INFOLINK COLLEGE

THE THIRD NATIONAL RESEARCH CONFERENCE ON THEME QUALITY RESEARCH FOR SUSTAINABLE DEVELOPMENT

ORGANIZED

BY

RESEARCH AND COMMUNITY SERVICE OFFICE

AUGUST, 2021

Hawassa, Ethiopia

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OPENING SPEECH

Your Excellency Mr. Dereje Tekalign, President of Infolink College

Your Excellency Mr. Sintayehu Zeleke, Vice President for Academic Affairs and Research

and our Key note Speaker

I have been head of Info link College since 2009 G. C. The more I learn from my work in that post – and the more I reflect on what I learn— the more strongly I feel about Info link's unique ability to contribute to the betterment of society. So, I truly welcome this opportunity to share with you some of my thoughts on "The role of the 21st Higher education Institutions.

Alongside education, research can have a decisive impact on HEIs contribution to society. Beyond its duty to impart knowledge, it is HEIs commitment to research that allows it to conceive solutions to global challenges.

Infolink College was purely teaching college when it was established. we are well known especially in our quality teaching since 2009 as we places a high value on the system of supervision and small-group teaching, and we undoubtedly have extraordinary lecturers and technology plat forms that support it. Our students are taught and inspired by the same academics mainly from known government universities and we follow lengthy processes of selection to assign teachers for courses.

But, today we highly advocate the integration of teaching and research. In the near future, we are planning to become a research-intensive institution that places a culture of research and freedom of inquiry at its very heart. I want you assure you that the culture of research is an integral part of Info link's DNA next 10 years.

I'd also like to stress the importance of interdisciplinary research –and in particular the crucial role that the sciences, humanities and social sciences have in contextualizing the new knowledge we create. The problems we face are human problems. The solutions may be technological, or science-based, but they can only be implemented in a human context.

But, whether fundamental or applied, whether in the hard sciences or in the arts and humanities, what should drive HEIs is the thrill of discovery, and the certainty that it is making a difference to society –locally and globally.

Recently, Info link College has been taking some serious measures to promote research activities in addition to its main mission-quality teaching and learning. Some of the developments were:

- ✓ Creating links with research universities both inside and outside
- ✓ The establishment of the office of research and development and the appointment professionals who can carry out the job
- ✓ the finalization of curriculum review of need driven post graduate programs that can scale up research activities at the college
- ✓ Assigning budget for activities related to research and community services activities
- ✓ providing training and creating sensitization program for staffs to institutionalize research culture

Dear Guests, Ladies and Gentlemen,

My final message is that for meaningful and visible impact in research and quality education, Info Link College is highly committed to invest in facilities and infrastructure, leadership and management, innovations and other necessary issues.

This 3rd national conference on theme Quality **Research for Sustainable Development** is part of our long plan to advance quality research and education at Info Link College.

As a founder and top manager of this Institution, I am so eager and happy to serve my country by investing in Education in an ethical manner. I and my colleagues at the college are highly committed to advance quality education and research. Please join us!!

I wish you very successful research conference at Info link College and I want to announce that the first national research conference on theme quality research for sustainable development is officially opened.

Thank you

WELCOME SPEECH

Dr. Teshome Gudissa

Your Excellency Mr. Dereje Tekalign, President of Infolink College

Your Excellency Mr. Sintayehu Zeleke, Vice President for Academic Affairs and Research

and our Key note Speaker

Our Dear Guests

Ladies and gentlemen!!

I am honored to have this opportunity to make speech or share my experience regarding the value of research for sustainable development. It is surely no accident that many of the states which lapse into deadly conflict these days have high levels of poverty and an inequitable distribution of wealth; governance which is neither inclusive nor responsive which does not reach all corners of the land; and an absence of the rule of law. Such development problems cannot be addressed over night, but addressed through problem solving research and by promoting problem solving technology.

Research has the power to do the following:

- ✓ Build knowledge and facilitate learning
- ✓ Means to understand various issues and increase public awareness
- ✓ An Aid to business success
- ✓ A way to prove lies and to support truth
- ✓ Means to seize opportunities
- ✓ A seed to love reading, writing, analyzing and sharing valuable information
- ✓ Nourishment and exercise for the mind and generally research is a means for sustainable development.

Ladies and Gentleman,

For me, research activities in Ethiopian higher education Institutions be it public or private should include:

- Support for national leadership and ownership. A commitment to building national capacities.

- Acting to reduce inequalities significantly, and to build tolerance between peoples. The aim should be to strengthen social cohesion to reduce the risk of tensions boiling over into conflict.

-Support for building governance which is inclusive and responsive, allows for civic space, and helps develop the institutions and capacities needed to prevent descent into conflict.

For many People in Private Higher Education Institutions, education is just about money, important as that is. But, truly speaking, education is all about solidarity, the exchange of knowledge and best practice, and support for the acquisition of technology and building the capacity to innovate and breakthrough in research. Unlike others, I am very optimist that with good enabling environments in place, the private higher education institutions can play a very constructive role through investment in quality education and research to bring about inclusive and sustainable growth.

Taking this opportunity, please allow me to thank the founding father and the president of Info link College, Mr. Dereje Tekalign and other key stakeholders for taking some serious measures to promote research activities in addition to its main mission-quality teaching and learning. In all my informal talk with him, I recognized that he want to scarify himself for research, innovation and technology. He became a fan of the principle of **publish or perish,** which is the golden principle of academia. With his great effort, some partnerships with abroad universities are happing. Example: collaboration with VIU. Today we do have this very small gathering in the name of research at Infolink College. But, I have a dream that after two or three years we will organize an international conference with some 100,000 researchers and practitioners coming from all over the world in a very beautiful conference room somewhere in Ethiopia or abroad. Have a very wonderful research conference!!! Thank you

CLOSING SPEECH

Sintayehu Zeleke(Assistant Professor), Vice President for Academic Affairs and Research

Your Excellency Mr. Dereje Tekalign, President of Infolink College

Your Excellency, our Key note Speaker

Our Dear Guests

Ladies and gentlemen!!

I am honored to have this opportunity to make a concluding remark on the first national conference organized under the theme quality research for sustainable development. In this research conference five research papers were presented. These are:

- Service Quality and Its Effect on Customer Satisfaction in Star-mark Hotels of Shashemene Town, Ethiopia
- Management of liquidity Risk in Selected Commercial Banks of Ethiopia by Focusing on Asset and Liability Management
- Assessment on Attitude of Business Enterprise towards Value added Tax: The case study in Sodo City
- Determinants of Financial Performance of Private Commercial Banks in Ethiopia: CAMEL Approach.

Though few researcher papers were presented, we could able to get many lessons and the findings of these research works seem applicable to solve problems on the ground. Even though most of our

permanent and par time staffs masters and degrees above, the practice of research is at an infant stage in our college.

Thus, what we did today in the name of research conference serves as motivational element for staffs in our college to take part in research in addition to their teaching role. As the president of the college, Mr. Dereje Tekalign indicated it very well; we designed strategies to promote quality research activities in addition to promoting quality education. We do not only struggle to stay in the market, but we want to stay in a very beautiful way. We want to make our college excel in teaching and research. But, this cannot happen with the support of our friends. So, taking this opportunity, I would like say that Infolink College is yours and we are friends. So, cooperate with us to realize our vision and mission. Finally, I would like to extend my appreciation and heartfelt thanks to the following bodies for the success of the conferences:

- Mr. Dereje Tekalign, President of infolink College
- Office of Research and Community Services
- Office of vice president for Academic Affairs
- Office of Corporate Affairs
- Research Presenters and facilitators
- Deans and vice Deans
- Research participants

Thank you very Much! I want to officially announce that the conference is closed

Service Quality and Its Effect on Customer Satisfaction in Star-mark Hotels of Shashemene Town, Ethiopia

Dr TsegayeMathewos Mena*
PRESIDENT, SHALOM BUSINESS AND TECHNOLOGY COLLEGE HAWASSA

Abstract

In order to achieve their mission, the vision of all hotels is delivering quality services to satisfy their customers who are consuming the services of the hotels. The main objective of this study is to analyze the effect of service quality on customer satisfaction in the case of star-rated hotels in Shashemene town. To address this objective, the researcher employed the most widely used model called Service quality (SERVQUAL) model and analyze the effect of service quality dimensions (Tangibility, Reliability, Responsiveness, Empathy, and Assurance) on customer satisfaction. The researcher implemented an explanatory research design with quantitative and qualitative research approaches. The researcher selected 315 star-rated hotel customers using stratified and convenience random sampling technique that were determined based on Carvalho (1984) sampling table. They were asked to rate their opinion according to a five-point Likert scale ranging from strongly disagree to strongly agree levels. The analysis section of this study is based on descriptive and inferential analyses. The major data analysis techniques of the inferential part are including correlation and multiple linear regressions. The study result indicated that the services given by star-rated hotels were appreciated by customers. Service quality measurements such as reliability, responsiveness, and tangibility had a significant effect on customer satisfaction. Since hotel is a service-oriented organization, the hotel managers should keep in providing service quality so as to retain the existing customers and attract new customers.

Keywords*:* Assurance, Empathy, Reliability, Responsiveness, Satisfaction , Tangibility

Introduction

Hotel industry is one of the major types of tourism industry and provides many different services including accommodation, restaurants, and cafes. Therefore, it has power to change the industry of tourism in the world. The market for the hotel industry, especially classified hotels in a developing countrylike Ethiopia, is closely linked to the tourism industry, because a majority of consumers for the services sector come from international tourists and localcustomers/tourists. A relative increase of investment recently observed in the hoteland tourism sector nationally and internationally which may initiate the wide research studies in the field (Eshghi*et al*., 2008).

Customer satisfaction has also been a subject ofgreat interest to organizations and researchers alike. This is because the principalobjective of organizations is to maximize profits and minimize cost.So, profit maximization can be achieved through increase in sales with lesser costs.One of the factors that can help to increase sales is customer satisfaction, becausesatisfaction leads to customer loyalty recommendation and repeat purchase (Wilson *et al.*, 2008).

Africa's unparalleled natural resource endowment and consumer market of around onebillion people provide a wide range of investment and trading opportunities that arebeing increasingly explored by the private sector, both foreign and local.Ethiopia is one of the African countries that possess the highest number of UNESCOWorld Heritage Sites in Africa, with sites spread throughout the whole country, andtherefore has great potential to develop itself as a tourist destination with the requiredinfrastructure and services (Bekele, 2015).

Oromia National Regional State is one of the regional states where the huge construction of hotels is undergoing. Concern to GDP, the service share of the Oromia region is accounts for 8.3% of the total RGDP (13.7 %) and Industry (3.5%). Total sector shares reached; agriculture 66%, Industry 12.8%, and service 21.2%. It shows that the service sector is dramatically growing and plays a high role in the nations and regional economic development next to agriculture (Oromiya's Almanac Magazine, 2015). However, the delivery of quality service and satisfying the customers' need in the hotel industry are the critical problems which invite the potential researchers in the area. Therefore, this study tried to examine the effect of service quality on customer satisfaction in star-rated hotels in Shashemene town, Ethiopia.

Literature Review

Service Quality

Many writers define service in different ways and manners. But an author defines service as "any intangible act or performance that one party offers to another which does not result in the ownership of anything." However, it results in the customers' satisfactions (Kotler & Keller, 2009). For this study, researcher preferred the user-based approach which defined quality as compared with the satisfaction. The highest quality means the best satisfaction of consumers' preferences. Accordingly, service quality was defined by Czepiel (1990) as customer perception of how well a service meets or exceeds their expectations of service quality is commonly noted as a critical prerequisite and determinant of competitiveness for establishing and sustaining satisfying relationships with customers. Thus service quality can intend to be the way in which customers are served in an organization which could be good or poor.

As cited by Su (2004), service quality is defined as the degree and direction of discrepancy between a customers' perceptions and expectations, while perceived service quality is the gap between a customer's expectations and perceptions (Parasuraman et al., 1985).In light of discussion in the review of related literature, service quality is also defined as global judgment of attitude relating to the overall excellence or superiority of the service (Parasuraman *et al*., 1988).

In this study, service quality can be defined as the difference between customers' expectations for service performance prior to the service encounter and their perceptions of the service received. Service quality theory (Oliver, 1980) predicts that clients will judge that quality is low if performance does not meet their expectations and quality increases as performance exceeds expectations. Hence, customers' expectations serve as the foundation on which service quality will be evaluated by customers. In addition, as service quality increases, satisfaction with the service and intentions to reuse the service increase.

Service quality has been increasingly recognized as a critical factor in the success of any business (Parasuraman et al., 1985; 1988). Employees are determinants of service quality (Kusluvan*et al*., 2010). Mohsin and Lockyer (2010) similarly found that management and employee commitment are prerequisite to successful provision of quality service. Customers too are important in delivering quality service (Crick & Spencer, 2010) and focus on customers in total quality management

enhances customer satisfaction (Kotler et al., 2003; Sit et al., 2009). The main dimensions of service quality were Tangibility, Reliability, Responsiveness, Assurance and Empathy.

Tangibles

The tangibles involve the firms' representatives, physical facilities, materials, and equipment as well as communication materials. Furthermore, Physical environmental conditions appeared as a clear evidence of the care and attention paid for the details offered by the service provider (Fitzsimmons & Fitzsimmons, 2001). Davis et al. (2003) summarize tangibles like the physical confirmation of the service. More specifically, Parasuraman et al. (1985) define the tangibility as appearance of physical facilities, equipment, personnel, and written materials.

Reliability

Reliability depends on handling customer service issues, performs the services right the first time; offers services on time, and maintain a record of error-free. Moreover, they define reliability as the most significant factor in conventional service (Parasuraman et al., 1988). Reliability also consists of the right order fulfillment; accurate records; accurate quote; right in the bill; Results are more accurate than commissions; keep the promise of service. Yang et al. (2004) also mentions that reliability is the most significant factor in hotel services.

Responsiveness

Responsiveness is defined as "the willingness to help customers and provide prompt service"(Parasuraman et al., 1988). Furthermore, Johnston (1997) defines responsiveness such as speed and timeliness of service delivery. This consists of processing speed and service capabilities to respond promptly to customer service requests, and wait a short and queuing time. More specifically, responsiveness is defined as the willingness or readiness of employees to provide services. It contains the timeliness of service (Parasuraman et al., 1985). It also contains
understanding the needs and requirements of the customer, easy operation time, individual attention provided by the staff, attention to the problem and customers' safety in their dealings (Kumar et al., 2009).

Empathy

Parasuraman et al. (1985) defined empathy as a caring and individual attention that the firm provides to its clients. It contains giving individual attention to employees who understand the needs of their customers and customer facilities during business hours. Furthermore, Ananth et al. (2011) demonstrates empathy in their research of private sector banks, provide individual attention and easy operation time; give personal attention, and understand the specific needs of customers. Fitzsimmons and Fitzsimmons (2001) suggest that empathy contains approachability, sensitivity, and efforts to understand customer needs. Also, Johnston (1997) defined empathy as the ability to make customers feel welcome, especially by staff contacts.

Assurance

Assurance refers to the safety, security and a privacy policy of customer transactions with the SRVTH and HHS including a privacy policy. Dabholkar et al. (1996) recommended adding the security dimension to future service quality research. Security is ensued when the service becomes safe, and the customer information gets protection (Parasuraman et al., 2005; Zeithamlet al., 2002).

Customer Satisfaction

A customer is a stakeholder of an organization who provides payment in exchange for the offer provided to him by the organization with the aim of fulfilling a need and to maximize satisfaction. Sometimes the term customer and consumer are confusing. A customer can be a consumer, but a consumer may not necessarily be a customer. Another author explained this difference as a customer is the person who does the buying of the products and the consumer is the person who ultimately consumes the product (Solomon, 2009).

According to Barsky (1995) customer satisfaction is a complex construct as it has been approached differently. As expressed by Levesque and McDougall (1996), satisfaction is conceptualized as an overall customer attitude towards a service provider. Also customer satisfaction has been described as an effective response, focused on product performance compared to some repurchased standard during or after consumption (Halstead et al., 1994). Satisfaction can be a person's feelings of

pleasure or disappointment that results from comparing a product's perceived performance or outcome with their expectations(Kotler& Keller, 2009).

Requirements for satisfaction are unique for each individual and they are dependent on many aspects, such as customers' mood, perceptions and expectation. Simpson (2010) highlighted that if the company is able to set standardized employees conduction where interaction with customer is concerned, it will be certainly easier to implement procedures and guidelines by this to ensure customers' satisfaction. In highly competitive industries, customer satisfaction has a positive impact on firms' profitability (Abbasi et al., 2010) and is essential for retaining customers (Clow &Vorhies, 1993). This is valid for the hotel industry (Bowen & Shoemaker, 1998), and more generally in the broader service industry environment (Zeithaml et al., 1996).

Customer satisfaction is defined as "the consumers' response to the evaluation of the perceived discrepancy between prior expectations and the actual performance of the product or service as perceived after its consumption" (hence considering satisfaction as an overall post-purchase evaluation by the consumer" (Fornell, 1992).This definition is supported by some other authors, who think that consumer's level of satisfaction is determined by his or her cumulative experience at the point of contact withthe supplier (Sureshchander et al., 2002). Customer satisfaction has also been defined by another author as the extent to which a product's perceived performance matches a buyer's expectations (Kotler et al., 2002). Some existing researcher presented that "the simplest way to know how customers feel, and what they want is to ask them" this applied to the informal measures (Levy, 2009). Generally, customer satisfaction refers to the result of comparison between customers' expectations and customer's perceptions.

Conceptual Framework

The following conceptual framework has been constructed based on the literature review to show the relationship between dependent and independent variables of the study. Accordingly, there are five independent which were included. Customer satisfaction as dependent variable and service quality dimensions such as reliability, assurance, tangibility, empathy, and responsiveness as independent variables.

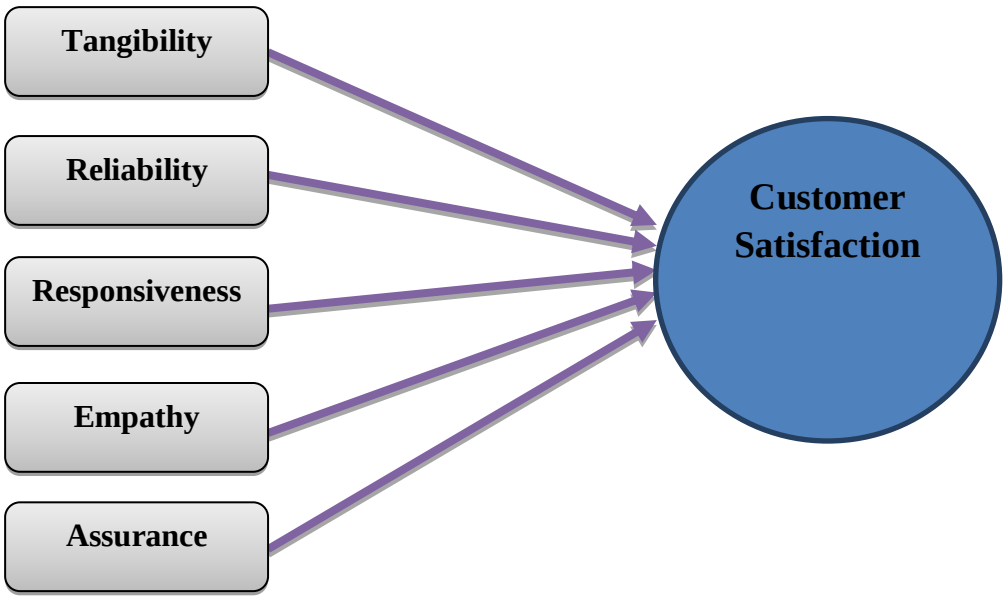

Figure 2.1: Conceptual Framework

Source: Parasuraman et al. (1985; 1988)

Hypothesis

H_1: Tangibility has significant effect on customer satisfaction.

H_2: Reliability has significant effect on customer satisfaction.

H_3: Responsiveness has significant effect on customer satisfaction.

H_4: Empathy has significant effect on customer satisfaction.

H_5: Assurance has significant effect on customer satisfaction.

Research Methodology

The researcher used explanatory and descriptive type of research design. The study was based on both quantitative and qualitative research approaches that deal with assessing service quality and its effect on customer satisfaction. A stratified sampling technique was used to select a representative sample of employees from each hotel. Shashemene town has five star-rated hotels and the target groups of the study were hotel customers. The sample size is the number of elements (an object that possesses the information sought by the researcher and about which inferences are to be made) to be included in the study by considering qualitative and quantitative aspects. In the research, various factors were considered when determining sample size. Regarding sample size determination for this study, the convenience Sampling Method, one of the several methods which were developed by Carvalho (1984) has been preferred by the researcher. The sample size of this research was 315 customers which were technically selected from the total population of around 8119 customers (domestic and foreign customers).

Table 3.1: *Name of Star-rated Hotels*

No.	Name of Hotels	N	n
1	Rift ValleyTourist Hotel	3093	120
2	Kafyalew International Hotel	460	18
3	Shala Hotel	829	32
4	Firamont Hotel	792	31
5	Haile Hotel	2946	114
	Total	8119	315

Source: Human Resource Office Report from Respective hotels, 2020

This study employed both opened and closed ended questions as an instrument for data collection. A five-point scale, ranging from strongly disagree (1) to strongly agree (5) was used in designing the questions. Finally, the data were analyzed using both descriptive and inferential statistics. Descriptive statistics such as mean and standard deviation, as well as inferential statistics such as correlation and multiple linear regression were applied to achieve the research hypothesis.

Result and Interpretation

This section of the study, the data collected from customers of Shashemene Hotels through close ended questions was analyzed and the results of open-ended items were discussed. The main purpose of the study was assessment of the effects of service quality on the customers' satisfaction in star-rated hotels at Shashemene town.

Descriptive Summary of Study Variables

The structured data instrument used in this research was based on 31 questions divided under five service quality dimensions/variables including; tangibility, reliability, responsiveness, assurance and empathy representing the service quality model and customer satisfaction, with the purpose of the level of perception and expectation of customers' about the quality service offered by the hotels and overall satisfaction of customers in star-rated hotels using a five point Likert scale questions.

Table 4.1: *Descriptive Summary of Study Variables*

Variables	N	Minimum	Maximum	Mean	Std. Deviation
Reliability	315	1.75	5.00	4.1270	.46892
Responsiveness	315	1.83	5.00	4.2153	.45703
Assurance	315	2.50	5.00	4.2333	.42503
Empathy	315	1.80	5.00	4.1975	.43185
Tangibility	315	1.00	5.00	4.2423	.55661
Satisfaction	315	2.00	5.00	4.2646	.44954

Source: Own survey, 2020

As Table 4.1 shows, respondents have agreed on the service quality of star-rated hotels of Shashemene town. Customers were agreed on reliability of the service (M =4.13, SD = 0.469), responsibility (M = 4.22, SD = 0.457), assurance (M =4.23, SD = 0.425), and Empathy (M = 4.198, SD = 0.432). Likewise, customers of star-rated hotels were satisfied with the given service (M = 4.26, SD = 0.450). In summary, customers of star-rated hotels were satisfied and agreed on the service quality as well.

