag length determination

Model	*Lag-Length*	FPE	AIC	SC	HQ
1	0	3.23e-14	-5.52	-5.12	-5.38
2	1	6.78e-18*	-14.14*	-10.14*	-12.75*

† :FPE: Final prediction error, AIC: Akaike information criterion, SC: Schwarz information criterion, HQ: Hannan-Quinn information criterion.

Table 5: Results of Co-integration analysis (Give Win Results): Results of Private Investment model

(a) Standardized β Eigenvectors

(b) Standardized α coefficients

LPINVGDP	-1.1649	0.18623	-0.0138	-0.0261	-0.0024
LRGDP	-0.0093	-0.0820	0.0065	0.0034	-0.0024
LRER	-0.0502	0.18791	0.0280	0.0065	-0.0051
LDSR	0.3057	-0.3288	0.0879	-0.0464	0.0315
LEDTGDP	0.1368	0.1013	0.0186	-0.0272	-0.0232

Table 6: Test for Zero restriction on α-coefficient

Real GDP Model

	LEDGDP	LDSR	LHCDSP	LRER	LPINVGDP	FDGDP
α –coefficient	-0.1658	-0.5202	-0.0150	0.1572	1.3628	-0.0044
LR-test: $\mathbf{X^2}(\approx \mathbf{1})$	0.51474	1.1221	0.021304	0.99792	11.594	11.594
P-Value	0.4731	0.2895	0.8840	0.3178	0.0007**	0.0007**

‡: **Denotes rejection at 5 % significance level

External Debt Model

	LRGDP	LPINVGDP	LRER	LDSR	TDTGDP	FDGDP
α-coefficient	0.0043	0.2623	0.0199	-0.0894	0.0003	-0.0018
LR-test: $\mathbf{X^2}(\approx \mathbf{1})$	0.12126	15.593	0.49305	1.0161	0.0050	0.39726
P-Value	0.7277	0.0001**	0.4826	0.3134	0.9433	0.5285

Private Investment Model

	LRGDP	LRER	LDSR	LEDTGDP
α –coefficient	-0.0093	-0.0502	0.3057	0.1368
LR-test: $\mathbf{X^2}(\approx \mathbf{1})$	0.038350	0.15674	0.58419	0.54614
P-Value	0.8447	0.6922	0.4447	0.4599

Table 7: Pair wise Granger-Causality Test (Lags: 1)

Real GDP Model

Private Investment Model

External Debt Model

Null hypothesis	Obs	F statistic	Prob.
LPINVGDP does not Granger Cause LEDGDP	36	0.22566	0.6379
LEDGDP does not Granger Cause LPINVGDP		6.57949	0.0150

Factors Influence the Use of Digital Legacy

Shui-Lien Chen[1], Jim Shih-Chiao Chin[2], Yu-Pei Cheng[3], Bing-Jhe Li[4]
Department of Management Sciences, Tamkang University, Taiwan[1,3,4]
Department of Hospitality Management, Taoyuan Innovation Institute of Technology[2]
slchen@mail.tku.edu.tw[1]
chin@tiit.edu.tw[2]
135938@mail.tku.edu.tw[3]
luck0314@yahoo.com.tw[4]
*Corresponding Author: luck0314@yahoo.com.tw

Abstract

The digital legacy concept has recently gained considerable attention and international discussion and assets have gradually begun to be stored digitally, replacing traditional storage. The value and risk of digital legacy has become a crucial topic of study, and charged or noncharged digital legacy management services have operated for several years. This study discussed perceived value, involvement, perceived risk, privacy concern, attitude strength, and purchase intention of the digital legacy management service in Taiwan. Common online users in Taiwan were chosen as the research setting and data were collected online and from the streets. This study received 450 responses, including 60 invalid responses and 390 usable responses. AMOS 17.0 was used as a tool to analyze the research hypotheses using structural equation modeling (SEM). The hypotheses were all supported as follows. First, involvement(INV) had a significant and positive effect on attitude strength(AS); second, emotional value(EMV) had a significant and positive effect on attitude strength(AS); third, epistemic value(EPV) had a significant and positive effect on attitude strength(AS); fourth, financial risk(FR) had a negative effect on overall attitude strength(AS); fifth, physical risk(PSR) had a negative effect on overall attitude strength(AS); sixth, attitude strength(AS) had a positive effect on purchase intention(PI); seventh, subjective norm(SN) had a substantial effect in this research model. Finally, this study offers several managerial and theoretical implications for recreation farm managers and discusses further research aspects for future academics. Previous studies have only defined digital legacy and shown its relevance to daily life. How people's perceived value, risk, and privacy concern determine the need for a digital legacy management service and people's concerns regarding a digital legacy management service are topics worthy of study.

Key word: Perceived value, Perceived risk, Digital legacy, Privacy concern, Attitude strength

Knowledge economy vs. traditional economy & its impact on economic development

Associate Prof. Alotaibi Mohamed Meteb

Al-imam Muhammad Ibn Saud Islamic University

College of Economic and Administrative Sciences- department of Economic

E-mail address: drmotaibi14@gmail.com

Abstract

The research paper handles the knowledge-based economy's concept and its aspects which distinguish it from the traditional economy. The paper focuses mainly on the most important

essential changes in the work of the new economy's mechanism and its momentum. The paper aims to analyze and measure the economic value of information as a source of the world economy after transformation from the industrial revolution to the information revolution. In addition, the paper shows certain measuring indicators of the information. The unique characteristics distinguishing information are represented in the economic value increase of its components as a result of long series of its treatment processes. The measuring analysis process is conducted through treating information based on cost and value. It is necessary as well to handle the reversal relation between them according to an economic viewpoint. The paper has adopted a descriptive analytical technique and the revenue-cost technique to analyze the information economic value. The paper is divided into six parts and finally it draws some recommendations.

Key-words: economic value- knowledge-based – traditional economy- cost and benefit .

Introduction: Information occupies a distinguished position in the world economy after the economic ideas focused on natural resources and traditional productive engine of the world economy. The economic development revolves around them, especially after the emergence of the industrial revolution. The rapid technological advancement and the emergence of information and communication technologies that led to diminish time and distance (the gap of time and space) among the world's various continents and countries. Therefore, the growth and development of the information importance is sustained under a fully transparent economy. This adds an new economic resource to the traditional resources, i.e. information (Hany Attia Mohi-Eldin,2008).

Peter F. Drucker has used the term knowledge economy and knowledge society in chapter 12 of its book entitled "The Age of Discontinuity" Various terms are often used to ascertain different aspects of the knowledge economy such as information economy society, the digital economy, the new economy network, knowledge economy and information revolution. The United Nations estimates that the knowledge economies account for about 7% of world GDP and growing at 10% annually. It should be noted that 50% of productivity growth in the European Union is considered as a direct result of the use and production of information and communication technology (The World Bank, 2005). The human community development track is always related to the human knowledge development. Over the whole history of humanity, each community has enjoyed a certain level of knowledge and science. Therefore, the development stages of those communities were comprehensively a reflection of knowledge

development. Therefore, the knowledge concept is not something new, but generally the new thing about is the size of its impact on current economic, social and cultural rights, and on the modern man's lifestyle. The world had witnessed during the last quarter of the twentieth century, the greatest change in human history. That is, the third transformation after the emergence of agriculture and industry. This transformation is embodied in the highly developed revolution of science and technology. Nowadays constitute the peak of the information and communication technology revolution. Information and knowledge have become an essential resource of the economic resources. They have rather become the new strategic resource in the economic life which supplements the natural resources and the emergence of what is called as the "knowledge economy". Thus, science and knowledge have currently become the key elements (factors) of production in society. The current age is known as post-industrial era, where the production of knowledge, investment, consumption and circulation are considered as the main sources of growth and sustainable development. Today, the real wealth of nations dwells mainly in their people's minds followed by the material wealth dwells inside the earth or on its surface. The main feature of this knowledge-based economy is that the practical applications are based on the theory in contrary to the previous stage in which theory precedes application. Today, the scientific researches have become continuously successive like gold mines in inventions, discoveries and new scientific fields. However, they are inexhaustible, and its profitability and investment feasibility have become a undoubted issue (Jeremy Rifkin, 2003).

The paper is based on the main characteristics that distinguish the knowledge-based economy from the traditional economy. It handles the transformation of the work of the new economy mechanism and its momentum. It refers to certain measuring indicators of the information society. It attempts to measure the information economic value through its implementation as one of the capital terms according to the economic concept. Since it is considered as an economic resource on the one hand which tangibly or intangibly leads to revenue. On the other hand, it is considered as a cost spent to obtain economic resources such as having an industrial environment or a commodity to be used in economic activities. However the measurement process, in terms of cost, leads to the measurement of the so-called cost of acquisition and possession of economic resources for information and then to the measurement of information accumulation. The study has adopted the descriptive analytical technique and the cost-revenue technique to analyze and measure the information economic value.

The paper is divided into six parts. The first part deals with the resources of the new economy, while the second part handles the main driving forces in light of the knowledge economy. The third part identifies the main characteristics of the knowledge economy compared to the traditional economy. The fourth part deals with the analysis and attempt to measure the information economic value. The fifth part refers to some measuring indicators of the information society. Finally, the sixth part presents the most important models proposed to measure the information value. Finally, the paper draws some suggestions.

First: New Economy Resources: each economic system has got its own distinguished resources on which it is based according to its mechanisms and laws. The content of information society is based on triple aspects: data, information and knowledge rules (Zaid bin Mohamed Al-Ramany, 2008). At the beginning, it is remarkable that the modern information resources should be handled according to a pure information viewpoint prior to the analysis of its content under the contemporary information system. Data are formats mentioned in the English dictionaries or they are verified things act as a basis of measuring, calculation or induction processes (Nassen T R. 2001). They are multi-format information that could be handled or sent by digital tools and technologies. It is seems clear that the data concept means that they are the raw and primary resource for information environment. They are the direct inputs that feed the knowledge system with numbers or symbolic features which do not refer apparently to an exact concept. They lack treatment provided by the mathematical or statistical models which clarify the entwined relation among their components. Treatment classifies data, puts them in a knowledgeable course and establishes the dwelt relations between them and other data or previous information. Thus, a new concept or meaning is revealed which the user could consume in his daily activity. Information is a unit or group of data which goes through a series or stage of information treatment stages to induce meanings in a form of mathematical format or text. It provides the user a chance use such information in forming a new conception or paving the way for treating other forthcoming data.

Second: the main driving forces in light of the knowledge economy: There is a range of key driving forces that led to change the rules of trade and competitiveness in a knowledge economy. Globalization, where markets have become Globalized. Markets and products have become more global. Besides the growing revolution of Information / Knowledge Intensity - efficient production relies on information and; over 70 per cent of workers in developed economies are information workers; many factory workers use their heads more than their hands. In addition, the spread of Computer networking that bring information "ever nearer".

Computer networks and the internet help make the world as one village. As a result, the need to develop goods and services increase constantly, and become bought and sold through electronic networks. A matter which requires knowledge of the new technology applications which is necessary to meet economic demand (Jean-Eric Aubert and Reiffers, Jean-Louis, 2003). These forces have contributed to the expansion of international production through the liberalization of policies and eliminate borders between countries. This gives room to all kinds of foreign direct investments and the various arrangements of capitalism. The rapid technological change and lower costs of transport and communications have facilitated the economical integration between geographically dispersed parts and transportation of products across the world in search of efficiency. Finally, the increased competition has forced companies to discover new ways to increase efficiency, including the use of new markets and the relocation of certain production activities to reduce costs.

Third: Knowledge economy features versus traditional economy: If the economy means traditionally the science of rarity; resources rarity versus multiple and unlimited needs, the knowledge economy in light of digital technology is an economy of abundance. This is attributed to the fact that knowledge cannot be consumed or exhausted. However, it is self-breed consumption, through the transfer to other knowledge. Thanks to digital technology, the marginal cost of any subsequent version of the initial version, which are often very expensive to diminish gradually become closer to zero. This is what creates abundance in production so that the principle of abundance is the most striking feature of the knowledge economy. The knowledge economy can be defined as an economy in which knowledge production, distribution and use, constitute the main engine of the process of sustainable growth, wealth creation and employment opportunities in all areas. Knowledge constitutes a major source of the wealth of sophisticated and well-being of society. One of the main characteristics of the knowledge economy is the continued and increased expansion of employment in science and technology in all fields of economy. In addition to its effective role as a critical factor in the production process, its great impact on experiences, learning ability, organization and innovation in the economic system. Knowledge has replaced capital and became the main source of growth. It enhances the competitive advantage of companies within the economic system. The following are the main features of the knowledge economy compared to the traditional economy:

- the concept of value according to the knowledge economy: the traditional economy based on the binary value of use and the commodity exchange value. The knowledge economy

adds two new values. The first value one represents the information and knowledge value whenever it is possible to measure the information quantity and estimate its revenue. In such a case, knowledge has become a main factor of the production factors and a mere additional factor to increase its efficiency as it was under the traditional economy. The second one is the symbolic value, such as the value of science and the values of civilization and national identity. In contrast to the value of material assets such as land, real estate and movables which are relatively stable, and retain a fundamental portion of its value even whenever it is not exploited (land value usually increases over time). The knowledge assets lose their value if not used, as they can lose their value promptly whenever more advanced and sophisticated knowledge technology emerge. The acceleration of knowledge production, and obsolescence and the erosion of its value force the investor to seek and achieve the maximum return within the possible shortest time. This is attributed to the fear of the emergence of competing product based on more advanced knowledge that may underestimate the value of his product. Therefore, the knowledge-based commodity producers firstly exaggerate the prices of their commodities in an inappropriate way to their production cost such as prices of computers and mobile phones or digital cameras when they are firstly produced (Nabil Ali, Nadia Hegazy, 2005).

- Property concept according to the knowledge-based economy: it is characterized by unlimited unrestricted –multiple property because of the disconnection between the former landlord and what he had previously possessed. Whenever a person sells the knowledge product, he practically remains the owner of its dwelt knowledge. In addition, the knowledge –product buyer practically possesses its dwelt knowledge. Therefore, the knowledge economy is transformed into abundance economy due to knowledge sharing in contrast to property under the traditional economy where property is exclusive. Whenever a person sells something he is no longer its landlord. In contrast to the material property, there are difficulties to determine, authorize and protect the intellectual property, particularly the information-industry products. Therefore, the question of intellectual property protection is one of the most important tasks which the World Trade Organization seeks to achieve and over-generalize.

The World Trade Organization has approved the treaty of “commercial aspects of the intellectual property” “TRIPS” and joined it a treaty which determine disputes solutions. The treaty is based on Berin chart “related to the intellectual property”. However, it is inadequate due to challenges raised by communications and information technology, particularly the internet network. Today,

there are efforts seeking modern techniques to adapt special nature of the knowledge-based product. (Kinitsy, Ohmy, 2006).

- the relationship between demand and supply according to the knowledge economy: It is known that demand is determined by supply in the traditional economy, as the society needs exceed its productivity. According to the knowledge economy, supply creates demand. This means that the productive capacity of society has exceeded its needs. Supply has become the larger in terms of quantity, better in terms of quality and more enriched in terms of diversity, due to the high-technology development (especially digital and network). The transition occurs from quantity to quality stage. It could be said that the economy is no longer interested in addressing the rarity issue. However, it has become related to the question of abundance. This attributed to the fact that knowledge has become one of the new production factors. In contrast to the traditional factors of production, they do not face the problem of depletion because they are characterized by continued growth. While the economic resources depleted because of their consumption, the knowledge resources increase due to the increase of their consumption rate (Peter Drucker,2001).

- the cost concept under the knowledge economy: According to the knowledge economy, high cost is fixed to produce the first version product of the knowledge product. However, the marginal cost used to reproduce the additional versions is usually very lower or close to zero. This new feature reduces the importance of , even eliminate, the concept of "optimal size" of production. It has become possible to produce any later size based on the commodity's first edition which is based on highly-intensive knowledge. This attributed to the production diminished cost to the minimum rate. This phenomenon, that is, high fixed cost associated with very low marginal cost, stimulates the tendency to market monopoly. It leads the companies to strengthen their knowledge capital in order to be distinguished in the market. This explains the uniqueness of the limited number of companies in the field of knowledge-intensive products and increasing merger cases. This phenomenon encourages companies to sufficiently sells the product first version and freely distributes the additional versions later in the case of association with the service requested by the consumer when a great number of the mobile phone companies in the world intend to provide a free device for those who buy the phone line.

Thus, the knowledge assets are dissimilar to the material asset since they are exhausted when used and they are cloning with minimum marginal cost approaches zero. The economy is divided

into different sectors, some of which produce material goods, such as food, cars, and clothing etc.. These goods subject to the behavior of well- known law of diminishing returns, where returns increase to a certain level, after which they start to diminish. There are other sectors which produce highly-intensive and technology services and goods. In such sectors the primary cost (investment and fixed) aims to develop a high programmed and digital knowledge. However, the additional cloning production cost is very low. Thus, returns increase as profitability highly and reversely soars up in accordance with production increase. These goods subject to the behavior of increasing returns law (Emirates Center for Strategic Studies and Research, 2004).

- The knowledge economy is an economy of the intangibles: The traditional economy is characterized by assembling the property and material capital, in contrast to the knowledge economy which is the economy of neither weight nor size. Therefore, it could be said that it is the economy of the intangibles which is primarily based on the knowledge capital and oriented towards minimization and the replacement of material content by information. The data indicate that about 90% of the capital market value for some highly-intensive knowledge companies such as Microsoft and America Online, SAP is represented in the moral assets. It is clear that the future in light of the knowledge economy is for the companies "graceful", where the value is measured by ideas, rather than assets and material assets (Arab Human Development Report, 2003).

- The knowledge economy is an economy of acceleration: The traditional economy represents the relatively slow economy as it relies on the traditional train, car, plane and mail. The knowledge economy is the economy of high-speed movement. It depends on satellite-based and e-mail, the Internet and other modern means of communication and transportation. This speed helps exceed the barrier of space and time. The e-commerce is one of the most prominent manifestations of this in the new economy. Therefore, it could be said that "The Economics of speed to replace the economies of scale" in the new market of competition (Najm Aboud, 2005). The company‘s success to enter the market before others enables it to set prices and get high profit margins. However, maintaining the first-place competition for a few months just means so much for the company. The more speed the good is available at the market, the longer the period of its survival at the market is. This allows the company to recover its investment and make money quickly and achieve an adequate profit before the good becomes obsolete.

Fourth: the economic value of information: The emergence of the concept of commodification of information, and its employment in the production of economic value added, has resulted in the need to create accurate standards and constants to measure the information content by a quantitative standard fit to be accredited as the basis of economic evaluations of movement within the economic structure of the informational / digital market (Ziad bin Mohammed Romany, 2010). Generally there are three basic criteria to determine the things value, namely quantity, kind and the factor of time. Meanwhile the other factors are used to form secondary criteria or they are associated with others to judge the value factor. Before determining the value of information, the meaning of the word 'value' should be determined. In light of the abstract economic concept, the single information value equals a specific sum of money currency. However, according to the military criterion, its value is determined based on its contribution quantity to end the battle against an enemy that tries to harm the national security system. The more complicated the information role in human activity is including the socio-economic and cultural aspects, the larger the criteria difficulties size on which the value determination process is based in line of entwined and overlapped factors (Cramer, 1997). There are several options to estimate value including Cost-Effectiveness Analyses or Cost-Benefit Analyses. Whereas the former is used to select the optimal way to accomplish a specific end such as providing systematic protection for an information system, the latter analyzes the benefits of cost as compared to the investments that provide various abilities. In spite of the attempt to find an easy and clear method to determine the absolute value of single information, it should be admitted that value is closely related to its content which obtains its material from the nature of using that value besides the activities that the rivals could practice through it. For further clarification, some information forms such as trade secrets are of paramount importance for the bodies which possess them. This is attributed to the important opportunity which they provide for that body's members to establish products or practice better businesses and commercial activities than those bodies that lack such information. Such information will lose its value whenever it spreads for all and the public. The same thing is applied to the intellectual capital such as applied programmes or intellectual production which is based on the principle of intellectual protection. On the other hand, there are other types of information such as advertisement and political ideas whose value increase with further spread and manage to break through all angles of the environment in which they are launched. Such information will lose its value whenever it spreads and its value will be obtained from its effect on actions such as purchasing encouragement and election and voting decisions. On a third hand, information

content could have an absolute value regardless of its usage circles and user's nature. Information could be invaluable for an organization or one of the society's members. However, that information could have no value for another organization or an individual lives in another environment. In other words, it could be said that user has a value model to deal with single information which differs from the model that others adopt in dealing with the same piece of information in light of the developments surrounding it. In this concern, Cramer, 1997 suggests four essential bases to determine the value. Each basis proposes a self-evident approach to guess the value which each piece of information possesses. These bases are Development Basis, Operation Basis, Market Basis and Collection Basis. Generally, there is a different group of controlling factors which affect the information value. The information value emerges from the user's identity, its usage, its effect nature on others and the nature of its resulted in effects. An attempt to guess the value of each piece of information in each of these models will show a different group of results. They are based on the perspective nature of each piece of information. The following simplified format describes the value equation for each piece of information:

Value Basis= Function (Information identity, user's identity, user's end, other activities and actions, expected results of its usage)

For example, X possesses a package of high-value applied programmes. This programmes package constitutes high value for the rival body Y which works in the same field and may exploit it in analyzing the applied programmes codes. Then it will employ it in one of its products or may deeply understand it by designing and developing the programme. On the contrary, that invaluable information has no value for the body which does not possess important knowledge to produce programmes. However, it may have paramount important value for the information pirates who aim to establish knowledge for rival institutions and companies to obtain huge sums.

Fifth: some indicators measuring the information society: the information society criteria are indicators which predict the society's entry or transformation into the information society. Such criteria have deserved a lot of arguments which raised several questions. Are they attributed to technology, technology spending or technology spread in the information society? Can spread measured by spending on the information technology or by the quantity and range of the introduced information? These indicators aim to measure the extent of progress in a certain country by using indicators related to the measurement of information technology accessibility

provided the availability of primary conditions particularly those related to human development. Indicators should not be considered as a constant group which does not change over time. Some of them could be useless in the future or lose its value with the change of the indicators objectives of the information society. Some (WPIIS) believe that the information society indicators change according to four entwined stages, namely readiness and intensity of usage, effect of using that technology and finally the outcome of that technology in relation to development. These stages are as follows:

- Readiness indicators represent the main requirements to support the building of the information society. They measure the society's readiness extent to transfer and benefit from the information technology.
- Usage-intensity indicators show the extent and aim of using that technology in different sectors such as business, education or others.
- Usage-effect indicators are mainly related to organizing changes of (e.g. business and government). Such changes describe human investments and capital as a knowledge basis. They describe as well the new methods used in organizing work; production; invention; research and development for competitiveness in the future at the world level (Nor El-Din Sheikh Abied, 2004).
- Technology outcome indicators are related to the social effect and level. They show the social homogeneity degree, employment at the work market and level of productivity and competitiveness.

A study conducted by Hend Olwy 2006 howed some indicators related to measuring the information society. According to their significance and order the findings are: establishing the information culture; establishing information national policy; information infrastructure, communication infrastructure; information contribution to the rate of gross national income; internet users in scientific research; number of computers and other indicators.

Sixth: models suggested to measure information: The unique characteristics distinguished information and the new information environment constitute an obstacle when handling the information value according to economic criteria or standards. Undoubtedly, information is currently the golden key for the economic activities. They have become an important source for institutions and companies. Some believe "the organization which revolves around things deliberation and the capital has totally changed into managing the

economic wheel based on information" (Ducker, 1992). Although information is distinguished from other economic resources by its own characteristics, advantages and high economic value, it still has no fixed official value in the financial and economic budget of the state. This contradicts to transforming and fixing the computers and their programmes in the form of capital in the financial and economic budgets. In fact, computers and their programmes are but mechanisms and treatments for information from different aspects. However, the real economic return dwells in information per se. information provides suitable atmosphere and great ability to direct services, making proper decisions, improving performance efficiency, achieving competitive accomplishments and it could be sold directly as an independent commodity (Marijke, V., 1998). Clearly, the value determination process of the economic information still lacks great negligence and defect in spite of the effective role which the information play in the contemporary economic model. The important basis for information cost and value in a certain information system represented in the stored information in the system medium and not in the computer equipments or its programmes. Therefore, the information systems try to focus on supporting and reinforcing the information value (the new commodity) more than giving attention to the systems and technology (production equipments). They are considered as its helping and serving tools. However, there is no unanimity on how to measure the information value. It has really only a notional value not as a quantity measured by the quantitative measurement tools (Wang and Strong, 1996). The information economic measurement process entails measuring the information getting cost and measuring the information value as an economic resource which achieves tangible benefit to elevate the institutions economic value. The information getting cost could be measured through applying some of the following concepts: direct cost which includes data getting cost, and the indirect cost which includes factory cost (resources exhaustion + installments of turning off the ready programmes) and operation process cost in order to transform data into information such as ready programmes cost and human resources cost used in data operation process (wages). The measuring process of the above-mentioned cost terms depends on the accounting system mechanism used to determine spending cost to get the information through several methods according to accounting concepts. Among them are cost versus benefit concept, efficient input to analyze cost components, or the activity-based system. The measuring process of the information value as an economic resource is based on two approaches. The first is the behavioral approach related to the effective information quantity in realizing the benefited person and how he obtains information through suitable

communication channels. The second is the financial and quantitative approach based on economic bases according to the following theory (Daniel Moody, 1999). The resource possession is the basis for benefits inflow and hence the benefits from the resource over the origin's lifetime before its total extinction. Can the possession concept be related to the information resources as an economic resource? It is necessary to indicate that the possession concept should be related to property rights concept. Thus, the possession element can be exploited in possessing the resource and hence getting benefited from it in any way. The raised question is "is a lasting or inconstant resource?" An example of inconstant information is the political news which affects the economic situation. There is a term-deferred continued benefit such as invention potency which represents productive information monopoly. However, this sort becomes extinct with the appearance of a better sort. In both sorts, the information value is measured through the effect based on the implementation process under the information reality. Some may question the extinction of that resource as the other resources under the general frame of the economic theory. This means the end of its benefit regardless of the property element. Some may indicate that the lasting economic resource could last indefinitely with the increase of the information resource value due to the accumulated experience that works on the continuity of that resource and the increase of its value. Therefore, how can a resource become extinct when it increases according to the economic concept? For clarification an accounting view, the resource possession cost will represent its value as an origin. Therefore, the extinction (erosion) equals the amount of the annual cost discount when applying the principle of revenues-spending equality and based on the assuming age. The accounting zero estimation of the economic resource's record value means restoring the money spent to obtain that resource and its transformation into a real-record extinct possession which economically increases as an added value. Therefore, the resource's added value is considered as a resource possession without adding costs. In addition, the freely added value concept resembles to a great extent the special treatment for a shop popularity which appears without a possession process due to the spread of the consumer's knowledge of one of the products. This grants the shop special trust which does not result from a purchasing process of that popularity resembles the purchasing of the trade marks and so on. Thus, the shop popularity is transformed into an economic resource emerges as a secondary product in the project-establishment process. This resource is lasting as long as the institution or the project still achieves success in attracting more consumers based on preserving such popularity (Verrijn, Sturat, A. & Hesse, W., 2001). The information

value measurement as an economic resource according to the previous concept is applicable in the cases of merging and separation of the institutions through the value difference. Suppose that two major corporations agreed to merge in one great economic institution, the landlord-share determination process in the new corporation will be based on the capital besides the difference resulted from the higher-information possession of one corporation over the other based on their market-values.

Conclusion: it could be said that the economic dilemma is currently based on the information abundance not the rare traditional resources. This is because the knowledge effect has become the crucial element in all aspects of the economic activity. Knowledge has become the main basis for any social or economic growth. Therefore, the world has changed from searching for or colliding for the rare resources sources to searching for and colliding for controlling as much as a great amount of knowledge sources. The competitive advantage which is based on size abundance and market-wide spread retreats to give room for those advantages based on elasticity and speed. Institutions, which have become highly capable of properly meeting the demand on an exact time, are the qualified institutions to occupy the leading rank of the digital economy. Therefore, the structures based on leadership, control and decision-making processes continually get narrower field with the increasing dependence on the technologies and means of the knowledge economy. To accomplish an information-characterized society, the primary conditions should be available. They most importantly include among others human resources development, interest of research development and benefit from the experience of advanced countries in the knowledge and information fields. The measurement of information society penetration is necessary to determine development in a certain country. A matter which entails a sound statistical system and database that can show the measurement indicators. They are usually main indicators related to the socio-economic system of the state. A matter which entails the adoption of effective policies to obtain, assimilate and transfer information. These components support each other in paving the way for drawing a comprehensive strategy aims to meet the knowledge gap.

References:

- Arab Human Development Report. (2003): Towards Establishing a Knowledge-Society. The UN Programme, the Arab Fund for Socio-economic Development, Oman 2003, PP 36-48

- Cramer,M.L.,(1997): Measuring The Value of Information, Info WAR Conference, Virginia, September 10-12,1997.
- Daniel Moody(1999): Measuring The Value Of Information: An Asset Valuation Approach, European Conference on Information Systems (ECIS'99).
- Drucker, Peter F.(1992) :The Age of Discontinuity, Guidelines to Our Changing Society, Transaction Publishers, Washington, USA.
- Drucker, Peter F.(1992): The Economy's Power Shift, Wall Street Journal, September 24, 1992.
- Drucker, Peter (2001): Post-Capitalism Society. Research Centre, Public Administration Institute, Riyadh, KSA, PP316-30.
- Emirates Center for Strategic Studies and Research (2004): Human Resources Development in a Knowledge-based Economy. Abu Dhabi, PP 200-1.
- Hany Mohy El-Din Attia (2008). Information: Towards Value-Measurement Indicators in the Information Society. Beni Sueif University.
- Hend Olwy (2006): The Information Measuring Indicators: Librarians view. Monteri University, Quasntia, Algeria.
- Jean-Eric Aubert and Reiffers ,Jean-Louis (2003): Knowledge Economies in the Middle East and North Africa: Toward New Development Strategies, WBI Learning Resources Series, The World Bank, Washington, D.C.
- Jeremy Rifikin (2003): Opportunities Age. A Capitalism Culture where life is a new Experience. Emirates Center for Strategic Studies and Research, Abu Dhabi PP 103-25.
- Kinitsy Ohmy (2006): World Economy: the Next Stage? Challenges and Opportunities in Borderless World. Al-Dar Al-Arabia for Science. Beirut, PP 40-47, PP 165-71.
- Marijke,V.,(1998): Information :The Concept, Electronic Document.
- Nabil Ali, Nadia Hegazy. (2005): Digital Gap: Arab Vision for Knowledge-Society. Alam El-Maarfa Series, Vol. no. 318. Kuwait, PP 400-12.
- Najm Aboud. (2005): Knowledge Management Conceptions, Strategies, Processes. Oman, PP 163-224.
- Nasseri,T.,(2001):The Knowledge Enterprise, Electronic Document.
- Nor El-Din Sheihk Abied (2004): Syrian Information Society Indicators for the UN Development Programe, Syrian Office,Ministry of Culture and Communication.
- Verrijn-Sturat,A. & Hesse,W.,(2001): The Value of Information in the "e-age", Electronic Document.

- Wang, R.Y. and Strong, D.M. (1996): Beyond Accuracy: What Data Quality Means to Data Consumers, Journal of Management Information Systems, Vol. 12, No. 4, Spring.
- World Bank ,World Development Report (2005): A Better Investment Climate for Everyone, Washington D.C,USA.
- WPIIS : Defining and measuring eCommerce: A status report, OECD.
- Ziad bin Mohamed Al-Romany (2010): Information Economy. KSA
- Ziad bin Mohamed Al-Romany (2008): Knowledge Economic Value in Globalization. Riyadh, KSA.

AN EVALUATION OF INTERNAL CONTROL SYSTEM IN NIGERIAN BANKS

BY
BABANGIDA SANI
DEPARTMENT OF ACCOUNTANCY
FEDERAL POLYTECHNIC, KAURA NAMODA,
ZAMFARA STATE, NIGERIA.
Email: mujban@gmail.com

ABSTRACT
For long, the widespread of fraudulent practices in the banking industry has affected the privileges and existence of many banking organizations in Nigeria. The main purpose of this study is to evaluate the system of internal control in Nigerian Banks. The study is descriptive and data is obtained from secondary sources. The literature of internal control system was

clearly discussed, through search of relevant textbooks, journals, past research work and other publications. The study confirmed that the presence of Internal Control system in the banks has provided reasonable assurance regarding the effectiveness and efficiency of operations of banks in Nigeria, the reliability of financial and management reporting and guarantees compliance with applicable laws and regulations. Though controls were observed to be generally effective, there were some lapses noted as the systems did not have the necessary built-in ongoing monitoring processes and the separate evaluations performed were either not adequate or were not acted upon appropriately by management. *The study end with some recommendations for improvements on those components of control variable found ineffective in the study.*

INTRODUCTION

For organization to succeed and achieve its set goals, internal control must be present. Internal control is the methods employed to help and ensure the achievement of an objective.

Internal control is a process effected by the entity's board of directors, management, and other personnel, designed to provide reasonable assurance regarding the achievement of objectives in the following categories: effectiveness and efficiency of operations; reliability of financial reporting; and compliance with applicable laws and regulations. Coso Report (1992)

A system of effective internal controls is a critical component of bank management and a foundation for the safe and sound operation of banking organizations. A system of strong internal controls can help to ensure that the goals and objectives of a banking organization will be met, that the bank will achieve long-term profitability targets and maintain reliable financial and managerial reporting. Such a system can also help to ensure that the bank will comply with laws and regulations as well as policies, plans, internal rules and procedures, and decrease the risk of unexpected losses or damage to the Bank's reputation.

Internal Control System is an essential pre-requisite for an efficient and effective management of any organization including Banks, which is the main focus of this study.

The regularity of fraud and misappropriation of funds is creating fear, anxiety, and a loss of confidence in the minds of bank customers. Internal control system is considered to be essential in accounting system as this will enhance the effectiveness and efficiency of the management of an enterprise.

An adequate system of internal control reduces but does not eliminate the possibility of fraud or irregularities and error. An internal control system therefore, can only provide reasonable assurance that the management objectives in establishing the system are achieved.

Although there are many banks in operation in Nigeria today, it will be very difficult to attempt coverage of these banks in a study as the current one. This study covers the internal control system of ECOBank Nigeria PLC. .

For every organization to function smoothly, it must have a good internal control system. In most organizations, there is the problem of lack of good internal control system. Due to this, irregularities are found in their accounts.

MATERIALS AND PROCEDURES

OVERVIEW OF THE NIGERIAN BANKING INDUSTRY

The Nigerian banking industry which is regulated by the Central Bank of Nigeria is made up of; deposit money banks referred to as commercial banks, development finance institutions and other financial institutions which include; micro-finance banks, finance companies, bureau de changes, discount houses and primary mortgage institutions. The development in Nigeria banking sector dated back to 1892 when the first commercial bank (The African Banking

Corporation) was established in Lagos. According to Adekanye (1986) "the bank experienced some difficulties which led to the establishment of British Bank of West Africa".

Commercial banking which is a large component of the Nigerian financial sector started in 1892 with the establishment of the first banking firm, Standard Bank Nigeria Ltd. (now First Bank Plc). Since then, the number of commercial banks in Nigeria has changed overtime. The banking industry is effectively dominated by a few banks. Moreover, the rash of financial distress resolution options including outright liquidation, mergers and holding action had profound consequences on competition in the commercial banking market.

The Nigerian Banking industry showed stronger capacity to finance real sector activities with substantial credit flow to the core private sector" with this, the challenge to the internal control system became enormous. The global financial crisis occurred on account of concentration of the credit portfolio of financial institutions on overvalued sub-prime mortgage related assets, built up till 2006. By mid 2007, most of the assets had suffered default. The crisis was felt in Nigeria though lower oil prices, a decline in capital inflow, pressure on foreign resources, and a sharp decline in the performance of the stock market.

Special examination to review, evaluate and determine the quality of the banks' portfolios, corporate governance issues, as well as their risk management framework was jointly undertaken by CBN/NDIC in June 2009.

The exercise revealed various infractions including substantial nonperforming loans; poor corporate governance; weaknesses in capital adequacy; and illiquidity in the system. Consequently, the Central Bank of Nigeria (CBN) approved new Managing Directors (MDs)/Chief Executive Officers (CEOs) and Executive Directors for eight (8) of the ten (10) weak banks out of the twenty five existing banks and task them with the responsibility of continuing the business of the banks as going concerns. These affected banks include Afribank, Union bank, Oceanic bank, Bank PHB, Intercontinental Bank, FinBank, Spring Bank and Unity Bank.

CONCEPT OF INTERNAL CONTROL

The structure of modern banking system and the high expectation from the investors and the society at large has called for a more tightened internal control system.

The operational standard practices committee of the UK defined internal control as the whole system of controls, financial and otherwise, established by the management in order to carry on the business of the enterprise in an orderly and efficient manner, ensure adherence to management policies, safeguard the assets and secure as far as possible the completeness and accuracy of the records (IAG6). Princeton (2008) Internal Control is a process effected by an organization's structure, work and authority flows, people and management information system, designed to help the organization accomplish specific goals or objective".

Similarly, Woolf (1985) observes that the striking thing about the definition is it's all- embracing nature and it is clear that internal control is concerned with the control operative in every area of corporate activity, as well as with the way in which individual controls inter-relate. Extending the comment further, one can posit that internal control in organization should comprise of all types of control measures i.e. both financial and non-financial, record and non-record related, which must be working harmoniously to ensure the attainment of organizational objectives and the safeguarding of resources.

Therefore, internal control refers to any combination of measures, policies and procedures that the management of an organization adopts in order to ensure that the assets of such organization

are duly protected and that all operations are carried out in the most efficient manner. These measures are adopted to enhance the realization of organizational objectives.

Components Of Internal Control

Internal control systems consists of five interrelated components that provide the foundation for fraud detection (COSO, ICIF, 1994). These are:

1. **Control Environment:** The control environment sets the tone of an organization, influencing the control consciousness of its employees. The Committee of Sponsoring Organizations (COSO), a voluntary organization offering guidance on monitoring internal controls, report indicates that this component is the foundation for all other components of internal control, providing both discipline and structure to the organization. Ethical business practices, management philosophy and a sense of business integrity all play key parts in the control environment component.
2. **Risk assessment:** Risk assessment in the context of financial reporting is generally associated with the company's ability to record, process, summarize and report financial data. More simply, it can be described as identifying types of potential misstatements and designing controls to prevent or promptly detect those misstatements.
3. **Control activities:** Control activities are the policies and procedures that assist in ensuring that management directives are successfully implemented. They provide the means to address the various risks that may hinder the achievement of the organization's objectives. In essence, control activities are established in response to perceived risks.
4. **Information and communication:** Information and Communication consist of the capture of significant data communicated to designated employees, the Board and other third parties in the form of reports, both written and oral. The information is generally viewed as integral to the proper functioning of the business entity.
5. **Monitoring:** Monitoring is the process of evaluating and assessing the systems of internal control to ensure that the procedures are consistently applied over an extended period of time. As mentioned above, the Board receives a regular management report to assist in monitoring of community activities. On an on-going basis, staff evaluates the various systems of internal control and updates/modifies/enhances where needed. Any discovered deficiencies are addressed immediately and added to the overall systems of internal control.

Objectives of Internal Controls

Internal control is a process affected by the board of directors, senior management and all levels of personnel. It is not solely a procedure or policy that is performed at a certain point in time, but rather it is continually operating at all levels within the bank. The board of directors and senior management are responsible for establishing the appropriate culture to facilitate an effective internal control process and for continuously monitoring its effectiveness; however, each individual within an organization must participate in the process. The main objectives of the internal control process are to:

(a) Ensure the effectiveness and efficiency of operations (including protection of asset)
(b) Ensure reliability of financial reporting
(c) Ensure compliance with applicable laws and regulations and
(d) Ensure that the instructions and directional guidelines fixed by the executive management or the management board are applied.

The committee of sponsoring organization (COSO) of the treadway commission (1999) categorizes the above stated objectives of internal control system as a means to provide reasonable assurance that;

(i) Assets are safeguard and used for business purposes.

(ii) Business information is accurate; and
(iii)Employees comply with laws and regulations.

EVALUATION OF INTERNAL CONTROL SYSTEM

The evaluation of internal control system entails the assessment and appraisal of the system to determine its establishment.

Though the system may be claimed to be effectively operational, however, there is the human tendency to relax from its compliance, and gradually depart from the originally designed high standard of procedure.

Due to this, a programme of independent method must be developed to test and appraise the manner in which the system of internal control is functioning.

Some methods usually adopted in test – checking the functioning of internal control system by organisation are: employing the service of an external auditor or appraise it or the use of their internal audit department or employing the services of a consultancy firm. There are some "characteristics of internal control system which are necessary for its evaluation".

These characteristics are referred to as the criteria of internal control system.

(i) Reliable Personnel with clear Responsibilities.
(ii) Separation of Duties
(iii) Proper authorisation
(iv) Adequate Documentation
(v) Proper Procedures
(vi) Physical Safeguard
(vii) Bonding, Vacations, Rotation of Duties
(viii) Independent checkCost Benefit Analysis

INTERNAL CONTROLS WITHIN COMPUTER SYSTEMS

Glynne (1995) and Dandago (1999) classify the main controls within a computer system into: Systems Development and Control; Organizational Controls; and Procedural Controls.

[i] Systems Development and Control: As a computer system develops, all stages of the development must be fully recorded; the accounting processes analyzed would be tabulated in the form of a flow chart, as a permanent record. Programmes must be standardized as much as possible; they must be carefully stored— preferably in a special "library" under lock and key. Amendments to programmes should be written out, on pre-determined forms, fully authorized and verified by the use of test packs, before put into actual operation.

[ii] Organizational Controls: As in any other section of the business, organizational internal control within the computer section is achieved by staff rotation, segregation of duties and responsibilities, use of control totals to check upon output, and carefully logging of activities both of personnel and machines. The computer files require particular control—by the use of special storage library and a system of identity numbers for each file coupled with a file register. The organization must also provide for fire and standby arrangements.

[iii] Procedural Controls: These are controls related to the actual processing of information within the system- i.e., to ensure that the correct file is processed, with substantial accuracy, based upon the right information, and that the output is correctly used. They comprise of input controls, output controls and processing controls.

There is therefore the need for a more sound internal control system, made up of in-built controls, in the computer system, to be able to control the level of fraud in the banking industry.

METHODOLOGY

Secondary data were used for this study. The secondary data were extracted from review of relevant literature, including newspapers, magazines, professional accounting journals and past research findings.
The purpose will be to establish trends, make inferences, draw conclusions and proffer suggestions and recommendations.

SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

SUMMARY OF FINDINGS

Evidence abound to show that Internal control is not solely a procedure or policy that is performed at a certain point in time, but rather a process that should be continually operating at all levels within a bank. However, each individual within an organization must participate in the process. The board of directors and senior management are responsible for establishing the appropriate culture to facilitate an effective internal control process.
Every good system of internal control must be capable of sustaining credible adherence to management's policies, safeguard its assets, and be able to guarantee complete recording of all its business transactions. A system of effective controls can help to ensure that the bank will comply with laws and regulations as well as policies, plans, internal rules and procedures, and decrease the risk of unexpected losses or damage to the bank's reputation.

CONCLUSION

Management has the ultimate responsibility for an organization's internal control structure. Designing an effective internal control system is an art not a science. Combinations of the following can be used in designing an internal control system: Organization, Policies, Procedures, Personnel, Accounting, Budgeting, Reporting and Internal Review.
An effective internal control system in a banking organization ensures cost effectiveness in operations, sustains the confidence of depositors and shareholders thereby making the bank more attractive to them.
Many banks that have experienced losses from internal control problems did not effectively monitor their internal control systems. Often the systems did not have the necessary built-in ongoing monitoring processes and the separate evaluations performed were either not adequate or were not acted upon appropriately by management.

RECOMMENDATIONS

On the basis of the findings of this study, the following recommendations are hereby made:

(i) All banking business should be conducted in compliance with applicable laws and regulations, supervisory requirements and internal policies and procedures, so as to protect the bank's franchise and reputation, which are necessary for its survival.
(ii) Management should institute an appropriate and properly integrated system of accounts and records. In addition, there should be frequent internal audit to monitor every transaction in a bank.
(iii) Emphasis on maintaining effective internal control system should first start with the management, which is the first line of defence, next by independent auditors who provide the second defence and of course the regulatory authorities who provides the last defence layer. .
(iv) Banks management should continuously identify and evaluate factors that could adversely affect the attainment of their objectives. They should ensure that internal control system is consistent with the nature, complexity and risk of their activities and responds to changes in the banks' environments and conditions.

(v) In this information age, banks managements should ensure adequate safeguard to risk associated to electronic information systems and the use of information technology to avoid disruptions to business and potential losses to banks in Nigeria. The system should also be periodically tested to ensure maximum protection of funds.

REFERENCES

1. Adekanye F. The Elements of Banking in Nigeria.(F&A Publishers Limited, Lagos Nigeria 3rdEd.1986)
2. Central Bank of Nigeria, (2000) **Guidelines For The Practice of Universal Banking In Nigeria**, 22 December 2000.
3. COSO Report (1992), **Integrated Framework**, New York, USA. **In:** Damagum, Y.M. (2003), Effective Internal Control System for Fraud Detection**,** a paper intended for presentation at the First National Conference on Ethical Issues in Accounting, organized by the Department of Accounting BUK From 6- 10 January, 2003 (Unpublished).
4. Dandago Y.M (1999), Auditing in Nigeria. A comprehensive text. Adamu Joji Publishers, Kano Nigeria
5. De Paula F.C. and Attwood F.A. Auditing, Principle and Practice (London, Pitman Book Ltd, ELBS Ed, 1982)
6. Princeton, A (2008) www. wordnet.princeton.edu/perl/webwn
7. Woolf, E. Auditing Today (London: Prentice – Hall Inc, 2nd Ed 1982)

THE EFFECT OF PRE-TREATMENT SOLUTIONS AND TIME ON ACETYLATION OF WOOD FLOUR USING COMMERCIAL VINEGAR

Yakubu Azeh[1], Gabriel Ademola Olatunji[2], Umar Musa Tanko[3]

[1,3,] **Ibrahim Badamasi Babangida University, Lapai, Nigeria.**

[2,] **University of Ilorin, Ilorin, Nigeria**

Abstract

Effect of different pre-treatments and time on acetylation using commercial vinegar was investigated. Similar weight gains in acetyl were obtained despite varied pre-treatment procedures

employed, but acetylation of samples increased with increasing time. This research work has shown that commercial hypo could be used for dual purpose such as, for fiber pre-treatment as a substitute for NaOH and for solvents used for the removal of wood extractives. FT-IR spectroscopy was very vital in providing evidence of the success of acetylation as it was used for characterization of important functionalities of acetylated products. Important absorptions in the acetate group were detected and these include; C–O, C=O, –C–CH_3–, and the reduction in –OH absorptions also showed that some level of acetylation occurred. This work further opens the door for new application of vinegar in wood industry for surface modification of wood and lignocellulosic fibers for industrial applications.

Keywords: Wood, hypo, vinegar, acetylation, time.

INTRODUCTION

Acetylation

Chemical modification of wood can be defined as a process of bonding a reactive simple chemical to a reactive part of a cell wall polymer, with or without catalyst, to form a covalent bond between the two. This excludes chemical impregnations (dipping or soaking non-bonding chemicals in carrier solvents), polymer inclusions, coatings, and heat treatments. Chemical modification of wood/lignocellulosic resources has historically been used to isolate various cell wall components; study differences in properties of wood and lignocellulosic fibers as a result of changing the chemistry to improve the performance properties of wood [1]. Acetylation describes a chemical modification reaction that introduces an acetyl group into a compound [2]. Specifically, acetylation refers to the process of introducing an acetyl group into a compound by substitution of an acetyl group for an active hydrogen atom. This reaction leads to the formation of specific esters, the acetate. Acetic anhydride is the conventional reagent commonly used for this purpose as it reacts with free hydroxyl groups present in biopolymers.

Different types of wood/lignocellulosic fibers have been acetylated using a variety of chemicals and procedures and these include; baggase, jute, bamboo, kenaf, wheat straw, pennywort, water hyacinth, cellulose and wood cellulose and wood flour of Boabab (*Adansonia Digitata*), Mahoganny (*Daniella Oliveri*), African locust bean (*Parkia Biglobosa*) and Beech wood (*Gmelina Arborea*) [1, 2, 3, 4, 5]. Both organic and inorganic catalysts have been used in acetylation of wood or lignocellulosic [3, 5, 6, 7, 8, 9, 10]. The reaction with acetic anhydride results in the formation of acetic acid as by-product [5, 7, 11,12, 13]. The by-product, acetic acid is known to cause product degradation and also pollutes the environment while acetic anhydride itself is an irritant and is highly toxic and expensive. For this reasons, it has been banned in some countries from being used for acetylation [14]. The standpoint of industrial application of any reagent used for wood / fiber modification should generate by-products that are eco-friendly and/or produced no by-product, and should be cheap and readily available, and the reacted chemicals should not be toxic or carcinogenic in the treatment stage and in the finished products. Acetylated fiber will also find applications in value-added composites and has already been used to produce experimental exterior-profiled door skins, window components, lightweight sports

equipment, automotive parts and exterior composite furniture. It has also been studied as a component in fiber-thermoplastic composites. Up to 70 percent acetylated fiber has been used to make a conical extruded polypropylene thermoplastic composite [1]. The use of vinegar for acetylation of wood flour was first reported by [5]. Since, then, the research group had developed interest to further investigate the reaction of wood biopolymers with vinegar under different reaction conditions. In our first attempt using vinegar as acetylating agent, the results showed that it is actually a potential chemical agent that could replace other reagents that are not environmentally friendly. In the present study, different pre-treatments of wood dust were carried out before acetylation using vinegar at different time interval and at constant temperature in order to investigate the effect of acetylation time on fiber modification. We also investigated the application of commercial hypo for the removal of lignin, wood extractives and its ability to be used as a swelling agent for fiber surface for enhanced functionalization. This is the first study, as far as the authors are aware, where commercial hypo is applied to swell the fiber surface to improve the up-take of acetylating agent.