The Relationship between Study Variables

In this thesis, the researcher used Karl Pearson's coefficient of correlation (or simple correlation), because it is the most widely used method of measuring the degree of relationship between two variables. This coefficient assumes that there is linear relationship between the two variables. The possible values of correlation coefficients range from –1 (a perfect negative relationship) to +1 (a perfect positive relationship) or a direct relationship between two variables. A value of 0 indicates no linear relationship between two variables (Kothari, 2004). In this section, the independent variables were analyzed one by one using correlation analysis in order to identify their individual relation with the dependent variable before conducting the regression analysis.

Table 4.2: *Correlation Analysis Result*

		Reliability	Responsiveness	Assurance	Empathy	Tangibility	Satisfaction
Reliability	Correlation	1	.565**	.481**	.533**	.492**	.510**
	Sig. (2-tailed)		.000	.000	.000	.000	.000
	N	315	315	315	315	315	315
Responsiveness	Correlation	.565**	1	.525**	.658**	.484**	.515**
	Sig. (2-tailed)	.000		.000	.000	.000	.000
	N	315	315	315	315	315	315
Assurance	Correlation	.481**	.525**	1	.506**	.412**	.432**
	Sig. (2-tailed)	.000	.000		.000	.000	.000
	N	315	315	315	315	315	315
Empathy	Correlation	.533**	.658**	.506**	1	.432**	.467**
	Sig. (2-tailed)	.000	.000	.000		.000	.000
	N	315	315	315	315	315	315
Tangibility	Correlation	.492**	.484**	.412**	.432**	1	.646**
	Sig. (2-tailed)	.000	.000	.000	.000		.000
	N	315	315	315	315	315	315
Satisfaction	Correlation	.510**	.515**	.432**	.467**	.646**	1
	Sig. (2-tailed)	.000	.000	.000	.000	.000	
	N	315	315	315	315	315	315

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

Source: Own survey, 2020

The results of Table 4.2 shows that reliability has a positive and statistically significant association with the customer satisfaction ($r = 0.510$, $p<0.01$). This indicated that the reliability has a significant relationship with the customer satisfaction. Likewise, responsiveness has positive and statistically significant relationship with customer satisfaction ($r = 0.515$, $p<0.01$). In the same manner, assurance has positive and statistically significant relationship with customer satisfaction ($r = 0.432$, $p<0.01$). Similarly, Empathy has positive and statistically significant relationship with customer satisfaction ($r = 0.467$, $p<0.01$). Equally, tangibility has positive and statistically significant relationship with customer satisfaction ($r =0.646$, $p<0.01$). To sum up, all independent variables(tangibility, reliability, responsiveness, assurance and empathy) have positive andsignificant association with the dependent variable (customer satisfactions). Furthermore, the interrelationships between independent variables were not showing multicollinearity effect.

The Effect of Service Quality on Customer Satisfaction

In this study, multiple linear regression analysis was applied since it facilitates the evaluation of the level of effect that multiple independent variables that cause on a particular dependent variable.

Table 4.3: *Results of Regression Analysis Model Summary*

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.704[a]	.496	.488	.32169

a. Predictors: (Constant), Tangibility, Assurance, Empathy, Reliability, Responsiveness

b. Dependent Variable: Satisfaction

Source: Model summary, 2020

According to the model summary of multiple linear regression analysis, the R-value of the model as per Table 4.3 was 0.704 which shows the highest degree of relationship between independent and dependent variables. The adjusted R^2 value of the regression model was 0.488, indicating that 48.8% of variance in customer satisfaction was accounted by tangibility, assurance, empathy, reliability, and responsiveness.

Table 4.4: *Results of ANOVA Output*

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	31.478	5	6.296	60.837	.000[b]
	Residual	31.976	309	.103		
	Total	63.454	314			

a. Dependent Variable: Satisfaction

b. Predictors: (Constant), Tangibility, Assurance, Empathy, Reliability, Responsiveness

Source: Model summary, 2020

The result of the ANOVA output table (Table 4.4) answers the question whether the multiple linear regression model itself is statistically significant or not significant. Since the F-test found in the ANOVA table measures the probability of chance departure from a straight line (F= 60.837, $p<0.01$), the overall model is significant. This indicated that the regression model is statistically significant when tangibility, assurance, empathy, reliability, and responsivenesswere included.

Table 4.5: *Results of Multiple Linear Regression Analysis*

		Unstandardized Coefficients		Standardized Coefficients		
Model		B	Std. Error	Beta	t	Sig.
1	(Constant)	.974	.216		4.516	.000
	Reliability	.134	.051	.139	2.607	.010
	Responsiveness	.128	.058	.130	2.200	.029
	Assurance	.076	.053	.072	1.419	.157
	Empathy	.078	.059	.075	1.327	.186
	Tangibility	.365	.040	.452	9.208	.000

Note: B= Regression coefficient (Estimate), Std. Error = Standard Error, Dependent variable = Customer satisfaction

Source: Model summary, 2020

As can be seen from the results of Table 4.6, out of five variables that were included in the model, three predictors have found to be a significant effect on the customer satisfaction. These are reliability, responsiveness, and tangibility. Reliability has a positive and significant effect on the customer satisfaction. The results of the beta coefficient ($\beta = 0.139, p < 0.01$) indicates that a one unit increase in the reliability of the service given by star rated hotels, leads a 0.139 unit increase customer satisfaction.

Responsiveness has a positive and significant effect on customer satisfaction. The results of the beta coefficient ($\beta = 0.130, p < 0.05$) indicated that customer satisfaction will be increased by 0.130 as a result of a one unit increase in the responsiveness of the hotel. This can also interpreted as that for every unit increase in responsiveness, a 0.130 unit increase in customer satisfaction is predicted. Tangibility is another variable that had effect on the satisfaction level of customers. In line with this variable, the result of Table 4.6 shows that tangibility has a positive and significant effect on customer satisfaction. The result of the beta coefficient also indicates that a one unit increase in tangibility, leads a 0.452 unit increase in the customer satisfaction ($\beta = 0.452, p < 0.01$).

Conclusion and Recommendations

Conclusion

Customers were happy with the ability of hotels and resorts to performing the promised service dependably and accurately. Customers agreed that hotels had the willingness to help them and provide prompt service. Customers appreciated the knowledge and courtesy of the service hotel and resort's employees and their ability to inspire trust and confidence in customers toward the hotels. Customers have agreed on hotel employees' commitment to delivering quality services, skillfully handling of conflicts and efficient delivery of services resulted in satisfied customers for long term benefits. Customers were satisfied with the availability of physical facilities, equipment, and appearance of personnel in the hotels and resorts to the expected level. Service quality measurements such as reliability, responsiveness, and tangibility had a significant effect on customer satisfaction in star-rated hotels of Shashemene town. The availability of physical facilities, equipment, and appearance of personnel in the hotels and resorts to the expected level was the dominant factor for customer satisfaction followed by reliability and responsiveness.

Recommendations

Based on the findings of the study, the researcher recommended that hotel managers should set the proper service quality standards and support staff in availing resources and facilities (trained staff, proper system, and advanced technology) as per service quality dimensions to satisfy their customers. They also have to minimize the obstacles in cooperation with the staff to establish an organizational culture that complies with the service quality rules and standards. Likewise, hotel managers should improve low-level customers' perceptions of the delivery of quality service to upgrade their performance. It is also important to give attention to service quality dimensions which scored a high scale level in analysis to improve them more and work on strongly on those which scored lower scale values to improve them.

To provide quality services and make customers satisfied, hotel managers are recommended to recruit staff that had adequate knowledge in service managing, especially in hotel management. Managers have to forecast and understand customers' expectations. They have to also be careful not to have exaggerated advertisements to increase the customers' expectations. Additionally, managers have to take care of those "bad word-of-mouths" as they have high negative implications. Since quality is dynamic in its nature, it is recommended that the hotel managers make efforts to improve the quality of products and services through periodical quality assessment and evaluations.

Reference

Abbasi, A. S., Khalid, W., Azam, M., & Riaz, A. (2010). Determinants of customer satisfaction in hotel industry of Pakistan. *European Journal of Scientific Research*, *48*(1), 97-105.

Ananth, A., Ramesh, R., &Prabaharan, B. (2011). Service Quality GAP Analysis inPrivate Sector Banks A Customer Perspective, *Internationally IndexedJournal, 2(1),* 245-252.

Barsky, J. D. (1995). *World-class customer satisfaction*. McGraw-Hill.

Bekele, S. (2015). Perceived service quality and its relationship with customer loyalty in Ethiopian hotel industry. *Journal of Contemporary Research in Management*, *10*(4), 31.

Clow, K.E., &Vorhies, D.E. (1993). Building a competitive advantage for service firms.*Journal of Services Marketing*, 7(1), 22-3.

Crick, A.P., & Spencer, A. (2010). Hospitality quality-New directions and new challenges. Emerald Group Publishing Ltd

CzepieI, J. A. (1990). Service encounters and service relationships: Implications forresearch. *Journal of Business Research*, 20: 13-21.

Dabholkar, P. A., Thorpe, D. I., &Rentz, J. O. (1996). A measure of service quality for retail stores: Scale development and validation. *Journal of the Academy ofMarketing Science*, *24*(1), 3–16.

Eshghi, A., Haughton, D., & Topi, H. (2008). Determinants of customer loyalty in the wireless telecommunications industry. *Telecommunications policy*, *31*(2), 93-106.

Fitzsimmons, J. A., & Fitzsimmons, M. J. (2001). *Service management*. McGraw Hill

Fornell, C. (1992). A National Customer Satisfaction Barometer: The Swedish Experience. *Journal of Marketing*, 56, 6-21.

Halstead, D., Hartman, D., & Schmidt, S.L. (1994). Multisource effects on thesatisfaction formation process. *Journal of the Academy of Marketing Science, 22*,114-29.

Kotler, P., & Keller, K. L. (2009). *Marketing management* (13th ed.). New Jersey: Pearson Education Inc, Upper Saddle River.

Kotler, P., Armstrong, G., Saunders, J., & Wong, V. (2002). *Principle of Marketing* (3rd ed.). Prentice Hall: Europe.

Kumar, M., Kee, F. T. &Manshor, A. T. (2009). Determining the relative importance of critical factors in delivering service quality of banks; an application of dominance analysis in SERVQUAL model. *Managing Service Quality*, 19(2), 211-228.

Kusluvan S, Kusluvan, Z., Ilhan, I., Buyruk, L. (2010). The human dimension: a review of human resources management issues in the tourism and hospitality industry. *Cornell Hospitality Quarterly, 51*(2), 171-214.

Levesque, T., & McDougall, G. (1996). Determinants of customer satisfaction in retailbanking. *International Journal of Bank Marketing,* 14(7), 12-20.

Mohsin, A., Lockyer, T. (2010). Customer's perception of service quality in luxury hotelsin New Delhi, India: an exploratory study. *Int. J. of Contemp. Hospitality Manag,22*(2), 160-173.

Oliver, R. L., (1980). A Cognitive Model of the Antecedents and Consequences of Satisfaction Decisions. *Journal of Marketing Research,* 17(1), 460-469.

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

Parasuraman, A., Zeithaml, V. A., & Berry, L. L. (1988). SERVQUAL: A multiple item scale for measuring customers' perceptions of service quality. *Journal ofRetailing*, 64(1), 12– 43.

Sureshchandar, G.S., Rajendran, C., &Anantharaman, R.N. (2002). The relationship between service quality and customer satisfaction-a factor specific approach.*Journal of Services Marketing,* 16(4), 363 – 379.

Zeithaml, V. A., Berry, L. L., & Parasuraman, A. (1996). The behavioral consequences of service quality. *Journal of Marketing Research*, 60(2), 31-46.

Management of liquidity Risk in Selected Commercial Banks ofEthiopia by Focusing on Asset and Liability Management

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Abstract

Since banks are dominant types of financial institution in any economy, they have to be in healthy liquidity position. The study aimed to evaluate management of liquidity risk of selected commercial banks in Ethiopia with special focus on asset liability management. Purposive sampling technique was used and seven commercial banks (one governmental and six private commercial banks) were incorporated in the study. Secondary data from audited financial statement were taken for fifteen years from 2004-2018 were used in the study. Liquidity risk as dependent variable and (profitability, capital adequacy, loan to deposit ratio, loan growth, and deposit growth, income diversification, and bank size were considered. The correlation and regression were conducted by using e-view 9 software. The regression result reviled that the liquidity risk is explained dependent variables is 78.3 percent. The association between liquidity risk and profitability, loan growth, deposit growth, and ratio of interest income to total income negative, whereas, the association between capital adequacy and bank size was positive. The significant variables were profitability, capital adequacy, deposit growth, loan growth, and bank size. The banks are advised consider tradeoff between the profitability and liquidity.

Key words: Liquidity Risk Management, Asset Liability Management, Commercial Banks in Ethiopia

Introduction

Banks are very important sectors for their role in the economy of any nation. They operate lots of business transaction and facilitate it. To do so, they shall be in better liquidity position. The banks in Ethiopia are challenged by liquidity risk repetitively since the economy is unstable in the country. Liquidity risk management is therefore contemporary issues in the banking modern management.

Liquidity is the ability of a bank to fund increases in assets and meet obligations as they fall due, without incurring unacceptable losses. As per (IOSCO, 2002) liquidity risk is the risk of ability to meet commitment in timely and cost effective manner while maintaining asset. Liquidity risk is the risk that the bank will not be able to meet efficiently both expected and unexpected current and future cash flow and collateral needs without affecting either daily operations or the financial condition of the firm. The main role of banks in the financial market is to create liquidity and transform risk. Banks use short-term debt to invest in long-term assets. This function creates liquidity risk and therefore a bank unable to roll over maturing debt can fail despite of being solvent. The objective of liquidity management thus is to ensure that banks are able to meet in full all their financial obligations as they fall due.

ALM is the ongoing process of formulating, implementing, monitoring and revising strategies related to assets and liabilities to achieve an organization's financial objectives, given the organization's risk tolerances and other constraints. The issue of jointly managing assets and liabilities arises in a number of industries, such as banking, insurance, and pension funds, as well as at the level of individual households (Chaturvedi, 2014).

The asset liability management in the recent years has become a tool of integrated analysis of assets and liabilities so to value not only the interest rate risk but the liquidity risk, solvency risk, firm strategies and asset allocation as well. The landscape of asset liability management for the financial sector is ever changing and the scope of asset liability management activities has widened. Banking institutions have adopted asset liability management strategies to address key risks such as; interest rate risks, liquidity risk and foreign exchange risk. A sound ALM process integrates strategic, profitability, and net worth planning with risk management (Rosen & Zenios, 2006).

Brief Review of Literature

A bank is a firm whose assets include primarily financial claims issued by borrowers, such as households, corporate firms, governments, and other financial intermediaries, and whose liabilities are sold as secondary claims to capital surplus units in various forms, such as demand deposits, savings deposits, term deposits, subordinated debt (loan capital), or equity shares (Dermine, 2007).

Over the years, banks remained and will continue to be an important institution for any economy as they play the most fundamental role in the payments system. In most developing countries, commercial banks are the most dominant financial institutions, with the capital market institutions playing a minimal role. Of the main functions of commercial banks is the availing of funds (monetary) to its customers. For a bank to be in a position to do so, it must be in a healthy liquidity position (Mennawi & Ahmed, 2020).

As per (Jayanthi & Umarani, 2014) managing assets and liabilities is a prime concern for the banks. Intense competition for business involving both the assets and liabilities, together with increasing volatility in the domestic interest rates as well as foreign exchange rates, added up the risk exposure of banks. This has brought pressure on the management of banks to maintain a good balance among spreads, profitability, and long-term viability. The objective of ALM is to maintain a match in the terms of rate sensitive assets (those assets that will move in search of the most competitive interest rates) with their funding sources (savings, deposits, equity, and external credit) in order to reduce interest rate risk while maximizing profitability (Biety, 2010).

Different theories are associated with liquidity risk management like asset allocation theory, commercial loan theory, liability management theory, and liquidity preference theory. In asset allocation theory, given riskless lending and borrowing rates and all investors working with the same set of inputs, all investors will prefer a single portfolio of risky assets (Marozva, 2015). While in commercial loan theory it is assumed as credit facility secured by goods cannot be repaid if the goods can't be sold off, or if the customer takes a loan to buy the goods (Emmanuel, 1977). Liability management theory says banks have focused on liabilities side of the balance sheet than the asset but banks are currently used both asset and liability to meet liquidity needs (Markowitz,

1959). Firms should maintain an optimum level of liquidity to able to grasp opportunity that promise higher return in the future and firm's works as per the liquidity preference theory.

Different scholars find determinant factors of liquidity risk management. As per (Bhati, Zoysa, & Jitaree, 2019) there is a significant relationship with bank-specific variables of capital to total assets and bank size with liquidity risk. However, the regulatory factors of cash reserve ratio and profitability determined by return on equity (ROE) and non-performing assets were not found to have any effect on liquidity of Indian banks.

As per (Vodova, 2010) bank liquidity is positively related to capital adequacy, interest rates on loans, share of non-performing loans and interest rate on interbank transaction and negatively related to inflation rate, business cycle and financial crisis. The influence of banks size is ambiguous.

Bank liquidity decreases with the size of the bank: big banks rely on the interbank market or on the liquidity assistance of the Lender of Last Resort, small and medium sized banks hold a buffer of liquid assets which is fully in accordance with the "too big to fail" hypothesis. Liquidity is negatively influenced also by the interest margin and monetary policy interest rate. Both factors lead to higher lending activity of banks and thus reduce bank liquidity. The interest rate on interbank transaction has a negative impact on bank liquidity (Vodova, 2013).

In Ethiopia bank practice, bank size and loan growth has negative and statistically significant impact on liquidity; while non-performing loans, profitability, and inflation have positive and statistically significant impact on liquidity of Ethiopian private commercial banks. However, capital adequacy, and short term interest rate have no statistically significant effect on the liquidly of Ethiopian private commercial banks (Mekbib, 2016).

Globally, researchers such as (Sukmana & Suryaningtyas, 2016), (Bhati, Zoysa, & Jitaree, 2019), (Mennawi & Ahmed, 2020), (Vodova, 2010), (Alzoubi, 2017), (Vodova, 2013), (Sayedahmed, 2018), (Sopan & Dutta, 2018), (Diep & Nguyen, 2017) (Cucinelli, 2013), (Zaghdoudi & Hakimi, 2017), studied on determinant factors of liquidity risk management in banks within different countries. Other also studied on risk management practices in commercial banks like (Sam, 2015). Researchers also investigate the effect of asset liability management on liquidity risk of commercial banks such as (Guthua, 2013) and (Martha, 2014).

In country level, researchers such as, (Assfaw, 2019) on firm-specific and macroeconomic determinants of banks liquidity: empirical investigation from Ethiopian private commercialbanks, (Suraphel, 2017) on assessment of liquidity risk management practices and challenges in case of private commercial banks in Ethiopia, (Trualem, 2009) on assessment of liquidity risk management practices of commercial banks in Ethiopia, (Desalegn & Veni, 2019) (Tseganesh, 2012) and (Mekbib, 2016) on determinants of liquidity risk in selected commercial banks in Ethiopia.

Statements of the Problem

One of the most important roles of any financial system is to provide liquidity. Liquidity management is more essential for some financial intermediaries than others. Banks liquidity is directly affected by asset liability management decisions. Managers should always analyze the impact that any ALM decision will have on the liquidity position of the bank. A key issue to ensure advancement has to be how to make sure banks successfully balance their liquidity risk in order to be stable and still supply the economy with adequate liquidity. Public policy makers will aim to continue strong national economic growth while keeping low unemployment and inflation. Banks themselves have a motive to ensure stability and also boast earnings. The sheer size and complexity of the modern economy increases the importance of this topic and this is all the more reason it needs to be carefully considered.

The focus of many empirical studies carried out on determinants of liquidity risk of commercial banks, challenge of liquidity management, determinants of profitability, and determinants of financial performance and effect of asset liability management on profitability. While the effect of asset liability management for the liquidity risk management is uncovered still now. Even existing works of literature on determinants of banks liquidity risk did not show accurately what determines the liquidity risk management of banks in Ethiopia because of inconsistency of findings among scholars. Moreover, the liquidity risk management analysis of banks in Ethiopia was made by previous researchers largely very outdated years means before 2014. The current study, therefore, aimed at investigating the management of liquidity risk of commercial banks in Ethiopia with special focus on asset liability management.

Objective of the study

- To evaluate effect of profitability on liquidity risk of commercial banks in Ethiopia
- To evaluate effect of capital adequacy on liquidity risk of commercial banks in Ethiopia
- To examine effect of loan to deposit ratio on liquidity risk of commercial banks in Ethiopia
- To examine effect of loan growth on liquidity risk of commercial banks in Ethiopia
- To scrutinize effect of deposit growth on liquidity risk of commercial banks in Ethiopia
- To scrutinize effect of income diversification on the liquidity risk of commercial banks in Ethiopia
- To estimate effect of bank size on the liquidity risk of commercial banks in Ethiopia

Research Hypothesis

Ho1: There is no significant relationship between the profitability and liquidity risk of commercial banks in Ethiopia.

Ho2: There is no significant relationship between the capital adequacy ratio and liquidityrisk of commercial banks in Ethiopia.

Ho3: There is no significant relationship between the loan to deposit ratio and liquidityrisk of commercial banks in Ethiopia.

Ho4: There is no significant relationship between the loan growth and liquidity risk of commercial banks in Ethiopia.

Ho5: There is no significant relationship between the deposit growth and liquidity risk of commercial banks in Ethiopia.

Ho6: There is no significant relationship between the income diversification and liquidityrisk of commercial banks in Ethiopia.

Ho7: There is no significant relationship between the liquid asset to total asset ratio andliquidity risk of commercial banks in Ethiopia.

Ho8: There is no significant relationship between the bank size and liquidity risk of commercial banks in Ethiopia.

Research Methodology

The study employs both descriptive and explanatory research design to evaluate management of liquidity risk with emphasis on asset liability management of selected commercial banks in Ethiopia for the study period of 2004-2018 within seven prominent commercial banks.

The study employed quantitative research approach. The current research has adopted sampling survey particularly judgmental sampling to select seven oldest banks from total of seventeen commercial banks in Ethiopia. Secondary data were collected from audited financial statement of each selected banks for the stated period.