MATERIALS AND METHODS

Reagents and solvents

The wood-dust used in this work was obtained from a local Saw-mill, Lapai, Niger state. All reagents used were of analytical grade. These include; toluene, ethanol, acetone and sodium hydroxide with exception of commercial hypo and vinegar [(Heinz) made in England by H. J. Co. Ltd] that were used for sample lixiviation and acetylation and were obtained in a local market.

SAMPLE PRE-TREATEMENTS

Mercerization of sample

Three gram (3 g) each of oven dried extracted sample was mercerized using 40 cm^3 of 17 % NaOH in a beaker in order to increase the fiber surface area to promote the penetration of the acetylating reagent. The mixture was stirred on a magnetic stirrer for 30 min. After mercerization, the sample was washed with distilled water until it was neutral. After washing, the residue was oven died for 3 h and weighed [5]. Hypo is an alkaline solution of NaOCl and is cheap, and has swelling effect on the material, easily neutralized after use to form products which cause no environmental pollution.

Sample Lixiviation with Commercial Hypo

Three gram (3 g) each of oven dried extracted sample was carried out using 40 mL of hypo in a beaker in order to further remove wood extractives, lignin and other impurities that may be present to the greatest extent possible, so that the residue contains the smallest possible amount of lignin and resins, with the exception of cellulose taking advantage of its cheapness, swelling and bleaching effects and ease of washing after use. The mixture was stirred on a magnetic stirrer for 30 min afterward; the

sample was washed with distilled water until it was neutral. After washing, the residue was oven dried at 105 ^{o}C for 3 h. The procedure was repeated for each wood flour sample [5].

Extractible Content

Air dried samples of Mahogany (*Daniella Oliveri*), African locust beans (*Parkia Biglobosa*), Dogonyaro (Neem), Mandobia (*Mandevillia Splendens*) and Beech wood (*Gmelina Arborea*) wood dust collected from the saw-mill were ground in a porcelain mortar and sieved through a 2 mm nylon size mesh. 5 g of each of the sieved sample was weighed and placed in an extraction thimble in a Soxhlet extraction unit. A mixture of ethanol and toluene (2:1 w/v %), was used as solvent and extracted for 3 h. After extraction, the sample was rinsed with ethanol and hot water and then oven dry at 105 ^{o}C until a constant weight was obtained. The extractible were calculated as a percentage of oven dried test samples and the method was repeated for each sample [5].

ACETYLATION OF SAMPLE

Batch-wise acetylation of pre-treated samples

Two gram (2 g) of pre-treated sample of wood species oven dried at 105 ^{o}C for 3 h with a constant weight ($Wunt$) were treated with 140 mL of vinegar as acetylating agent in batches at 80 ^{o}C for 1, 2, and 3 h acetylation time via refluxing. After the reaction, the residue was thoroughly washed with distilled water until it was neutral and then oven dried to constant weight for 3 h. The extent of acetylation was calculated as weight percent gains ($WPGs$) based on the differences in oven dried weight of the samples before ($Wunt$) and after the reaction ($Wtrt$) according to the equation.

$$\boldsymbol{WPG} = \frac{\boldsymbol{Wtrt - Wunt}}{\boldsymbol{Wunt}} \boldsymbol{x100}$$

Where $Wtrt$ = Constant dried weight of sample after acetylation while

$Wunt$ = Constant weight of sample before acetylation [5].

INFRARED SPECTROSCOPY

The FT-IR spectra of the untreated and acetylated wood-dust samples were recorded at National Research Institute for Chemical Technology (NARICT) Zaria, Kaduna state, Nigeria. The samples were run as (KBr) pellets disk on Perkin- ELMER, FTIR-84OOS Fourier Transform infrared spectrophotometer in the range of 4000 cm^{-1} to 500 cm^{-1} [5].

RESULTS AND DISCUSSION

Results of weight percent gains (WPG)

The extent of acetylation was calculated based on weight percent gains in acetyl for all treated samples using the formula;

$$WPG = \frac{Wtrt - Wunt}{Wunt} x100$$

Where $Wtrt$ = Constant dried weight of sample after acetylation while $Wunt$ = Constant weight of sample before acetylation.

It was observed that weight percent gains in acetyl **(Table 1)** increased with increasing time of the reaction at constant temperature (80 ^{o}C) of acetylation for both sample pre-treatment and acetylation procedures used. The reagents used for sample pre-treatment played dual role as an extractant and as a swelling agent enabling the penetration of acetylating reagent followed by subsequent fiber functionalization. In the present study, similar weight gain in acetyl was obtained for both hypo and NaOH treated samples, despite varied pre-treatment procedures used. Results showed that, hypo could be used to swell-up the fiber surface in place of NaOH, which is commonly used for this purpose in order to enhance acetyl up-take. This work showed that hypo, satisfies this condition, which is quite new and interesting.

Infrared Spectra Studies

The IR Spectra bands of vinegar acetylated wood flour samples are shown in **Table 2-5.** The absorption bands at 3836-3417, 3767-3406, 3992-3363, 3992-3373, 3393-3381cm^{-1} as reflected separately in IR Spectra of Vinegar acetylated samples are characteristic absorptions of bonded –OH group stretching vibrations obtained for 1h acetylation time using conventional procedure. A comparative study for non conventional and conventional procedure was adopted for acetylation of two sets of wood flour samples using 2 h acetylation time. The following –OH bands were obtained as shown in their respective IR spectra of wood flour pre-treated/lixiviated with commercial hypo; 3985-3371, 3983-3371, 3992-3358, 3992-3381, and 3996-3348 cm^{-1} while the –OH absorption bands of wood samples pre-treated using conventional method are listed as reflected in their respective spectra; 3934-3431, 3973-3383, 3996-3369, 3998-3356, 3977-3377 cm^{-1} **[**2, 4, 5, 7, 9, 13, 16]. Both pre-treatments carried out on wood flour samples before acetylation showed reductions in –OH absorption bands. The intensity of the –OH absorption bands in the acetylated wood flour decreased. This decrease in the intensity of –OH band is an indication that the hydroxyl group contents in wood flour were reduced during acetylation, indicating that some level of acetylation had taken place [13, 21]. The non conventional pre-treatment could be adopted for the removal of wood extractives in order to facilitate acetyl up-take and subsequent functionalization of wood reactive polymers. The presence of –OH absorption in vinegar treated wood flour has been attributed to hydroxyl functionalities not accessible

to chemical reagents [2]. The –OH absorption bands of non acetylated wood or lignocellulosic fibers are predominantly detected at 4500 - 4000 cm^{-1}.

The absorption bands at 1743, 1737, 1732, 1730, 1724, 1726, 1396, 1392, 1388, 1383, 1381, 1371, 1718, 1365, 1261, 1257, 1255, 1253, 1251, 1247 and 1249 cm^{-1} are associated with acetylated samples and are characteristic absorptions of carbonyl (C=O ester stretching vibration of acetate (–C–CH_3–) group due to acetylation and (νC–O) stretching band vibrations of the acetyl moieties and (C=O) deformation in the ester bond during acetylation [9, 12, 13, 14, 15]. Another important band that showed evidence of acetylation is the C–H stretching of aliphatic methyl group (–CH_3) of the acetate due to acetylation in cellulose and hemicelluloses at 2933-2918 cm^{-1} is associated with acetylated samples [2, 4, 5, 7, 9, 15]. The Absorption bands at 1595-1500 cm^{-1} are characteristic absorption of aromatic skeletal vibrations caused by lignin. This showed the presence of lignin in wood flour used [9, 18, 18, 19]. The bands at 1491-1408 cm^{-1} are due to CH_2 deformation and stretching in cellulose, lignin, and xylan [2, 5, 9, 13, 15, 16]. The peak absorptions at 1043.52, 1045.43, 1047.38 and 1049.31 cm^{-1} respectively have been assigned for C–O stretching vibrations in cellulose, hemicelluloses, and primary alcohol [2, 4, 5, 7, 9, 12, 15, 20]. As observed in the present work increase in acetylation time led to increase in acetyl gains as expected and this can be seen in the IR spectra of wood flour samples acetylated for 1, 2, and 3h at 80 ^{o}C respectively.

For example; 3 h acetylation gave the highest (C=O) absorption peak intensity at 1743 cm^{-1}; 2h conventional method of acetylation gave 1730 cm^{-1} while non conventional method gave 1737 cm^{-1} and 1h conventional method gave 1732 cm^{-1}. The above results showed that the results obtained by the procedures using the non conventional approach did not show any difference with regards to pre-treatment steps adopted. For this reason, hypo, a commercial and readily available and cost effective house hold bleach proved useful for removal of wood extractives and lignin. We also observed that when samples that had been extracted with hypo were further treated with a mixture of toluene-ethanol mixture (2:1), no colour change due to wood extractives and lignin was observed. This implied that extraction with hypo was successful and therefore, could be used as a substitute for conventional extracting solvent mixtures such as; benzene-ethanol, toluene-ethanol e. t. c. The absence of absorption band at 1800 – 1760 cm^{-1} in all the spectra of vinegar treated samples was an indication that the temperature at which acetylation was conducted did not led to the generation of acetic anhydride which may form at high temperature, while the absence of absorption peak at 1700 cm^{-1} in all spectra is evidence of the absence of non reacted carboxylic acid in vinegar acetylated samples [5].

Conclusion

This research work further demonstrates the success of acetylation using commercial vinegar in the absence of a catalyst. Acetylation increased with increasing time and there was no effect due to the different pre-treatment procedures of sample treatments. This implied that Hypo could be applied for

sample lixiviation/extraction of wood extractives and lignin reduction as well as fiber swelling for enhanced functionalization and acetyl up-take.

Recommendations

The following recommendations have been made based on the outcome of this work:

Further investigation on the use of commercial hypo as extracting solvent especially, for lignocellulosic fiber should be carried out.

Efforts should be intensified on the investigation of vinegar as an alternative acetylation agent building on the present and other published work.

NMR and SEM should be used for structural and morphological studies.

References

1. Roger M., Rowell., **(2006)**: Acetylation of Wood. ***J. Forest Products,*** 56(9), 4-12.

2. Azeh, Y., Olatunji, G. A., Sunday, O. and Olubunmi, A., **(2012)**: Ketene acetylated wood cellulose for industrial applications in wood-base and polymer industry. ***Journal of environmental science and technology*****,** 5(3), 168–176.

3. Roger M. Rowell, Rune Simonson, Sabine Hess, David V. Plackett, Dave Cronshaw, and Elizabeth Dunningham., **(1993):** Acetyl Distribution in Acetylated whole wood and Reactivity of Isolated wood cell-wall components to acetic anhydride.

4. Azeh, Y., Tanko, M. U., and Mohammed, Sani S. D., **(2011)**: Chemical modification of microcrystalline cellulose: Improvement of Barrier surface properties to enhance surface interactions with some synthetic polymers for food and pharmaceutical industry. ***Pelagia Research Library, Advances in Applied Science Research***, 2(6), 532-540.

5. Azeh, Y., Cheku, M., Paul, A. M., **(2013):** Acetylation of Wood Flour from Four Wood Species Grown in Nigeria using Vinegar and Acetic Anhydride. ***International Journal of Carbohydrate Chemistry*****,** 2013, 1-6, *http://dx.doi.org/10.1155/2012/456491.*

6. Roger M. Rowell, Richard H.S. Wang & John .A. Hayatt **(1986)**: Flakeboards made from Aspen and Southern pine wood flakes Reacted with Gaseous Ketene. ***J. Wood Chem. Technol.*** 6(3), 449-471.

7. Adebajo, M. O. and Frost, R. L., **(2004)**: Infrared and13C mas nuclear magnetic resonance spectroscopic study of acetylation of cotton. ***Spectro chimica acta,*** 60(1-2), 449–453.

8. Behboob, M., and Holger, M., **(2002)**: Soft rot decay in acetylated wood: Chemical and anatomical changes in decayed wood. A paper presented at the 33rd Annual Meeting of the International Research Group on Wood Preservation, Cardiff, Wales 12-17 May 2002; 1-13.

9. Bodirlau, R., and Teaca, C.A., **(2007)**: Fourier Transform Infrared Spectroscopy and Thermal Analysis of Lignocellulosic Fillers Treated with Organic Anhydrides. ***Rom J. Phys.*** 54(1-2), 93-104.

10. Bledzki, A.K., Mamum, A. A. and Gabar, V.S., **(2008):** The effect of acetylation on properties of flax fibre and its polyethylene composites. **Express polymer letters,** 2 (6), 413-422.

11. Roger, M. R., Richard, H.S.,W.and John,A. H., **(1988)**: Flakeboards made from Aspen and Southern pine wood flakes Reacted with Gaseous Ketene. ***J. Wood Chem. Technol***. 6(3), 449-471.

12. Mohebby, B., **(2005)**: Attenuated Total Reflection Infrared Spectroscopy of white-rot decay beech wood. ***International biodeterioration and biodegradation,*** 55, 247-251.

13. Mohebby, B., **(2008)**: Application of ATR Infrared Spectroscopy in Wood Acetylation. ***J. Agric. Sci. Tech***. 10, 253-259.

14. Nihat, S.C., and Nilgul, O., **(2011)**: Acetylation of Wood Components and Fourier transformation Infrared Spectroscopy Studies. ***African Journal of Biotechnology*,** 10(6), 3091-3096.

15. Mona, N., Aisha E.M.S., and Abdel Hakim, A. A., **(2010)**: Optimization of characterization of sugar cane bagasse liquefaction process. ***Indian J. of Sciences and Technology***, 13(12): 207–212.

16. Tuong, V. M., Jian, L., **(2010)**: Effect of Heat Treatment on the Changes in Colour and Dimensional Stability of Acacia Hybrid Wood. ***Bio-Resources***, 5(2), 1257-1267.

17. Pawel, S., Masahisa, W., Laurent, H., Hiroyulei, S., and Bjorn, T. S., **(2004)**: Crystal Structure of Cellulose Triacetate I. ***Macromolecules,*** 37, 4547-4553.

18. Nada, A.M.A., Moussa, W. Abd El-Mongy, S., and Abd El Sayed, E.S., **(2009)**: Physicochemical Studies of Cation ion Exchange wood pulp. ***Australian J. of Basic and Applied Sciences,*** 3(1), 9-16.

19. Anna, S., Sandak, J., Pradzynski, W., Zborowska, M., and Negri, M., (**2009):** Near Infrared Spectroscopy as a Tool for Characterization of Wood Surface. ***Folia Forestalia Pol***., 40, 31-40.

20. Laura, M. I. I., Ana, R. G., Lopes, J. D. and V.F. L.F., **(1996)**: Infrared Approach to the study of Absorption on cellulose: Influence of cellulose crystallinity of Absorption of Benzophenone. ***Lagmuir***, 13, 4126-4132.

21. Supri, A. G., Lim, B. Y. **(2009)**: Effect of Treated and Untreated Filler Loading on the Mechanical, Morphological, and Water Absorption Properties of Water Hyacinth Fibers-Low Density Polyethylene Composites. ***Journal of Physical Science***, 20(2), 85–96.

Table 1: Average weight percent gain (WPG) in acetylated wood flour

Sample	Weight Percent Gain (WPG)			
	$3h^{ncvp}$	**$2h^{hypo}$**	**$2h^{NaOH}$**	**1h**
Gmelina	13	13	12	10
Mandevillia	15	12	13	11
Neem	15	13	12	11
Parkia	15	14	11	13
Daniella	17	11	10	12

Table 2: Assignment of the IR Spectra bands of functional groups in acetylated wood flour treated with vinegar based on related work (acetylation: 1h)

Sample	Absorption	Functional group	References based on acetic anhydride, ketene and vinegar as acetylating agents
$MVAns_i$ $MVAms_i$ $MVAps_i$ $MVAds_i$	3381.33-3992.78	–OH Bonded stretching vibrations	[2, 5, 9, 15, 16].
$MVAns_i$ $MVAms_i$ $MVAps_i$ $MVAds_i$	2144.91-2920.32	$–CH_3$ Asymmetric stretching of aliphatic	[2, 5, 9, 16].
$MVAns_i$ $MVAms_i$ $MVAps_i$ $MVAds_i$	1726.35-1732.13	C=O Carbonyl stretching vibrations of acetyl groups	[2, 5, 9, 12].
$MVAns_i$ $MVAms_i$ $MVAps_i$	1606.76-1637.32	C=C Benzene ring vibrations in lignin	[2, 5, 7, 9, 15].

$MVAds_i$			
$MVAns_i$	1508.38-1595.18	C=C absorption of aromatic skeletal vibrations caused by lignin	[5, 7, 9, 17, 18, 19].
$MVAms_i$			
$MVAps_i$			
$MVAds_i$			
$MVAns_i$	1408.04-1558.59	C–H deformations and bending vibrations of CH_2 in cellulose and hemicelluloses	[2, 5, 9, 15, 16].
$MVAms_i$			
$MVAps_i$			
$MVAds_i$			
$MVAns_i$	1325.14-1371.43	C–H deformations of CH_3 group in acetyl	[2, 5, 7, 12, 13].
$MVAms_i$			
$MVAps_i$			
$MVAds_i$			
$MVAns_i$	1251.84-1257.63	Stretching of C–O and C=O deformations of ester bond	[2, 5, 12, 13, 15].
$MVAms_i$			
$MVAps_i$			
$MVAds_i$			
$MVAns_i$	1045.45	C–O Stretching vibrations in cellulose /hemicelluloses	[2, 5, 7, 12, 15].
$MVAms_i$			
$MVAps_i$			
$MVAds_i$			

Key: MVA = Mercerized vinegar acetylated; S_2 = Sample 2; n = Neem; g = Gmelina; p= Perkia; m = Mandobia; d = Daniella

Table 3: Assignment of the IR Spectra bands of functional groups in acetylated wood flour treated with vinegar based on related work (acetylation; 1st set 2h)

Sample	Absorption	Functional group	References base on acetic anhydride, ketene and vinegar as acetylating agents

MVAms MVAns MVAds MVAgs MVAps	3348.54-3996.64	–OH Bonded stretching vibrations	[2, 4, 5, 7, 9, 13, 15].
MVAms MVAns MVAds MVAgs MVAps	2146.84-2924.18	–CH_3 asymmetric stretching of aliphatic	[5, 7, 9, 15].
MVAms MVAns MVAds MVAgs MVAps	1714.77-1732.13	C=O Carbonyls	[9, 12, 13].
MVAms MVAns MVAds MVAgs MVAps	1604.83-1639.55	C=C Benzene ring vibrations in lignin	[4, 5, 7, 9, 13].
MVAms MVAns MVAds MVAgs MVAps	1408.08-1491.02	C–H deformations and bending vibrations CH_2 in cellulose and hemicelluloses	[2, 4, 9, 15, 16].
MVAms MVAns	1321.28-1392.65	C–H deformations of CH_3 group in acetyl	[2, 5, 7, 9, 12].

MVAds			
MVAgs			
MVAps			
MVAms	1251.84-1255.7	Stretching of C–O and C=O deformations in ester bond	[2, 4, 5, 7, 13, 15].
MVAns			
MVAds			
MVAgs			
MVAps			
MVAms	1045.45-1049.31	C–O stretching vibrations in cellulose / hemicelluloses	[2, 5, 7, 9, 13, 15].
MVAns			
MVAds			
MVAgs			
MVAps			

Key: MVA = Mercerized vinegar acetylated; S = Sample; n = Neem; g = Gmelina; p= Perkia; m = Mandobia; d = Daniella

Table 4: Assignment of the IR Spectra bands of functional groups in acetylated wood flour treated with vinegar based on related work (acetylation; 2nd set 2h)

Sample	Absorption	Functional group	References base on acetic anhydride, ketene and vinegar as acetylating agents
$MVAns_2$	3356.25-3998.57	–OH Bonded stretching vibrations	[2, 5, 9, 15, 16].
$MVAgs_2$			
$MVAps_2$			
$MVAms_2$			
$MVAds_2$			
$MVAns_2$	2148.77-2933.83	$–CH_3$ asymmetric	[5, 7, 9, 15, 20].
$MVAgs_2$		stretching of aliphatic	

$MVAps_2$			
$MVAms_2$			
$MVAds_2$			
$MVAns_2$	1718.63-1730.21	C=O Carbonyl stretching vibrations of acetyl groups	[5, 12].
$MVAgs_2$			
$MVAps_2$			
$MVAms_2$			
$MVAds_2$			
$MVAns_2$	1608.69-1645.33	C=C Benzene ring vibrations in lignin	[2, 5, 7, 9, 15].
$MVAgs_2$			
$MVAps_2$			
$MVAms_2$			
$MVAds_2$			
$MVAns_2$	1518.03-1519.96	C=C absorption of aromatic skeletal vibrations caused by lignin	[7, 9, 18, 18, 19].
$MVAgs_2$			
$MVAps_2$			
$MVAms_2$			
$MVAds_2$			
$MVAns_2$	1421.58-1448.56	C=H deformations and bending vibrations of CH_2 in cellulose and hemicelluloses	[2, 5, 9, 13, 15, 16].
$MVAgs_2$			
$MVAps_2$			
$MVAms_2$			
$MVAds_2$			
$MVAns_2$	1309.74-1357.93	C=H deformations of CH_3 group in acetyl	[2, 5, 7, 12, 13].
$MVAgs_2$			
$MVAps_2$			
$MVAms_2$			

$MVAds_2$			
$MVAns_2$	1247.99-1261.49	Stretching C−O and C=O deformation in ester bond	[2, 5, 12, 13, 15].
$MVAgs_2$			
$MVAps_2$			
$MVAms_2$			
$MVAds_2$			
$MVAns_2$	1043.52-1047.38	C–O Stretching vibrations in cellulose /hemicelluloses	[2, 5, 7, 12, 15].
$MVAgs_2$			
$MVAps_2$			
$MVAms_2$			
$MVAds_2$			

Key: MVA = Mercerized vinegar acetylated; S_2 = Sample 2; n = Neem; g = Gmelina; p= Perkia; m = Mandobia; d = Daniella

Table 5: Assignment of the IR Spectra bands of functional groups in acetylated wood flour treated with vinegar based on related work (acetylation; 3h)

Sample	**Absorption**	**Functional group**	**References base on acetic anhydride, ketene and vinegar as acetylating agents**
$MVAds_3$	3358.18-3998.57	–OH Bonded stretching vibrations	[2, 5, 7, 9, 13, 15, 16]. .
$MVAms_3$			
$MVAgs_3$			
$MVAns_3$			
$MVAps_3$			
$MVAds_3$	2146.84-2926.11	$–CH_3$asymmetric stretching of aliphatic	[7, 9, 15].
$MVAms_3$			
$MVAgs_3$			

$MVAns_3$			
$MVAps_3$			
$MVAds_3$	1718.63-1743.71	C=O Carbonyls	[5, 9, 12, 13, 14, 15].
$MVAms_3$			
$MVAgs_3$			
$MVAns_3$			
$MVAps_3$			
$MVAds_3$	1627.97-1647.41	C=C Benzene ring vibrations in lignin	[5, 7, 9, 13].
$MVAms_3$			
$MVAgs_3$			
$MVAns_3$			
$MVAps_3$			
$MVAds_3$	1500.67-1595.18	C=C absorption of aromatic skeletal vibrations caused by lignin	[2, 9, 12, 15].
$MVAms_3$			
$MVAgs_3$			
$MVAns_3$			
$MVAps_3$			
$MVAds_3$	1404.22-1448.59	C–H deformations and bending vibrations CH_2 in cellulose and hemicelluloses	[2, 9, 15, 16].
$MVAms_3$			
$MVAgs_3$			
$MVAns_3$			
$MVAps_3$			
$MVAds_3$	1321.28-1388.77	C–H deformations of CH_3 group in acetyl	[2, 7, 9, 12].
$MVAms_3$			
$MVAgs_3$			
$MVAns_3$			
$MVAps_3$			

$MVAds_3$	1231.84-1261.49	Stretching of C–O and C=O deformation in ester bond	[2, 12, 13, 15, 17].
$MVAms_3$			
$MVAgs_3$			
$MVAns_3$			
$MVAps_3$			
$MVAds_3$	1045.45-1065.45	C–O stretching vibrations in cellulose / hemicelluloses	[2, 5, 7, 12, 15
$MVAms_3$			
$MVAgs_3$			
$MVAns_3$			
$MVAps_3$			

***Key*: MVA = Mercerized vinegar acetylated; S_3 = Sample 3; n = Neem; g = Gmelina; p= Perkia; m = Mandobia; d = Daniella**

THE INFLUENCE OF PERCEIVED EASE OF USE AND PERCEIVED USEFULNESS ON THE INTENTION TO USE A SUGGESTED ONLINE ADVERTISING WORKFLOW.