The regression of the current study is run by using fixed effect model for panel data estimation. The liquidity risk was regressed by repressors such as profitability, capital adequacy, deposit growth, loan growth, and income diversification, ratio of total loan to total deposit and bank size which is a function of total asset.

The dependent variable is represented by liquidity and measured by the ratio of net liquid asset to short term liability. Profitability is represented by ROE and measured by the ratio of profit after tax to total equity. Bank size was measured by the natural logarithm of total asset. Capital adequacy was also measured by the ration of total capital to total asset. The loan growth measured by the ratio of difference of current year loan from previous year loan to previous year loan, and deposit growth was measured by the ration of difference of current year deposit from previous year deposit to previous year deposit. The income diversification was also measured by the ratio of total interest income to total income and the remaining variable is ratio of loan to deposit itself.

Thus, the collectable panel data was analyzed by using descriptive statistics, correlations, and linear regression analysis. Mean values and standard deviations used to analyze the general trends of the data from 2004 to 2018. A multiple linear regressions model and t-static was used to determine the relative importance of each indicators of asset liability management in influencing liquidity risk. Necessary diagnostic tests like normality, hetroscdeacity, autocorrelation, and multicollinearity were checked.

Finding of the Study

Descriptive Statistics of Variables

In this section, the descriptive statistics of dependent variable, liquidity risk and the repressors was presented. The mean, median, standard deviation, minimum, and maximum values for the dependent and independent variables were included.

The mean score of liquidity risk 54.1 percent which implies for one birr increase in short term liability, the banks could able to finance 0.541 birr from the current asset and obligation without incurring unacceptable losses. The value of the standard deviation for LR is 10.8; this implies that the liquidity risk of Ethiopian Commercial banks varies from the mean by 10.8 times. The mean score of profitability was 31.8 percent which indicate that during banks could generate 31.8 birr for 100 birr investment in equity. The value of the standard deviation was 9.56. the mean for capital adequacy, deposit growth, income diversification, loan to deposit ration, loan growth, and bank size were 14.36, 27.24, 57.39, 59.86,.28.85 and 10.013 percent respectively. While the standard deviations for each variable were 2.36, 11.31, 7.13, 10.29, 12.41, and 0.53 respectively (see table 1).

Correlation Analysis

The correlation coefficient between liquidity risk and return on equity -0.33 which means the profitability of the commercial banks has negative association with liquidity risk. The negative association existed because if the banks are more conservative in maintaining good liquidity position, they will trade off the profitability growth or performance. The second highest association among the other independent variables with the liquidity risk is existed with the loan growth. The association is -0.30 which when the loan growth is becoming higher and higher, the liquidity position of the bank will be less and less. The third highest associated variable is ratio of interest income to total income. The association is -0.26 which shows when the interest income is becoming higher and higher from the non-interest income, the liquidity position of the bank will be less and less. The last weak association is existed with the deposit growth. The association is -

0.23. The remaining variables are not associated with liquidity risk of selected commercial banks in Ethiopia (see table 2).

Test for mean of Error is zero

In fact, if a constant term is included in the regression equation, this assumption will never be violated if the regression did not include an intercept, and the average value of the errors was non zero but in this study the model constitute the constant term.

Test for Heteroskedasticity

Homoskedasticity fails whenever the variance of the unobservable changes across different segments of the population, which are determined by the different values of the explanatory variables. The Breusch-Pagan-Godfrey test for heteroskedasticity was used to test the presence of the heteroskedasticity. In the assumption of homoscedasticity to be fulfilled F statistic, and observed r square should be greater than 5 %. In the study also, the probability of F-statistics, and observed R- square are 52.2% and 49.1% respectively. In this case all the *F* statics and observed R-squared of the test statistic give the same conclusion that there is no evidence for the presence of heteroscedasticity (see table 3).

Test for Multicolinearity

There were different arguments towards the multicollinearity problem. (Gujarati, 2004) stated that multicollinearity problems exist when the correlation coefficient among variables greater than 0.75. (Creswell, 2009) also suggested that a correlation above 0.8 between explanatory variables should be corrected for. Lastly, (Hair, Black, Babin, Anderson, & Tatham, 2006) argued that also correlation coefficient below 0.9 may not cause serious multicollinearity problem. In contrary to this, (Kennedy, 2008) argued that as any correlation coefficient above 0.7 could cause a serious multicollinearity problem leading to inefficient estimation and less reliable results. A correlation matrix used to ensure the correlation. This study adopts the most conservative view of (Kennedy, 2008) among the other and accepts the problem of multicollinearity if the value is exceeds than 0.7 and all the correlation coefficient values are less than 0.75; even they are less than 0.70;

suggesting that there is no problem of multicollinarity. In this study the highest correlation coefficients are -0.42 between bank size and the ratio of total loan to total deposit which implies no multicollinearity problem (see table 4).

Test for Normality

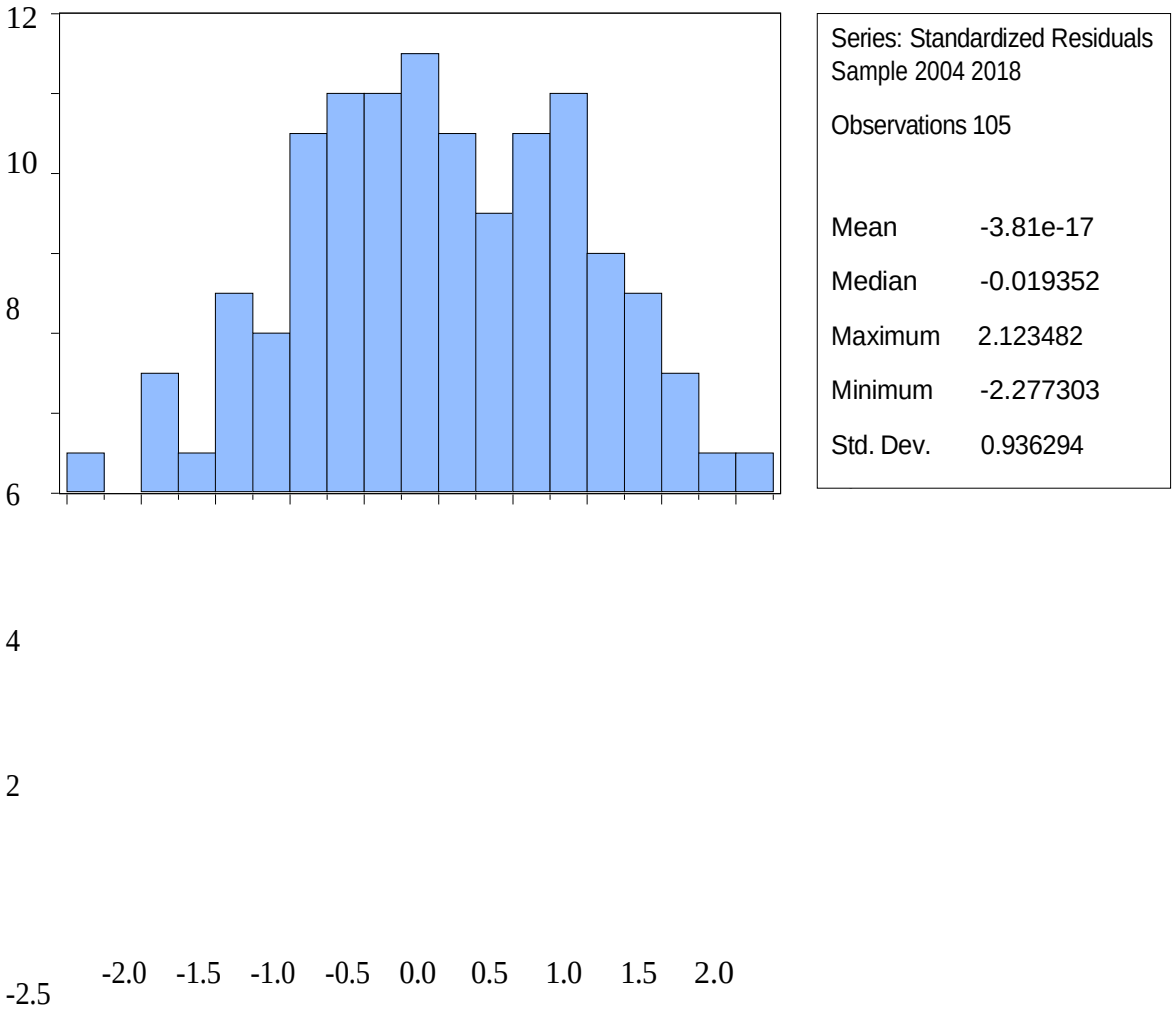
The normality assumption is about the mean of the residuals is zero. In this study, the normality of the data was mainly checked with the popular Bera-Jarque test statistic (Brooks, 2008). The standardized measurements of a distribution are known as its skewness and kurtosis. Skewness measures the extent to which a distribution is not symmetric about its mean value and kurtosis measures how far the tails of the distribution area. The author noted that the Jarque-Bera statistic will not be significant for disturbance to be normally distributed around the mean. The hypothesis for the normality test was formulated as follow:

H0: Error term is normally distributed H1:

Error term is not normally distributed

$\alpha = 0.05$ and decision Rule: Reject H0 if P value of JB less than significant level 0.05.Otherwise, do not reject H0.

Figure 1 Normality Test



As it is depicted from figure, the Jarque-Bera shows a probability of 0.49 for the given model. The result suggests that data used for the model construction is normal i.e. meets the property of normal distribution.

Test for Autocorrelation

As noted in (Brooks, 2008) it is assumed the errors are uncorrelated with one another, if the errors are correlated with one another, it would be stated that they are 'auto correlated' or that they are serially correlated. The simplest and most popular test to detect the existence of autocorrelation is Durbin Watson (DW test). According to (Brooks, 2008) Durbin-Watson stat (DW-test) statistic near 2 suggest little evidence for autocorrelations and the null hypothesis stated that there is no auto- correlations would not be rejected. The Durbin Watson test reports as a test statistic, with a value from 0 to 4, where

If the value is 2, there is no autocorrelations

If the value is between 0 to less than 2, there is positive autocorrelation

If the value is in between greater than 2 and less than 4, there is negative autocorrelation.

But according to the rule of thumb, the Durbin Watson test value in between 1.5 and 2.5 shows a relative normal data or it depicts as there is no autocorrelation. Or on the other hand, there is no any evidence to reject the null hypothesis which state as there is no autocorrelation between data.

The Durbin-Watson test statistic of the given model was approximately 1.8 which is near 2, thus the null hypothesis of no autocorrelation is within the non- rejection region of the number line and thus there is no evidence for the presence of autocorrelation (see table 5).

Model selection Criteria

Redundant Fixed Effects Tests was used to determine to select fixed effect or random effect. To determine whether the fixed effects are necessary or not, this study run a redundant fixed effects test as recommended by (Brooks, 2008). Therefore, based on the above discussion and table thep value is less than 5 %, thus, the fixed effect model is preferable for this study (see table 6).

Regression Analysis

The regression result shows R-squared statistics and the adjusted R-squared statistics of the model were 83% and 78.3% respectively. This means the independent variable (return on equity, capital adequacy, the ratio of loan to deposit, deposit growth, loan growth, bank size, and the ratio of interest income to total income) collectively explain 78.3 % of the changes in liquidity risk of the listed commercial banks in Ethiopia during the study period. Thus the variables are good explanatory variables to identify the effects of asset liability management on banks Profitability in Ethiopia. However, the remaining 21.7% of changes was explained by other factors which are not included in the model. Probability of (F-statistic) displays the p-value corresponding to the reported F-statistic so in above table the F-statistic was 12.68 and overall reliability and validity of the model was further enhanced by the Probability (F-statistic) value (0.00000) which indicates strong statistical significance indicates that the overall model is highly significant at 1% and that all the independent variables are jointly significant.

The regression result shows that five explanatory variables had significant impact on liquidity risk of Ethiopian commercial banks. The significant variables are profitability measured by return on equity (RoE), capital adequacy, deposit growth, loan growth and bank size were significant at 1% specifically with the p-value for those variables of 0.0000 for profitability measured by RoE, 0.0045 for capital adequacy, 0.0000 for deposit growth, 0.0000 for loan growth and 0.0061 for bank size or total asset. The remaining two variables which are the ratio of total loan to total deposit and the income diversification (measured by the ratio of interest

income to total income) were statistically insignificant. The probability values of the t-spastics for each variable were 0.1824 and 0.1013 respectively.

The negative coefficient of explanatory variables against liquidity risk are; profitability measured by RoE (-0.276581), ratio of total loan to total deposit (-0.122633), deposit growth (-0.080262), loan growth (-0.080259), and income diversification measured by the ratio of interest income to total income (-0.108734). On the other hand, three variables which are bank size and capital adequacy had positive relation with the liquidity risk of the listed commercial banks during the study period with coefficient of 0.027796 and 0.261212 respectively.

Thus, the regression model can be re-written as follows

$$\mathbf{LogLR = 2.64 - 0.2766LogRoE_i + 0.2612Log}CA_{i,t} \mathbf{- 0.0802LogDepGr_{i,t} - 0.0802LogLnGr_{i,t} + 0.0278BnkSz_{i,t} + Ɛi}$$

Hypothesis Testing for the Given Model

Ho_1: There is no significant relationship between profitability measured by return on equity and liquidity risk of commercial banks in Ethiopia. As the regression result shows there is significant statistical relationship, thus the null hypothesis is rejected and the alternative hypothesis is accepted.

Ho_2: There is no significant relationship between capital adequacy measured by total capital to total asset and liquidity risk of commercial banks in Ethiopia. As the regression result shows there is significant statistical relationship, thus the null hypothesis is rejected and the alternative hypothesis is accepted.

Ho_3: There is no significant relationship between the ratio of total loan to total deposit and liquidity risk of commercial banks in Ethiopia. As the regression result shows there is no significant statistical relationship, thus the null hypothesis is failed to reject.

Ho_4: There is no significant relationship between deposit growth and liquidity risk of commercial banks in Ethiopia. As the regression result shows there is significant statistical relationship, thus the null hypothesis is rejected and the alternative hypothesis is accepted.

Ho_5: There is no significant relationship between loan growth and liquidity risk of commercial banks in Ethiopia. As the regression result shows there is significant statistical relationship, thus the null hypothesis is rejected and the alternative hypothesis is accepted.

Ho_6: There is no significant relationship between bank size measured by the natural logarithm of total asset and liquidity risk of commercial banks in Ethiopia. As the regression result shows there is significant statistical relationship, thus the null hypothesis is rejected and the alternative hypothesis is accepted.

Ho7: There is no significant relationship between income diversification measured by the ratio of interest income to total income and liquidity risk of commercial banks in Ethiopia. As the regression result shows there is no significant statistical relationship, thus the null hypothesis is failed to reject.

Conclusion

The study aim to examine the impact of asset and liability management on the liquidity risk of selected commercial banks (seven prominent commercial banks: one public and six private banks) for fifteen years (from 2004-2018) using panel data analysis (with fixed effect regression model). The result revealed that the association between liquidity risk and return on equity as measurement of profitability, loan to deposit ration, loan growth, deposit growth, and ratio of interest income to total income and was negative, whereas, the association between liquidity risk and the remaining variables (capital adequacy, ratio of total liquid asset to total asset and bank size) was positive. The significant variables were profitability, capital adequacy, deposit growth, loan growth, and bank size. On the other hand the ratio of total loan to total deposit, ratio of total liquid asset to total asset and income diversification measured by ratio of interest income to total income were not

statistically related with the liquidity risk of selected Ethiopian commercial banks during the study period.

Recommendations

Based on the findings of the study the following possible recommendations were forwarded, The study revealed profitability, capital adequacy, deposit growth, loan growth, and bank size are the key determinants of return liquidity risk of, Therefore, Bank managers are advised to give due attention to the significant variables to manage their liquidity risk properly.

- The profitability highly affects the liquidity risk for selected commercial banks for this study; thus, it is necessary to kept appropriate level of liquidity position while they are formulating the profitability strategy. The banks may expected to shift their profitability strategy not only from the loan or interest, they have also to diversify into other sources like commission revenue, advising revenue and other sources which are not related to liquidity concept.
- The capital adequacy is better to be more improved to kept good level of liquidity position. Perhaps this strategy may be the function of the of national bank of Ethiopia to increase the initial capital amount of the banks for establishment and better to enforce all established banks to increase their paid up capital in order to solve the liquidity problem.
- Selected Ethiopian commercial banks better to give priority so as to maintain the optimum level of loan growth as it affects both profitability and liquidity. On the other hand the bank shall not set loan growth strategy alone in priority, rather it shall be equally with other strategies like with liquidity strategy because loan growth could not only serve banks healthiness. The loan diversification and composition between short term and long term also shall be maintained at the optimal level to reduce the liquidity risk of the bank.
- The positive relationship between bank size and liquidity risk revealed the “too big to fail” hypothesis, in which big banks may encourage to disburse more loans and advances. Thus, big banks needs to manage their liquidity position and shall give due attention on resource mobilization and liquidity management in parallel to increase their total asset and increasing assets in the forms of loan.

Recommendation for Future Researcher:

The coming researcher could expand this research through increasing banks to all established banks or widening the concept like the impact of liquidity on financial performance

The problem can be investigated in other financial sector like microfinance institution and also insurance even if these sectors are not as such sensitive sectors for liquidity problem.

The current research used only secondary data; thus the coming researcher could useprimary data and also use macro-economic variables

Bibliography

IOSCO. (2002). *Sound Practice for the Managment of Liquidity Risk at Security Firms* . Onternational Organization Of Security Commisison .

Ajibola, J. O. (2016). The Effects of Assets and Liability Management on Financial Performance of Some Selected Nigerian Banks. *Journal of Accounting and Financial Management, 2*(2), 44-63. Retrieved from www.iiardpub.org

Alzoubi, T. (2017). Determinants of Liquidity Risk in Islamic Banks. *Banks and Bank Systems, Volume 12, Issue 3, 2017, 12*(3), 142-148.

Assfaw, A. M. (2019). Firm-Specific and Macroeconomic Determinants of Banks Liquidity: Empirical Investigation from Ethiopian Private Commercial Banks. *Journal of Accounting, Finance and Auditing Studies, 5*(2), 123-145.

Bhati, S. S., Zoysa, A. D., & Jitaree, W. (2019). Factors affecting the liquidity of commercial banks in India: a longitudinal analysis . *Faculty of Business - Papers (Archive) Faculty of Business and Law.*

Biety, M. M. (2010). An Introduction to Liquidity and Asset-liability Manageme. *Tool 4 on Striking the Balance in Microfinance*.

Brooks, C. (2008). *Introductory Econometrics for Finance* (2 ed.). New York: Cambridge University Press.

Chaturvedi, D. V. (2014). Asset Liablity Managment in Banks. *International Journal of Engineering Technology, Management and Applied Sciences, 1*(2), 17-52.

Creswell, J. (2009). *Research Design quantitative, qualitative and mixed methods approaches* (3 ed.). California: Sage Publications.

Cucinelli, D. (2013). The Determinants of Bank Liquidity Risk within the Context of Euro Area. *Interdisciplinary Journal of Research in Business, 2*(10), 51-64.

Dermine, J. (2007). ALM in Banking. In S. Zenios, & W. Ziemba, *Handbook of Asset and Liability Management.* Elsevier Science B.V.

Desalegn, W. N., & Veni, P. (2019). Determinants of Liquidity Risk in Selected Commercial Banks in Ethiopia. *International Journal of Advanced Research in Management and Social Sciences, 8*(4), 108-124.

Diep, N. T., & Nguyen, T.-L. (2017). Determinants of Liquidity of Commercial Banks in Vietnam in the Period 2009-2016. *International Journal of Scientific Study*, *5*(6), 237-241.

Dzapasi, F. D. (2020). The impact of Liquidity Management on Bank Financial Performance in a subdued economic environment: A case of the Zimbabwean Banking Industry. *PM World Journa, 9*(1), 20-39. Retrieved from www.pmworldjournal.com

Emmanuel, N. R. (1977). *Commercial Banking in an Era of Deregulation* (3rd ed.). Greenwood Publishing Group.

Gujarati, D. N. (2004). *Basic Econometrics* (4 ed.). New York, USA: The McGraw-Hill Companies, Inc.

Guthua, A. M. (2013). The Effect of Asset Liability Management on the Liquidity Risk of Commercial Banks in Keny . *Master Thesis in University of Nirobi*. Kenya .

Hair, J., Black, W., Babin, B., Anderson, R., & Tatham, R. (2006). *Multivariate data Analysis* (6 ed.). New Jersey: Person Education.

Hoanga, C. V., Nguyena, L. Q., Trana, M. D., & Hoanga, a. T. (2020). The impact of income diversification on liquidity creation and financial performance of Vietnamese. *Journal of Accountinig*, 553-568.

Jaxybekova, G., Nurgaliyeva, A., Nurmagambetova, A., Gumar, N., & Asanova, A. (2018). Liquidity Risk Evaluation. *Revista ESPACIOS, 39*(16), 41-57.

Jayanthi, M., & Umarani, R. (2014). Asset-Liability Management in Banks. *Peer Reviewed International Journal, 2*(9), 10-25.

Kennedy, P. (2008). *Guide to Econometric* (6 ed.). Malden: Blackwell Publishing,.

Mamati, M. W., Ayuma, C., & Mwirigi, P. K. (2017). Effect of Asset Liability Management on Liquidity Risk of Micro-Finance in Kenya. *International Journal of Economics, Commerce and Management, 4*(10), 681-726.

Markowitz, H. M. (1959). *Portfolio Selection : Efficient Diversification of Investment.* New Haven: Yale University Press.

Marozva, G. (2015). Liquidity and Bank Performance. *International Business and economic Research Journal, 114*(3), 453-462.

Martha, S. R. (2014). The Effect Of Asset Liability Managment on the Financial Performance of Commercial Banks in Kenya . *Master Thesis in University of Nairobi*. Kenya.

Mazzù, S. G. (2019). Liquidity Risk Drivers and Bank Business Models. *Articles of risks* , 1-18.

Mekbib, S. Y. (2016). Determinants of Liquidity in Commercial Banks of Ethiopia: The Case of Selected Private Banks. *Master Thesis in Addis Ababa University*. Addis Ababa , Ethiopa

Mennawi, A. N., & Ahmed, A. A. (2020). The Determinants of Liquidity Risk in Islamic Banks: A Case of Sudanese Banking Sector. *International Journal of Islamic Banking and Finance Research, 4*(1), 38-49.

Mohamad, A. (2016). Determinants of Banks Liquidity: Empirical Evidence on Turkish Banks. *Masters of Science in Banking and Finance in Eastern Mediterranean University*.

Mugenyah, L. O. (2015). Determinants of Liquidity risk Management of Commercial banks in Kenya. *Master Thesis in University of Nairobi*.