Okafor Daberechi Jackson[1], Nico Meissner[2] and Azman Bin Bidin[3]

[1]Multimedia University (MMU), Malaysia, okaforjackson89@yahoo.com
[2]Multimedia University (MMU), Malaysia, nico.meissner@mmu.edu.my
[3]Multimedia University (MMU), Malaysia, azman.bidin@mmu.edu.my

ABSTRACT.

The objectives of this study is firstly, to find out if perceived ease of use has any influence on the intention to use a suggested online advertising workflow. Secondly, to find out if perceived usefulness has any influence on the intention to use a suggested online advertising workflow. The problem this study seeks to solve is the issue of expertise in online advertising for Malaysia

SMEs. That is to say, how can we make it simple for Malaysian SMEs to learn how to create online advertisement for their products or services on their own? In this study semi-structured interviews, observation and think aloud protocol were used as the methodology. At the end the researcher found out that, perceived ease of use do not have any influence on the intention to use the suggested online adverting workflow, while perceived usefulness has a positive influence on the intention to use the suggested online advertising workflow. In this paper, the researcher laid out the research problem, the method used in solving the research problem, the related studies done and the findings.

Keyword: Malaysia, Online advertising, SMEs, advertising design.

INTRODUCTION

After a series of interchanges with advertising experts, Richards and Curran (2002, p. 74) developed the following definition: "Advertising is a paid, mediated form of communication from an identifiable source, designed to persuade the receiver to take some action now or in the future." Advertising can also be defined as "any paid form of non-personal communication about an organization, product, or idea by an identified sponsor" (George and Michael, 2007, P.17). Majority of firms believes that advertising is beneficial in the form of building awareness. A successful advertisement is able to increase the company's performance in many aspects, increase market share, increased sales which in turn generates higher profit, building reputable brand image and so on Gan (2010). According to Clow and Baack (2006), advertising represents an important means by which organizations communicate with their customers, both current and potential, thus having clear objectives for advertising will aid operational decision making for advertising programs in effectively conveying the intended message to the audiences.

The major purpose of advertising is to sell something, a product, a service, or an idea and to create awareness. The objective of an advertising campaign may adopt many forms such as the following, (Clow & Baack, 2006, p.151). Increase brand awareness of existing brand or create awareness of new brand. Building brand image, increase customer traffic. Increase retailer or wholesaler orders. Responding to inquiries from end users and channel members. And lastly providing quality information. In regard to online advertising, there are different definitions, but in this study the researcher adopted the definition from Schlosser et al. (1999, p. 36), who defined online advertising as "any form of commercial content available on the Internet that is designed by businesses to inform consumers about a product or service"

Country head for Google Malaysia Sajith Sivanandan reported that Many SMEs want to do more online, but feel they lack the time, resources, or expertise to get started. Therefore, because of this problem Google Malaysia has launched a new initiative to get small and medium enterprises (SMEs) into digital advertising. This new initiative is called The Premier SME Partnership Program, it is designed to bring digital marketing to more Malaysian SMEs by fostering a network of partners dedicated to providing specialized services that help SMEs grow, the company said in a statement. (Sijith, 2010). This new initiative from Google Malaysia helps

Malaysian SMEs to solve the problem of time. This is because SMEs who do not have time can simply approach these Google Malaysia partners and their online advertisement will be handled for them.

But making use of Google partners does not solve the problem of resources because these SMEs still need to pay for the services and also it does not solve the problem of expertise because these Google partners won't be willing to teach these SMEs the online advertising procedures. The importance of Malaysian SMEs where emphasized by the Prime Minister Datuk Seri Najib Tun Razak in his 2014 budget announcement. The Malaysian government has allocated RM2.6bil for 13 specific programmes for SME development. Additionally, under the Green Lane Policy programme, the government also provides a subsidy on interest rate of 2% or a maximum of RM200, 000 per year and stamp duty exemption for loan agreements under the soft loan incentive scheme. (The star online, 2014).

From the information above the researcher discovered that Google Malaysia is trying to help Malaysian SMEs to overcome the problem of time and the Malaysian government is trying to help the Malaysian SMEs to overcome the problem of time. But no one is trying to understand or help Malaysian SMEs to overcome the problem of expertise in terms of online advertising.

Problem statement

There are challenges faced by SMEs. While it is common for SMEs to face financing and working capital issues, this sector also tends to shy away from research and development (R&D), which usually requires a considerably hefty amount of investments without a fixed return on investment. Apart from their role in terms of their contribution to exports, employment and economic growth, there is a wide recognition in the literature about the challenges and barriers facing Malaysian SMEs. These prevent them from growing further and put them in a critical position to face the new challenges that are rising from globalization, liberalization and extensive organizational, institutional, and technological change (Saleh & Ndubisi, 2006). SMEs in Malaysia are facing many new challenges, domestically as well as globally. These challenges include intensified global competition, limited capability to meet the challenges of the market liberalization and globalization, limited capacity for technology management and knowledge acquisition etc. (Small and Medium Industries Development Corporation, [SMIDEC] 2005).

But the challenge this paper seek to solve is the issue of expertise for Malaysia SMEs. The researcher discovered that there is little or no attempt yet to help Malaysia SMEs solve the problem of expertise. This means SMEs being able to create their online advertisement on their own. This is the research problem this research seeks to solve.

Research objectives

The objectives of this research are:

- Firstly, to find out if Perceived ease of use has any influence on the intention to use a suggested online advertising workflow.
- Secondly, to find out if perceived usefulness has any influence on the intention to use a suggested online advertising workflow.

Research questions

This study seeks to answer the following research questions:

Q1: Does Perceived ease of use have any influence on the intention to use a suggested online advertising workflow?

Q2: Does perceived usefulness have any influence on the intention to use a suggested online advertising workflow?

LITERATURE REVIEW

SMEs and internet usage in Malaysia

In this research, one of the research objectives was to find out the barriers that may hinder Malaysian SMEs from using the suggested online advertising workflow. Therefore, it is important to understand why some Malaysia SMEs are not adopting the internet for their businesses. Noor and Shifa (2014) studied the adoption of E-Commerce by SMEs in Malaysia. The study found two important factors for SME to adopt e-commerce, and they are SME location and the manager's experience of living abroad.

Set (2014) explored the internet adoption on Tourism Small and Medium Enterprises (TSMEs) in Malaysia. Findings of this study show that the most use of the internet by TSMEs is for information to customer, followed by Email, and looking for information. Syed (2009) studied the adoption of internet by Malaysia SMEs. The findings show that manager's characteristics, perceived benefits, organisational culture, technological competency, and cost of adoption have significant relationships with internet adoption. Tan (2009) studied the internet-based ICT adoption among SMEs in southern Malaysia. Findings indicate that majority of Malaysian SMEs are using Internet-based ICT for e-mailing and surfing purposes.

Kogilah, Santhapparaj, and Uchenna (2008) conducted a research on website adoption among SMEs. The findings shows that the greatest barrier to website adoption is the security issues followed by lack of Technical and IT personnel, high start-up cost, low ROI, and inadequate knowledge in that order. In this research, one of the research objectives was to find out the barriers that may hinder Malaysian SMEs from using the suggested online advertising workflow. Therefore, it is important to understand why some Malaysia SMEs are not adopting the internet for their businesses.

SMEs and online advertising in other countries

This research focused on Malaysia SMEs, but the research also wanted to see how SMEs on other countries are adopting online advertisement Heiligtag and Xu (2007) studied the factors affecting the adoption of internet advertising for Australia SMEs. In the study, eight variables were identified as factors affecting the adoption of internet advertising, namely: relative advantage, compatibility, operation expenses, complexity, organization size, top management support, organization innovativeness, and customer interaction.

Samiaji (2012) studied the adoption of social media networks by Indonesian SME. The studies found that individual characteristics, size of organization, and the structure of organizations are factors that enable the success of using social media networks for supporting a business. Ifinedo (2011) studied Canadian SMEs in order to find what causes them to be reluctant about accepting internet and e-business technologies (IEBT) in their operations. The study's findings indicated that perceived benefits, management commitment/support, and external pressure are significant factors of IEBT acceptance. They also found that factors like organizational IT competence, vendor support, and availability of financial support positively influence IEBT acceptance by the SMEs.

Lee and Cheung (2004) developed a theoretical framework for analysing the adoption of internet retailing for SMEs in Hong Kong. They found that organizational readiness (IT sophistication, financial resources, and customer readiness); perceived benefits of internet retailing and environmental factors are the key variables affecting adoption of internet retailing.

SMEs and online advertising in Malaysia

In the studies below the researcher was interested to find out what other researcher have discovered about Malaysia SMEs and their behaviours towards online advertising. Ramayah et al. (2011) conducted a study to investigate the determining factors for the usage of web-based marketing by SMEs in Malaysia found that the most used web-based marketing application by Malaysia SMEs is email, whereas the least used application is online payment system.

Also, Alam et al. (2011) empirically examine determinants of E-commerce adoption by Malaysian Small and Medium-sized Enterprises. They found that relative advantage, compatibility, organizational readiness, manager's characteristics, and security have significant impact on e-commerce adoption by Malaysia SMEs. Natalia (2010) studied the successful SME web design through consumer focus group found that Malaysia SMEs believe that a transactional SMEs website should have three main strong points: it must be secure; price information should be provided; and a wide range of images should be shown.

METHODOLOGY

The theory of Technology Acceptance Model (TAM) by Fred Davis (1989) was adopted in order to explain the acceptance and use of the suggested online advertising workflow that the researcher suggested to Malaysia SMEs.

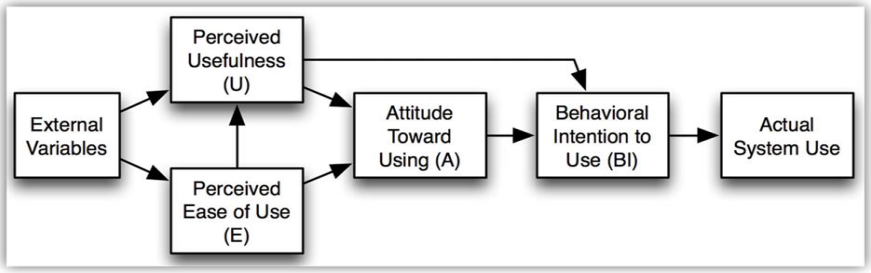


Figure 1: The technology acceptance model, adopted from Davis (1989)

Semi-structured interviews, observation and think-Aloud protocol were chosen for data collection.

Pilot study

The researcher conducted a pilot study with two participants. Before the pilot study, the researcher developed an online advertising workflow. This workflow was then tested by the pilot study participants. During the pilot study, the participants said they were not comfortable with a video recording. Rather they prefer only audio recording. And because of this, the researcher adjusted the data collection instrument by removing video recording from the data collection.

Data collection

The research participants involved eight willing Malaysia SMEs employees in the state of Melaka. To qualify as a participant for this research, the participants must not have previous knowledge in online advertising (have not created an online advertisement previously). Each participant was asked by the researcher to choose the topic. After which they followed these steps to create their online advertisement.

- Step 1: They created a website for their business.
- Step 2: They created an advertisement for their business in Google AdWords.
- Step 3: They created a facebook page for their business.
- Step 4: They created a facebook advertisement for their business.

Interview Questions

A set of four questions were used as a guide in these interviews.

Question 1 measures perceived ease of use while question 2 measures perceived usefulness

1) Did you find this workflow easy/complicated to use?

2) Do you think it is useful to your company?

Question 3 and 4 measures intension to use the suggested online advertising workflow

3) Would you use it again?

4) Would you recommend it?

Limitation of data collection

In this study, data was collected from eight participants only. The result of this research is based on the opinion and view of these eight participants, therefore the result cannot be generalized. In addition, the data collection was done in only one State in Malaysia called Melaka; therefore, future research could be done to cover more states in Malaysia with larger sample size and different data collection method.

FINDINGS

Participant's profile

There were four male participants, four female participants. The participants selected the following sectors for their online advertisement. Hotel (Participants A), insurance (Participants B), farm (Participants C), Law (Participants D), Fashion (Participants E), Hospital (Participants F), Property (Participants G), Restaurant (Participants H). The eight research participants were selected carefully and they were specifically those people who work in SMEs and who have no previous experience in online advertising (i.e. have not created online advertisement before). The researcher ensured that, during the data collection that all participants understood the content of this research and that they were willing to co-operate and be a part of this research. After which they all signed the consent form. The eight participants were given the suggested online advertising workflow for them to follow and recreate what was suggested on the workflow on their own. Data was collected during the testing phase through semi-structured interviews; think-aloud protocol and observation.

Reviewing research question 1

Research question 1 says; does Perceived ease of use have any influence on the intention to use an online advertising workflow? To answer this question the researcher at the end of the task interviewed the participants and recorded their responses with an audio recording device. In response to the interview question on perceived ease of use, some participants described the workflow as easy while some said it was a little bit complicated and confusing. The interview question was; did you find this workflow easy/complicated to use? The participants responded to this question in different ways. The responses of the participants on the above question can be read on the table below.

Table 1: Participants who perceived the workflow to be easy or complicated

Participants	Easy	Complicated	Indecisive	Behavioural intention to use the workflow in future
PA			"I won't say it is easy but I will say it is learnable"	"Yes I will use it."
PB	"I think it is easy to use"			"I will still use it even if it is complicated because it will bring benefit to my business"
PC	"the workflow is not complicated, it is quite straightforward"			"I think it is quite convenient"
PD	"I think it is easy, if I just follow the workflow"			"I will find a way to use it"
PE		"It was a little bit complicated"		"Yes I will still use this workflow if it was complicated, but I will have to practise"
PF		"Google advertisement was a little bit confusing"		"I will still use it, all I have to do is to figure another way out"
PG		"I think creating the website was a little bit complicated and confusing and also the Google advertisement"		"But that won't stop me from using it. Instead I will learn it"
PH			"It was a bit difficult, but following the workflow made it easy"	"I think I need it because I will want to promote my business so that people can

				know about it”

Looking at the responses from the participants, the researcher observed that all the participants agreed that they would use the workflow in the future. There is behavioural intention to use the workflow in the future. In addition, from the interview responses, the researcher noticed that the participants that said the workflow was a little bit complicated and confusing agreed that they would use the workflow in the future and those that said it was easy agree that they will use the workflow. So from the participants responses the researcher concluded that the perceived ease of use do not have any influence on the intention to use an online adverting workflow. Instead of not using the workflow, if it is complicated some participant said they are willing to learn it or practise more.

Reviewing research question 2

Research question 2 says, does perceived usefulness have any influence on the intention to use an online advertising workflow? To answer this question the researcher at the end of the task interviewed the participants and recorded their responses with an audio device. In response to the interview question on the perceived usefulness of the suggested workflow, all participants described the workflow as useful. The interview question that asked about the usefulness of the workflow was; do you think it is useful to your company? The responses from the participants can be viewed in the table below.

Table 2: Participants who perceived the workflow to be useful or not useful.

Participants	Useful	Not useful
PA	“Definitely I think this workflow will be useful to me in the future if I start a business that means I don’t have to hire an expert.”	
PB	“I think this workflow will be useful to my company in the future.”	
PC	“I will use this workflow again in future, it is quite convenient.”	
PD	“I can’t see any way how this workflow won’t be useful to my company in future, so definitely it will be useful to me.”	
PE	“The aspect I find useful is the part of the advertisement.”	
PF	“I think in future if I have a company the workflow will be useful to my company especially the Google advertisement.”	
PG	“I think it will be useful to my company in future especially the facebook part.”	
PH	“Yes I think it will be useful to my company in future. I will use it again in future, but I must first learn how to write a good content first so that when people visit my business website they can understand what my business is all about.”	

All the participants responded that the workflow would be useful to their business or company. The researcher discovered by looking at the interview responses that perceived usefulness has an influence on the intention to use an online advertising workflow. From the responses, the researcher noticed that the participants would not use the suggested online advertising workflow if it were not useful to them. For example, PB said "… I will not be interested to use it if it was not useful" in addition PF also said"… But if it is not useful to my company I may not use it." Therefore, the researcher concluded that perceived usefulness has a positive influence on the intention to use an online advertising workflow.

DISCUSSION

The problem this research seeks to solve is the issue of expertise in online advertising for Malaysia SMEs. Many Malaysians SMEs have not yet taken their business online; some who have website and social media pages does not know how to advertise their business online. One of the reasons is because of lack of expertise, Sajith (2010). That is the research problem this research seeks to solve. To solve this problem firstly the researcher suggested an online advertising workflow for Malaysia SMEs that tackles the problem of expertise. Then the researcher tested the workflow using eight participants who worked in an SME.

The researcher tested the workflow because the researcher wanted to find out if perceived ease of use and perceived usefulness have any influence on the intention to use an online advertising workflow. At the end of the workflow testing, the researcher was able to get answers to these research questions.

Contribution of the study

This study contributed to knowledge by developing a workflow, which will help Malaysia SMEs to overcome the problem of expertise in terms of online advertisement. This research also contributed to knowledge by discovering the influence of perceived ease of use and perceived usefulness in the intention to use an online advertising workflow. For Malaysia SMEs there are some factors hindering them from taking their business online and they are time, resources, and expertise Sajith (2010). Looking at these factors, Google Malaysia decided to help solve the problem of time. Google Malaysia launched a new initiative to get small and medium enterprises (SMEs) into digital advertising. This new initiative is called The Premier SME Partnership Program. Any SME who do not have the time to handle his or her online advertisement on his own can easily approach google Malaysia partners and they will do all the advertisement for him.

In addition, Malaysia Government is trying to solve the problem of resources. The Malaysian government has allocated RM2.6bil for 13 specific programmes for SME development. (Najib,

2014). So looking at the above information the researcher concludes that the main contribution of this research is in the area of expertise in terms of online advertisement for Malaysia SMEs.

Limitation of the study

This study only focused on Malaysia SMEs so the result may not be relevant to other sectors or other countries. In addition, the benefit of this study might be limited to Malaysia SMEs. Data were collected from eight participants only, and the result of this research is based on the opinion and view of this eight participants. Therefore, the result cannot be generalized. In addition, the data collection was done in only one State in Malaysia called Melaka. Thus, future research could be done to cover more state in Malaysia with large sample size and different data collection method.

Implication for practice

This research will be beneficial to Malaysia government, Malaysia SMEs policy makers and SME owners and managers. SMEs owners in Malaysia can also educate their employees using this workflow; this may result in SMEs creating their online advertisement in-house instead of outsourcing them to other companies

Implication for research

The key implication for future research is that perceived ease of use did not have any influence on this research participant's intention to use an online advertising workflow. This is different from what (Davis 1989) proposed. Does this maybe point to a generational difference to Davis' participants? Is there a geographical/social difference to Davis? This interesting finding needs further research

Recommendation for future research

This research focused on the creation of online advertisement only. It did not touch the aspect of optimization and management of the online advertisement. Research should be done on the optimization and management aspect of the online advertisement. This is because creating the advertisement is just the first step. In order for a company to advertise their business effectively, they need to know how to optimize and manage the online advertisement in order to get a good result and achieve their online advertising objectives.

CONCLUSIONS

From the beginning of this research, the researcher seeks to solve the problem of expertise in online advertising for Malaysia SMEs. Because of this problem, the researcher suggested an online advertising workflow, which will help to solve the issue of expertise for Malaysia SMEs. Semi-structured interviews, observation and think-Aloud protocol for data collection. The Technology Acceptance Model (TAM) was adopted in order to explain the acceptance and use of the suggested online advertising workflow that the researcher suggested to Malaysia SMEs. In this study, it was found that perceived ease of use don't have any influence on the intention to use an online advertising workflow, but in the other hand perceived usefulness has a positive influence on the intention to use an online advertising workflow.

REFERENCES

Alias R., Mimi L. A. and Amin M. A. (2008). Technical Efficiency of Small and Medium Enterprise in Malaysia: A Stochastic Frontier Production Model, International journal of economics and management Vol.2, No.2, pp.395-408.

Azizah, O., Ramayah, T., Lim. B. L., Osman, M. and Malliga M. (2011) Determining Factors for the Usage of Web-Based Marketing Applications by Small and Medium Enterprises (SMEs) in Malaysia, Journal of Marketing Development and Competitiveness vol. 5, No.2, pp 70-86.

Christopher Chan (2010). Using online advertising to increase the impact of a library Facebook page, Library Management, Vol. 32, No. 4/5, pp. 361-370.

Davis, D. F., Bagozzi, P. R., and Warsaw, R. P. (1989). User Acceptance of computer technology- a comparison of two theoretical models. Management Science, 35, pp. 982-1003.

Emeric Solymossy (2008). Differences in the knowledge networks of SMEs firms, Erenet Vol. 3 No. 1, pp. 1-13.

Gan Kien Siong (2010). An empirical analysis: Advertising effects on firm performance in the Malaysian consumer products sector

Gresi, S. and Isil, S. (2012). The Importance of Online Behavioral Advertising for Online Retailers, International Journal of Business and Social Science, Vol. 3, No. 18, pp.114-125.

Ilham, S., Hadi, N., Shishi, K. P. and Ahmad F. (2011). Empirical study of internet adoption among small and medium entrepreneurs (SMEs) in Malaysia (a structural equation modeling approach)

Ines, K., and Natalia, V. (2011). Successful SME web design through consumer focus groups, International Journal of Quality and Reliability Management, Vol. 28, No. 2, pp. 132-154.

Jochen, W., Ramaseshan B., Joris, K., Zeynep, G. C., and Jay K. (2013). Managing brands and customer engagement in online brand communities, Journal of Service Management, Vol. 24 No. 3, pp. 223-244.

Katherine Taken Smith (2012). Longitudinal study of digital marketing strategies targeting Millennials, Journal of Consumer Marketing, Vol. 29, No.2, pp.86-92.

Levenburg, Nancy M; Schwarz, Thomas V; Motwani, Jaideep. (2005) Understanding adoption of internet technologies among SMEs, Journal of Small Business Strategy, Vol. 16 No. 1, pp. 51- 69.

Noor, A. H., and Shifa, M. N. (2014). An Investigation of Key Adoption of E-Commerce in SMEs in Malaysia.

Norudin Mansor and Ahmad Faisal Amri Abidin (2010). The Application of E-Commerce among Malaysian small medium enterprises, European journal of scientific research, Vol.41, No.4, pp.591-605.

Payam, H., Mehdi, B., Fahimeh, A., and Fatemeh G. V. (2012). Internet advertising adoption: a structural equation model for Iranian SMEs, Internet Research, Vol. 22, No. 4, pp. 499-526.

Sethela, J. and Rosli, M. (2011). Role ambiguity and job performance of employees in the service sector SMEs in Malaysia, Malaysian Management Journal, Vol. 15, pp1-20.

Ying, W. and Shaojing S. (2010). Examining the role of beliefs and attitudes in online advertising a comparison between the USA and Romania, International Marketing Review, Vol. 27 No. 1, pp. 87-107.

Zeljka, H., Susan, B. B., and Neil Hair (2012). Why we ignore social networking advertising, qualitative market research: An international journal, Vol. 15, No. 1, pp. 19-32.

IDENTIFYING AND FIGURING OUT THE COMMUNICATIVE FORCE OF UTTERANCES IN O'NEILL'S *THE HAIRY APE*

Mahmood A. Farhan
College of Education for Human Sciences/Ibn Rushd
University of Baghdad

ABSTRACT

Communication could be more problematic if certain characters violate or flout the cooperative principle suggested by the Grice (1975) . This study aims to verify that the use of indirectness by addressers can lead to ambiguity . The main problem is attributed to the fact that

some characters may vary their use of language and the communicative of the force involves making assumptions , inferences , presuppositions , and implicature ; therefore , there may be different meanings for one utterance . Moreover , misunderstanding may be caused by ambiguity or vagueness which may mislead addressees . For example :

Yank : (in a vague , mocking tone)

Say , when do I go from hero ?

Policeman : (giving him a push – with a grim indifferently)

Go to hell

Here Yank's abstract meaning states that it is a question and his utterance meaning is figured out by the policeman since there is no ambiguity of sense and reference , and therefore the first person singular pronoun (I) refers to Yank and the place deictic expression (hero) refers to industrial workers of the world .As for Yank's force , the policeman fails to figure it out since his reply " go to hell " indicates that the policeman fails to make assumptions and inferences .Yank's force lies in the fact that he wants a place to belong to and not to go anywhere.

Accordingly , the present study seeks to analyze the pragmatic aspect of communicative force of utterances in some extracts selected from O'Neill's *The Hairy Ape* in terms of implicature , presupposition and indirectness.

The procedures followed in this paper are to achieve the above mentioned aim : Firstly , classifying the types of and /or levels of meaning , secondly analyzing the collected data by adopting Thomas's model of meaning (1995) and Grice's model of conversation maxims (1975) .

The main conclusions that the paper has come to are illustrated as : Firstly , meaning is the result of interaction between abstract meaning , the speaker , the hearer and the context .Secondly , the process of interpretation of the force by addressees / addressers undergoes assigning reference to words in context and then comes to the force . Finally , some characters tend to violate or flout Grice's maxims of conversation .

Keywords : pragmatic force , cooperative principle , implicature , presupposition , indirectness.

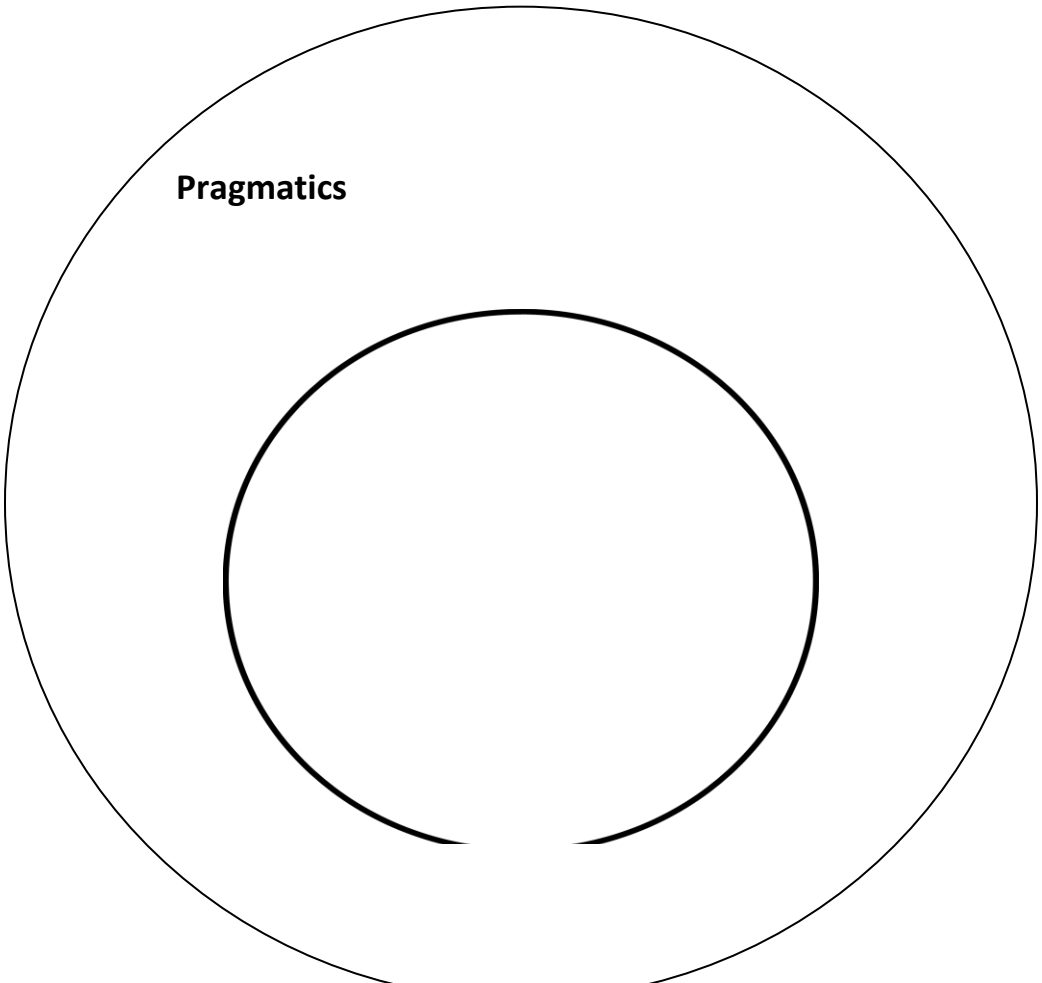
INTORDUCTION

The current paper is an investigation of the pragmatic force of the utterances .It tackles a problematic issue which has been one of the main concerns of the

field of pragmatics in studying language in use . Thus , the process of interpretation of utterances is very complicated , that is , it depends on the features of context . Besides , there is the factor of the addressee's comprehension of the utterances or more specifically the effect or the force of the utterance on the part of the addressee(s) ; in addition , it tries to investigate the contextual role in assigning sense and reference to the utterance to arrive at its force which is the core of interpretation.

1.1 What is Pragmatics ?

Pragmatics , according to Fillmore (1981:14), is concerned with three-termed relations namely , (a) a linguistic form , (b) the communicative functions and (c) the context in which these linguistic forms can have communicative functions as shown in figure (1) below :



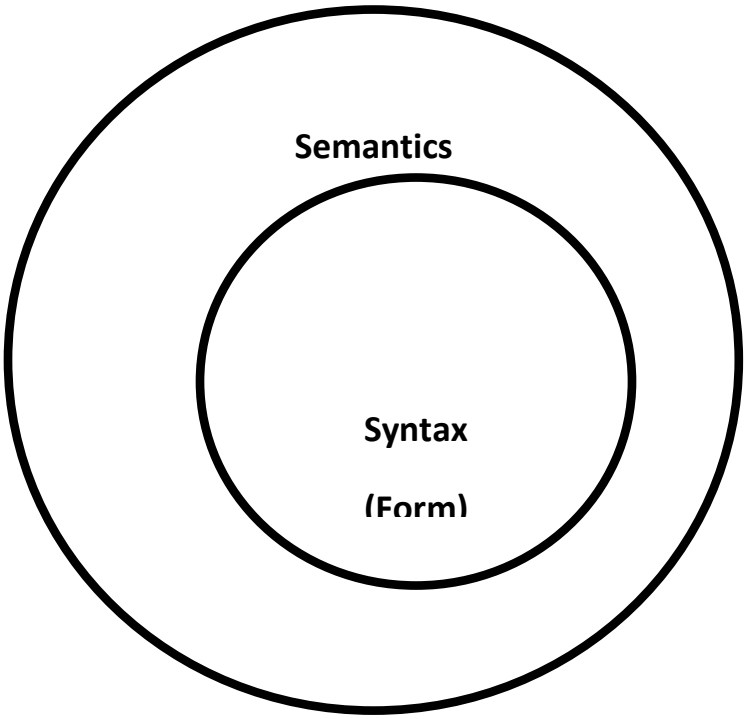


Figure 1
Pragmatic relations according to Fillmore (1981:141)

Similarly , Levinson (1983: 91) adds that pragmatics is the study of those relations between language and context which might be grammaticalized or encoded in the structure of a language .

Thomas (1995: 2) considers pragmatics as meaning in interaction and it might be related to the study of meaning as communicated by a speaker and interpreted by a listener .It focuses on the use of language in particular situation , aiming at explaining how factors outside of language contribute to both literal meanings and non –literal meanings which speakers communicate by using meaning and language use that are dependent on the speaker , the addressee and other features of context utterances (Alline , 2001: 1)

1.2 The Notion of Meaning

The notion of meaning has been of central concern to semanticists and pragmatists throughout their search to determine why words would have the meaning they do have .This , of course led to the fact that placed the concept of meaning as one of the most central topics within the philosophy of language .Simpson (1995: 176) states that human beings do not produce utterances for the sake of phonetic phonological or grammatical features unless there are

linguists involved in the study of these aspects of language ; thus , utterances are produced because they convey meaning

1.2.1 Semantic Meaning

The traditional view of formal semantics proposes that Semantics must deal with the literal meaning of words and sentences as determined by the rules of language while pragmatics deals with what users of a language mean by their utterances (i.e. there is a close relationship between the meaning of a declarative sentence and its truth conditions) where language is viewed as system of rules or conventions (Racanti ,2001:76).Semantics as Finch (2000,143) states is the study of meaning communicated through language it focuses mainly on decontextualised meaning .Similarly Razmjoo(2004:133)
observes that Semantics attempts to focus on that words conventionally mean rather than what a speaker might want them to mean on a particular occasion , for example , the literal meaning of a word 'needle' includes thin , sharp , steel and instrument .

1.2.2 Pragmatic Meaning

Pragmatics is the study of contextual meaning in that it involves the interpretation of what people mean in a particular context and how the context influences what said .It requires a consideration or how speakers organize what they are talking to , where , when and under what circumstances.

1.3 Levels of Meaning

There are three levels of meaning which are of main concern and relevance to the core of the study (i.e. the communicative force of utterances)that an addressee had to go through or move from one level to another in order to arrive at the speaker's intentions or force of utterance . Accordingly, these levels are classified by Thomas (1995: 3)
who believes that there are three levels of meaning that are adopted as one model of analysis of the communicative force of utterances since they can best underlie the efficient use of language and they generally facilitate the communication of the speaker's intended meaning or force .

1.3.1 Abstract Meaning

Abstract meaning , as Thomas (1995: 2) states , is concerned with what a word , phrase , sentence , etc. could mean (for example the dictionary meanings of words or phrases).Löbner (2002:4) also argues
that the meaning of words , phrases and sentences , taken as such , i.e. out of any particular context , in their general senses they constitute the level of meaning which is called expression meaning .Consider the following example :
I do not need your bicycle .
To determine the meaning of this sentence , the main verb in a sentence occupies a key role in its meaning so , what is the meaning of the verb need ? Actually , there are two verbs need an auxiliary verb in " I need not go " and a full verb assign the above example , it is used with a direct your bicycle and roughly means " require" .In our example what is needed is described as your bicycle " i.e. by an expression composed of possessive pronoun your and the noun bicycle .The noun means some sort of vehicles with two wheels and without a motor .The two words 'need' and ' bicycle' are the main carriers of information in the sentence so called content words (Ibid:6)

1.3.2 Speaker Meaning :

Hurford and Heasly (1983: 5) state that " speaker meaning " is what a speaker means (i.e. , intends to convey) when he uses a piece of language .Consider the following conversation between people:

A: Nice day
B: Yes , a bit warmer than yesterday , isn't it ?
A: That's right – one day fine , the next cooler.
B: I expect it might get cooler again tomorrow
A: May be – you never know what to expect , do you ?
B: No , have been away on holiday?
A: Yes , we went to Spain
B: Did you ? we're going to France a next month
A: Oh are you? That'll be nice for the family .Do they speak French ?

It is true that many sentences carry information in a certain way , but it is also true that many sentences are used by speakers not to give information but to keep the social wheel turning smoothly .Thus , the speakers meaning can include courtesy and hostility, praise and insult, endearment and taunt. Therefore , the same sentences are used by different speakers on different occasions to mean different things .

However , Thomas (1995 : 16-12) states that there are two aspects or levels of speaker meaning (i.e., utterance meaning and force).The first one is what a speaker actually does mean by these words on this particular occasion .This is called utterance meaning which is the first level or component of speaker meaning , The second level is ' force ' which refers to the speaker's communicative intention .For example , if some one says to you : Is that your car? There are no ambiguities of sense or reference that the word ' that 'refers to ' your car 'and 'your ' refers to 'you' .So , there is no problem of the first level of speaker meaning (i.e. utterance meaning) but still you have problem in the second level (i.e., the force) .Does the speaker express admiration or scorn ?

1.4 Assigning Sense in Context

When one wants to know the meaning of certain words in context , he or she wants to use context to interpret the meaning by means of assigning the proper meaning to the words in accordance with context.

1.5 Assigning Reference in Context

A listener needs to assign reference to the words that a speaker uses , and since there is no direct relationship between entities and words , the listener typically has to make inference as what the speaker intends to identify .

As Yule (1996: 22) points out :

… [refrence] is not simply a relationship between the meaning of a word or phrase and an object or person in the world .It is a social act , in which the speaker assumes that the word or phrase chosen to identify an object or person will be interpreted as the speaker intended .

1.6 Data Analysis

1.6.0 Introduction

Communication is an active process .The level of interaction or discourse which is involved in this study occurs between the interlocutors there must be ,at least , some potential and cognitive agreement as to what utterances could mean ,and by taking the contextual clues into consideration. Accordingly , the current paper is concerned with the analysis of some dramatic extracts selected from O'Neil's The Hairy Ape. The model of analysis adopted in this study is Thomas's model of meaning (1995).

1.6.1 Thomas's Model of Meaning

Thomas's model of meaning includes two levels :

(a) Abstract meaning which is concerned with what a word , a phrase , or a sentence could mean and (b) speaker meaning which has two components (ie, utterance meaning and force) .They are best illustrated in the following figure (2) :

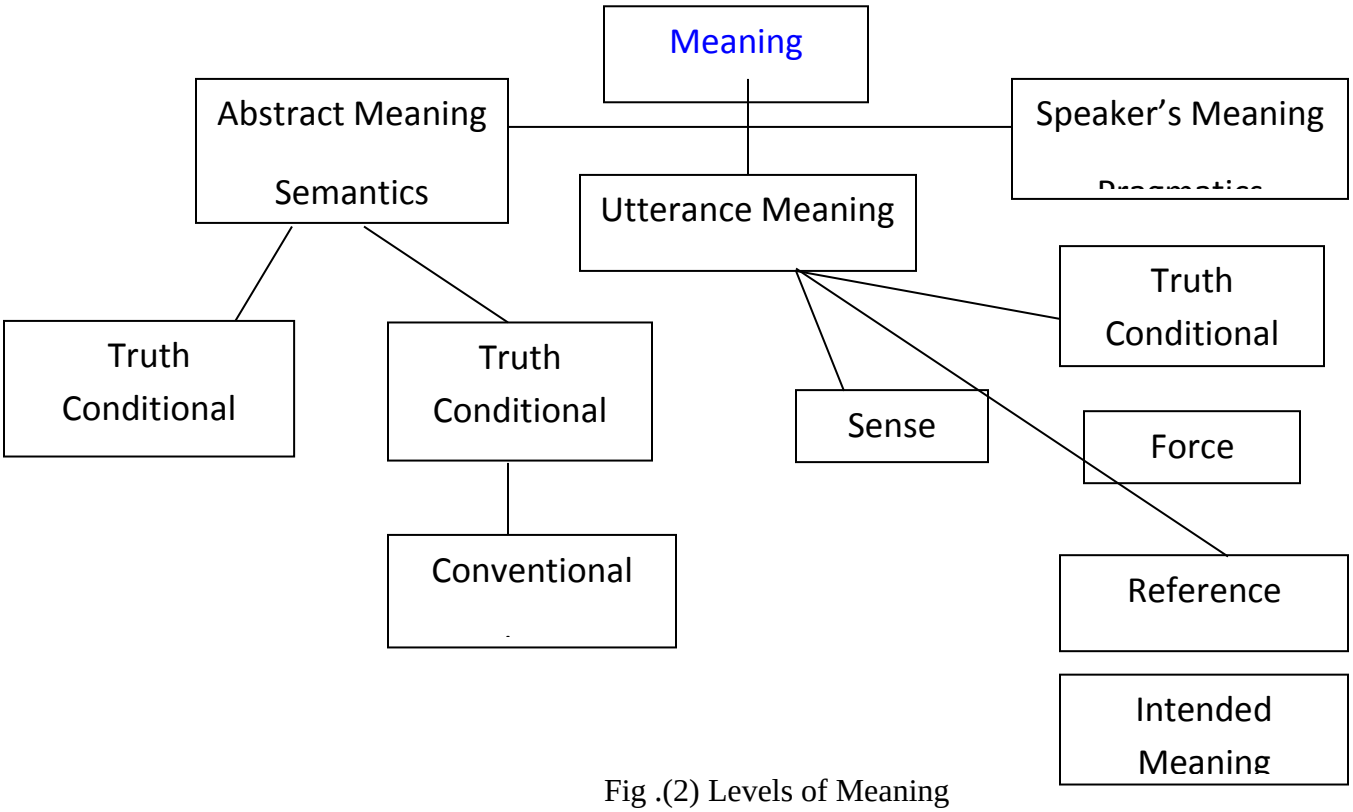


Fig .(2) Levels of Meaning
(Adopted from Thomas , 1995: 20)

1.6.2 The Analysis of The Hairy Ape

Extract No.(1)

Yank : I'm make a home or yuh!
Long :E says this stinking ship is our 'ome

(scene 1:Lines133-146,p.76)

The above extract is a conversation between Yank , the central figure of the play , and Long , his shipmate .However, Yank's abstract meaning seems to be an order .As for this utterance meaning , it is clear and there are no ambiguities of sense and reference .As for Yank's force , Long understands that Yank tries to convince the stockers that the only home available for them is the ship.

Extract No. (2)

Yank : say , where do I go from here?
Policeman : Go to hell

Here Yank's abstract meaning shows that it is a question and his utterance meaning is figured out by the policeman. As for his pragmatic force , the policeman fails to figures it out since his reply ' go to hell ' indicates that he fails to make assumptions and inferences Yank tries to convey the fact that he wants a place to belong to and not to go anywhere .

Extract No. (3)

Long ; well , when we are .
Fifth Avenue .Keep off the grass.
Yank : I do not see no grass , boob

In this extract , Long's abstract meaning is a kind of statement and his utterance meaning is evident .Thus , Yank is able to rigor out Long's utterance meaning but he is not able to figure out Long's force in which Yank takes the utterance " Keep off the grass " to mean literally where as Long tries to text Yank it is a sign of showing passengers their destination or ordering , them to stay off other people's land or property.

Extract No. (4)

Paddy : He's fallen in love , I'm telling you .
All: Love !

(scene 4 : Lines 41-44, p.88)

The above extract is a conversation between Paddy and other stokers , nevertheless , from Paddy's abstract meaning , one may find that it is a statement , and from his utterance meaning , one may find there is no problem in sense and reference and the person deictic expression 'He'refers to Yank . " I " refers to " Paddy " and " You " refers to the " the stokers " , Hence , the stokers are able to understand Paddy's utterance meaning with the help of linguistic context. As for Paddy's force , one may find that he uses a paralinguistic features (ie, wink) when lie uses the utterance ' He is fallen in love ' to indicate the fact that he makes fun of Yank as well as it is an irony .As a result , the stokers are able understand Paddy's force for they share the same mutual knowledge of the world .

1.6.3 Grice's Model of Conversation Maxims (1975)

The following extracts show the data analyzed by this adopted model for analysis of the communicative force of utterances in O'Neil's The Hairy Ape (1920)

Extract No.(1)

Long : Yer wants to get back at her don't yer?
Yank : (furiously) De lousey tart

(scene 5: lines 63 – 71, p.94)

This extract is a dialogue between Yank and Long .They are talking about Mildred .However , Yank uses indirectness since he tries to avoid confrontation with Long and /or makes understatement .So, Yank's reply shows that he violates more than one Gricean maxims. On one hand , he violates the maxim of quality and makes relation when he gives irrelevant information and he does not address the subject of directly .Besides , Yank violates the maxim of manner when he gives vague utterances 'De lousey tart '.It is not clear from the above utterance what does the word 'tart' mean?
and to whom does it refer since it is vague in that it has fuzzy boundaries consequently .It may mean a fruit pie , or tough person or a woman of bad reputation .One can understand its meaning unless he knows the context in which it is uttered .Although Yank violates Grices's maxims , Long is able to figure out Yank's force , in that Yank tries to take revenge of Mildred depending on the linguistic context and social and cultural context .

Extract No.(2)

Secretary : Just what was it made you want to join us ? Come out with that straight
Yank : Well , dot's me ! belong
Secretary : You mean change the unequal conditions of society by legitimate direct action or with dynamite.
Yank : Dynamite ! Blow it often
De oith , steel all de
Cages all de factories
Steamers , buildings , jails

Secretary : Will, you dirty , spy
you rotten agent provactor
you're a brainless ape.

(scene 7: Lines 104-149, p.104)

This is a dialogue between the secretary and Yank .The secretary asks Yank the reason behind his coming to the organization .Yet , Yank's reply seems to be uncooperative since he blatantly flouts the requires .Moreover , Yank violates the maxims of relation in that he purposefully changes the subject or at least fails to address the topic directly .Yank also flouts the maxim of manner in giving vague information so the utterance ' I belong ' seem to be
vague and consequently the secretary fails to understand Yank's force (i.e. he tries to find a place to) and mistakenly thinks him to be a spy .
This failure is due to the cultural and social distance which manifests differences in the knowledge of the word .

Extract No.(3)

Yank : (standing up and glaring at Long)
De y're just baggage who makes
Dis tub run ? Ain't it us
Guys? We belong and dey don't
Paddy : we belong to this , you're
saying ? we make the ship to go , you're saying

(scene 1:Lines 162-200, p. 77)

This is a conversation between Yank and Paddy .Yank violates the maxim of manner in that he uses ambiguous utterances such as ‘ baggage ‘ that means either ‘luggage’ or rich people and tub that in being uncooperative using too much information .Nevertheless , Paddy is able to figure out his force (i.e. the ship is his home and nothing else) and this stems from the background knowledge shared by them in addition to the social and cultural context .

Extract No.(4)

Mildrad : (Looking up with affected dreaminess)
How the black smoke swirls
Back against the sky .Is it not beautiful?
Aunt: (without looking up)
I dislike smoke of any kind
Mildrad : My great –grand mother smoked
A pipe –a clay pipe
Aunt : (ruffling) vulgar
Mildrad : She was too distant a relative to be vulgar

(scene 2:Lines20-24, p.81)

The above extract is a conversation between Mildrad and her Aunt .It seems that Mildrad flouts the maxim of quantity since she uses more information than is required .She also calls smoke beautiful while in reality it is ugly , and she flouts the maxim of relation .Consequently , she tries to make fun of her aunt .Mildrad’s force is to annoy or disturb her aunt and her aunt is able to figure out Mildrad’s force depending on the linguistic context , the social and cultural background , and the knowledge of the world .

CONCLUSIONS

After analyzing the force , the paper has reached the following conclusions :

(1) The process of interpretation by addressers/addressees undergoes the following steps:
   (a) assigning sense to words in context .
   (b) assigning reference to words in context .
   (c) After assigning both sense and reference to words in context , it is reached at the utterance meaning , then comes to the force .

(2) It is found that characters' meanings are of three levels which characters may vary their use of utterances depending on context .

(3) Some characters may vary their use of utterance depending on context.

(4) Some kind of misunderstanding may arise when characters fail to figure out the context together with the force of utterance .

(5) Some characters tend to violate and / or flout Grice's maxims for the following reasons .

   (a) To avoid confrontation
   (b) To make joke , overstatement and understatement
   (c) To change their attitudes towards others
   (d) To save face when a conversational contribution is not well received.

REFERENCES

Finch, G ,(2000) *Linguistic Terms and Concepts* . London : Macmillan Press Ltd.

Grice , H.P. (1975) .*Logic and Conversation* .New York : Academic press
Hurford , J.R. and Heasly , B. (1983) *Semantics* .Cambridge University Press.

Razemjo, S.A. (2004) *Fundamental Concepts in Linguistics* .Shims University Press.

Simpson , J.A (1995) *Meaning and Communication* .Cambridge : Cambridge University Press.

Thomas , J. (1995) *Meaning in Interaction* .London :Longman group Ltd .

Thakur, S. (1999) *Semantics* .Delhi : Bharati Bhawan Publishers.

Yule , G. (1996) *Pragmatics.* Oxford : Oxfrod University Press.

S-fibrations and Calculus Left Fractions

Akrur Behera and Sandhya Rani Mohapatra
Department of Mathematics
National Institute of Technology
Rourkela - 769 008 (India)

Abstract

Let $\mathcal{C}$ be any small $\mathcal{U}$-category, where $\mathcal{U}$ is a fixed Grothendeick universe. Let S be a set of morphisms in the category $\mathcal{C}$. Let $\mathcal{C}[S^{-1}]$ be the category of fractions of S and $F_S : \mathcal{C} \to \mathcal{C}[S^{-1}]$ be the canonical functor. For convenience we write $F_S = F$. Bauer and Dugundji [2] have introduced the concept of S-fibration, weak S-fibration, S-cofibration and weak S-cofibration in the category $\mathcal{C}$ and have explored the properties of these concepts. There are some other advantages over the assumption that the set of morphisms S admits a calculus of left (right) fractions [4, 6]. In this note we study some cases showing how the assumption that S admits a calculus of left (right) fractions helps us to prove that weak S-fibration implies S-fibration and weak S-cofibration implies S-cofibration.

1. Calculus of left (right) fractions

The concepts of calculus of left fractions and right fraction play a crucial role in constructing the category of fractions $\mathcal{C}[S^{-1}]$.

1.1 Definition. ([6], p. 258) A family of morphisms S in the category $\mathcal{C}$ is said to admit a *calculus of left fractions* if

(a) S is closed under finite compositions and contains identities of $\mathcal{C}$,

(b) any diagram

$$\begin{array}{ccc} X & \xrightarrow{s} & Y \\ f\downarrow & & \\ Z & & \end{array}$$

in $\mathcal{C}$ with $s \in S$ can be completed to a diagram

$$\begin{array}{ccc} X & \xrightarrow{s} & Y \\ f\downarrow & & \downarrow g \\ Z & \xrightarrow[t]{} & W \end{array}$$

with $t \in S$ and $tf = gs$,

(c) given

$$X \xrightarrow{s} Y \underset{g}{\overset{f}{\rightrightarrows}} Z \overset{t}{\dashrightarrow} W$$

with $s \in S$ and $fs = gs$, there is a morphism $t : Z \to W$ in S such that $tf = tg$.

A simple characterization for a family of morphisms S to admit a calculus of left fractions is the following.