NAFOSTED. (2019). The Determinants of Liquidity Risk of Commercial Banks in Vetinam. *Banks and Bank Systems, 14*(1), 94-110.

Negash, D. W., & Veni, P. P. (2019). Determinants of Liquidity Risk in Selected Commercial Banks in Ethiopia. *International Journal of Advanced Research in Management and Social Sciences, 8*(4), 108-124.

Novickytėa, L., & Petraitytė, I. (2013). *Assessment of banks asset and liability management: problems and perspectives (case of Lithuania).* Vilnius University, Saulėtekio ave. 9, Vilnius 10222, Lithuan.

Raditya, S., & Sari, S. (2016). Determinants of Liquidity Risk in Indonesian Islamic and Convectional Banks. *Jurnal Ilmu Ekonomi Syariah (Journal of Islamic Economics), 8*(2), 187-200.

Romana, A., & Sargub, A. C. (2015). The impact of bank-specific factors on the commercial banks liquidity: empirical evidence from CEE countries. *Proceeding of Economics and Finance 20*. 7th International Conference on Globalization and Higher Education in Economics and Business.

Rosen, D., & Zenios, S. (2006). *Handbook of Asset and Liability Management.* North Holand : Holand Publishing plc .

Sam, H. K. (2015). Liquidity Risk Management Practices case of selected Financial Institution in the Kumasi Metropolis. *Master Thesis in Kuame Nkumtrah University*.

Sayedahmed, M. Y. (2018). Determinants of Banks Liquidity; An Empirical Study of Banks Working in Palestine. *Master Thesis in Islamic Universityof Gaza*.

Singhn, A., & AnilKumarSh. (2016). An empiricalanalysisofmacroeconomicandbank-specific factors affecting liquidityofIndianbanks. *Future BusinessJournal, 2*, 40-53.

Sopan, J., & Dutta, A. (2018). Determinants of Liquidity Risk in Indian Banks: A Panel Data Analysis. *Asian Journal of Research in Banking and Finance, 8*(6), 47-59.

Sukmana, R., & Suryaningtyas, S. (2016). Determinmants of Liquidity Risk in Indonesian Islamic and Coventional Banks. *Journal of Islamic Economics, 8*(2), 187-200.

Suraphel, A. (2017). Assessment of Liquidity Risk Managment Practices and Challenges; The case of Private Commercial Banks in Ethiopia . *Mster Thesis in Saint Mary University* . Adiss Ababa , Ethiopia .

Trualem, M. (2009). Assessment of Liquidity Risk Managment Practices of Commercial Banks in Ethiopia. *Master Thesis in Addis Ababa University*. Addis Ababa , Ethiopia .

Tseganesh, T. (2012). Determinants of Banks Liquidity and their Impact on Financial Performance: empirical study on commercial banks in Ethiopia. *Master Thesis in Adiss Ababa University*. Adiss Ababa, Ethiopia.

Umarani, D. R. (2014). Asset-Liability Management in Banks. *Peer Reviewed International Journal, 2*(9), 10-25.

Vodova, P. (2010). Determinants of Commercial Banks' Liquidity in the Czech Republic. *Recent Researches in Applied and Computational Mathematics*. Karviná, Czech Republic: Silesian University in Opava.

Vodova, P. (2013). Determinants of Commercial Bank Liquidity in Hungary. *journal Financial internet, 9*(3), 64-71.

Yimer, M. S. (2016). Determinants of Liquidity in Commercial Banks of Ethiopia: The Case of Selected Private Banks. *Master thesis from Addis Ababa University, Ethiopia*.

Zaghdoudi, K., & Hakimi, a. A. (2017). The Determinants of Liquidity Risk: Evidence from Tunisian Banks. *Journal of Applied Finance & Banking, 7*(2), 71-81.

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Annexes

Table 1: Descriptive Summary of Variables

	LR	RoE	CA	Dep Gr	II/TI	Ln/Dep	Ln Gr	Bank size
Mean	54.1	31.8	14.36	27.24	57.39	59.86	28.85	10.013
Median	54.6	30	13.97	26.31	58	60.28	25.85	10
Maximum	78.7	63	19.22	64.59	79	91.5	70.63	11.39
Minimum	31.1	18	10.36	5.23	39	30.4	8.06	8.83
Std. Dev.	10.8	9.56	2.36	11.31	7.13	10.29	12.41	0.536
Observation	105	105	105	105	105	105	105	105

Table 2: Correlation Analysis

	LR	RoE	CA	DepGr	II/TI	Ln/De	Ln Gr	Bnk Sz
LR	1							
RoE	-0.33	1						
CA	0.06	0.18	1					
DepGr	-0.23	0.01	0.02	1				
II/TI	-0.26	-0.21	-0.29	-0.09	1			
Ln/De	-0.09	-0.38	0.14	0.01	0.30	1		
LnGr	-0.30	-0.01	-0.02	0.29	0.02	0.08	1	
BnkSZ	0.10	0.36	-0.04	-0.22	-0.33	-0.40	-0.08	1

Table 3 Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.8642	Prob. F(8,96)	0.522
Obs*R-squared	7.6725	Prob. Chi-Square(8)	0.491

Table 4 Test of Multi-Collinearity

	RoE	Ln Gr	Ln/Dep	DepGr	CA	II/TI	BnkSz
ROE	1						
LNGR	0.019	1					
LA/TA	-0.115	-0.16					
Ln/Dep	-0.36	0.06	1				
DepGr	0.019	0.21	-0.021	1			
CA	0.183	-0.03	0.115	0.014	1		
II/TI	-0.19	-0.006	0.29	-0.029	-0.28	1	
BnkSZ	0.35	-0.030	-0.417	-0.166	-0.039	-0.32	1

Source: computed from E-views 9 results

Table 5 Durbin-Watson Test Results for the Regression Model

Durbin Watson test	1.792557

Table 6: Redundant Fixed Effects Tests

Redundant Fixed Effects Tests

Equation: Untitled

Test cross-section fixed effects

Effects Test	Statistic	d.f.	Prob.
Cross-section F	9.179071	(6,90)	0.0000

Source: computed from E-views 9 results

Table 7 Regression Result of the Model

Dependent Variable: LOGLR	Method: Panel EGLS (Cross-section SUR)			
Date: 07/20/20 Time: 13:29	Periods included: 15			
Sample: 2004 2018	Total panel (balanced) observations: 105			
Cross-sections included: 7	Linear estimation after one-step weighting matrix			
Cross-section SUR (PCSE) standard errors & covariance (d.f. corrected)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOGROE	-0.276581	0.046601	-5.935033	0.0000***
LOGCA	0.261212	0.089541	2.917234	0.0045***
LOGL_D	-0.122633	0.091266	-1.343688	0.1824
LOGDGR	-0.080262	0.015379	-5.218777	0.0000***
LOGLNGR	-0.080259	0.014899	-5.386910	0.0000***
BANK_SIZ	0.027796	0.009905	2.806236	0.0061***
LOG_II_TI	-0.108734	0.107712	-1.009485	0.3154
C	2.644594	0.319977	8.264938	0.0000
	Effects Specification			
Cross-section fixed (dummy variables)				
	Weighted Statistics			
R-squared	0.853627	Adjusted R-squared		0.781302
S.E. of regression	1.006485	F-statistic		12.68286
Prob(F-statistic)	0.000000	Durbin-Watson stat		1.792757

*Source: computed from E-views 9 results *** refers for the variables which are statistically significantat the probability level of 1%*

Assessment on Attitude of Business Enterprise towards Value added Tax: The case study in Sodo City

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Abstract

This research assessed the attitude of business enterprise towards VAT in the case of Sodo city. To investigate this research primary data is used. Also business enterprises were purposively selected to collect primary data. Structured questionnaire and unstructured interview question used. Tabulation and percentage aim putting of raw data analysis ways used. On the other hand awareness of business enterprises towards VAT and measure the business enterprises were taken by revenue and custom authority office of Sodo city to reduce fraud related VAT is analyzed.

Key words: VAT

Introduction

Taxation is the largest source of revenue of modern government. Government may raise lower taxes to achieve social and economic objectives or to achieve political popularity within a certain groups. Some economist consider taxation an important tool for maintain the stability of a country's economy (Gebrie, 2008).

One of the mechanism in which the country raise revenues to finance governments spending on the goods and services is through taxation. Beginning the adoption of tax is by France in 1954. It was gradually been adopted by other countries. By 1969 only eight nations had adopted VAT, out of this cote-Devour was the first country in Africa to introduce VAT in 1960. Brazil from Latin America (southern America) and Japan from Asia were also among the first group of countries that introduced VAT in their respective continents (Misrak, 2008).

VAT is a family of sales tax. However, it differs from traditional sales tax as well as turnover tax. The need for VAT emanates from the very weakness of sales tax that is intended to replace. VAT is

a special types of indirect tax in which a sum of moneys is levied at a particular stage in the sales of a product or services until it reaches an end user (Misrak, 2008).

the other writers also write as , VAT is an indirect tax that is changed when ever at a taxable person makes at a taxable supply of goods and services in the course of his business although, it is finally born by the customer. In one or other the meaning is the same.

VAT is popular in Europe but, it is not used in the united states of America- the VAT is levied on the Difference between sales revenue and cost of purchased Commodities input. Depending on the treatment of capital in puts, a VAT may be equivalent to a tax on consumption, net income or gross income (Rosen, 1995).

In order to realize the properly reduction objective and attain other vital social and economic objectives, the Ethiopian government acknowledged that successful implementation of overall tax reform programs is crucial. As result, VAT was implemented in the system of Ethiopia as one of the components of the tax reform program. The Federal Democratic republic of Ethiopia (FDRE) government has adopted VAT in to its tax system in January 2003 G.C rescinding the sales and excise tax proclamation No 68/1993. It has been introduced on January 1, 2003, by replacing the former sales tax system (Misrak, 2008).

As VAT is an indirect tax, it is eventually collected from end-users and payable to a government through registered legal tax payers.

Accordingly, the VAT legislation of Ethiopia provides two types of registration for its VAT administration purposes depending up on some criteria to be met and the nature of the business activities mandatory and voluntary registration (Misrak, 2008).

Statement of the problem

The most important source of revenue of government is tax. In the recent year all government's current expenditures and capital expenditures is raised from the source tax.

VAT is one of indirect type of tax. The revenue generated from this tax is used for the payment of defense and social security's construction of infrastructures, and different facilities, provision for food aids, shelter, medical cares, educations, and recreation facilities. This shows that the benefits of public expenditures may go to any one irrespective of tax paid.

The tax is a compulsory payment to the government without the direct return. However, in our country it is very difficult to decide that VAT collection and registration is takes place according to the countries rules and regulations, because; the business enterprise may cause different problem such as: tax evasion, avoidance and others means for their own benefits rather than the governments revenue that serves society directly or indirectly.

Thus, the study assesses the attitude of business enterprise towards VAT in the case of Sodo city administration.

In line with the above problem statement, the following main research questions were addressed in this paper:

- Does the business enterprise have awareness about VAT?
- Is registration for VAT has effect on the business activity of taxpayers?
- What has been done by Sodo city revenue and custom authority to reduce fraud related VAT?

Objective of the study

General Objective

The general objective of the study is to assess the attitudes of business enterprises towards VAT in case of Sodo city.

Specific objective

The study would have specific objectives under the Umbrella of the general objectives as follow.

- To assess the awareness of the business enterprise about the VAT registration,
- To assess the effect of registration for VAT on business activities of taxpayers,
- To examine the Sodo city revenue and custom authority whether it has done an activity the fraud related to reduction of the VAT.

Significance of the Study

The study would focused on assessing the attitude of business enterprise towards VAT. This study is important to providing insight for business enterprises attitude towards VAT if there, create awareness about VAT for taxpayer and also initiate other researchers to perform better study to come up with relevant information for improved performance.

Scope of the Study

The study would conduct in Sodo city. Which is found in West Arsi Oromia region? For VAT application too vast and difficult to cover all of them, the scope of the study would on the attitude of business enterprises towards VAT

Limitation of the study

In conducting this study the researcher faced several problems which have negative impact on performance. The major limitations are: lack of experience in the field of study, lack of some awareness among the respondents about VAT system, lack of sufficient secondary data, and some of the respondents lack willingness to fills the questionnaires.

Those limitations hinder the researches to gather sufficient data from the business enterprises.

Organization of the paper

This paper consists of five chapters: chapter one includes an introduction, chapter two deals with literature review, chapter three about the research methodology, chapter four is analysis and presentation of data and the last chapter present conclusions and recommendation.

Literature Review

Meaning of VAT

VAT is a tax on value added to a commodity or services. It means that the VAT is imposed on the value that business firms added to the goods and services that it purchases from other firms. It adds value by processing or handling these purchased items with its own labor force or its own machinery, buildings or other capital goods. Thus, the difference between sales proceeds and the cost of materials, and extra that is purchased from other firms in its value added, which is the tax base of VAT (Gebrie, 2008).

VAT is a tax on value added to goods and services by enterprises at each stage of production and distribution process. It arises whenever a << taxable person>> makes a << supply of goods and service>> in the course of his business. Thus, in some country's is called << goods and services tax>> or << GST>>VAT was invented by a French economist in 1954 by Maurice Laure, director of the French tax authority. VAT was invented; because' very high sales taxes and tariffs encourage cheating and smuggling (Gebria, 2008).

History of VAT

VAT Genesis and Development

Emergence and rapid spread of VAT is among dramatic and most important tax development of the later 20th century and still continues. VAT was invented in 1954 by a French economist Maurice Laurie who was joint director of the French tax authority, although German industrial list. Wilhelm von Siemens proposed the concept in 1918. France was the first country to introduce VAT effective from April 10, 1954. By 1969 only eight nation has adopted VAT, out of this cote- devour was the first country in Africa to introduce VAT in 1960 Brazil from Latin America (south America) and Japan from Asia were also among the first group of countries that introduced VAT in their respective continents.

Since, 1979 VAT as the main form of indirect tax by many countries indifferent parts of the world. According to international monitory fund (IMF) report 2004, more than four billion, 70% of the world's population now live in countries with VAT and VAT rises about $18 Trion in tax revenue, roughly one quarter of all government revenue. Furthermore, among more than 190 countries of the world, over 136 (72%) of them have made VAT part of their tax system (Misrak, 2008).

VAT In Ethiopia

The VAT replaced the current sales tax on manufactures and imported good and service on January 1, 2003. The responsibility for the correct calculation and timely payments of VAT rests on the tax payer himself. The VAT is a broad based tax on the consumption of goods and services it is collected at all stage in the production and distribution process beginning with the importers and producers of raw materials and ending with the retailers cascading of the tax (i.e. tax on tax) is avoided by providing for accredit for the tax paid at the preceding level. Unlike, the sales tax system, where by relief is granted only to raw materials used directly for tax paid on capital goods, distribution and administration inputs. Sales of export goods are not subject to the VAT. Removing the tax content (on inputs) from exported goods makes the goods more competitive in international, markets.

VAT is a customer expenditure it is collected on business transaction and imports. Most business transaction involves supplies of goods and services and VAT is payable if they are: Supplies made in Ethiopia, made by a taxable person, made in the course of furtherance of a business and are not specifically exempted or zero rated (Hancock,1998).

Forms of VAT

VAT can be designed to have different forms: exemption and rates. There are town important (main) varieties of VAT; Consumption variety and income variety. The difference between these two varieties emerges from the treatment of capital depreciation. However, Carlshoup distinguishes between four possible varieties of VAT: Production VAT, consumption VAT, income type VAT and wage type VAT (David N, 1997).

VAT Rates

The number and rate of value added tax vary from country to country and some countries have two or more tax rates. In Ethiopia case, taxable supplies are charged at zero rate and standard rates of 15%.

According to (Gebrie, 2008) the standard rate is a tax rate of 15% based on the tax exclusive value of the goods and services supplied. Any taxable supply, which is not charged to tax at the zero rates, is charged to tax at the standard rate. This includes: Every taxable transactions by a registered person; every imports of goods, other than an exempted import and an import or services and

Zero VAT rate is a VAT rate of zero (null) which is also set by country's tax law to charge VAT on taxable goods and services. In a zero VAT rate, a taxable person (VAT registered person) charges VAT on its sales at zero percent (zero rate) effectively, the supplier does not collect VAT on its taxable sales subject to zero VAT rates and thus, there is no output VAT. Accordingly, the taxable supplier does not have a tax liability on its sale; but, is allowed the tax credit (refund for tax paid on its purchase to provide the supply, i.e. input VAT (Misrak, 2008).

2.5 VAT Refund

AVAT refund (VAT refundable) is a net VAT that a registered person (taxable person) expected to be given back from the concerned tax authority. during a given accounting period when input VAT (VAT paid on in purchases) exceeds output VAT (VAT charged on supply) are glistered person is entitled to VAT refund based on the following provisions: Zero rate supply and standard rated supply (Gebrie, 2008)

VAT Registration

If the supply is within the scope of VAT, the person who makes such supply must register for VAT. Under the VAT law of Ethiopia, any person conducting a commercial activity or intending to conduct a commercial activity may apply to be registered for VAT, the term<< any person>> for purposes of VAT registration includes:-Sole proprietor; share company; unregistered partnership and registered partnership; public enterprises; nonprofit making body; public finance agency; joint venture; estate of the deceased; trust; incorporated or un incorporated profit making organization; and Sport club, society or association.

A term << Commercial activity>> For VAT registration purpose also refers to any business of whatever and includes; but, not limited to the followings: Ordinary business and trades such as: shop, contractors, manufactures, whole sales, etc. Professions such as: Builders, Engineers, Accountants, lawyers;

Activities of non- profit moving bodies such as: societies, associations, sporting clubs, etc (Misrak, 2008)

Registration Procedure

Application for compulsory as well as voluntary registration must be made on application form called<<Application for VAT registration>> and the authority is required to register the person in the VAT register, and issue a certificate of registration within 30 days of registration containing details of: The full name and other relevant details of the registered person; the date of issuance of the certificate; the date from which the registration effect and; the registered person's tax payer identification number.

If the registration is disallowed FIRA was have to notify the applicant and the reasons for the refusal. The tax authority may deny the application for voluntary registration if the person: Has no fixed place of residence or business; does not keep proper accounting records; has no bank account; and has previously been registered for VAT purposes; but failed to perform his duties under the VAT law (Gebrie, 2008)

Time of application and registration

According to (David N, 1997), Person Who carries on taxable activity and is not registered is required to file an application for VAT registration. It shall fill an application for registration no later than the last day of the month after the end of the period if:

1. At the end of any period of 12 calendar months the person made during that period, taxable transactions with a total value exceeding 500,000 birr or the last day of the month of the period if:

2.At the beginning of any period of 12 calendar months when there is reasonable grounds to expect that the total value of taxable transactions to be made by the person during that period will exceed 500,000 birr, and

According to (Gebrie, 2008) registration takes place on one of the following dates, depending up on which date comes first: In case of obligatory registration, on the first day of the accounting period following the month in which the obligation to apply registration arose; in case of voluntary registration, on the first day of the accounting period following the month in which the person applied for registration, or on the date selected by the registered person on his application for a registration. A registered person who conducts taxable activity in a branch or division shall be registered only in the name of the registered person. However, up on application the tax authority may the registered person to register one or more of its branches or division as separate registered persons. The tax authority allow when it's satisfied on such case that divisions or branches maintains an independent accounting system and can be identified by the nature of its activities or location.

Cancellation of Registration

VAT registered person can apply for cancellation of registration: If tax payer ceased to make taxable transactions; at any time after a period of 3 years of the date of his most recent registration or VAT if the registration persons total taxable transactions in the periods of 12 months then beginning reasonable are expected to be not more than 500,000.00 birr. The cancellation of VAT registration takes effect: At the time the registered person ceased to make taxable transactions. For example, if one close down or sell business. However, if one has more than one business and is not closing down or selling them all, he may not be able to cancel it will depend on the level of taxable turnover of the remaining businesses. If the registered person has not ceased to do so at the end of the accounting period during which the person applies to the authority for cancellation of VAT registration. When registration for VAT is cancelled, the authority is required to remove the person's name and all other details from the VAT Registered and the Person is required to return back the issued certificate of registration (Gebrie, 2008).

Merits and Demerits of VAT

Merits of VAT

The following are some of the advantages or merits of the VAT:

It avoids cascading effect of tax (tax on tax): VAT works on the principle of that when the raw material passes through various manufacturing stages and manufacture products through various distribution stages, tax should be levied on the incremental value at each stage and not on the gross sale price. This insures that some commodity does not get taxed again and again, and this there is no cascading effect. Putting the concept in simple terms, in VAT system, each input is taxed only once (Misrak, 2008).

It is major comprehensive and equitable tax system: Even through the ultimate burden of VAT full on the final customer, VAT is collected by the government from all sectors that from import manufacturing, Whole sale and retail sectors. Therefore, it is a more compressive and equitable taxes system. On the contrary, sales tax is normally levied at one stage of whole marketing (Misrak, 2008).

It reduces the possibility of tax evasion: in the case of VAT the tax are divided in to several parts depending on the number of stage of production and sales. In each stage every transaction is made using VAT invoice approved by tax authority. In addition each VAT registered person (Supplier) has to maintain appropriate records on their sale and purchase transaction. Those obligations make tax evasion difficult (Akan, 2002).

It has less tax burden: Under VAT system, the tax is collected are small fragments at different stage of production and sale. Hence, the VAT payers feel the burden of the less (Misrak, 2008).

It has neutral in allocation resources: Regardless of the number of production and distribution, VAT is collected in each stage; therefore, VAT is expected to be perfectly neutral in the location of resources in the form of production and commercialization (Misrak, 2008).

It improves productivity/burden of tax is shared by all factories) in VAT system, a firm has to par tax even though it van it to loss. The firm cannot claim any exception for loss because it pats taxes on the value produced and not on profits so, firms was always try to improve their performance and

reduce the cost of production. As a result, the overall productivity of the country was be improved (Misrak, 2008).

It promotes capital investment and saving; VAT is a consumption tax since one pay VAT on its expenditure and has the option to sure so as not to be taxed. Furthermore, relief from tax on capital goods may encourage investment. Potential investors also consider tax legislation as one of the factors in making investment decision (Hancock, 1998).

It enhances exports and foreign exchange wealth: Exports of goods and services in most countries that implement VAT are liable to VAT. At zero rates this may make exports internationally competitive and thus encourage exports (Misrak, 2008).

Demerits of VAT

The following are some of the demerits of VAT from many:

It is regressive in nature: A straight forward single rate VAT with few exemptions would tax lower income groups (the poor) more heavily than the higher income groups (the rich). It is thus incongruent with the basic principles of taxation which states that reason should be taxed according to his ability to par. This makes VAT regressive tax system. In order to compensate for its regressive effect a number of countries have expected basic goods particularly food items from VAT (Hancock, 1998).