1.2 Theorem. ([3], Theorem 1.3, p. 67) *Let S be a closed family of morphisms of $\mathcal{C}$ satisfying*

(a) *if $uv \in S$ and $v \in S$, then $u \in S$,*

(b) *every diagram*

$$\begin{array}{ccc} \bullet & \xrightarrow{s} & \bullet \\ f\downarrow & & \\ \bullet & & \end{array}$$

in $\mathcal{C}$ with $s \in S$ can be embedded in a weak push-out diagram

$$\begin{array}{ccc} \bullet & \xrightarrow{s} & \bullet \\ f\downarrow & & \downarrow g \\ \bullet & \xrightarrow[t]{} & \bullet \end{array}$$

with $t \in S$.

Then S *admits a calculus of left fractions.*

The notion of a set of morphisms admitting a calculus of right fractions is defined dually.

1.3 Definition. ([6], p. 267) A family S of morphisms in a category $\mathcal{C}$ is said to admit a *calculus of right fractions* if

(a) any diagram

$$\begin{array}{ccc} & & X \\ & & \downarrow f \\ Z & \xrightarrow[s]{} & Y \end{array}$$

in $\mathcal{C}$ with $s \in S$ can be completed to a diagram

$$\begin{array}{ccc} W & \xrightarrow{t} & X \\ g\downarrow & & \downarrow f \\ Z & \xrightarrow[s]{} & Y \end{array}$$

with $t \in S$ and $ft = sg$,

(b) given

$$W \overset{t}{\dashrightarrow} X \underset{g}{\overset{f}{\rightrightarrows}} Y \xrightarrow{s} Z$$

with $s \in S$ and $sf = sg$, there is a morphism $t : W \to X$ in S such that $ft = gt$.

The analog of Theorem 1.2 follows immediately by duality.

1.4 Theorem. ([3], Theorem1.3*, p. 70) *Let* S *be a closed family of morphisms of* $\mathcal{C}$ *satisfying*

(a) *if* $vu \in S$ *and* $v \in S$, *then* $u \in S$,

(b) *any diagram*

$$\begin{array}{ccc} & & \bullet \\ & & \downarrow f \\ \bullet & \underset{s}{\rightarrow} & \bullet \end{array}$$

in $\mathcal{C}$ *with* $s \in S$, *can be embedded in a weak pull-back diagram*

$$\begin{array}{ccc} \bullet & \overset{t}{\rightarrow} & \bullet \\ g \downarrow & & \downarrow f \\ \bullet & \underset{s}{\rightarrow} & \bullet \end{array}$$

with $t \in S$.

Then S *admits a calculus of right fractions.*

We recall the definitions of Adams completion and cocompletion.

1.5. Definition. [4] Let $\mathcal{C}$ be an arbitrary category and S a set of morphisms of $\mathcal{C}$. Let $\mathcal{C}[S^{-1}]$ denote the category of fractions of $\mathcal{C}$ with respect to S and $F : \mathcal{C} \to \mathcal{C}[S^{-1}]$ be the canonical functor. Let $\mathcal{S}$ denote the category of sets and functions. Then for a given object Y of $\mathcal{C}$, $\mathcal{C}[S^{-1}](-, Y) : \mathcal{C} \to \mathcal{S}$ defines a contravariant functor. If this functor is representable by an object Y_S of $\mathcal{C}$, i.e., $\mathcal{C}[S^{-1}](-, Y) \cong \mathcal{C}(-, Y_S)$ then Y_S is called the (*generalized*) *Adams completion of* Y with respect to the set of morphisms S or simply the S-*completion* of Y. We shall often refer to Y_S as the *completion* of Y [4].

The above definition can be dualized as follows:

1.6. Definition. [3] Let $\mathcal{C}$ be an arbitrary category and S a set of morphisms of $\mathcal{C}$. Let $\mathcal{C}[S^{-1}]$ denote the category of fractions of $\mathcal{C}$ with respect S and $F: \mathcal{C} \to \mathcal{C}[S^{-1}]$ be the canonical functor. Let $\mathcal{S}$ denote the category of sets and functions. Then for a given object Y of $\mathcal{C}$, $\mathcal{C}[S^{-1}](Y, -) : \mathcal{C} \to \mathcal{S}$ defines a covariant functor. If this functor is representable by an object Y_S of $\mathcal{C}$, i.e., $\mathcal{C}[S^{-1}](Y, -) \cong \mathcal{C}(Y_S, -)$ then Y_S is called the (*generalized*) *Adams cocompletion* of Y with respect to the set of morphisms S or simply the S-*cocompletion of* Y. We shall often refer to Y_S as the cocompletion of Y [3].

The following results will be used in the sequel.

1.7 Theorem. ([3], Theorem 2.10, p. 76) *Let S be a saturated family of morphisms of the category $\mathcal{C}$. Then the following three statements are equivalent*:

(a) *Every object Y in $\mathcal{C}$ admits an S-completion.*

(b) *S admits a calculus of left fractions, $\lim_{\rightarrow} P_Y$ exists for all Y, where $P_Y : \mathcal{C}(Y; S) \to \mathcal{C}$, and F_S commutes with $\lim_{\rightarrow} P_Y$.*

(c) *S admits a calculus of left fractions, $\lim_{\rightarrow} P_Y$ exists for all Y and F_S commutes with all colimits in $\mathcal{C}$.*

1.8 Theorem. ([6], Lemma 19.2.6, p. 261) *Let $\mathcal{C}$ be an arbitrary category and S a set of morphisms of $\mathcal{C}$. Let $\mathcal{C}[S^{-1}]$ denote the category of fractions of $\mathcal{C}$ with respect to S and $F_S : \mathcal{C} \to \mathcal{C}[S^{-1}]$ be the canonical functor. Let the following hold*:

(a) *S consists of monomorphisms.*

(b) *S admits a calculus of left fractions.*

Then F_S is faithful.

2. S-fibrations

Each class S of morphisms in a category $\mathcal{C}$ determines a concept of fibration (and cofibration) in $\mathcal{C}$. We recall the concepts of S-fibration and weak S-fibration from [2].

2.1 Definition. [2] Let S be a subset of morphisms of $\mathcal{C}$. A morphism $p : E \longrightarrow B$ in $\mathcal{C}$ is called an S-*fibration* [2] if for each diagram

$$\begin{array}{ccccc} W & \xrightarrow{s} & X & \xrightarrow{g} & E \\ & & f \searrow & & \downarrow p \\ & & & & B \end{array}$$

with $s \in S$ and $pgs = fs$, there exists a morphism $g' : X \to E$ in $\mathcal{C}$

$$\begin{array}{ccccc} W & \xrightarrow{s} & X & \overset{g'}{\underset{g}{\dashrightarrow \atop \rightarrow}} & E \\ & & f \searrow & & \downarrow p \\ & & & & B \end{array}$$

such that $gs = g's$ and $pg' = f$.

2.2 Definition. [2] Let S be a subset of morphisms of $\mathcal{C}$. A morphism $p : E \longrightarrow B$ in C is called a *weak S-fibration* [2] if for each diagram

$$\begin{array}{ccccc} W & \xrightarrow{s} & X & \xrightarrow{g} & E \\ & & f \searrow & & \downarrow p \\ & & & & B \end{array}$$

with $s \in S$ and $pgs = fs$, there exists a morphism $g' : X \to E$ in $\mathcal{C}$ and a morphism $t : X \to X$ with $t \in S$

$$\begin{array}{ccccccc} W & \xrightarrow{s} & X & \xrightarrow{t} & X & \overset{g'}{\underset{g}{\dashrightarrow \atop \rightarrow}} & E \\ & & & & f \searrow & & \downarrow p \\ & & & & & & B \end{array}$$

such that $gs = g's$, $ts = s$ and $pg' = ft$.

The following result is elementary in nature.

2.3 Proposition. *S-fibration implies weak S-fibration.*

Proof: Let $p : E \to B$ be an S-fibration in the category $\mathcal{C}$. In order to show that $p : E \to B$ is also a weak S-fibration consider an arbitrary diagram

$$\begin{array}{ccccc} W & \xrightarrow{s} & X & \xrightarrow{g} & E \\ & & & f \searrow & \downarrow p \\ & & & & B \end{array}$$

with $s \in S$ and $pgs = fs$. Since $p : E \to B$ is a S-fibration, there exists a morphism $g' : X \to E$ in $\mathcal{C}$,

$$\begin{array}{ccccc} W & \xrightarrow{s} & X & \overset{g'}{\underset{g}{\dashrightarrow}} & E \\ & & & f \searrow & \downarrow p \\ & & & & B \end{array}$$

such that $gs = g's$ and $pg' = f$. Considering $t = 1_X : X \to X$, we can have $gs = g's$ and $pg' = f1_X = ft$. This completes the proof of the Proposition 2.3. ■

Under some moderate assumptions on the set S, it can be proved that weak S-fibration always implies S-fibration.

2.4 Proposition. *Let S be the set of morphisms in $\mathcal{C}$. Let $F : \mathcal{C} \to \mathcal{C}[S^{-1}]$ be the canonical functor. Suppose the following conditions hold*:

(a) $p : E \to B$ *is a weak S-fibration.*

(b) S *admits a calculus of left fractions.*

(c) S consists of monomorphisms.

Then $p : E \to B$ is an S-fibration.

Proof: For showing that $p : E \to B$ is a fibration consider the diagram

$$\begin{array}{ccccc} W & \xrightarrow{s} & X & \xrightarrow{g} & E \\ & & & f \searrow & \downarrow p \\ & & & & B \end{array}$$

with $s \in S$ and $pgs = fs$. Since $s \in S$, $pgs = fs$ and $p : E \to B$ is a weak fibration, there exist a morphism $g' : X \to E$ and $t : X \to X$ with $t \in S$ such that the following diagram commutes

$$\begin{array}{ccccc} W & \xrightarrow{s} & X & \xrightarrow{t} & X \\ & & & & \overset{g'}{\underset{g}{\rightrightarrows}} \\ & & & & E \\ & & & f \searrow & \downarrow p \\ & & & & B \end{array}$$

i.e., $g's = gs$, $ts = s$ and $pg' = ft$. It is enough to prove that $pg' = f$. Since $pg' = ft$ we have $pg's = fts = fs$. Since F is a covariant functor, we have $F(pg's) = F(fs)$, i.e., $F(p)F(g')F(s) = F(f)F(s)$. Since $F(s)$ is an isomorphism in $\mathcal{C}[S^{-1}]$ we have $F(p)F(g') = F(f)$, i.e., $F(pg') = F(f)$. By Theorem 1.8, F is faithful. Hence we have $pg' = f$. This completes the proof of the Proposition 2.4. ■

3. S-cofibrations

The dual concepts of S-fibration and weak S-fibration are respectfully S-cofibration and weak S-cofibration. We recall these concepts from [2].

3.1 Definition. [2] Let S be an arbitrary set of morphisms in a category $\mathcal{C}$. A morphism $j : B \to E \in \mathcal{C}$ is called an S-*cofibration* if for each diagram

$$\begin{array}{ccccc} E & \xrightarrow{g} & & X & \xrightarrow{s} & W \\ j\uparrow & & \nearrow f & & & \\ B & & & & & \end{array}$$

with $s \in S$ and $sgj = sf$ there exists a morphism $g' : E \to X$

$$\begin{array}{ccccc} E & \overset{g'}{\underset{g}{\overset{\dashrightarrow}{\rightarrow}}} & & X & \xrightarrow{s} & W \\ j\uparrow & & \nearrow f & & & \\ B & & & & & \end{array}$$

in $\mathcal{C}$ such that $g'j = f$ and $sg = sg'$.

3.2 Definition. [2] A morphism $j : B \to E \in \mathcal{C}$ is called a *weak* S-*cofibration* if for each diagram

$$\begin{array}{ccccc} E & \xrightarrow{g} & & X & \xrightarrow{s} & W \\ j\uparrow & & \nearrow f & & & \\ B & & & & & \end{array}$$

with $s \in S$ and $sgj = sf$ there exists a morphism $g' : E \to X$ and $t : X \to X$ with $t \in S$

$$\begin{array}{ccccccc} E & \overset{g'}{\underset{g}{\overset{\dashrightarrow}{\rightarrow}}} & & X & \xrightarrow{t} & X & \xrightarrow{s} & W \\ j\uparrow & & \nearrow f & & & & & \\ B & & & & & & & \end{array}$$

such that $st = s,\ g'j = tf$ and $sg = sg'$.

The following result is elementary in nature.

3.3 Proposition. *S-cofibration implies weak S-cofibration.*

Proof. Let $j : B \to E$ be an S-cofibration in the category $\mathcal{C}$. In order to show that $j : B \to E$ is also a weak S-cofibration consider an arbitrary diagram

$$\begin{array}{ccccc} E & \xrightarrow{g} & X & \xrightarrow{s} & W \\ j\uparrow & \nearrow f & & & \\ B & & & & \end{array}$$

with $s \in S$ and $sgj = sf$. Since $j : B \to E$ is an S-cofibration, there exists a morphism $g' : E \to X$

$$\begin{array}{ccccc} E & \overset{g'}{\underset{g}{\dashrightarrow\ \to}} & X & \xrightarrow{s} & W \\ j\uparrow & \nearrow f & & & \\ B & & & & \end{array}$$

in $\mathcal{C}$ such that $g'j = f$ and $sg = sg'$. Considering $t = 1_X : X \to X$, we can have $st = s$, $g'j = tf$ and $sg = sg'$. ■

Under some moderate assumptions on the set S, it can be proved that weak S-cofibration always implies S-cofibration.

3.4 Proposition. *Let S be the set of morphisms in $\mathcal{C}$. Let $F_S = F : \mathcal{C} \to \mathcal{C}[S^{-1}]$ be the canonical functor. Suppose the following conditions hold*:

(a) $j : B \to E$ *is a weak S-cofibration.*

(b) S *admits a calculus of left fractions.*

(c) S consists of monomorphisms.

Then $j : B \to E$ is an S-cofibration.

Proof. For showing that $j : B \to E$ is an S-cofibration, consider an arbitrary diagram

$$\begin{array}{ccccc} E & \xrightarrow{g} & X & \xrightarrow{s} & W \\ j\uparrow & \nearrow f & & & \\ B & & & & \end{array}$$

with $s \in S$ and $sgj = sf$. Since $s \in S$ and $sgj = sf$ and $j : B \to E$ is a weak S-cofibration, there exist a morphism $g' : E \to X$ and $t : X \to X$ with $t \in S$ such that the following diagram commotes

$$\begin{array}{ccccc} E & \overset{g'}{\underset{g}{\rightrightarrows}} & X & \xrightarrow{t} X \xrightarrow{s} & W \\ j\uparrow & \nearrow f & & & \\ B & & & & \end{array}$$

i.e., $st = s$, $g'j = tf$ and $sg = sg'$. It is enough to prove that $g'j = f$. Since $g'j = tf$ we have $sg'j = stf = sf$. Since F is a covariant functor we have $F(sg'j) = F(sf)$, i.e., $F(s)F(g')F(j) = F(s)F(f)$. Since $F(s)$ is an isomorphism in in $\mathcal{C}[S^{-1}]$ we have $F(g')F(j) = F(f)$, i.e., $F(g'j) = F(f)$. By Theorem 1.8, F is faithful. Hence we have $g'j = f$. This completes the proof of the Proposition 3.4. ■

4. Adams completion and S-fibrations

In [2], Bauer and Dugundji have examined the notion of $\boldsymbol{S}$-fibration in the category $\boldsymbol{\mathcal{T}}$, the category of topological spaces and continuous functions; under suitable choice of the set $\boldsymbol{S}$ they have shown that a map $\boldsymbol{p} : \boldsymbol{E} \to \boldsymbol{B}$ is an $\boldsymbol{S}$-fibration if and only if it is a

Hurewicz fibration. In this note, under reasonable assumptions we show that a morphism $\boldsymbol{p} : \boldsymbol{E} \to \boldsymbol{B}$ in a category $\boldsymbol{\mathcal{C}}$ is an $\boldsymbol{S}$-fibration if and only if it is a weak $\boldsymbol{S}$-fibration.

4.1 Theorem. *Let* $\boldsymbol{S}$ *be a saturated family of morhpisms of a category* $\boldsymbol{\mathcal{C}}$ *and let every object in* $\boldsymbol{\mathcal{C}}$ *admit an Adams completion. Let* $\boldsymbol{S}$ *consist of monomorphisms. Then* $\{$*weak* $\boldsymbol{S}$*-fibrations*$\} = \{\boldsymbol{S}$*-fibrations*$\}$.

Proof. The proof follows from Theorem 1.7, Propositions 2.3 and 2.4. ■

The following is a direct consequence of Theorem 4.1.

4.2 Corollary. *Let* $\overline{\boldsymbol{S}}$ *be the saturation of a family of morhpisms of a category* $\boldsymbol{\mathcal{C}}$ *and let every object in* $\boldsymbol{\mathcal{C}}$ *admit an* $\overline{\boldsymbol{S}}$*-completion. Let* $\boldsymbol{S}$ *consist of monomorphisms. Then* $\{$*weak* $\overline{\boldsymbol{S}}$*-fibrations*$\} = \{\overline{\boldsymbol{S}}$*-fibrations*$\}$.

4.3 Note. In the presence of the conditions of Proposition 2.4, we have {weak $\boldsymbol{S}$-fibrations} $= \{\boldsymbol{S}$-fibrations$\}$.

4.4 Note. If S contains only the identities of the category $\boldsymbol{\mathcal{C}}$, then {weak $\boldsymbol{S}$-fibrations} = $\{\boldsymbol{S}$-fibrations$\}$ ([2], Remark 1); this is so because $\boldsymbol{S}$ satisfies the conditions of Propositions 2.4.

4.5 Remark. Everything which has been obtained for $\boldsymbol{S}$-fibration and weak $\boldsymbol{S}$-fibration can be dualized in the usual fashion to yield the corresponding results for $\boldsymbol{S}$-cofibration and weak $\boldsymbol{S}$-cofibration [2].

References

[1] Adams J.F. : *Localization and Completion* : Lecture Notes in Mathematics, Univ. of Chicago (1975).

[2] Bauer F.W. and Dugundji J. : *Categorical Homotopy and Fibrations* : Trans. Amer. Math. Soc. 140 (1969), 239 - 256.

[3] Deleanu A., Frei A. and Hilton P.J. : *Generalized Adams completion* : Cahiers de Top. et Geom. Diff. 15 (1974), 61 - 82.

[4] Gabriel P. and Zisman M.: *Calculus of Fractions and Homotopy Theory* : Springer-Verlag, New York (1967).

[5] Mac Lane S. : *Categories for the working Mathematicians* : Springer-Verlag, New York (1971).

[6] Schubert H.: *Categories* : Springer-Verlag , New York (1972).

Trade-off between Quality Dimensions in Relation to Trade-off between Strategic Positions

Iris Gertner Moryossef

Hadassah Academic College, Jerusalem

3.

4. Abstract

In the competitive surroundings of today, when technology and knowledge are easily attained, firms should know what not to do – try to trade off within a strategic position in order to maintain a competitive advantage in their target markets [1].

The aim of any strategy means not only using the company's activities to its advantage, but also choosing activities which are different from those of rivals.

A company acknowledges interfacing between different sets of activities, and uses the correlation between them to accomplish adjustable strategic position tradeoffs, thus keeping them unique and valuable.

As high quality is still a difficult and challenging competitive issue, one of the interesting questions is: what is the best combination between quality dimensions that will gain a valuable and unique strategic position.

This paper will try to deal with this question, based on the correlation between quality dimensions and strategic positions, the achievement of a sustainable and inimitable advantage in the customer's perception, and the company's manufacturing skills.

Keywords: Quality, quality dimensions, strategic position.

Tradeoffs between strategic positions

One of the major challenges of a company is creating a unique strategy and accomplishing a valuable strategic position, superior to its rivals. Such decisions

must precede the company's activities in order to achieve greater customer satisfaction than that of rivals. However, strategy also means combining tradeoffs between activities to make tradeoffs in competition.

Tradeoffs between strategic positions can be a result of 1) inconsistence in image reputation; 2) changing skills, employee behavior and other activities; and 3) limits of internal control [1].

Without tradeoffs between strategic positions, the firm's strategy may be imitative and its perceived quality may diminish with time. Since the strategic position determines the activities and the combination between them, one popular combination is that of cost and quality, and often occurs when the customer is willing to pay a high price for high quality or a low price for low quality.

Debating between high quality, high prices and low cost has led many firms to deal with quality and its categories as a competitive priority and as a valuable advantage as a preferred strategy position. The company cannot be good in all the dimensions: it should know what not to do in order to achieve a competitive position, and quality as a priority.
As [2] notes quality can classify the following eight categories: 1) performance; 2) features; 3) reliability; 4) conformity; 5) durability; 6) serviceability; 7) aesthetics; and 8) perceived quality.

The difficulty of firms to maintain their quality performance and to use their activities as a competitive priority has led this writer to ask the following question: what is the right dimension for a firm to use to create a better strategic position?

Garvin's [2] dimensions are not necessarily interrelated [3] meaning that a firm should not use all eight dimensions at the same time.
Although Porter [1] mentions that a firm should not specialize in all the dimensions and should know what it cannot do, Voros [4] finds that unit market recognition should be equal in each dimension, in order to avoid bottlenecks.

The choice of which acknowledged quality the market will recognize must be based on the firm's manufacturing (operation decisions) and customer's expectations and satisfaction (TQM philosophy). The superior combination can lead to a strategic position, with a competitive advantage profitable to the firm in a situation of high quality, high price, and low cost [5], [6]. The problem is that not every dimension is recognized or valuable for the customer at the same level, meaning not every dimension is acceptable.

Quality and quality dimensions as a competitive advantage

The aim of a company in competing with rivals is to have a strategic position which reflects its competitive priorities. If increasing competition is the primary basis for changing, focusing on quality as an important competitive advantage and puzzling it out of quality's dimension is essential to understand.

Strategy should be changed rapidly according to customer satisfaction, the firm's capabilities, and surrounding changes, in order to maintain better positioning and better customer demand [1].

Product quality is the outcome of the organization's strategic capabilities to utilize its tangible and intangible resources and personal skills. Eventually the combination of these resources will determine the organization's success in creating an advantage in the competitive environment [7].

Competitive advantages can give the firm better access to its customers, increasing the demand, while advantages in the supply (cost) can reduce the costs of the firms with better and superior technology.

There are two ways to achieve an advantage: 1) lower price than the competitors, or 2) higher quality than that of the competitors.

Together, the eight dimensions cover a broad range of quality; some are measurable, some are subjective, some are inherent and others are timeless. Each is self contained and distinct, i.e., a product can be high in one dimension and low in another. A company that chooses to compete by the quality advantage needs not guarantee all eight-quality dimensions in its products. On the other hand, it can establish its business strategy on one or more of the quality dimensions.

With the advancement of the firm from internal to external quality and to fulfill customer satisfaction (TQM), it should emphasize performance, conformance and serviceability.
Thus can companies compete with each other in different niches to specific customers' needs.

Tradeoffs between quality dimensions, as Porter [1] revealed, are explained by one of the following reasons:

1) Inconsistence in image or reputation, for example Ivory soap trying unsuccessfully to attain a premium positioning to cheaper soap;
2) Tradeoffs arising from activities like changing skills, equipment, or configurations;
3) Tradeoffs arising from choosing to compete one way rather than another due to limitations inside the firm.

Using Garvin's [8] segmentation and Sebastianelli and Termini's [3] research we can see that the *user-based definition* is related to aesthetic and perceived quality, the *manufacturing-based approach* is related to conformance and reliability while the *product-based approach* is related to performance, durability and features.

Because the firm should change its strategic position and implement it to consumer satisfaction, each segment in the firm should focus on its ideal approach, e.g., marketing professionals should implement the user-based or the product-based approach, as they perceive the customer and meeting the customer's requirements as the organization's foremost goal.

As opposed to them, the manufacturing department will utilize the operation management approach, because for them, quality means high performance at a low cost. This can create conflict within the organization. However, no definition of quality avoids the customer satisfaction and expectations of the product. Quality is correlated to other variables such as price, cost, market share, probability and advertising. The use of quality as a business strategy is carried out in many ways, combining market segment price and profitability.

The motivating dilemma is, what dimension does the customer prefer in order to have a superior positioning strategy? This dilemma is related to the conflict mentioned above, between the manufacturing section and the marketing section [2].

Tradeoffs between quality dimensions in order to create a strategic position

An interesting question concerns the correlation between tradeoffs between quality dimensions and strategic position tradeoffs.

The company should always change its strategic position, and quality is a significant competitive instrument that the company will want to adopt in order to achieve a high price for low cost [7]. Since the company cannot have both high quality and low price positioning at the same time [1] a better way for the firm to change its position is trading between the activities themselves, most likely between other quality dimensions [9], [6].

Given that over time competitors are able to offer products with the same characteristics, and customers are willing to pay less for the same quality [10] competing on this dimension is not long-term and firms should get a competitive advantage in other dimensions (for instance aesthetic, perceived quality, reliability, or serviceability).
Prahalad and Hamel [7] considered core competencies, such as the firm's intangible resources and skills resources, unlike physical assets, to be 1) communication; 2) high involvement; 3) commitment to working; 4) potential access to markets; 5) difficulty to imitate; 6) having a major perceived contribution for the customer's benefit; and 7) stable with use. Using its core competencies, the firm can move from one position to the other and choose the accurate position for its customers.

Summary and conclusions

Business strategy is the creation of a unique valuable position based on intangible, imitable, and sustainable resources [11], [9]. Changing the strategic position is essential in approaching new customers' needs in order to increase revenue and profits.

If performance quality is easy to copy, firms can implement other dimensions in order to change position.

Changing quality dimensions can enable firms to approach different markets or to penetrate the current markets, having a competitive advantage vis-à-vis their rivals. An interesting question is, how can a firm persuade customers that its product is better than others' with the same activities? A firm can trade off quality dimensions only when it competes on multiple dimensions [4]. When competition increases, the quality levels are higher and the company must excel in more than one dimension.

This writer avers that when competition increases the asymmetry between the dimensions is reduced and companies must penetrate using a user-based approach together with a manufacturing and product-based approach.

Tradeoffs between dimensions in quality, followed by changing the strategic position, must contribute to both customer satisfactions and the firm's revenue. In the competitive playground this is a popular move.

This writer believes that as they are prejudiced and subjective, perceived and aesthetic dimensions are the most complicated dimensions a firm can use, but still are the inimitable and lasting categories.

The changing of dimensions should be done when a firm contributes to the customer's value in terms of quality versus price, while in many cases reputation and brand name allow the firm to charge higher prices only because of a better perceived quality.
The ability to build core competencies is mostly in the hands of the managers, who are able to consider the company to be different than others.

In order to use the resources as a competitive advantage they must fulfill the following: 1) substitutability; 2) inimitability; 3) appropriateness; 4) durability; and 5) competitive superiority [11], [9].

Managers should build their strategy on resources that fulfill all five of the above in order to base it on core competencies, and in the changing global surroundings, the firm should continually do the following: 1) invest in new resources; 2) upgrade its own existence; 3) add new resources (Intel Corporation), upgrade to alternative resources (AT&T) or upgrade resources to move into a more attractive industry (Nucor Corporation) [7], [9].

According to Garvin [2] and Sebastianelli & Tamimi [3], quality is related to product price in a negative and positive correlation, dependent on the customer's availability to knowledge. On the other hand, if the customer is aware of other issues, such as brand name or store image, the higher price does not necessarily mean higher quality and the correlation can be negative (i.e. higher quality and lower price).

Using one of the quality approaches, the firms must, or should, select in what dimension to compete and on what target niche they wish to focus.

References:

1. Porter, E. M., (1996). From competitive advantage to corporate strategy, in, M. Gold & K. Sommers Luchs, *Strategic issues for divested groups*, Ch. 12: 285- 315.
2. Garvin, A. D., (1984). What does product quality really mean? Harvard University
3. Sebastianelli, R. & Tamini, N., (2002). How quality dimensions related to defining quality. *International Journal of Quality & Reliability Management*, 19 (4), 442-453. .
4. Voros, J. (2002). Product balancing under conditions of quality inflation, cost pressures and growth strategy. *European Journal of Operational Research 141*, 153-166
5. Porter, E. M., (1985). *Competitive strategy: techniques for analyzing industries and competitors.* New York: The Free Press, 4-26, 202-214.
6 Fine, H. C., (1986). Quality improvement and learning in productive system *Management Science 32,* 10, 1301-1315 .
7. Prahalad & Hamel (1990). The core competence of the corporation. *Harvard Business Review* May –June, 79-91.
8. Garvin, A. D., (1987). Competing on the eight dimensions of quality. *Harvard Business Review*
9. Collins, J. D. & Montgomery, C.A. (1995). How do you create and sustain profitable strategy: competition on resources. *Harvard Business Review 73* no 4 (July August 1995) pp 118-128
10. Voros, J. (2006). The dynamic of price, quality and productivity improvement decisions. *European Journal of Operational Research 17,* 809-823.
11. Barney, J., Wright, M., & Ketchen, D.J., Jr. (2001). The resource based view of the firm: ten years after 1991. *Journal of Management 27*, 625-641

Investigating the effects of habitual use, satisfaction and user value perspectives on continuation intention of mobile social Apps

Yalda Roodbaei*

Master Degree Student. Department of Management, Bandar Abbas Branch, Islamic Azad University, Hormozgan, Iran
Maryam Kenarehfard

Abstract

The emergence of mobile social Apps has dramatically changed our communications. These kinds of Apps enjoyed a rapid growth in 2013. Although research literature on mobile App usage is abundant, studies focusing on key determinants of users' continuance intention regarding social Apps are rare. The present study investigated the effect of customer value perspectives, satisfaction, and habit on the continuance intention of social App use. A total of 300 valid questionnaires were collected by survey method and structural equation modeling was employed in the subsequent data analysis. The results revealed that users' continued usage intention is significantly influenced by satisfaction and habitual use. Moreover, full mediation effects of satisfaction and habit were found between perceived usefulness, social ties and intention to continue use. However, the results did not support the mediating effect of habit between hedonic motivation and continuance intention. The findings extend our understanding of users' continuance intention in the context of social Apps.

Key words:

Social Apps, Continuance intention, Satisfaction, Habit, Customer value perspectives

1. Introduction

Our communications and relationships with others are changing very rapidly due to the use of social mobile Apps such as WhatsApp, WeChat and LINE, which provide free messaging services. These applications help users connect with their friends instantly. Flurry Analytics (2014) reported a 115% year-over-year growth of overall mobile application downloads in 2013. The most dramatic growth in Apps in 2013 was up to 203%.

On the other hand, some leading social Apps such as Facebook have suffered a decline in use, particularly among teenagers, while alternative social Apps such as Instagram and Telegram are becoming more popular, the reason for which is the rapid explosion of the release of new social Apps providing a wide variety of functions.

* corresponding author
Email: yroodbaei@gmail.com

As new social Apps are being launched, users are provided with more opportunities to access them. Therefore, retaining existing users is the challenge of related industries such as mobile services. Understanding how users develop continuance intention can benefit such industries, and help them provide new social Apps meeting users' needs. This study attempts to find out whether users will continue using their currently used social Apps, how satisfied the users are with the Apps they are currently using, and what the main factors affecting users' post-acceptance usage of social Apps are.

To address the above issues, this study relies on a research framework of social App continuance intention developed by Hsiao, Chang, and Tang (2016), based on Bhattacherjee's (2001) post-acceptance model of information system (IS) continuance . In this framework, satisfaction is adopted to explain the users' continuance intention. In addition, a habitual construct is applied due to the fact that users access mobile Apps frequently and daily; hence, their behaviors may become habitual. Therefor, these two constructs have been adopted as predictors of continuance intention (Kim, et al., 2005; Limayem et al., 2007). Besides, three perspectives of perceived value, namely utilitarian, hedonic, and social views concerning the distinct nature of social Apps have been applied. The research framework is presented in Fig. 1. The present study contributes to the literature by shifting the focus from initial adoption to continued use of social Apps. Besides, the proposed model in this study incorporates satisfaction and habit, which have rarely been used in other similar models. Another contribution of this paper is identifying three importance customer values in the context of using social Apps and revealing their effects on satisfaction, habit, and continuance intention. Moreover, this study investigates the mediating effects of habit and satisfaction.

2. Theoretical Background and Hypotheses Development

Satisfaction and continuance intention

Satisfaction along with continuance usage is viewed as the key to fostering and retaining a loyal relationship with consumers. It is an overall affective response to the gap between prior expectation and perceived performance after consumption (Oliver and Desarbo, 1988). In the current study, we define customer satisfaction as the total consumption perception of consumers when using social Apps. Research on user satisfaction and continuance usage has emerged as a dominant issue in the IS and marketing literature. Bhattacherjee (2001) proposed the ''post-acceptance model of IS continuance", which aims to explain an IS user's intention, and is focused on post-acceptance variables. In this model, users' continuance intention is determined by their satisfaction with IS use and perceived usefulness of continued IS use. Bhattacherjee (2001) argued that users with higher levels of satisfaction tend to have stronger intention to use the online channel again in the context of an online environment. The direct relationship between satisfaction and continuance intention is at the core of the IS continuance model, and is validated empirically (Bhattacherjee, 2001). Besides, a significant body of research in the areas of IS and marketing suggest that user satisfaction is a reliable predictor of continued IS use intention (Thong et al., 2006; Wang et al., 2010). Past studies of mobile services have also supported this argument that customer satisfaction is positively related to

post-purchase intention (Kim et al., 2011). Consistent with most prior IS and marketing studies, it stands to reason that satisfaction is a powerful predictor of continuance intention. Thus:

Hypothesis1. Satisfaction positively influences continuance intention.

2.3. Habit and continuance intention

Habit has been included in certain continuance intention models to explain IT-use behavior because consumers use those IT devices frequently and the behavior becomes automatic (Limayem et al., 2007). It is defined by researchers from different perspectives across disciplines, and is commonly understood as ‘‘learned sequences of acts that become automatic responses to specific situations, which may be functional in obtaining certain goals or end states” (Verplanken and Wood, 2006). In the current study, we define habit in the context of social Apps as the extent to which users tend to automatically access social mobile Apps without thinking (Kim et al., 2005). Habit theory supports the habit–continuance intention relationship because prior habitual behaviors can produce favorable feelings toward the behavior, thereby increasing continuance intention (Kim and Malhotra, 2005). In the context of IS, both intention and habit have been regarded as major antecedents of behavior; however, the relationships among habit, intention, and behavior have been quite controversial (Bhattacherjee et al., 2012; Limayem et al., 2007; Venkatesh et al., 2012). Habit can have both a direct and an interactive effect on behavior. While some studies have adopted habit as an antecedent of intention (Barnes, 2011; Hong et al., 2006; Venkatesh et al., 2012), others have considered it to be a moderator of intention and actual behavior (Guo and Barnes, 2011; Kim et al., 2005; Limayem et al., 2007). Some other studies have also insisted that habit has relatively little conceptual overlap with intentions, thus providing potentially additional explanatory power regarding continued IT usage (Limayem et al., 2007; Lee, 2014). Consistent with previous studies that the automaticity of behavior decreases the need to access intention (Aarts et al., 1998), we thus adopt habit and another important factor (i.e., satisfaction) as the antecedents of continuance intention instead of intention. Another controversial issue regarding habit is its relationship with satisfaction and with other factors (e.g., perceived usefulness). Some researchers have concluded that satisfaction leads to habit, as they assume that satisfactory experiences with a behavior will increase one’s tendency to repeat the same activity (Aarts et al., 1998; Limayem et al., 2007). However, other researchers hold the contrary stance that habit has a significant effect on satisfaction (Khalifa and Liu, 2007; Shiau and Luo, 2013). Their arguments are that habit is a major driver of affect, and satisfaction is also an affect. In this sense, habit could affect satisfaction directly by enhancing a favorable feeling towards a behavior (Limayem and Hirt, 2003). The third argument is that habit and satisfaction are parallel and distinct variables, so they do not have causal relationships (Woisetschläger et al., 2011). In the current paper, we consent the third argument and test their effects on continuance intention as mediators between perceived value variables and continuance intention. Although satisfaction is commonly believed to have a relationship with repurchase intention, few studies

have yet confirmed that satisfaction leads to actual repurchase behavior (Olsen, 2002). Moreover, the development of habits requires a certain amount of repletion or practice for a reasonable amount of time (Aarts et al., 1998). Consumers' satisfactory experiences with a behavior will increase their tendency to repeat it, but it does not necessarily lead to the formation of habitual behavior. Despite the contentious role of habit with other variables, in particular satisfaction, its relationship with continuance intention is evident. The marketing literature also posits that habit is an important predictor of customer loyalty or repeat purchase intention (Rauyruen et al., 2009). The frequent use of mobile Apps can fit into users' daily life patterns; thus, continued usage may not be strongly influenced by conscious evaluation such as satisfaction, but rather may be the result of habitual use (e.g., Kim et al., 2005; Limayem et al., 2007). Research on switching behaviors also supports that the more habitual the behavior, the more the perceived effort necessary to change that behavior (Jones et al., 2002), because any intention to switch service providers would require extra information processing effort which would result in a potential loss of benefits. Thus, deriving from previous research, we posit that habit has a significantly positive effect on continuance intention.

Hypothesis2. Habit positively influences continuance intention.

2.4. Customer value perspectives

Customer value has been recognized as an important predictor of customer purchase decision in the marketing and ecommerce literature (Kim et al., 2007). It is derived from an individual's experience and interaction with a product or service (Turel et al., 2010). Understanding the value of a product or service from the perspective of users has long been recognized as a successful customer strategy, and is often linked to overall business performance (Desarbo et al., 2001). In general, value is often divided into utilitarian and hedonic values (Pöyry et al., 2013). Other scholars have proposed functional needs and nonfunctional wants (including social, emotional, and epistemic values) as motives for obtaining products or services in the context of information technology (Turel et al., 2010). Kim et al. (2011) proposed that three pertinent dimensions of customer consumption value influence consumers' purchase intention: functional, emotional, and social. The consumer behavior literature has indicated that behavioral intentions for products or services may be driven by multiple values (Kim et al., 2012; van der Heijden, 2004). As such, the effect of multiple value dimensions should be taken into account concurrently as predictors of behavior. Recent research has provided significant evidence that the relevance of emotional, hedonic, and social aspects should not be ignored (Banerjee and Kumar, 2013). Prior research has indicated that value considerations motivate people to perform a specific behavior for both utilitarian and hedonic purposes (Chiu et al., 2012; Kim et al., 2012). Yang and Peterson (2004) argued that perceived value not only affects consumption choice decision as its original view, but may also influence many other behavioral outcomes such as customer satisfaction, behavioral usage intentions, and loyalty. Therefore,

this study has constructed an integrated model with multiple viewpoints for investigating social App usage, including utilitarian, hedonic, and social components, as follows.

2.4.1. Utilitarian motivation

An important and long-standing IS research question is how to accurately explain user acceptance of new information technology. One of the dominant theories in this area of research is rooted in Davis' technology acceptance model (TAM), which is widely applicable for elucidating user acceptance of productivity-oriented information systems, such as task-related systems (Hsiao and Yang, 2011). Utilitarian value reflects the acquisition of a product or service in an efficient manner, and can be viewed as reflecting a more task-oriented, cognitive, and non-emotional outcome of adoption (Babin et al., 1994; Holbrook and Hirschman, 1982). The objective of a utilitarian information system is to increase the user's task performance while encouraging efficiency. Therefore, utilitarian systems provide instrumental and productivity-oriented value to users. Based largely on a utilitarian view, the traditional model of user acceptance of IS includes perceived usefulness and perceived ease of use as key variables influencing behavioral intention to use. However, while perceived usefulness has consistently proven to be an important construct of post-adoption behavior and in prior continuance studies, perceived ease of use has not (Bauer et al., 2005). Hence, we include only perceived usefulness in our model. When Davis first introduced perceived usefulness as one of the constructs in TAM, it was defined as ''the perceived degree to which an individual believes that using a specific service or system improves his or her task performance" (Davis, 1989). The ''two-appraisal" model of satisfaction evaluation (Oliver and Desarbo, 1988) posits that cognitive interpretation and related processes of product/service usage lead to satisfaction. In addition, Babin et al. (1994) proposed that utilitarian value should influence customer satisfaction, and they empirically showed strong correlations of utilitarian value with satisfaction. Therefore, consistent with previous studies related to these two fields, this paper hypothesizes the following:

Hypothesis3a. Perceived usefulness positively influences satisfaction.

Theoretically, perceived value can be considered a cognition-based construct for capturing the benefit-cost discrepancy. Usefulness is the individual's perception of the act of performing a behavior to gain specific rewards. Previous usage experience plays an important role in building continuous usage intentions (Dorsch et al., 2000). Rogers (1995) explained that such experience might reduce uncertainty and help obtain information on high-tech services since habit refers to one's automatic behavior because of learning (Limayem et al., 2007). As mentioned earlier, the value considerations motivating consumers to engage in a specific behavior have utilitarian and hedonic dimensions (Chiu et al., 2012). Additionally, the TAM suggests that individuals accept information technology if they believe in its positive performance (Davis, 1989), and thus will increase the tendency to use it frequently. Therefore, this study tests the following hypothesis:

Hypothesis3b. Perceived usefulness positively influences habit.

2.4.2. Hedonic motivation

The value of a hedonic system reflects the degree to which the user experiences fun or enjoyment when using IS. The major concept of hedonic influence is captured by perceived enjoyment, which was introduced to the TAM model as playing a crucial role in explaining consumer adoption of new technology (Davis, 1989). Differing from traditional information technologies, many mobile Apps serve entertainment purposes, enabling users to experience pleasure when using the system. Such entertainment-oriented Apps exert significant worldwide influence (Childers et al., 2001). Hedonic motivation is defined as the fun or pleasure derived from using a technology, and it has been shown to play an important role in determining technology acceptance and use (Brown and Venkatesh, 2005). Individuals often seek out stimulation of multiple sensory channels, and mobile Apps can provide such multisensory experiences (van der Heijden, 2004). The pleasure trait of hedonic systems has a strong effect on users' attitudes because their aim is to maximize the users' enjoyment while using a certain technology (Childers et al., 2001). Social Apps may be viewed as interactive hedonic systems by users, which they can use to communicate with others. These pleasurable and fun experiences evoke favorable and positive feelings that will lead to a higher degree of satisfaction and continued usage intention. The consumer behavior literature has demonstrated that both utilitarian and hedonic value influence consumers' repurchase and use intention of products or services. Perceived enjoyment and usefulness are usually treated as the major hedonic and utilitarian components, respectively (Coursaris and Sung, 2012). Barnes (2011) suggested that modern digital products and services should work for multiple purposes because they contain both hedonic and utilitarian components. As mentioned before, user satisfaction is conceptualized as individuals' affective reactions to the use of social Apps. The satisfaction construct is perceived to be in parallel with the attitudes construct. Therefore, perceived enjoyment is inferred to impact users' satisfaction with social App usage. In the light of these arguments, we propose the following:

Hypothesis4a. Perceived enjoyment positively influences satisfaction.

Habit has been included in the post-continuance model to account for IT-use behaviors that have become automatic (Limayem et al., 2007). Prior research has considered consumer values as a motivation affecting consumers' behavioral outcome, such as behavioral usage intentions and post-continuance intention (Chiu et al., 2012; Kim et al., 2012; Yang and Peterson, 2004). Hedonic value, one of the important customer values, is confirmed as being a crucial element in the use of technology acceptance (Brown and Venkatesh, 2005). If an individual evaluates his or her consumption experience positively, it is likely that his/her willingness to perform the same behavior increases, i.e., mobile App usage in this study. When users communicate using social Apps, the feeling of enjoyment increases their tendency to repeat the action, and this action occurs without a conscious decision to act, and is performed as a habit. Therefore, the following

hypothesis regarding the relationship between perceived enjoyment and habit can be proposed:

Hypothesis4b. Perceived enjoyment positively influences habit.

2.4.3. Social influence

The IS literature has suggested that the perspective of social influence plays an important role in the adoption of innovative products and services (Turel et al., 2010; Venkatesh et al., 2012). Social influence is defined as the degree of impact on the interaction among people in the social network (Rice and Aydin, 1991), and as the perceived pressure gained to perform a specific behavior (Venkatesh and Brown, 2001). For example, people can share service experiences such as media consumption or use, and these joint experiences are likely to form a collective basis for conversations within a social network. In the process of creating social networks, social ties represent individuals of social networks' perceived strength of social relationship with others. These social ties play a role in coercing behavioral norms among group members as well as promoting a diffusion of information (Chai et al., 2011). The strength of ties is often measured in terms of duration, frequency of contact, and social importance (Money, 2004), for example, how often an individual corresponds or communicates with others and how important an individual considers his/her friends. Strong social ties give customers abundant opportunities to recommend a service to others, and in such situations, these ties depend greatly on customer satisfaction. In general, social influence has stronger impacts on young people than on older users because young people gain approval from others to experience a sense of community and connection, in particular in mobile phone use or other kinds of novel technology (Smetana et al., 2006. Accordingly, from a social perspective, we consider that social ties positively relate to satisfaction in the current study.

Hypothesis5a. Social ties positively influence satisfaction.

Both habits and social ties act as important variables in IS consumption (Woisetschläger et al., 2011). An important precondition for the development of habit is when there has been a high frequency of the behavior in a stable context which has become an automatic response to that context (Limayem et al., 2007). In the context of a social App group, individuals share service experiences such as media consumption or use, and these joint experiences are likely to form a collective basis for conversations within social networks of customers. When one social App gains popularity among group users, then its daily use becomes steady, and it may even diminish the use of other social Apps (Quan-Haase and Young, 2010). Thus, given that using a familiar social App occurs at high frequency, and individuals do not spend much time thinking about using it, it is likely that it can become habitually enacted. In light of these arguments, we propose the following:

Hypothesis5b. Social ties positively influence habit.

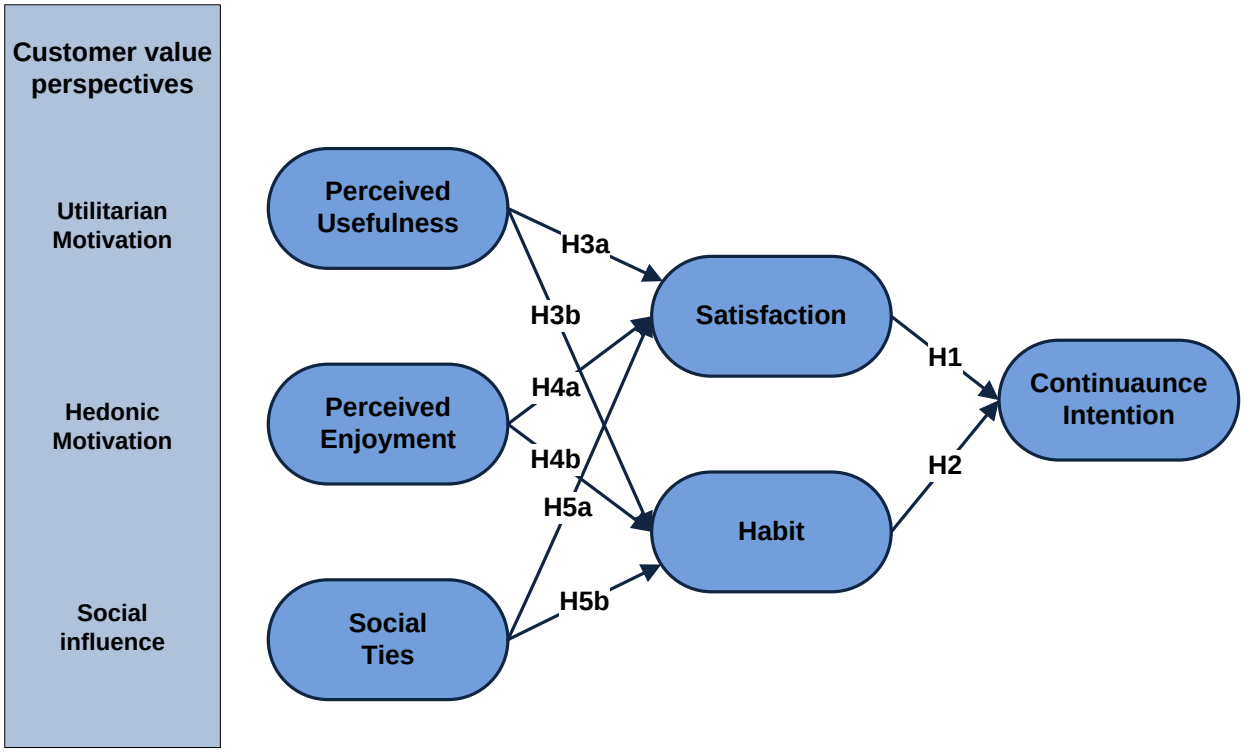


Fig1. Research framework

3.1. Participants and procedure

Empirical data for this study were collected through a paper-based survey of senior high school students from Iran. The large number of mobile App users in Iran suggests that Iranian users have more experience with mobile applications compared with users from many other countries, and are suitable for analysis in a study of mobile Apps. Since young people comprise the majority of heavy users of mobile applications, therefore, a student sample is suitable for this mobile App study. In addition, as Bhattacherjee and Premkumar (2004) pointed out student subjects are not systematically different from other users; they can be effective surrogates for non-students or adults in various empirical studies. Therefore, this study collected data from teenagers at some high schools in Iran. An experienced instructor administered the survey during regular class time with the permission of the teachers and students. The questionnaire consisted of three parts. First, a short greeting, research purpose, and a guarantee of confidentiality were expressed to the students. Then, before the research items, a brief statement asked the students to recall the social App which they use most frequently. The final part of the introduction related to demographic information such as age, gender, and related mobile information. After the brief introduction, the instructor gave the students a copy of the questionnaire, leaving sufficient time for them to complete it. Upon completion, the respondents were thanked and dismissed. Of the 350 questionnaires distributed, 300 usable questionnaires were collected and used for subsequent analysis (92.9%). Using Chow's test and Wilk's lambda (Chow, 1960), the results of all three samples showed no significant differences in the items measuring dependent and independent variables. Therefore, the data from the

schools were pooled because they were similar and statistically inseparable. The composition of female and male students made up 50.8 % and 49.2 % of the sample, respectively.