It requires advanced economic structure: The proper Implementation of VAT system required organization and advanced financial and economic structure as it complicated system. VAT system also requires proper record keeping of invoice at each stage of production and sale by both the seller and buyer. Hence, it becomes, difficult to implement the system in all types of economy (Misrak, 2008).

It is not simple and easy system to adopt; as VAT is a complicated system in its nature. The system is not easy and simple. To adopt specially, in under developed countries were the tax administrative set-up in inefficient and inexperienced to understand and complicated tax structure.

Input additional burden to tax authority; In VAT system , the manufacture whole sellers and retailers have to fulfill various legal formalities in the form of manufactures various records, accounts, books etc. the verification of those formalities put additional burden to the enforcing authorities (Misrak, 2008).

It is uneconomical (high cost): VAT system involves high of administration, assessment, verification collection, etc. hence; it is highly uneconomical. It also imposes high tax compliance costs on the legal VAT tax payers (Purhot, 2000).

It is exposed for tax evasion: VAT system depends a lot up on tax cooperation of the tax payer. Each firm itself calculates it s tax liability and also finds out the taxes paid by the earlier firms. Once, however, the sellers realize that the administrative machinery of the government is ill-equipped to do all the necessary cross-checking, they were resort to the creation of false purchase invoices showing

taxes paid by others. To the extent this happens, tax evasion becomes major possibility and a common practice (D/r. Ram swami, 2005).

It has reams loopholes for the tax evasion: Although VAT system requires proper record keeping of invoices at each stage of production and distribution by both the buyer and seller it has ream loopholes for tax evasion. This many include the following:

Tax payers could cover report sales of zero rated goods

It enables buyers and sellers to strike secret deals with regards the issuance of receipts.

It could lead to the formulation of forged provides' recipients to claim tax credit on input VAT (Misrak, 2008).

The VAT is inflationary in character: some people argue that VAT is inflationary in nature that it leaves its customers with larges disposable incomes. In some country inflation is more of tax push than that of a demand pull nature. As such VAT is less than multistage turn over tax in such; VAT is less than multistage turn over tax in such economy.

Research design and Methodology

Description of study area

Sodo city is the Administrative capital of southern zone and is located at about 370 km of road distance from Addis Ababa to the south zone since its foundation.

Research Design

In research design the researchers, would used the descriptive method of data analysis because, it helps to describes and summarized the data using indexes or statistics in addition, it helps to describe the present Status of the research area of investigation.

Source and Method of Data Collection

The research would use primary source data in order to complete the study. Primary data would collect from Sodo city business enterprises owners, and Sodo city revenues and customs authority office. On this primary data the researcher will used both structured questionnaire and unstructured interview method. In addition to this different published and unpublished documents were used to review different literatures that related with the study.

Sampling techniques

The sampling techniques selected for this study would a judgmental sampling of non-probability techniques. The reasons for selecting this technique: - It enables the researcher to select the respondent that fits for the researcher. In addition, it is convenient, low cost and less time consuming as compared with other sampling techniques.

Target population and sample size

In Sodo city, currently 30 business enterprises exist with VAT. Hence, collecting data from those total business enterprises consume time and large human power. Therefore, 15 business enterprises were selected from the total population by the researcher through judgmental sampling method.

Method of Data Analysis and Presentation

Once the data would collect then the data analysis would follow to make the raw data ready for interpretation and reporting. Before starting the process of analysis the raw data would ready for interpretation and reporting. Before starting the process of analysis the raw data would edited and checked for errors omissions .then the researcher would use percentage and tabulation to interpret the data. Then after, the researcher would use descriptive analysis to describe the attitude of business enterprise towards VAT

Data Analysis and Interpretation

The consideration that under line here is chooses analysis methods for best interpretation and demonstrating the results.

For analyzing the researcher collected the data from Sodocity, tabulation and percentage computation was the most method of analyzing the data for best interpretation and demonstration of the results. From the total population who are operating business 40 owners have been selected to arrive at this result. Depending on the information obtained for respondents almost all of the owners of business enterprise are liable to VAT to extent the amount imposed on them.

Gender status of the owners of business enterprises

The table below shows the gender status of business enterprises runners

Table 4.1 Gender status of the owners

Gender status	No of respondents	Percentage (%)
Male	26	65
Female	14	35
Total	40	100

Source: Survey result for the study 2013 E.C

As indicated in the table 4.1 (65%) of the respondents from the sample surveyed are male and the rest (35%) are female. this indicates that, the participation of males is more than the females in running business enterprise in the area. So, there is imbalance of sex in participation of business activities.

Age of Business Enterprises Owners

The age status of the owners of the business enterprise is shown in the table below as follows:

Table 4.2 Age status of owners of business enterprises

Age group	No of respondents	Percentage (%)
Below 20 years old	0	0
From 21-60 years old	32	80
Above 60 years old	8	20
Total	40	100

Source: Survey result for the study 2013 E.C

From the total sample of 40 owners of business enterprise, Age status constitute, below 20, from 21 to 60,and above 60 years and their percentile shares are (0%), (80%) and (20%) respectively.

From this data the researchers infer that, the age group of 21-60 years are operating the business enterprise dominantly in the town, which covers the highest portion (80%) of the total age group and followed by age group of greater than 60 which consists of (20%) and the age below 20 where not participate in the business enterprises. This indicates that, most business enterprises are run by adult age group and greater than half of business enterprises are dominated by them. From this the productive age group have high share for the growth of country's economy. But not only productive (adults) age group others age group have their own contribution to the country development.

Educational level of business enterprise owners

The table below indicates educational level of business enterprises owners.

Table **4.3** Educational level of business enterprise

Educational level of business enterprise owners	No of respondents	Percentage (%)
Read and write	0	0
Primary	12	30
Secondary	20	50
College , university and above	8	20
Total	40	100

Source: Survey result for the study 2013E.C

According to survey results of the above table, from the total population (50%) of respondents are complete their secondary education, (30%) and (20%) of respondents are complete their primary, and college, university and above education level respectively.

From this survey, half of the business enterprises owners are complete their secondary education level. Also most of them complete their primary and some of them complete their college, university and above educational level. All of them can read and write. In general, there are no illiterate owners of business enterprise according to researcher survey results.

Marital status of the business enterprises

Table 4.4 Marital status of the business enterprise

Marital status	No of respondents	Percentage (%)
Married	36	90
Unmarried	4	10
Total	40	100

Source: Survey result for the study 2013 E.C

As indicated in the table 4.1.4 above (90%) of the respondents is married and (10%) are single. In general, this indicates that almost all of the owners of business enterprise are married.

Forms of the business Enterprise

Forms of the business Enterprise was represented in the table as follows:

Table 4.5 forms of the business they are engaged

Forms of the business	No of respondents	Percentage (%)
Sole proprietorship	34	85
Partnership	4	10
Share company	2	5
Total	40	100

Source: Survey result for the study 2013 E.C

Form the above table (85%) of the business enterprises are sole proprietorship, (10% are partnership and (5%) are Share company, shared the sample sizes.

As seen in the above table the owners of business enterprises are running by themselves that is sole proprietor. Partnership is follows the sole proprietor. Share company is somewhat appear.

Types of the Business Enterprises

The table below shows the types of the business the respondents are engaged.

Table 4.6 Types of Business Enterprise

Serial NO	Types of business		No of respondents	Percentage (%)
1	Merchandise	Retailer	30	75
		Wholesaler	6	15
2	Manufacturer		4	10
3	Service type		0	0
Total			40	100

Source: Survey result for the study 2013 E.C

As shown in the above table (75%) and (15%) retailers and wholesalers respectively are merchandise and (10%) are manufactures.

From the business merchandise type, large numbers of them are retailers and followed by wholesalers' merchandise. From the table showed manufactures are somewhat low.

Duration of activities in business enterprises of the owners

The following table show in detail the duration of owners in business enterprise activities.

Table 4.7 Duration of owner' activities in business enterprise

Duration of the business	No of respondents	Percentage (%)
below 5 years	6	15
From 6 to 10 years	24	60
Above 10 years	10	25
Total	40	100

Source: Survey result for the study 2013 E.C

From the total sample, the duration of activities in business activities constitute, below 5, from 6 to 10 and above 10 years. Their Share in percentage are (15%), (60%) and (25%) respectively.

In general, the survey result show that, more than half of owners participate in business activities from 6 to 10 years and some of them participate for below 5 years and above 10 years.

Awareness of Business enterprise on VAT

Access of information on VAT is needed for business enterprises owners. The following table expresses in detail on the access of information for business enterprise owners.

Table 4.8 the access of information for business enterprise on VAT.

Serial No	Are you aware about VAT?	No of respondents	Percentage (%)
1	Yes	34	85
2	No	6	15
Total		40	100

Source: Survey result for the study 2013 E.C

As presented in the above table, most of the business enterprises owners get information on VAT. However, from total population of 40 owners, (15%) of owners cannot access information on VAT. Through media and Sodo city VAT administration bureau (85%) of the owners accesses the information.

This indicates that, most of the owners of the business enterprise access information related VAT. In general, their information related VAT have great role in changing attitude and awareness of business enterprise owners.

Source of Information on VAT Business Enterprises

The source of information for business enterprises related VAT is discussed in detail in the table below.

Table 4.9 source of information on VAT for business enterprises

Serial No	Source of information	No of respondents	Percentage (%)
1	From revenue and custom authority	20	50
2	From mass media	10	25
3	From record materials	4	10
4	Don't know about the VAT	6	15
Total		40	100

Source: Survey result for the study 2013 E.C

As indicated in the table 4.9 above, (50%) access information from revenue and custom authority, (25%) access from mass media, (10%) access from record materials and (15%) does not know about the VAT.

The business enterprise owners access information from revenue and custom authority office, mass media, and other records materials.

VAT Registered Business enterprises

The following table, presents whether the business enterprise owners registered for VAT or not.

Table 4.10 VAT registered owner's business enterprise

Serial No	Are you registered for VAT?	No of respondents	Percentage (%)
1	Yes	34	85.00
2	No	6	15.00
Total		40	100.00

Source: Survey result for the study 2013 E.

According to survey, from total sample of (85%) are registered for VAT and the rest (15%) are not registered for VAT. The registered for VAT are obligated by law for their sales are greater than 500,000 birr and some of them are registered voluntarily. As researcher observe the reason for unregistered business enterprises, their sales are less than 500,000 birr and newly established. Business enterprises sales are less than 500,000 birr are not obligated by low. In general, almost greater than half and quarter of the owners are registered for VAT.

Types of VAT registration on business enterprises

The form of the business enterprises are presented in the below table

Table 4.11 types of VAT registration business enterprises

Serial No	VAT registered Types	No of respondents	Percentage (%)
1	Voluntary	16	40
2	Mandatory	24	60
Total		40	100

Source: Survey result for the study 2013 E.C

From the above table, (60%) are registered mandatory and (40%) are registered by voluntarily.

As the above statistics shows that, most of business enterprises are registered by mandatory and some of them registered by voluntary.

The Advantage of Registration for VAT

The registration for VAT has May advantages which are listed below table:

Table 4.12 the advantage of registration for VAT.

Serial No	Advantage of registered VAT	No of respondent	Percentage (%)
1	Avoids cascading effect of tax	16	40
2	Comprehensive and equitability	10	25
3	It is fairs other than other tax types	6	15
4	It is paid by final customer	8	20
Total		40	100

Source: Survey result for the study 2013 E.C

The above table 4.12 shows, (40%) take VAT advantage as avoids cascading effect of tax for registered business enterprises, (25%) of owners take it as it is comprehensive and equitability, (15%) infers it as, it is fairs other than other tax types and (20%) share it is paid by final customers.

From table 4.12, most of the owners of business enterprise know the advantage of registered for VAT. The respondents set the advantage of registration for VAT as paid by final consumer, fair other than other tax types, comprehensive and equitability, avoid cascading effect of tax. In general, the VAT registered business enterprise owners take the advantages of registration. So, the VAT authority plays a great role on the VAT.

The Disadvantage of Registration for VAT

The disadvantages of register for VAT are discoursed in the following table in detail.

The Disadvantage of Registration for VAT

Serial No	Disadvantage of VAT registration	No of respondents	Percentage (%)
1	Decreases the sales of our business when all are not registered for VAT	34	60
2	Decreases our costumer if our competitors are not registered	16	40
Total		40	100

Source: Survey result for the study 2013 E.C

From the above table that most of the owners' fear for their market, if their competitor is not register for VAT. They set the disadvantages of the register for VAT as, decreases the business sales volume and costumers.

Submission of VAT by Business Enterprises

Vat is collected from business enterprises by tax revenue and custom authority. The VAT collection period (s) in Sodo city branch is show in the table below.

Table 4.14 period of VAT payment to the ERCA

Serial No	Period	No of respondents	Percentage (%)
1	Month	_	_
2	Quarterly	_	_
3	semi- annually	_	_
4	Annually	40	100
Total		40	100

Source: survey result for the study 2013 E.C

From the above table, Sodo city revenue and custom authority follows the per year for the VAT collection from its customers. The business owners are pay their VAT registered in a yearly basis. If they are not pay within the specified time tax authority follow the penalty.

The Activities of Sodo city Revenue and custom Authority office to reduce fraud on VAT

The VAT related fraud takes place by business enterprise owners registered for VAT. To reduce the VAT related fraud, the Sodo city revenue and custom authority work on it, as the information researcher get from the office.

The office take measures to reduce the fraud related VAT as solution, the following means: These measures are teach consumers to take bill for their payments, obligate the business enterprise registered for VAT to use cash register machine for their sale, give invoice to customers, audit their performance and punish owners done such acts.

The Activities of Revenue and custom authority office to change attitude of business enterprises towards VAT

The revenue and custom authority office activates to change the attitude of business enterprise towards VAT. As the researchers get information from the office, the office work with the town administration aware the business enterprises on workshops, prepare coupon and disperse to the business enterprise, and work with local media, to change the attitude and awareness of business enterprises.

Conclusion and Recommendation

Conclusion

Most of business enterprises in Sodo city that have been filled the questionnaire have completed their secondary education and can easily understand the tax laws, rules and regulation. They also have more than 6 years of experience in the business. Majority of the business enterprises are also engaged as a sole-proprietorship and activate as retailers.

The study addressed both VAT registered and unregistered business owners. Out of which most of them are VAT registered. Most of the targeted business through that registering for VAT is advantageous in that it avoids cascading effect, and comprehensives and equitable. So, it not affects their business activities.

The business enterprises have remitted the VAT to the tax administration office annually.

Getting access to VAT related information was relatively easier in sodo city revenue and custom authority office and most of the tax payers happy with that and it have great role in changing their awareness on VAT.

Sodo city Revenue and custom authority office used different means to avoid fraud related VAT by improving the VAT payer's awareness level, through punishing illegal actors and developing its employee's level of performance.

They also give training to the business enterprises frequently when the business owners are registered and they teach by keeping the annual programs.

Recommendations

Based on the research finding the following points could be forwarded as recommendation from the researcher's point of view.

It is better if the tax office work hard to increase awareness of business communities in general and VAT payers in particular in order to increase the awareness of society at the better level.

Tax collection is the activities that require proper communication and coordination to increase VAT collection and decrease tax fraud. From this point the researcher recommends that it is advisable if the revenue office work cooperatively to help the tax payers with their difficult and reduces the tax fraud accordingly.

The tax rules and regulation requires effective implementation. Based on this the researcher recommends that the revenue office has to strengthen its human resource with well-educated employees so as to implement the tax rules and regulation properly.

Rewarding model VAT collector is important to increase motivation of VAT payer. Based on this the researcher suggest that it is better if the revenue office reward the model VAT collector in order to motivate VAT registration and collecting the tax effectively.

Reference

Akan Gupta, (2002). Public finance. First edition: New Delhi India.

David N. Hyman, (1997). Public finance: A contemporary theory to policy. Fourth edition. New Delhi India.

D/r. Ram swami paraswaran, (2005). Public finance and taxation. Addis Ababa Gebrie Work, (2008). Tax accounting in Ethiopian context. Second edition: A.A. Alem printing press.

Hancock Dore, (1998). Taxation policy and practice. Second edition.

Harvey Rosen, (1995). Public Finance. Fourth edition: Princeton University.

Misrak Tesfaye, (2008). Ethiopian tax accounting: theory and practice. First edition.

Purhot Mahesh, (2000). Value added tax: the need of the new millennium. ninth edition.

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Determinants of Financial Performance of Private Commercial Banks in Ethiopia: CAMEL Approach

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Abstract

This study aims to identify bank specific CAMEL constituent determinants of financial performance of private commercial banks in the Ethiopia. The exceptional feature of this paper is the inclusion of many independent variables, the inclusion of all 16 operational private commercial banks in Ethiopia and the introduction of EPS in addition to ROA and ROE as key indicators of financial performance of private commercial banks in Ethiopia. The study used a secondary data for all private commercial at the moment in Ethiopian banking industry. Data from National Bank of Ethiopia Annual Report and head offices of the banks were used to do the analysis. The study considered bank specific CAMEL factors over the period from 2016 to 2020 and analyze them with fixed effect balanced regression model using SPSS 20. The study has found that financial performance is significantly affected by capital adequacy, management efficiency and liquidity position of private commercial bank. On the other hand the effect of asset quality and earning is weak and insignificant. To boost the financial performance of private commercial banks in Ethiopia, the study recommends banks to have better capital adequacy, management efficiency and liquidity position.

Keywords: *Balanced fixed effect regression model, determinants of financial performance, CAMEL, panel data, private commercial banks.*

Introduction

Inclusive Economic prosperity is a sign of success of a country and this is achieved through proper and efficient utilization of country's resources. In this context, banking sector is a major constituent that enables effective and appropriate utilization of financial resources of the country (Babar and Zeb, 2011). Commercial Banks play a dynamic role in the economic development of a country. They basically gather the idle savings of the people and make them available for investment purposes. They also create new demand for deposits by providing loans and purchasing investment securities. Banks also increase the mobility of capital (Saini and Sindhu, 2014). They are recognized worldwide as drivers of economic growth and job creation, thereby contribute towards alleviation of poverty. This shows that commercial banks are key to economic growth and are expected to be stable and financially sound. It is therefore, critical to measure the financial performance of the commercial banks and reflect on their performance.

According to Babar and Zeb (2011), banking industry being an important pillar of the financial sector of an economy, its performance measurement cannot be neglected. It has-been observed based on the standing of those countries that experienced crisis in their banking system that such instability can cause irreparable damage to country's economy (Ghasempour& Salami, 2016). As Rostami (2015) indicated, the CAMEL model is a tool that is very effective, efficient and accurate and can be used as a performance evaluate in banking industries and to anticipate the future and relative risk. This study focuses on the financial performance of private commercial banks in Ethiopia for the period 2016-2020. The CAMEL model which was adopted on November 1979 by FFIEC will be used to evaluate the financial performance of these banks with the view to assess the significance of their role in the growth and development of the economy of Ethiopia.

Statement of the Problem

The banking sector's performance is perceived as the replica of economic activities of the economy. The stage of development of the banking industry is a good reflection of the development of the economy (Misra&Aspal, 2013). Evaluation of financial performance ofthe banking sector is an effective measure and indicator to check the soundness of economic activities of a nation. On similar study by Ermias (2016) has also investigated the effects of internal determinants of profitability of six senior private Ethiopian commercial banks of the period 2000-2014 and thereby ranked the overall financial performance of the respective banks based on CAMEL model. He noted that bank specific factors incorporated into the CAMEL model affect to the extent of 67.5% of the changes in profitability of the private commercial banks of Ethiopia. On another study, Tesfaye (2014) examined the determinants of Ethiopian

banks performance considering bank specific and external variables on selected banks' profitability for the 1990- 2012 periods. He found that bank specific variables by large explained the variation in profitability.

Although various studies were made to explain bank performance using CAMEL parameters, there are few studies were done in private commercial banks of Ethiopia. Besides, these studies were not exhaustive in including all the
16 private commercial banks in Ethiopia to observe the bank performance. Apart from this, only ROA & ROE are used as dependent variables. Similarly,most of the studies were conducted at different periods of time, used different methodology, and findings were varied: study between (Dakito (2015); Mulualem 2015). Hence, the novel feature of this study is the inclusion of all operational private commercial banks in Ethiopia and the addition of EPS as one dependent indicator of the financial performance of private commercial banks inEthiopia.

Objectives of the Study

The overall objective of the study is to evaluate the financial performance of private commercial banks. Specifically, this research attempts to achieve the following objectives.

- To measure the Capital Adequacy of selected banks and their impact on financial performance
- To appraise the Asset Quality of the selected banks and their effect on the selected banks' financial performance
- To assess the extent to which Managerial Efficiency influence the financial performance of the selected banks
- To analyze the Earning Ability of the selected banks and see how they affect their financial performance
- To measure the Liquidity position of the selected banks and observe their impact on their financialperformance
- To draw conclusions on the performance of the listed commercial banks for the 10-year period

Scope of the Study

The scope of the study has covered all of the sixteen operating private commercial banks in Ethiopia. The time period for the study is bounded between 2016 and 2020.

The financial performance of the banks has been measured using five elements of CAMEL, which are capital adequacy, Asset quality, management ability, earning quality and liquidity.

Literature Review

The term financial statement has been widely used to represent two statements prepared by accountants at the end of specific period. They are: Profit and loss account or income statement and Balance sheet or statement of financial position. Ratio analysis is the process of determining and interpreting numerical relationship based on financial statements. It is the technique of interpretation of financial statements with the help of accounting ratios derived from the balance sheet and profit and loss account (Thukaram, 2006).

Ratios are indicators; sometimes they serve as pointers but not in themselves powerful tools of management. The ratios help to summarize the large quantities of financial data and to make qualitative judgment about the firm's financial performance (Thukaram, 2006). The CAMEL approach of measuring financial performance was traced back its origin to1979, when the Uniform Financial Institutions Rating System (UFIRS) was implemented in US banking institutions to introduce ratings for on-site examinations of banking institutions. Under this system, each banking institutions subject to on- site examination is evaluated on the basis of five critical dimensions relating to the bank's operations & performance (Sahajwala& Vanden Bergh, 2000). These are Capital, Asset Quality, Management, Earnings and Liquidity and are seen to reflect the financial performance, financial condition, operating soundness and regulatory compliance of the banking institution (Mulualem, 2015). An Eachofthe component factor is rated on a scale of 1 (best) to 5 (worst). A composite rating is assigned as an abridgement of the component ratings and is taken as the prime indicator of a bank's current financial condition. The composite rating ranges between 1 (best) and 5(worst), and also involves a certain amount of subjectivity based on the examiners' overall assessment of the institution in view of the individual component assessments (Sahajwala& Van denBergh,2000).

Hamduet al (2015) used the ratio of loan loss provision to total loan and loan loss provision to total asset to evaluate asset quality of commercial banks. On the other hand, Mulualem (2015) NPLs to total loans, NPLs to total equity, Allowance for loan loss ratio. Altanet al.(l2014) Used the ratio of Fixed asset to total asset to examine the Asset quality of the bank. Non- Performing loans to Gross Loans, Allowance for Doubtful loans to Loans outstanding, Gross NPAs to Net Advances ratio, Net NPAs to Net Advances ratio, Total Investments to Total Assets ratio, Net NPAs to Total Assets ratio, and Percentage Change in Net NPAs are some of the ratios considered to assess asset quality according to literatures by (Ermias, 2016; Tesfaye2014; Mulualem2015; Antenehet al., 2013; Minyahil,2015)

A Performance measure is the specific quantitative representation of a capacity, process, or outcome deemed relevant to the assessment of performance. Now days, the most commonly used approach of evaluating the overall performance of financial institutions as shown/proven in different literatures is CAMEL rating system. Hence, the researcher tried to assess the financial performance of financial institutions, particularly the banking sector, using the both descriptive (CAMEL) and inferential statistics. Different researchers used CAMEL model to evaluate the financial performance of different banks. (Minyahil, 2015)

CAMEL is a rating system generally used by the government policy circle, regulating bodies of commercial banks, that is, central banks and non-governmental policy research centers for the purpose of assessing the soundness of financial institutions. In this connection, Piyu rightly observed: "Currently, financial ratios are often used to measure the overall soundness of a bank and the quality of bank management. Thus, bank regulators may use financial ratios to help evaluateabank'sperformanceaspartofCAMEL rating system" (Piyu, 1992). The criteria for the performance of all the financial institutions under CAMEL Ratings include capital adequacy, asset's quality, management standard, earnings and liquidity maintenance (CAMEL). In some countries it is called CAMELS; because in addition to above mentioned five areas, system and sensibility is also considered as a barometer to judge a financial institutions' success or failure.

According to Christopouloset al. (2011), the result of the asset quality ratio tended to increase over the years. It implies a low ability to detect, measure, monitor and regulate credit risks, while at the same time considering its bad and doubtful claims for the Lehman Brothers. The policy adopted in issuing loans was proven to be the worst. By granting loans to insolvent, high-risk borrowers, it led to an increase of its non-performing loans each year, namely its bad and doubtfulloans.

On the other hand, empirical studies revealed that Ferrouhi (2014), Ginevicius and Podviezko (2011), Rozzani and Rahman (2013) and Sangmi and Nazir (2010) have employed the composite CAMEL ratings for comparative analysis of the financial performance of commercial banks in Morocco, Lithuania, Bang- ladesh, Malaysia and India. Although the CAMELS composite rating has been used for internal control and for supervisory as well as regulatory purpose, the aforementioned empiri- cal evidences confirmed that researchers have been employing the composite rating for identifying strong as well as the weak financial performance of commercial banks.In summary, the above reviewed literature depicts that the CAMEL model can be applied to measure and evaluate the financial performance of commercial banks. However, the results were not consistent when the CAMEL components are applied to ROA, ROE and NIM. The literature also shows that the ratios that were used to compute the CAMEL components are not consistent, that is, different researchers employed

different ratios. For instance, the researchers applied the total loans to total customer deposit, total loan/total deposit or total loans to total assets for computing the liquidity position of the commercial banks. Therefore, it can be concluded that commercial banks are rated differently when the CAMEL components are applied to ROA, ROE and NIM.

Research methodology

Research Design

In this study, a sort of explanatory research design has been used to explain the relationship between bank's performance and components of CAMEL by deriving quantitative data from the annual report of banks.

Target Population and Census Technique

The study has used census technique based on the availability of data for the period of the study. According to 2019/20 report of NBE there are sixteen licensed private commercial banks in Ethiopia. Based on the report the total number of populationof private commercial banks of Ethiopia are sixteen. All these banks have five years audited financialreport.

Therefore, the study has included all of those banks which have audited financial report for the considered period. The lists of banks that have been included in sample are with the criteria of five years of operation in the sector, which is from 2016 to 2020. Therefore, the matrix for the frame is 5*16 that includes 80 observations.

Method of Data Collection

Panel/longitudinal data have been used for the study as it has advantages over cross-sectional and time. Panel data involves the pooling of observations on the cross-sectional over several time periods. As Brook (2008) stated panel data can minimize the impact of omitted variables bias in regression by providing a sufficient number of observations that can address a broader range of issues than would be possible with pure time-series or cross sectional data alone.

The study has used secondary data over the period of 2016 to 2020. Data was collected from audited financial report of each private commercial bank included in the sample and annual report of NBE. All data that has been collected on annual base and the figures for the variables were on June 30 of each year under study.

Method of Data Analysis

To test the proposed hypotheses, descriptive statistical and inferential statistics has been used. Descriptive statistics such as minimum, maximum, mean, standard deviation of the variables (both dependent and independent) was used to describe the nature and dispersion of the data

over the research period and across the banks. Then, a correlation analysis was used to see the existence and degree of linear relationship between dependent and independent variables.
Finally, ordinary least square/OLS regression with their assumption has been employed to assess the level of impact the independent variables on the dependent variable. Data collected from different sources will be analyzed by using SPSS 20 softwarepackage.

Model Specification

Based on theoretical and empirical literature so far made the researcher had specified the following general balanced fixed effect linear regression model.

$$y_{it}=\alpha+\beta x_{it}+u_{it} \quad \text{..... (1)}$$

With subscript i denote the cross-section and t representing the time-series dimension. The left- hand variable y_{it} is the dependent variable, α is the intercept term, β is a $k\times1$ vector of parameters to be estimated on the explanatory variables, and x_{it} is a $1\times k$ vector of observations on the explanatory variables, t = 1, , T ; i1, , N.
Incorporating all relevant variables that affect profitability of private commercial banks the following specific model is used. The model was specified based on the assumption of normality, no hetero skedasticity, multi collinearity and serial autocorrelation of Classical LinearRegression.The following equations indicate the balanced fixed effect model of the study with respect to three profitability indicators-ROA, ROE and EPS.

ROAit = TCTAit + LEVERAGEit + FATAit + LLPTLit + NIEGEit + NPEPit + TDBRAit + NIITAit + IITIit + LATDit + Uit

ROEit = TCTAit + LEVERAGEit + FATAit + LLPTLit + NIEGEit + NPEPit + TDBRAit + NIITAit + IITIit + LATDit + Uit

EPSit = TCTAit + LEVERAGEit + FATAit + LLPTLit + NIEGEit + NPEPit + TDBRAit + NIITAit + IITIit + LATDit + Uit

Table1. *Definition and Measurement of Study Variables*

	Variables	Measure	Indications
Dependent	ROA	Net income/Total assets	It reflects the ability of a bank's management to generate profits from the bank's assets
	ROE	Net income/Total capital	It measures a corporation's profitability by revealing how much profit a company generates with the money shareholders have invested.
	EPS	Net income/ Number of outstanding shares	It is an important financial measurement which indicates the profitability of a company
Capital Adequacy	TCTA	Total capital/ Total asset	The ratio reflects the ability of a bank to Withstand the unanticipated losses.
	LEVERAGE	Debt/Equity	It indicates how much debt a company is using to finance its assets relative to the amount of value represented in shareholders' equity.
Asset Quality	FATA	Fixed asset/Total assets	It indicates how much fixed assets are hold by a company in comparison to total assets
	LLPTL	Loan loss provision / Total	It measures the strength of banks
Management Quality	NIEGE	Non-interest expense /Gross expense	It shows out of the gross expenses how much is the non- interest expense
	NPEP	Net profit/ No. of employees	It shows the surplus earned per Employee
	TDBRA	Total deposit/Branch	It shows average deposit mobilization per branch of a bank
	TLBRA	Total loan/Branch	It shows average loan disbursement per Branch of a bank
Earning Quality	NIITA	Net interest income / Total assets	It shows how much net interest income generated for each birr total assets
	IITI	Interest income / Total income	It indicates how much interest income is gained in comparison to total revenue(income)
Liquidity	LATD	Liquid asset/Total deposit	It shows the ability of a bank to meet its financial obligations

Data Analysis and Discussionof Findings

Descriptive Statistics of Data Analysis

The descriptive statistics for the dependent and independent variables are presented below. It represents the variables of the sixteen private commercial banks operating in the Ethiopia whose financial results were available from the year 2016-2020.The dependent variable is financial performance measured by ROA ,ROE and EPS in terms of the net income to total asset ratio, net income to total equity and net income to number of outstanding shares respectively. Independent variables such as Total capital to total Asset, leverage, Fixes Asset to Total Asset, loan loss provision to total loan, non-interest expense to total expense, net profit to employee, total deposit to branch, total loan to branch, net interest expense to total asset, interest income to total income and liquid asset to total deposit. In order to give a brief overview of the data, the researcher presented the following tables which contain the descriptive statistics of variables of selected commercial banks in Ethiopia.

Table2. *Descriptive statistics for the Dependent and Independent Variables*

	ROA	ROE	EPS	TCTA	LEVERGE	FATA	LLPTL	NIEGE	NPEP	TDBRA	TLBRA	NIITA	IITI	LATD
Mean	0.03	0.18	29.83	0.15	0.85	0.04	0.01	0.64	151,104	21,080,450	49,199,268	0.03	0.06	0.68
Median	0.03	0.17	28.00	0.14	0.85	0.02	0.00	0.65	129,003	11,355,174	43,500,375	0.04	0.06	0.62
Std. Deviation	0.01	0.05	12.70	0.04	0.04	0.12	0.01	0.11	74,597	28,189,109	33,378,500	0.01	0.01	0.43
Minimum	0.00	0.03	4.00	0.02	0.74	0.01	0.00	0.01	17,111	10,940	14,033,991	0.00	0.02	0.06
Maximum	0.04	0.34	67.00	0.26	0.91	1.05	0.08	0.82	381,137.80	115,827,729	203,371,378	0.06	0.08	2.14
Observation	80	80	80	80	80	80	80	80	80	80	80	80	80	80

Source: *Secondary Data Collected from NBE (2016-2020) and SPSS output*

Descriptive statistics generated through SPSS are shown in Table 2. The dataset is comprised of a 5-year annual data for the sixteen domestically listed commercial banks in Ethiopia from 2016-2020, which totaled 80 observations. The dependent variable is measured by Return on asset, Return on equity and Earnings per share (EPS). The EPS has a minimum value of 4.00 and a maximumof67.00. Meanwhile the mean value is 29.83.

ROA shows that the Ethiopian commercial banks attained, on average, a good performance over the last five years. As it can be seen from the above table, the average mean value of financial performance as measured by ROA for Ethiopian banking industry during the study period is about 0.03 with the minimum of 0.00 and the maximum of 0.04.The ROE has a minimum value of 0.03 and maximum 0.34 while the mean return is0.18.

This shows that on average, the return on equity was a bit higher at about 18% when compared with the return on assets of 3%. This shows that the private commercial banks have been able to generate more return for their shareholders and generated more return per birr of invested assets, as was above15% and 1% benchmarks respectively (Babar and Zeb,2011; Desta, 2016), hence showing better earnings ability over the five-yearperiod.

Capital adequacy for the sixteen banks was measured by two ratios, namely; leverage ratio and equity capital to total assets. The leverage ratio (LR), as measured by the ratio of total debt to total equity retained a mean value of 0.85, underscoring that private bank maintain almost 9 times more debt than equity in their capital structure, hence highly leveraged. In contrast, the ratio of equity to total assets (TETA) depicted a mean value of 0.15 or 15% which was above the benchmark of 4-6% (Desta, 2016).

This result confirms that the 16banks are highly leveraged. As a result, we conclude that the 16 banks kept enough capital to cushion themselves against insolvency in the period under study, whilst ensuring that they use more debt to raise their profitability ratios. In retrospect, their capital ratios should be above the statutory requirement of 15% in Ethiopia. Banks in Ethiopia are required to maintain a capital adequacy ratio at or above 8 percent, which, in the context of the current macroeconomic and financial environment, is regarded as a safe and prudent level. (SBB, 2011). On the other hand, asset quality was measured by provisions for loan loss ratio and ratio of total loans and advances to total assets respectively. The mean value for provisions for loan loss ratio was 0.01. Further, asset quality as measured by Ratio of Fixed asset to Total Assets (FATA) retained mean value of 0.04 and standard deviation of0.12. This outcome shows that nearly 4% of the assets of these banks are comprised of Fixed Asset. Meanwhile management quality as measured by the Ratio of Non-interest expense to Gross expense and Ratio of Total Loans to Branch retained mean values of 0.64 and 49,199,268 respectively. Ratio of Non-interest expense to Gross expense show less efficient the management is to control its

expenses .The mean value of the ratio of Total Deposit to Branch (TDBR) is 21,080,450. Average deposit mobilization per branch of a bank further management quality as measured by Net Profit to Number of Employee (NPEP) with mean value of 151,104 shows high efficiency of management. Earnings ability measures of Net interest income To Total Asset and Interest Income to Total Income recorded means and standard deviations of 0.03 (0.01) and 0.06 (0.01) respectively. This shows that on average, 3% net interest income generated for each birr total assets. Other ratio Interest income to Total Income average indicates 6% interest income gained in comparison to total revenue (income). Interest income to total income ratio is not appreciable but on the other hand the higher ratio also indicates the greater dependence of the bank on interest income.

The liquidity ratio of liquid asset to total deposit recorded mean value of 0.68. The Liquid Assets to Total Deposits ratios measures the liquidity available to the deposits of Banks. The high ratio indicates the conserving investment policy of private commercial banks and getting low risk and low return which enable Banks to cover unexpected deposit withdrawals, because it is above the regulatory requirement of 25%.Bank can meet any sudden withdrawal measured by the share of most sensitive liability.

Regression Results

Interpretation

if the p value (sig value) is less than 0.05, reject null hypothesis. If p value is greater than 0.05, accept null value.

ROATable3. ***Regression Results for Determinants of Financial Performance Measured by ROA***

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	.011	.007		1.522	.133	-.003	.025
	LEVERAGE1	.001	.000	.322	1.754	.004	.000	.001
	FATA	.001	.005	.018	.179	.859	-.009	.010
	LLPTL	-.332	.164	-.229	-2.032	.046	-.659	-.005
	NIEGE	-.011	.007	-.196	-1.450	.001	-.025	.004
	NPEP	5.455E-008	.000	.654	3.583	.001	.000	.000
	TDBRA	-4.873E-011	.000	-.239	-1.363	.004	.000	.000
	TLBRA	-2.392E-011	.000	-.138	-.699	.487	.000	.000
	NIITA	.047	.074	.075	.632	.529	-.101	.195
	LATD	.002	.002	.174	1.292	.002	-.001	.006
	TCTA	.068	.029	.494	2.324	.003	.010	.126

Source: *Secondary Data Collected from NBE (2016-2020) and SPSS output*

ROETable4. ***Regression Results for Determinants of Financial Performance Measured by ROE***

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	.053	.057		.927	.357	-.061	.167
	LEVERAGE1	.020	.004	.632	5.645	.000	.013	.028
	FATA	.010	.040	.021	.238	.812	-.071	.090
	LLPTL	-1.804	1.373	-.138	-1.314	.194	-4.547	.939
	NIEGE	-.090	.061	-.184	-1.467	.001	-.213	.033
	NPEP	5.811E-007	.000	.775	5.336	.000	.000	.000
	TDBRA	-4.484E-010	.000	-.241	-1.500	.003	.000	.000
	TLBRA	-4.836E-010	.000	-.307	-1.884	.064	.000	.000
	NIITA	.329	.612	.058	.538	.002	-.893	1.552
	LATD	.008	.015	.061	.503	.001	-.023	.038

Source: *Secondary Data Collected from NBE (2016-2020) and SPSS output*

EPSTable5. ***Regression Results for Determinants of Financial Performance Measured by EPS***

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	58.195	20.302		2.866	.006	17.611	98.778
	LEVERAGE1	.469	.422	.126	1.110	.002	-.376	1.313
	FATA	-1.137	11.405	-.011	-.100	.002	-23.935	21.660
	LLPTL	265.397	440.461	.087	.603	.004	-615.071	1145.866
	NIEGE	-45.844	30.259	-.291	-1.515	.003	-106.330	14.642
	NPEP	2.002E-005	.000	.117	.673	.504	.000	.000
	TDBRA	-2.586E-007	.000	-.614	-3.070	.003	.000	.000
	TLBRA	1.308E-007	.000	.363	1.879	.065	.000	.000
	NIITA	-289.767	178.673	-.222	-1.622	.010	-646.929	67.395
	LATD	3.447	4.462	.122	.772	.004	-5.473	12.366

Source: *Secondary Data Collected from NBE (2016-2020) and SPSS output*

The regression model measured the impact of the independent variables of CapitalAdequacy(Leverage and Equity to Assets ratios), Asset Quality (Provision for Loan Loss and FixedAsset to Total Asset), and Management Quality (NIEGE. NPEP, TDBRA and TLBRA),

Earnings Ability (NIITA and NITI) and Liquidity (LATD) on the Dependent variable ROA,ROE AND EPS of the selected banks. Table3, 4 and 5 presents the regression result of panel data using random effect models. The model was established based on the conventional methods of panel data model which is known as Static panel model. On the above models, table 3, 4 and 5 shows 49.9%, 63.1%and 50.2% of respectively the variation in the dependent variables were explained by explanatory variables. The rest 50.1%, 36.9% and 49.8% were not explained by the above explanatory variables. LEVRAGE, NIEGE, NPEP, TDBRA, NIITA, and LATD variables were significant in determining the profitability indicators-ROA, ROE and EPS. As one of the capital adequacy proxy, leverage was positive and significant in determining the financial performance indicator ROA, ROE and EPS. *Ceteris paribus*, at 95% CI, a 1% increase in this variable, it increases profitability measure by around 0.1%, 2% and 4.69% respectively. Besides, TCTA ratio is also statistically positive and significant enough to determine profitability in terms of ROA. That means, at 95% CI, a 1% increase in it, increases ROA by 6.8%. Asset quality was insignificant in determining financial performance in terms of ROA and ROE for private

commercial banks in Ethiopia. Even if financial performance measure in terms of EPS was statistically significant for both FATA and LLPTL, the interpretation does not give sense. Except TLBRA, all the other management quality variables are statistically significant to determine the financial performance variables of ROA and ROE. Both NIEGE and TDBRA affect the above dependent variable negatively, whereas the effect of NPEP is positive. Only NIEGE and TDBRA are statistically and negatively significant in determining EPS. For instance, the impact of net interest expense over gross expense (NIEGE) revealed that, it had a negative magnitude and significant difference with all profitability measurements. Holding other variables constant, at 95% CI a 1% increases in NIEGE; it reduces profitability of sampled private banks by 1.1%, 9% and 45.84% on ROA, ROE and EPS respectively. In general NPEP, TDBRA and TLBRA ratios explaining power were very small. Earning quality measured by net interest income to total asset ratio is only statistically and positively significant to determine financial performance in terms of ROE. Holdingotherthings constant, at 95% CI, a1% increase in NIITA ratio, increases ROE by 32.9%.

On the other hand, liquidity variable that has been captured by liquid asset by total deposit (LATD), showed that, it had positive and significant relation with profitability measurements-ROA, ROE and EPS. Holding other variables constant, at 95% CI, a1% increase in this ratio, increases the financial performance indicators of ROA, ROE and EPS of sampled private banks by 0.2%, 0.8% and3.45 %, respectively. Although, this ratio had positive coefficient, its parameter was not that much highly significant. Now a day, private banks are required to purchase government bonds while sanctioning loans to their customers. Hence, they generate interest income from their investment. That why this variable had positive slope. In conclusion, no asset quality proxies were significant in determining the performance indicators of both models ROA and ROE but significant on EPS.

Conclusion and Recommendations

The study sought to examine the performance of private commercial banks of Ethiopia with the CAMEL ratings for the period 2016-2020. To conduct the study, secondary data particularly audited financial statements were collected from sixteen private banks. Besides, both descriptive and inferential analyses were used to analyze the data. The major findings of the study were as follows;

Conclusion

The study objective was meant to determine the effect of bank specific factors on financial performance of private commercial banks in Ethiopia. The conclusions are made from the study findings from the analyzed data. The study concludes that capital adequacy affects the

financial performance of commercial banks. The study concludes that there exists a positive and significant association between capital adequacy and financial performance. Further an increase in capital adequacy would lead to a positive and significant increase in financial performance of the commercial banks. This shows that capital adequacy has an effect on financial performance. The study concludes that asset quality has an insignificant association with the two financial performances indicator, namely ROA and ROE, of private commercial banks in Ethiopia. The study concludes that management efficiency has a positive and significant association with financial performance of commercial banks .The study found that an increase in management efficiency would lead to a significant increase in financial performance of private commercial banks in Ethiopia. The study concludes that earnings ability has no significant association with financial performance of private commercial banks in Ethiopia in terms of ROA and EPS. The study concludes that liquidity has a positive and significant association with financial performance of commercial banks .The study found that an increase in liquidity would lead to a significant increase in financial performance of private commercial banks in Ethiopia.

Recommendations

From the findings and conclusions an increase in capital adequacy leads to a significant increase in bank's financial performance therefore the study recommends that bank capitalization should be encouraged in all commercial banks and other financial institutions so that performance can be enhanced. Institutions should strive to retain earnings to boost up capital rather than paying inflated bonuses. Well capitalized institutions have lower financial risk and thus are more likely to survive financial crisis thus, a well- capitalized banking system will ensure financial stability and make the industry more resilient against external shocks and risk. From the findings increase in management efficiency causes a significant increase on financial performance of commercial banks, the study therefore recommends that efficient and effective management should be adopted by bank managers to ensure that banks do not become insolvent. From the findings increase in liquidity causes a significant increase in bank performance the study therefore recommends that banks continue to keep the recommended liquidity levels to be able to meet customer demand for their deposits to avoid bank runs and panic in the market. Since banks are less profitable when less liquid, bank managers should be encouraged to invest in more liquid assets. This will not only improve bank profitability but it will also enable banks meet their short term obligations as they fall due. It is possible that liquid bank assets are more profitable due of some market inefficiency.

References

Ahsan, M. K. (2013). Measuring Financial Performance Based on CAMEL: A Study on Selected Islamic Banks in Bangladesh. Asian Business Review 6(1),2305-8730.

Al Karim, R., &Alam, T. (2013). An Evaluation of Financial Performance of Private Commercial Banks in Bangladesh : Ratio Analysis. Journal of Business Studies Quarterly, 5(2),2152-1034.

Alkhatib, A. (2012). Financial Performance of Palestinian Commercial Banks. International Journal of Business and Social Science, 3(3), 175–184.