3.2. Measurement of constructs

The variables of the study were measured by means of a 5-point Likert scale questionnaire, items of which were adopted from the previous literature. All measures with anchors ranging from ‘‘strongly disagree” to ‘‘strongly agree” are provided in the Appendix A. The back translation technique (with items translated from the original English scale into Persian, and then back into English) was used. During the translation process, any discrepancies between the two language versions were compared and resolved. To address face validity, three business professors were asked to refine the questionnaire. Based on their feedback, some items were reworded to fit the research purpose. The result of the pretest provided a first assurance of the validity of the scale items. The final version of the instrument is given in Appendix A.

Consistent with the previous research addressing technology acceptance, items of perceived usefulness (PU) were drawn from Davis et al. (1992). Items of perceived enjoyment (EN) were drawn from prior studies which assessed antecedent beliefs regarding information technology continuance (Thong et al., 2006). The questions for social ties (ST) were adopted from Nahapiet and Ghoshal (1998) as well as Tsai and Ghoshal (1998). Indicators for measuring satisfaction (SA) with the use of Apps were modified from Vila and Küster (2011), which is a study focused on consumers’ feelings and behaviors regarding the use of websites. Items of habit (HA) were adapted from Limayem and Hirt (2003). Finally, the construct of continuance intention (CI) was measured using items that assess a subject’s intention regarding the likelihood of continuing to use the current most frequently used social Apps (Bhattacherjee, 2001; Davis et al., 1992).

3. Empirical results

The analysis of the data obtained was conducted by means of structural equations, which involved the estimation of both the measurement and structural model (Anderson and Gerbing, 1988). In the first estimation, the dimensionality, reliability and validity of scales were examined through confirmatory and exploratory factor analysis. As shown in Table 1, the assessment results show a satisfactory fit to the data with a chi square ($\chi 2$) of 298.76 (df = 129, $p < 0.01$) and other goodness of fit indices as follows: NNFI = 0.95; CFI = 0.97; IFI = 0.97; GFI = 0.90; RMSEA = 0.074. Additionally, all the variables demonstrated significant internal reliability ranging from 0.67 to 0.87, as shown in Table1.

Having established an adequate measurement model, the next step was to analyze the structural model for the hypothesis testing. As shown in Table 2, satisfaction in significantly influenced by perceived usefulness (b = 0.19, $p < 0.01$, H1 supported), Perceived enjoyment (b = 0.14,
$p < 0.05$, H2), and social ties (b = 0.78, $p < 0.001$, H3 supported). The results also revealed that perceived usefulness and social ties have significant impacts on habit (b = 0.14, $p < 0.05$, H4 supported; b = 0.63, $p < 0.001$, H6 supported). However, perceived enjoyment does not have a significant effect on habit (b = 0.06), and H5 is not supported. . Finally, satisfaction with social

Apps and habit both significantly influence continuance intention (b = 0.40, p < 0.001; b = 0.42, p < 0.01; H7 & H8 supported).

Table I. Internal consistency and convergent validity for the participants sample

Factor	Item	λ	$t-value$	R^2	reliability
perceived usefulness (PU)	Q1	0.81	--	0.65	0.879
	Q2	0.90	16.78	0.81	
	Q3	0.83	15.75	0.69	
perceived enjoyment (EN)	Q4	0.71	--	0.50	0.674
	Q5	0.63	8.17	0.40	
	Q6	0.73	8.33	0.54	
social ties(ST)	Q7	0.73	--	0.53	0.808
	Q8	0.83	13.04	0.68	
	Q9	0.72	11.53	0.52	
satisfaction (SA)	Q10	0.81	--	0.66	0.809
	Q11	0.78	13.97	0.61	
	Q12	0.70	12.36	0.49	
habit (HA)	Q13	0.65	--	0.42	0.788
	Q14	0.76	10.63	0.57	
	Q15	0.86	11.30	0.75	
continuance intention (CI)	Q16	0.80	--	0.64	0.868
	Q17	0.88	16.24	0.77	
	Q18	0.81	15.10	0.66	
Fit indices	$\chi^2 = 298.76(124)$, (p<0.01) RMSEA= 0.069 NNFI=0.95; CFI=0.97; IFI=0.97				

Tables 2. Results of the structural model for the participants sample

Hypotheses	Path	Standardized β	$t-value$
H1	PU → SA	0.19^{**}	3.23
H2	EN → SA	0.14^{*}	2.45
H3	ST → SA	0.78^{***}	9.74
H4	PU → HA	0.14^{*}	2.10
H5	EN → HA	0.06	0.98
H6	ST → HA	0.63^{***}	7.07
H7	SA → CL	0.40^{***}	5.32
H8	HA → CL	0.42^{***}	5.31

Note: *p<0.05; **p<0.01; ***p<0.001.

Fig2. Standard estimate structural model

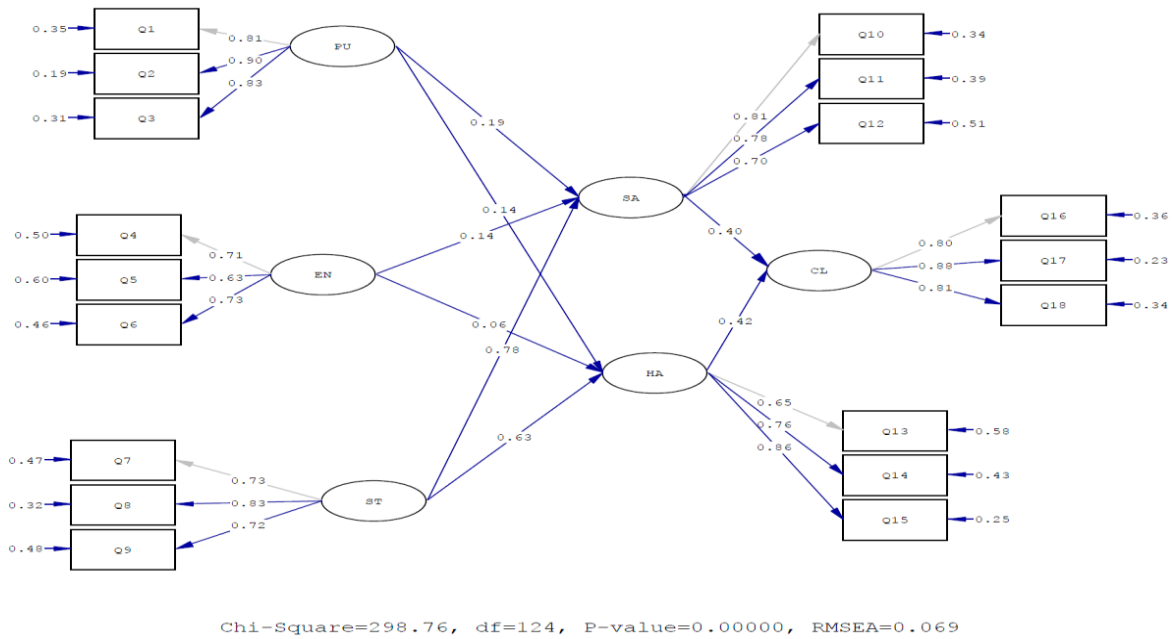
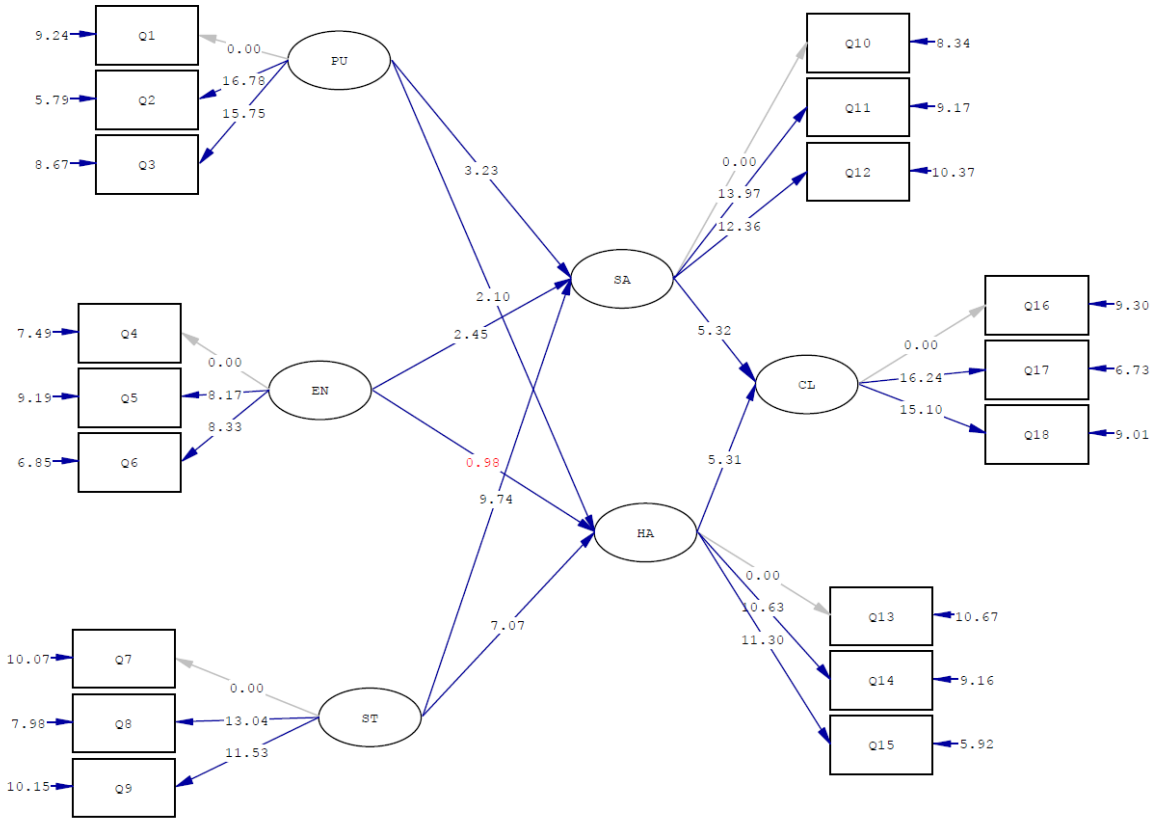


Fig3. T-value structural model



Chi-Square=298.76, df=124, P-value=0.00000, RMSEA=0.069

Discussion

Overall, the proposed model demonstrates a good fit. Most of the relationships are supported, as summarized in Table 2 and Fig 2,3. 7 out of 8 hypotheses are supported, indicating that the research model obtains good explanatory power to meet the research purpose.

The findings show that users' continuance intention of social Apps is significantly influenced by satisfaction and habitual use. This result points out that users are more likely to continue using their current social App if they are satisfied with it and if they are used to it. Consistent with previous studies (e.g. Bhattacherjee, 2001, Hsiao et al., 2016) on IS continuation, the present study also confirms the key role of satisfaction as a determining factor in users' intention to continue use. The findings also indicate that continuance usage of social Apps is indirectly driven by utilitarian and hedonic motivations and social influence. Perceived usefulness, and social ties affect continuance intention through satisfaction and habitual use. However, perceived enjoyment is not a very influential in this respect since it only affects continuance usage of social Apps through satisfaction. Of all three users' value perspectives, social influence (i.e., social ties) is identified as the strongest indirect determinant of users' continued usage, and hedonic motivation (i.e., perceive enjoyment) as the least important factor. That perceived usefulness is a determining element in users' intention to continue using social apps is consistent with IS literature. The second dominant factor on satisfaction and habitual use is the utilitarian motivation. It indicates that users care more about the social nature and functional aspect of social Apps such as reliability and efficiency in managing their daily tasks. Therefore, it emphasizes the competitive values of utilitarian features of the social Apps. it means that providers of mobile social Apps should find out what functions individuals are more satisfied with and use more frequently to explore which parts of their App use become habitual, and then to inform users to help them improve the efficiency of their daily life.

Implications and conclusions

Use satisfaction is positively influenced by all value perspectives. Based on the confirmation of perceived usefulness, to maintain user satisfaction and frequent use of social Apps, developers should emphasize the utilitarian features of their Apps to improve users' performance of daily tasks. The strong impact of social ties on satisfaction, habit and indirectly on continuance intention is proven. It indicates that users have a strong demand for social functions when using social Apps. Mobile social Apps facilitate users' communication, and help them convey their views. Service providers should apply strategies which provide users with opportunities to develop their sense of identity.

In summary, this study examined the factors affecting mobile social Apps users' intention to continue using their currently used App. Besides satisfaction and habit, three influential values from the utilitarian, hedonic and social perspectives were also validated.

The limitations of this study are mostly related to its external validity. The research was conducted within a single country, and a convenience sampling method was utilized. Accordingly, the results of the present investigation can be generalized only for teenagers in Iran. Including other important user behaviors (e.g., the names of the frequently used social Apps and frequency of usage) could provide insights into the characteristics of our respondents. Futugender, age, and cultural context

Appendix A
Measure of constructs

Perceived usefulness (PU):
PU1. Using this social App will improve my performance in managing my personal life Adapted from Davis et al. (1992)
PU2. Using this social App will increase my productivity in managing my personal life
PU3. Using this social App will enhance my effectiveness in managing my personal life

Perceived enjoyment (EN)
EN1. Using this social App is pleasurable Adapted from Thong et al. (2006)
EN2. I have fun using this social App
EN3. I find using this social App to be interesting

Social ties (ST)
ST1. I maintain close social relationships with my friends by using this social App
Adapted from Nahapiet and Ghoshal (1998) and Tsai and Ghoshal (1998)
ST2. I spend a lot of time interacting with my friends by using this social App
ST3. I have frequent communication with my friends by using this social App

Satisfaction (SA)
SA1. I think I made the correct decision in using this social App Adapted from Vila and Küster (2011)
SA2. My experience of using this social App has been satisfactory
SA3. I am satisfied with the social App I have downloaded

Habit (HA)
HA1. The use of social App has become a habit for me Adapted from Limayem and Hirt (2003)
HA2. I am addicted to using this social App
HA3. I must use this social App

Continuance intention (CI)
CI1. I intend to continue using this social App in the future adapted from Bhattacherjee (2001)
CI2. I will always try to use this social App in my daily life

CI3. I will keep using this social App as regularly as I do now

References
Aarts, H., Verplanken, B., van Knippenberg, A., 1998. Predicting behavior from actions in the past: repeated decision making or a matter of habit? J. Appl. Soc. Psychol. 28 (15), 1355–1374.

Ajzen, I., 1991. The theory of planned behavior. Organ. Behav. Hum. Decis. Process. 50 (2), 179–211.

Anderson, J., Gerbing, D., 1988. Structural equation modeling in practice: a review and recommended two-step approach. Psychol. Bull. 103 (3), 411–423.

Babin, B.J., Darden, W.R., Griffin, M., 1994. Work and/or fun: measuring hedonic and utilitarian shopping value. J. Consum. Res. 20 (4), 644–656.

Bagozzi, R., Yi, Y., 1988. On the evaluation of structural equation models. J. Acad. Mark. Sci. 16 (1), 74–94.

Banerjee, N., Kumar, D.A., 2013. Identifying the factors influencing users' adoption of social networking websites-a study on Facebook. Int. J. Marketing Stud. 5 (6), 109–121.

Barnes, S.J., 2011. Understanding use continuance in virtual worlds: empirical test of a research model. Inf. Manag. 48 (8), 313–319

Baron, R.M., Kenny, D.A., 1985. The moderator–mediator variable distinction in social psychological research: conceptual, strategic, and statistical considerations. J. Pers. Soc. Psychol. 51, 1173–1182.

Bauer, H.H., Barnes, S.J., Reichardt, T., Neumann, M.M., 2005. Driving consumer acceptance of mobile marketing: a theoretical framework and empirical study. J. Electron. Commer. Res. 6 (3), 181–192.

Bhattacherjee, A., 2001. Understanding information systems continuance: an expectation confirmation model. MIS Q. 25 (3), 351–370.

Bhattacherjee, A., Limayem, M., Cheung, C.M., 2012. User switching of information technology: a theoretical synthesis and empirical test. Inf. Manag. 49 (7), 327–333.

Bhattacherjee, A., Premkumar, G., 2004. Understanding changes in belief and attitude toward information technology usage: a theoretical model and longitudinal test. MIS Q. 28 (3), 351–370.

Brown, S.A., Venkatesh, V., 2005. Model of adoption of technology in the household: a baseline model test and extension incorporating household life cycle. MIS Q. 29 (4), 399–426.

Chai, S., Das, S., Rao, H.R., 2011. Factors affecting bloggers' knowledge sharing: an investigation across gender. J. Manag. Inf. Syst. 28 (3), 309–342.

Childers, T.L., Carr, C.L., Peck, J., Carson, S., 2001. Hedonic and utilitarian motivations for online retail shopping behavior. J. Retail. 77 (4), 511–535.

Chiu, C.M., Hsu, M.H., Lai, H., Chang, C.M., 2012. Re-examining the influence of trust on online repeat purchase intention: the moderating role of habit and its antecedents. Decis. Support Syst. 53 (4), 835–845.

Chow, G., 1960. Tests of equality between sets of coefficients in two tests of equality between sets of coefficients in two linear regressions. Econometrica 28 (3), 591–605.

Coursaris, C.K., Sung, J., 2012. Antecedents and consequents of a mobile website's interactivity. New Media Soc. 14 (7), 1128–1146.

Davis, F.D., 1989. Perceived usefulness, perceived ease of use, and user acceptance of information technology. MIS Q. 13 (3), 319–340.

Davis, F.D., Bagozzi, R.P., Warshaw, P.R., 1992. Extrinsic and intrinsic motivation to use computers in the workplace. J. Appl. Soc. Psychol. 22, 1111–1132.
Desarbo, W.S., Jedidi, K., Sinha, I., 2001. Customer value analysis in a heterogeneous market. Strateg. Manag. J. 22 (9), 845–857.

Dorsch, M.J., Grove, S.J., Darden, W.R., 2000. Consumer intentions to use a service category. J. Serv. Mark. 14 (2), 92–117.

Fornell, C., Larcker, D.F., 1981. Evaluating structural equation models with unobservable variables and measurement error. J. Mark. Res. 18 (1), 39–50.

Guo, Y., Barnes, S., 2011. Purchase behavior in virtual worlds: an empirical investigation in Second Life. Inf. Manag. 48 (7), 303–312.

Holbrook, M.B., Hirschman, E.C., 1982. The experiential aspects of consumption: consumer fantasies, feelings, and fun. J. Consum. Res. 9, 132–140.

Hong, S.J., Thong, J.Y.L., Tam, K.Y., 2006. Understanding continued information technology usage behavior: a comparison of three models in the context of mobile internet. Decis. Support Syst. 3 (42), 1819–1834.

Hsiao, C.H., Yang, C., 2011. The intellectual development of the technology acceptance model: a co-citation analysis. Int. J. Inf. Manage. 31 (2), 128–136.

Islam, M.Z., Low, P.K.C., Hasan, I., 2013. Intention to use advanced mobile phone services (AMPS). Manag. Decis. 51, 824–838.
Jones, M.A., Mothersbaugh, K.L., Beatty, S.E., 2002. Why customers stay: measuring the underlying dimensions of services switching costs and managing their differential strategic outcomes. J. Bus. Res. 55 (6), 441–450.

Karaiskos, D.C., Drossos, D.A., Tsiaousis, A.S., Giaglis, G.M., Fouskas, K.G., 2012. Affective and social determinants of mobile data services adoption. Behav. Inf. Technol. 31 (3), 209–219.

Khalifa, M., Liu, V., 2007. Online consumer retention: contingent effects of online shopping habit and online shopping experience. Eur. J. Inf. Syst. 16 (6), 780–792.

Kim, C., Galliers, R.D., Shin, N., Ryoo, J.-H., Kim, J., 2012. Factors influencing internet shopping value and customer repurchase intention. Electron. Commer. Res. Appl. 11 (4), 374–387.

Kim, D.J., Hwang, Y., 2012. A study of mobile internet user's service quality perceptions from a user's utilitarian and hedonic value tendency perspectives. Inf. Syst. Front. 14 (2), 409–421.

Kim, H.W., Chan, H.C., Gupta, S., 2007. Value-based adoption of mobile internet: an empirical investigation. Decis. Support Syst. 43 (1), 111–126.

Kim, H.W., Gupta, S., Koh, J., 2011. Investigating the intention to purchase digital items in social networking communities: a customer value perspective. Inf. Manag. 48 (6), 228–234.

Kim, J., Park, Y., Kim, C., Lee, H., 2014. Mobile application service networks: Apple's APP store. Serv. Bus. 8 (1), 1–27.

Kim, S.S., Malhotra, N.K., Narasimhan, S., 2005. Research note—two competing perspectives on automatic use: a theoretical and empirical comparison. Inf. Syst. Res. 16 (4), 418–432.

Kim, S.S., Malhotra, N.K., 2005. A longitudinal model of continued is use: an integrative view of four mechanisms underlying post-adoption phenomena. Manage. Sci. 5 (51), 741–755.

Lankton, N.K., McKnight, D., Thatcher, J.B., 2012. The moderating effects of privacy restrictiveness and experience on trusting beliefs and habit: an empirical test of intention to continue using a social networking website. IEEE Trans. Eng. Manage. 4 (59), 654–665.

Lee, W.K., 2014. The temporal relationships among habit, intention and is uses. Comput. Hum. Behav. 32, 54–60.

Limayem, M., Hirt, S.G., 2003. Force of habit and information systems usage: theory and initial validation. J. Assoc. Inf. Syst. 4, 65–97.

Limayem, M., Hirt, S.G., Cheung, M.K., 2007. How habit limits the predictive power of intention: the case of information systems continuance. MIS Q. 31 (4), 705–737.
Mayer, R.C., Davis, J.H., 1999. The effect of the performance appraisal system on trust for management: a field quasi experiment. J. Appl. Psychol. 84, 123– 136.

Money, R.B., 2004. Word-of-mouth promotion and switching behavior in Japanese and American business-to-business service clients. J. Bus. Res. 57 (3), 297–305.

Nahapiet, J., Ghoshal, S., 1998. Social capital, intellectual capital, and the organizational advantage. Acad. Manag. Rev. 23 (2), 242–266.

Oliver, R.L., Desarbo, W.S., 1988. Response determinants in satisfaction judgment. J. Consum. Res. 4 (14), 495–508.

Olsen, S.O., 2002. Comparative evaluation and the relationship between quality, satisfaction, and repurchase loyalty. J. Acad. Mark. Sci. 30 (3), 240–249.

Park, L., Baek, S., Ohm, J., Chang, H.J., 2014. Determinants of player acceptance of mobile social network games: an application of extended technology acceptance model. Telematics Inform. 31 (3), 3–15.

Podsakoff, P.M., MacKenzie, S.B., Lee, J.-Y., Podsakoff, N.P., 2003. Common method biases in behavioral research: a critical review of the literature and recommended remedies. J. Appl. Psychol. 88 (5), 879–903.

Pöyry, E., Parvinen, P., Malmivaara, T., 2013. Can we get from liking to buying? Behavioral differences in hedonic and utilitarian Facebook usage. Electron. Commer. Res. Appl. 12 (4), 224–235.

Quan-Haase, A., Young, A.L., 2010. Uses and gratifications of social media: a comparison of Facebook and instant messaging. Bull. Sci. Technol. Soc. 30 (5), 350–361.

Rauyruen, P., Miller, K.E., Groth, M., 2009. B2B services: linking service loyalty and brand equity. J. Serv. Mark. 23 (3), 175–186.

Rice, R.E., Aydin, C., 1991. Attitudes toward new organizational technology: network proximity as a mechanism for social information processing. Adm. Sci. Q. 36 (2), 219–244.

Rogers, E.M., 1995. The Diffusion of Innovations, fourth ed. The Free Press, NY.

Shiau, W.L., Luo, M.M., 2013. Continuance intention of blog users: the impact of perceived enjoyment, habit, user involvement and blogging time. Behav. Inf. Technol. 32 (6), 570–583.

Smetana, J.G., Campione-Barr, N., Metzger, A., 2006. Adolescent development in interpersonal and societal contexts. Annu. Rev. Psychol. 57, 255–284.
Thong, J.Y.L., Hong, S.J., Tam, K.Y., 2006. The effects of post-adoption beliefs on the expectation–confirmation model for information technology continuance. Int. J. Hum Comput Stud. 9 (64), 799–810.

Tsai, W., Ghoshal, S., 1998. Social capital and value creation: the role of intrafirm networks. Acad. Manag. J. 41 (4), 464–476.

Turel, O., Serenko, A., Bontis, N., 2010. User acceptance of wireless short messaging services: deconstructing perceived value. Inf.