Altan, M., Beduk, A., &Yusufazari, H.(2014). Performance Analysis of Banks in Turkey Using Camel Approach.14th International Academic Conference, Malta.

Aspal, P. K., &Dhawan, S. (2014). Financial performance assessment of banking sector in India:Acasestudyofoldprivatesectorbanks,The Business and Management Review5(3).

Basel Committee on Banking Supervision (2011). BaselIII: A global regulatory framework for more resilient banks and banking systems, Bank for International Settlements.

Chen, Y., Guo, R.J., &Haung, R.L. (2009). Two Stages Credit Evaluation in BankLoan

Appraisal. Journal of Economic Modeling, 26(1), 63-70.

Ermias, M. (2016).Financial Performance of Private Commercial Banks in Ethiopia: CAMEL Approach. (Master thesis). Addis Abeba University.

Funso, T. K., Kolasde, A.R., &Ojo, O.M.(2012). Credit Risk and Commercial Banks' Performance in Nigeria: A Panel Model Approach. Australian Journal of Business and Management Research, 2(2),31-38.

Golin,J.L.(2001). The Bank Credit Analysis handbook: A guide for analysts, bankers and investors. Singapore: J.Wiley

Gudata,A.(2015).Financial Performance Analysis InBanking Sector: in Selected Commercial Banks in Ethiopia. International Journal of Current Research, 7(10), 21883-21886. Retrieved from: http://www.journalcra.com

Hamdu, K., W/Michael, S., &Yonas, M. (2015). Soundness of Ethiopian Banks. International Journal of Finance and Banking Studies, 4(2), 2147-4486.

Ibrahim, M. (2014).A Comparative Performance of Two Banks in United ArabEmirates,

Joh,.N. Meyer (2008).Accounting For Non Accountants. New York, USA: Penguin Group Incorporated.

Kieso, E., Weygandt, J. and Warfield, D. (2012). Intermediate Accounting (14th edition). New York, USA: John WileyInc.

A structural Equation Analysis of Export Marketing Strategies on Export performance: Evidence from Textile and Garment Exporting Enterprises in Ethiopia

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Abstract

The main objective of this study was to examine the analysis of export marketing strategy on export performance ofexport companies based in Medium and large scale Textile and Garment Enterprises exporter in Ethiopia. Based on the purpose of the research and its application, the study is a descriptive – analytic one. In the current study, a questionnaire was used for research data collection to meet the study objectives and the population of the study includes 252 Textile and Garment Enterprises managers.A Partial Least Squares Structural Equation Modelling (PLS-SEM) was used to analyze quantitative data. In that, for analysis, SmartPLS-3 was employed for the analysis of data processing to test the feasibility of measurement models and structural models. The Model identified Product export marketing strategy, price export marketing strategy, distribution export marketing strategy and promotion export marketing strategy have positive and significant relation on export performancewith a significance level of 0.005, 0.001, 0.000, and 0.000 respectively in Ethiopian Textile and Garment Enterprises. The validated conceptual model makes significant contribution to theory development in the literature for export performance.To sum it up, the outcomes of this research offer recommendations to exporting firmsspecifically to those operating in Textile and Garment Enterprises and policy makers should also develop export marketing strategy to enhance exportperformance of firms.

Key words:*Export Marketing Mix Strategy, Textile and Garment Enterprises, Export Performance.*

Introduction

Internationalization of firms from developing countries has become a topic of increasing research interest principally owing to the observed growth effects of cross border venturing, and the demonstrated capacity of medium and large scale enterprises to drive economic development at national and regional levels (Mitigue, 2006; Demeke&Chiloane-Tsoka, 2015). Despite its relevance, firms desire to internationalize is mostly grounded in the fact that their domestic market is small and does not allow the firms to grow, which has led to a need in firms to seek more attractive and profitable markets (Mtigwe, 2006). In addition, international trade can bring benefits by allowing countries to exploit their comparative advantage, reap the benefits of scale economies and ensure competition, greater variety and, potentially, more stable markets and prices. Therefore, international presence is one of the crucial decisions for a company's existence in today's ever more globalized and competitive markets (Fayyoza, 2020).

In similar vein, an international trade has increased rapidly over the past few decades, mainly as a result of the growth in output, decreasing protectionism, important improvements in the international communication and transportation systems and greater regional economic integration (Theodosiou&Leonidou, 2007). In an interrelated study made by Waheeduzzaman and Dube (2014) confirmed that the decision concerned with export marketing strategy, which ultimately may determine export performance, has been, is and will be a research area of increasing interest for both academics as well as practitioners in this dynamic and turbulent environmentand generally being seen as one of the most relevant international marketing topics for the twenty-first century for firms survival. Stoian (2010) affirmed also that the desirability and/or feasibility of standardizing or adapting the export marketing strategy has been subject to numerous controversial discussions, nevertheless without reaching a general agreement (Imiru, 2018; Fayyoza, 2020).

In an international marketing strategy context, it is also worth noting that a number of studies on the role export marketing strategy on export performance have been mainly focused Multinational Enterprises (MNCs) or well-established firms and research on export-market related topics on medium and large scale enterprises has been limited (Theodosiou&Leonidou, 2007; Leonidou et al., 2015).Bearing in mind the importance of this sector, it is the aim of this

study to investigate this research gap with the objective of to determine if there is significant and positive relationship exists between export marketing strategies and export performance of Medium and large Scale Textile and Garment enterprises in Ethiopia.

Theoretical framework and hypotheses

Export marketing strategy is a means by which firms respond to competitive market conditions for survival. Conventionally, marketing strategy has been decomposed into the four elements of the marketing mix, i.e. product, pricing, place and promotion. Here, the linking of marketing strategy to export performance has been one of the most widely investigated topics in international marketing research as confirmed by (Rosenbloom et al., 1997; Shoham et al., 2008; Karaca, 2017;
Kashefi, et al, 2019; Chitauro&Khumalo, 2020; Fayyoza, 2020;Karim et al., 2020). However, although a great deal of research has been conducted in the area, the diversity of conceptualizations and performance measurements has led to inconsistent and contradictory conclusions. In view of such an issue, the following reviews made in line with the objective of the study, the influence of varying marketing mix elements to export performance would be explored in the case of Textile and Garment enterprise in Ethiopia.

Export Product Strategy

With regard to international marketing strategy, Hultman et al., (2009) disclosed that the relationship between product standardization/adaptation and export performance is a key issue within the international marketing strategy which is still rather unclear. The Study findings of (Lee & Griffith, 2004; Ali EkberAkgun et al., 2014; Joao, 2015; Leonidou et al., 2015;Calantone et al., 2016;Erdil&Ozdemir, 2016; Worku,2016; Kasiso, 2017, Valeria, 2017) concur that there existed a positive and strong evidence of the relationship between export product strategy and market performance of firms. A study made by Karaca (2017) disclosed that there is negative relationship between export product strategy and export performance. Consequently, the following hypotheses is posited:

> Ho1: Export product marketing strategy has no a positive and significant effect on export performance of Medium and Large scale Textile and Garment Enterprises in Ethiopia.

Export Price Strategy

Parallel study with pricing export strategy and satisfaction with export performance, though research lacks about price standardization/adaptation in the literature (Lages& Montgomery, 2014), the results obtained in relationship with export performance are mixed. There are numerous studies that recognize a positive and significant relationship between price export strategy and export performance (Shoham and Albaum, 1994; Lee & Griffith, 2004; Leonidou et al., 2015; Marianne et al, 2016;Kasiso, 2017). Alternatively, there are other studies that indicated negative relationship between export price strategy and export performance (Hoang, 2015; Koh and Robicheaux, 1988; Shoham, 1996; Sousa, &Lengler, 2009; Lages& Montgomery, 2014; Karaca, 2017).Therefore, the following hypotheses is posited:

> Ho2: Export Price marketing strategy has no a positive and significant effect on export performance of Medium and Large scale Textile and Garment Enterprises in Ethiopia.

Export Promotion Strategy

With promotion export strategy and satisfaction with export performance, when we talk about promotion standardization/adaptation we can find many studies reporting that firms that adapt their export promotional strategies faces improvements in export performance (Shoham, 1996; Poulis&Poulis, 2011; Karaca, 2017;Kim-Soon et al, 2018). And in the same way, in Leonidou et al., (2015) findings showed positive association between export promotion strategy and export performance, but on the other hand, a study made by (Antonio et al, 2016; Cavusgil&Zou, 1994; O'Cass& Julian, 2003)stated that a negative association exists between export promotion adaptation strategy and export performance. Therefore, the following hypotheses is posited:

> Ho3: Export Promotion marketing strategy has no a positive and significant effect on export performance of Medium and Large scale Textile and Garment Enterprises in Ethiopia.

Export Distribution Strategy

With regard to export distribution strategy, it is the export marketing mix element least investigated which is receiving particularly little attention in the context of standardization versus adaptation contention (Leonidou et al., 2015).

From the perspective of the international place strategy standardization/adaptation with other marketing mix elements, we can say that this marketing mix element received particularly little attention in the context of standardization versus adaptation contention (Shoham et al., 2008). In their comprehensive review, Li (2018) found a strong positive correlation performance of export distribution strategy and export performance of firms. In another interrelated studies (Zaiem&Zghidi, 2011; Karaca, 2017; Kasiso, 2017; Wang et al, 2017)found a strong positive correlation between distribution strategies and export performance.Therefore, the following hypotheses is posited:

> Ho4: Export Distribution marketing strategy has no a positive and significant effect on export performance of Medium and Large scale Textile and Garment Enterprises in Ethiopia.

Export Performance

In international market context, Export performance is defined as the extent to which a firm's objectives, financial, strategic and satisfaction with respect to exporting a product into a foreign market, are achieved through planning and execution of export marketing strategy. A firm usually initiates an export venture with a number of objectives, which can be financial export performance including profits, sales, or costs and/or strategic export performance including market expansion, competitive response, gaining a foothold in foreign market, or increasing the awareness of the product/firm and management satisfaction with export including the firm's export ventures and export ventures expectations.

Research model

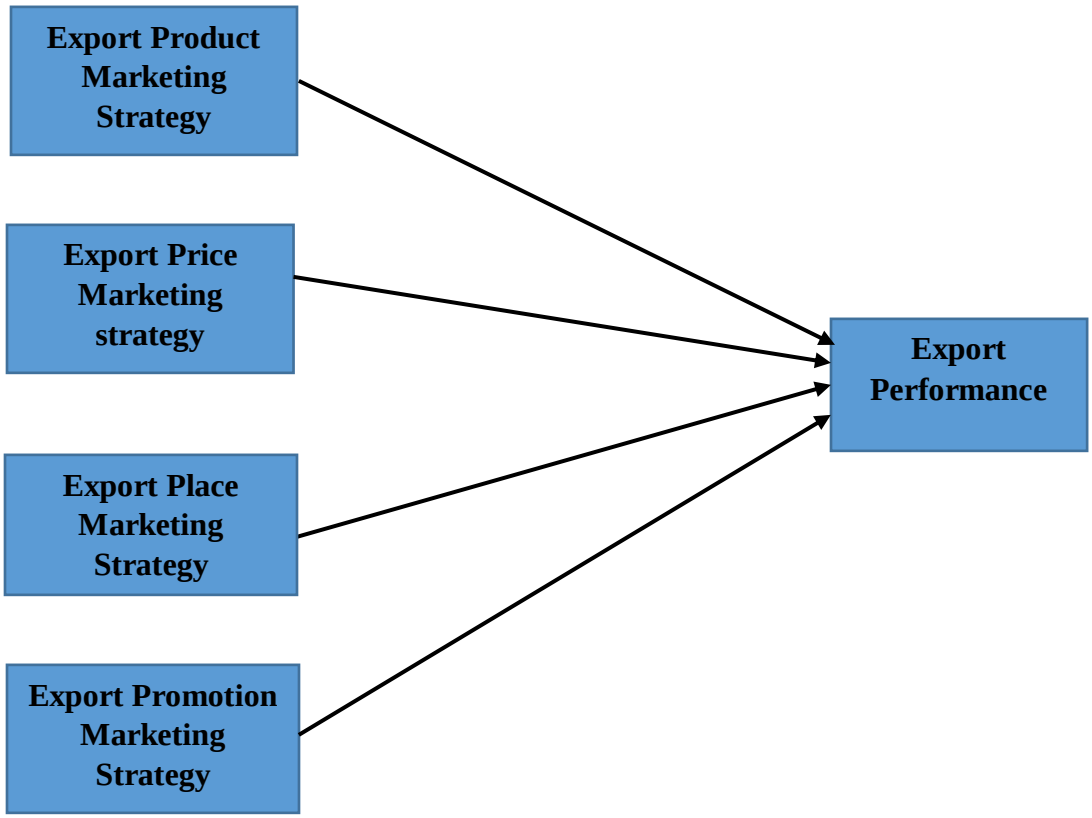
Figure 3.1 shows the independent variables on export performance (dependent variable). The latent variables are Export product marketing strategy, export price marketing strategy, export distribution marketing strategy and export promotion marketing strategy.

The review of the relevant literature on the subject suggests various export marketing strategies that affect export performance in the textile and garment enterprises in Ethiopian context. These export marketing strategiesare grouped into 4 categories including Export product marketing strategy (Pro); export price marketing strategy (Pri); export distribution marketing strategy (Pla) and export promotion marketing strategy (Prom). Therefore, the latent dimensions (along with the key associated attributes) further provide a theoretical basis to construct the research framework of the study depicted by Figure 1, where an arrow shows the direction of influence in the hypothesized structural model.

Theoretical framework on the study variables

The theoretical framework has been determined by reviewing the extensive literature on the study subject and the relationship between export product marketing strategy, export price marketing strategy, export distribution marketing strategy and export promotion marketing strategy and export performance have been explored by an extensive literature review on the role export marketing strategies on export performance. The theoretical framework has fourindependent variables which representedthe export product marketing strategy, export price marketing strategy, export distribution marketing strategy and export promotion marketing strategy. The Export performance serves as the dependent variable (See Figure 1).

Figure 1. Conceptual Framework of Export Marketing Strategy and Export Performance



Source: Adapted from Stoian et al, 2012

Research Methodology

Population and sampling of respondents

A survey was designed to obtain the effects of export marketing strategies on export performance of Textile and Garment Enterprises in Ethiopia. The population of the study was all exporters operating in Ethiopia. The data for the analysis was developed and applied to a sample of members of major two exporters product categories (textile and garment products). A total of 315 questionnaires were distributed to all exporters on Textile and Garment enterprises. And, 252 questionnaires were returned at the end of the data collection process, which 80 percent.

Variable Measurements

In this variable measurements, export marketing strategies contains four dimensions related with export product marketing strategy, export price marketing strategy, export place or distribution marketing strategy and export promotion marketing strategy. Each items were measured using a five point Likert scale ranging from 1 (Strongly disagree) to 5 (Strongly agree). In export marketing literature, many researchers have used this construct, resulting in high levels of reliability and validity measures (Hair et al, 2019). In this current study, the export performance were measured with three broad groups; strategic, financial and management satisfaction.

Data analysis and results

For analysis, SmartPLS-3 was employed for the analysis of data processing to test the feasibility of measurement models and structural models. An initial test of validity and reliability using smart PLS 3.0 was conducted. The model as depicted in figure 1 has four independent variables namely

Export product marketing strategy, export price marketing strategy, export place marketing strategy and export promotion marketing strategy. The dependent variable is export performance.

To assess the measurement model for the study, constructs validity and reliability of specific items measuring each latent construct, construct reliability, discriminate validity, as well as convergent validity for each of reflective constructs (export performance) were evaluated in order to determine the accurateness of the measurement (Hair et al, 2012, 2014, 2019). After calculating PLS algorithm, the next action was to assess the indicators reliability to see if there is any item indicator with loading less than 0.4 so as to delete them from the model. Therefore all the items indicators met the requirement as presented in Table 6.1; there is no case for deletion.

Table 7.1: Summary results for Measurement model assessment

Variables	Indicators	Loadings	Cronbach's Alpha	VIF	CR[a]	AVE[b]
Product Marketing Strategy	**Pro1**	0.834	0.726	1.553	0.846	0.647
	Pro2	0.755		1.309		
	Pro3	0.822		1.523		
Price Marketing Strategy	**Pri2**	0.818	0.706	1.359	0.835	0.629
	Pri3	0.763		1.374		
	Pri5	0.797		1.404		
Place Marketing Strategy	**Pla1**	0.776	0.843	2.134	0.927	0.864
	Pla4	0.755		2.134		
Promotion Marketing Strategy	**Prom1**	0.831	0.896	4.100	0.917	0.614
	Prom2	0.798		4.300		
	Prom3	0.749		2.445		
	Prom4	0.759		2.398		
	Prom5	0.812		4.500		
	Prom6	0.753		2.045		
	Prom7	0.777		4.100		
Export Performance	**FEP1**	0.848	0.891	2.763	0.913	0.569
	FEP2	0.814		2.901		
	FEP3	0.706		1.658		
	S1	0.744		2.374		
	S2	0.765		2.003		
	SEP1	0.749		2.377		
	SEP2	0.710		2.174		
	SEP3	0.684		1.920		

Notes: AVEs are in the diagonal; correlations are below the diagonal; AVE-Average variance extracted, CR- Composite reliability, CA- Cronbach's alpha

[a]*Composite reliability (CR) = (square of the summation of the factor loadings)/{(square of the summation of the factor loadings) + (square of the summation of the error variances)}.*

[b]*Average variance extracted (AVE) = (summation of the square of the factor loadings)/ {(summation of the square of factor loadings) + (summation of the error variances)}.*

Measurement Model on Export Marketing Strategy

The measurement model was evaluated on the constructs of Internal Consistency and Convergent Validity. Cronbach alpha and composite reliability criteria are used to measure the model constructs internal consistency (Hair et al., 2019) and stated that the value of 0.70 is acceptable. However, the study Cronbach alpha values found between the ranges of 0.706 to 0.896. The Composite reliability (CR) values should be greater than 0.70 as well (Nunnally& Bernstein, 1978). The values of CR found between the ranges of 0.835 to 0.927. In other words, according to Bagozzi and Yi (1988) presented that 0.70 value of composite reliability indicates that internal consistency reliability is extremely satisfying and favorable.

Hair et al. (2019) mentioned that the Average Variance Extracted (AVE) value greater should greater than 0.50, then the convergent validity is considered acceptable. And, the result of this study found that AVE values of the reflective constructs were ranged from 0.569 to 0.864. Subsequently, it established satisfactory convergent validity for reflective 1st order constructs measurement model. Therefore, the measurement model of the study validated successfully. The results can be seen in Table 7.1 and the Figure 7.1 can see the items loading, in respect of loading should be greater than 0.50 (Hair et al., 2019).

Based on the result of coefficients output – Collinearity statistics, the result disclosed that VIF value ranging from 1.205 to 5.603 as it is displayed from Table 6.1, meaning that the VIF value obtained is between 1 to 10, therefore, it can be concluded that there is no multicollinearity issue (Hair et al, 2019).

Moreover, the discriminant validity results of all constructs are presented in Table 7.2., where the square roots of the AVEs of each construct are greater than their correlations with any other construct, and hence supporting the discriminant validity of the constructs. In similar vein, indicator reliability was tested by assessing the factor loading of the items. According to Hair et al (2019), loading greater than 0.5 is acceptable and as shown in Table 7.1, all items scored beyond the value of 0.5 except for the items. Besides, average variance extracted (AVE) has been used to test the convergent validity and the results exhibit no evidence of strong correlations between constructs.

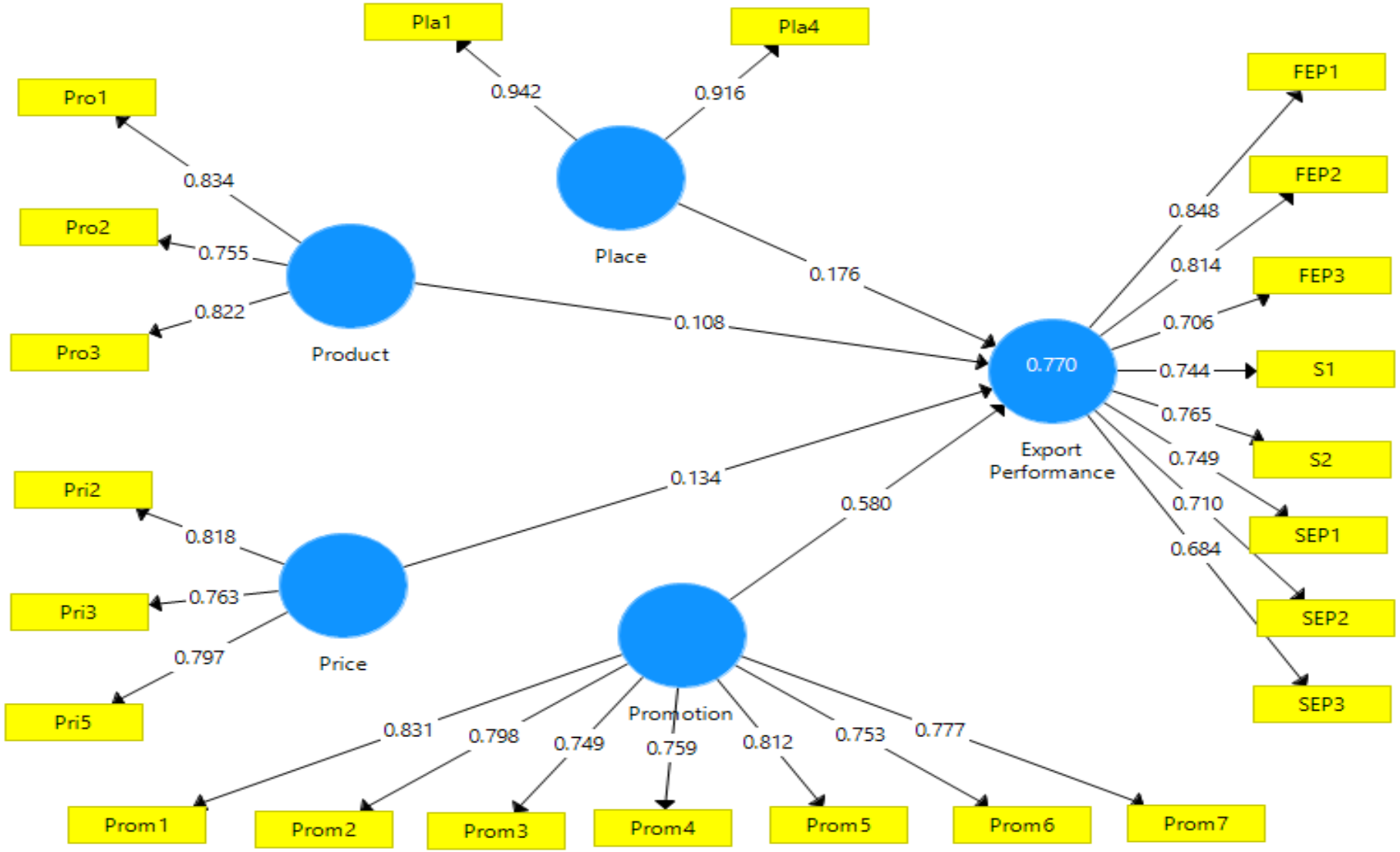


Figure 7.1. The Measurement Model

Table 7.2: Fornell-Larcker criteria for Discriminant Validity of Export Marketing Strategy

	1	2	3	4	5
1. Export Performance	**0.754**				
2. Export place marketing strategy	0.713	**0.929**			
3. Export price marketing strategy	0.617	0.493	**0.793**		
4. Export product marketing strategy	0.622	0.497	0.507	**0.804**	
5. Export promotion marketing strategy	0.853	0.719	0.588	0.619	**0.783**

Source: SMART PLS 3 Algorithm 2021 result

The diagonal value (in bold) is the square root of AVE, while other values are the correlations between the respective latent construct. The discriminant validity is achieved when a diagonal value (in bold) is higher than the values in its row and column. Referring to the above Table 7.2, it can be concluded that discriminant validity for all constructs are achieved.

Structural Model of Export Marketing Strategy

After satisfying all the requirements for the measurement model, this section presents the structural model of the analysis through the standard bootstrapping method using 499 bootstrap sample for 252 dataset to ascertain the significance levels for the direct and the moderating relationship. These include the hypotheses testing, evaluation of R-square and effect size.

Hypothesis Testing on the study variables

Table 7.3. Results of hypothesis testing of export marketing strategy

Hypothesis	Original Sample (O)	Standard Deviation	T Statistics	P Values	Supported
Product -> Export Performance	0.108	0.038	2.841	0.005*	Yes
Price -> Export Performance	0.134	0.042	3.229	0.001*	Yes
Place -> Export Performance	0.176	0.040	4.370	0.000*	Yes
Promotion -> Export Performance	0.580	0.042	13.783	0.000*	Yes

Source: Source: SMART PLS 3 Bootstrap 2021 result

In similar vein, Hair et al. (2019) for a good model, is assessing the path coefficient of all latent variables (paths) by comparing β values among all the paths. The highest β value symbolizes the strongest effect of predictor (exogenous) latent variable towards the dependent (endogenous) latent variable (Akter, 2011). Conversely, β value has to be tested for its significance level through t-value test. Here, the test is achieved by performing non-parametric bootstrapping technique. Bootstrapping technique computes t-value by creating pre-specified number of samples.

As suggested by Hair et al. (2019) that acceptable t-values for a two-tailed test are 1.65 (significance level = 10 percent), 1.96 (significance level = 5 percent), and 2.58 (significance level = 1 percent). In this study, bootstrapping generated 252 samples and these samples are used to compute t-values as presented in Table 7.3. Results from Table 7.3 demonstrate that all the paths attained t-value are higher than the cut-off point for a significance level of 5 percent, that is, 1.96. This implies that all the paths in the model have a strong relationship on export performance. The highest β value is 0.580 for export promotion marketing strategy and this is the most significant construct influencing export performance of enterprises in the study context with the highest t-value of 13.783.

H_{a1}*: Export product marketing strategy has a positive and significant effect on export performance of Medium and Large scale Textile and Garment Enterprises in Ethiopia.*

The PLS-SEM model as shown in Table 7.3 and Figure 7.1 confirms that the beta coefficient and p-values are significant (β1 = 0.018, p=0.005) showing that there is strong positive and significant relationship between export product marketing strategy and export performance. This study results show that export product marketing strategy has a positive and significant relationship with export performance. This corroborates with other studies (Moghaddam*et al*., 2011; Rao-Nicholson & Khan, 2017; Njuguna, 2018; Kashefi, *et al*, 2019; Karim *et al*, 2020) have been largely consistent as to positive and significant effect association between product export marketing strategy and export performance. In another interrelated study made by Stoian et al., (2012) also confirmed that product design, brand mix (name, sign, symbol, design), warranty, customer service as sales services, and product's valuable and unique contribution to the customer are product attributes that were determined to have a positive and significant relationship between export marketing strategy and export performance. But, a few studies have found mixed results which negates the relationship between export product marketing strategy and export performance. In addition, others works concludes also export product marketing strategy affects export performance significantly(Zeriti et al., 2014;Chen, 2016; Karim et al; 2020; Muis, 2020). But, a study made by Adis (2010) concluded that the product strategy did not have a significant positive effect on export performance. In similar vein, Amine and Cavusgil, (1986) inferred that product adaptation strategies negatively affected export performance of firms. Such inconsistencies in the results of these studies could arise from the specific nature of the industry or firm circumstances that may have needed to be investigated using the contingency theory of internationalization.

H_{a2}*: Export price marketing strategy has a positive and significant effect on export performance of Medium and Large scale Textile and Garment Enterprises in Ethiopia.*

The PLS-SEM model as shown in Table 7.3 and Figure 7.1 confirms that the beta coefficient and p-values are significant (β2 = 0.134, p=0.001) showing that there is strong positive and significant relationship between export price marketing strategy and export performance. Studies

made by (Lee & Griffith, 2004; Leonidou et al., 2015; Njuguna, 2018) and supports to the finding of this study and the most researched aspects of pricing as a strategy are pricing techniques, terms of sales, credit strategy, currency strategy, and price adaptation determined that the ability of exporters to modify prices in foreign market situations had a positive effect on export performance. In addition, they also found that adaption of a suitable pricing mechanism would improve their ability to generate more revenue from exporting of products. But, a few studies however contradicts the result which is affirmed by a study made by Adis (2010) reports that price competitiveness as an export marketing strategy did not affect the export performance because it might have led to less damaging price wars among exporters.

H_{a3}*: Export distribution marketing strategy has a positive and significant effect on export performance of Medium and Large scale Textile and Garment Enterprises in Ethiopia.*

The PLS-SEM model as shown in Table 7.3 and Figure 7.1 confirms that the beta coefficient and p-values are significant (β2 = 0.176, p=0.000) showing that there is strong positive and significant relationship between export distribution marketing strategy and export performance. The result of this study is consistent with the result of Leonidou et al., (2015) concluded that the use of a foreign sales representative office, direct sourcing, dealer support and after sale service contributed to positive export performance. Similarly, the finding of (Karanja et al., 2014; Njuguna, 2018; Chitauro&Khumalo, 2020) are also consistent with the finding that export distribution marketing strategy has a positive and significant effect on export performance. In contrast, there were a few studies that found that export performance was not affected by export place strategy, such as (Adis, 2010) and the reason for such inconsistencies was due to the failure of such ventures to have any strategic marketing effort to improve the export performance of firms.

H_{a4}*: Export promotion marketing strategy has a positive and significant effect on export performance of Medium and Large scale Textile and Garment Enterprises in Ethiopia.*

The PLS-SEM model as shown in Table 7.3 and Figure 7.1 confirms that the beta coefficient and p-values are significant (β2 = 0.580, p=0.000) showing that there is strong positive and significant relationship between export promotion marketingstrategy and export performance.

The findings of most studies by (Blesa&Ripolle, 2008; Njuguna, 2018; Kebede, 2019) have been largely consistent as to positive and significant association between export promotion strategy and export performance and a study made by argue that promotion strategy enables the exporting firm to acclimatize to foreign environments and pursue the right customers with effective integrated messaging and that it has a positive effect to export performance. In another interrelated study made by Eusebio et.al (2007) concluded that increased investment in promotional drives did not translate to superior export results but Sraha (2016) concluded that advertising spending had a negative influence on export performance (Al-Aali et al., 2013).

Table 7.4: Summary of the Hypothesis Results

Hypothesis		**Proposed Effect**	**Actual Effect on Export Performance**	**Supported/Not Supported**
Export product marketing strategy	H_{a1}	+	+	Supported
Export price marketing strategy	H_{a2}	+	+	Supported
Export distribution marketing strategy	H_{a3}	+	+	Supported
Export promotion marketing strategy	H_{a4}	+	+	Supported

Source: Survey Data (2021)

The Structural Model on Export marketing Strategy

Once a satisfactory assessment of the measurement model has been achieved, it is possible to further evaluate the structural model. PLS-SEM mainly focuses on prediction, and its aim is to maximize the variance of the dependent variables. Thus, the first step of a PLS model evaluation should be on the basis of the coefficient of determination (R^2), which indicates the amount of variance, and is a measure of the predictive power of the construct in question (Chin, 1998). Figure 7. 2 shows the graphical representation of the inner model with R^2coefficients. The significant paths suggested that all hypotheses were supported.

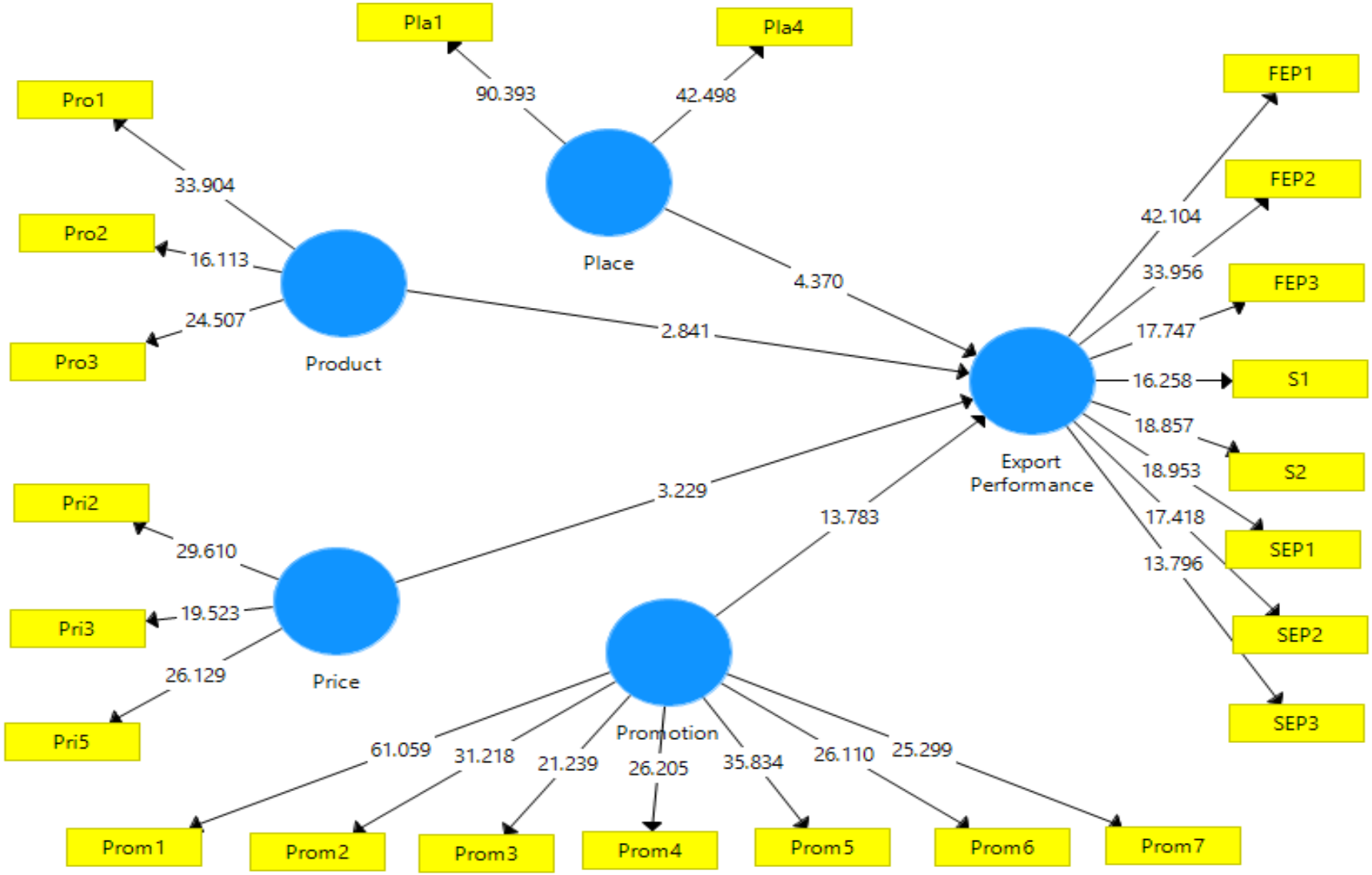


Figure 7. 2. Structural model assessment (n = 252 bootstrapped samples)

Concluding remarks

The four variables which are export product strategy, export price strategy, export place distribution and export promotion strategy has a significant and positive influence on export performance significantly at 95% confidence interval with a significance level of 0.005, 0.001, 0.000, and 0.000 respectively.

Limitation and Direction for Future Research

The limitations of the study should be considered when the results are interpreted. Firstly, although the empirical data focused on a sample of Medium and Large scale Textile and Garment enterprises in Ethiopia, so the findings could be of interest to firms in other sectors other than textile and Garment enterprises. Conversely, the readers should exercise caution in attempting to generalize this study's findings to considerably different countries. Secondly, the investigation was based on a limited number of valid observations (252) which restricted the number of variables/constructs to be included in the structural equation model to assess the role of export marketing strategy on export performance.

This study contributes both to the academic and practitioners' communities and the existent international marketing literature and practice by providing further support to the contingency approach of the international marketing strategy. In this study, the overall product, price, distribution and promotion export marketing strategy on export performance was assessed in Ethiopian Textile and Garment enterprises. The outcome of this study provides valuable implications for practitioners and managers too. In an international trade context, firm managers should be aware that in order to achieve superior export performance no strategy is strictly better than the other; no universal panacea for achieving export success exists.

As future research directions it would be interesting to replicate similar studies in distinct geographical contexts, therefore the results could be generalized to larger populations. Longitudinal analysis should also be conducted in order to illustrate the dynamics of exporting especially in the context of Textile and Garment enterprises. In this sense, it would also be recommendable to further research on this topic by employing qualitative techniques, based on in-depth case studies which would allow for a more detailed understanding of the impact of a multitude of contextual factors on the relationship established between the overall international

marketing strategy and export performance. Moreover, it may be advisable to carry out similar investigations within various industries, separately, as well as to differentiate the results obtained according to the specific overseas markets served. Thus, the formulation of pertinent comparisons would be possible, highlighting the differences established between the impact of export marketing strategy on export performance in distinct manufacturing and service sectors and/or socio-economic settings in developing countries context.

References

Adis, A.-A. A. (2010). Export Performance on the Malaysian Wooden Furniture Industry: An Empirical Study. *Journal of International Food and Agribusiness Marketing,* 22(1–2), 52–69. https://doi.org/10.1080/08974430903372773.

Al-Aali, A., Lim, J. S., Khan, T., and Khurshid, M. (2013). Marketing capability and export performance: the moderating effect of export performance. *South African Journal of Business Management*, 44(3), 59–70.

Ali Ekber, A., Halit, K., & Hayat, A. (2014). Standardization and Adaptation of International Marketing Mix Activities: A Case Study. *Procedia - Social and Behavioral Sciences,* 150 (2014) 609 – 618.

Amine, L. S. &Cavusgil, S. T. (1986). Export Marketing Strategies in the British Clothing Industry. *European Journal of Marketing,* 20(7), 21–33.

Antonio, N.G., Marta, P.O., Ramón, B.B. (2016). Market intelligence effect on perceived psychic distance, strategic behaviours and export performance in industrial SMEs", *Journal of Business & Industrial Marketing*, Vol. 31 Issue: 3, pp.365-380, doi: 10.1108/JBIM-03-2013-0065.

Blesa, A., &Ripolle, M. (2008). The influence of marketing capabilities on economic international performance. *International Marketing Review,* 25(6), 651–673.

Calantone, R. J., Kim, D., Schmidt, J.B., &Cavusgil, S.T. (2016). The influence of internal and external firm factors on international product adaptation strategy and export performance: A three-country comparison. *Journal of Business Research,* 59(2), 176-185.

Cavusgil, S.T., &Zou, S. (1994). Marketing strategy-performance relationship: An investigation of the empirical link in export market ventures. *Journal of Marketing,* 58, 1-21.

Chen, Y. (2016). The Impact of Marketing Strategies and Satisfaction on Student Loyalty: A Structural Equation Model Approach. *International Education Studies;* Vol. 9, No. 8; ISSN 1913-9020 E-ISSN 1913-9039.

Chitauro, T., &Khumalo, R. (2020). Factors Affecting the Export Performance of the Food and Beverage Manufacturing Firms in Zimbabwe. Academy of Marketing Studies Journal, Volume 24, Issue 1.

Demeke, Y., &Chiloane-Tsoka, E. (2015). Internationalization drivers of small and medium-sized manufacturing enterprises in Ethiopia: the case of leather and leather products industry. *Problems and Perspectives in Management,* 13(4), 32-42.

Erdil, S.T. &Ozdemir, O. (2016). The Determinants of Relationship between Marketing Mix Strategy and Drivers of Export Performance in Foreign Markets: An Application on Turkish Clothing Industry. *A paper presented on 12th International Strategic Management Conference*, ISMC 2016, 28-30 October 2016, Antalya, Turkey.

Eusebio, R., Andrue, J., &Belbeze, M. P. (2007). Management perception and marketing strategy in export performance. *Journal of Fashion Marketing and Management*, 11(1), 24–40.

Fayyoza, B. (2020). The role of Marketing Strategies in the development of the export potential of the republic of Uzbekistan (Empirical studies and lessons from Korean experience).*International Journal of Economics, Commerce and Management*, ISSN 2348 0386 Vol. VIII, Issue 2.

Hair, J. F., Sarstedt, M., Pieper, T. M., &Ringle, C. M. (2012). The use of partial least squares structural equation Modelling in strategic management research: a review of past practices and recommendations for future application. *Long Range Planning,* 45(5/6), 320–340.

Hair, J. F., Sarstedt, M., Hopkin, L., &Kuppelwieser, V. G. (2014). Partial least squares structural equation Modeling (PLS-SEM): *An emerging tool in business research review,* 26(2), 106–121.

Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2019). Multivariate data analysis (8th edn.). New York: *Pearson Pearson Education, Inc.* ISBN: 978-1-4737-5654-0.

Hoang, P. (2015). Relationship of Export Market Orientation, Selected Export Strategy, and Export Performance: An Empirical Study. *Global Journal of Management and Business*

Research: E Marketing. Volume 15 Issue 6 Version 1.0. Online ISSN: 2249-4588 & Print ISSN: 0975-5853.

Hultman, M., Robson, M. J., &Katsikeas, C. S. (2009). Export product strategy fit and performance: an empirical investigation. *Journal of International Marketing,* 17(4), 1–23.

Imiru,G.A. (2018). The Mediating Role of Marketing Strategy in the Effect of Antecedents on Export Performance of Leather and Textile Exporting Companies in Ethiopia. *Global Journal of Management and Business Research: E-Marketing,* ISSN: 2249-4588 & Print ISSN: 0975-5853.

Joao, S. (2015). Export marketing adaptation and export performance. *A Doctoral Thesis Submitted in Loughborough University*.

Karaca, A. (2017). Effect of Standardized Marketing Strategies on Export Performances of Turkish Jewellery Exporters. *Journal of Multidisciplinary Developments*, 2(2), 66-81, 2017 e-ISSN: 2564-6095.

Karanja, C.S., SMA, M., &Thuo, K.J. (2014). The Effect of Marketing Capabilities and Distribution Strategy on Performance of MSP Intermediary Organizations' in Nairobi County, Kenya. *Business Management and Strategy,* ISSN 2157-6068, Vol. 5, No. 1.

Karim, M. H., Karbasi, A. &Mohammadzadeh, H. S. (2020). Marketing Strategies and Export of Iranian Medicinal Plants. *Journal of Medicinal Plants and By-products,*1: 101-111.

Kashefi, M., Mohammadi, H., &Abolhasani, L. (2019). Effect of Marketing Strategies on Export Performance of Agricultural Products: The Case of Saffron in Iran. *Journal of Agricultural Science and Technology,* Vol. 21(4): 785-798.

Kasiso, C.M. (2017). The Effects of Marketing Strategies on Sales Performance of Small and Medium Enterprises in Kenya. MBA Thesis Submitted to University of Kenya for the Partial Fulfillment of the Requirements for the Award of Degree of Master of Business Administration.

Kebede, A. (2019). Determinants of Export Performance of Ethiopian Domestic Leather Footwear Manufacturing Firms. Thesis Submitted to the Addis Ababa University School of Commerce for the Partial Fulfillment of the Requirements for the Award of Degree of Master of Arts in Marketing Management.

Kim-Soon, N; Ahmad, R.A; & Shy; P.C. (2016). Export Promotion, Sales and Profits: A Structural Equation Modelling. *Journal of Southeast Asian Research,* DOI: 10.5171/2016.309540.

Koh, A. C., &Robicheaux, R. A. (1988). Variations in export performance due to differences in export marketing strategy: implications for industrial marketers. *Journal of Business Research*, 17(3), 249–258.

Lages, L., & Montgomery, D. (2014). Export performance as an antecedent of export commitment and marketing strategy adaptation: Evidence from small and medium-sized exporters. *European Journal of Marketing*, 1186–1214.

Lee, C., & Griffith, D. A. (2004). The marketing strategy-performance relationship in an export-driven developing economy: *A Korean illustration. International Marketing Review*, 21(3), 321–334.f.

Leonidou, L. C.; Samiee, S.; Geldres-Weiss, V. V. 2015. Using national export promotion programs to assist smaller firms' international entrepreneurial initiatives. *Cheltenham: Edward Elgar Publishing Ltd*,https://doi.org/10.4337/9781783471584.00023.

Li, M. (2018). Determinants of the export channel selection and export performance.*Durham theses, Durham University*. Available at Durham E-Theses Online: http://etheses.dur.ac.uk/12571/

Marianne, M., Ernst, I., & Waldo, K. (2016). Can South Africa sustain and diversify its exports? School of Economics, North-West University. *SAJEMS NS*, 19 No 2:249-263.

Mtigwe, B. (2006). Theoretical Milestones in International Business: The Journey to International Entrepreneurship Theory. *Journal of International Entrepreneurship*, 4, 1, 5-25.

Moghaddam, F. M., Hamid, A., Rasid, S. Z. A., and Darestani, H. (2011). The influence of export marketing strategy determinants on firm export performance: a review of empirical literatures between 1993-2010. *International Journal of Fundamental Psychology and Social Sciences*, 1(2), 26–34.

Muis, I. (2020). Marketing Strategy and Capability as the Mediators in Relationship of Market Orientation and Export Performance: A Case Study of Rattan Processing SMEs. *Binus Business Review*, 11(1), 31-42. https://doi.org/10.21512/bbr.v11i1.5964.

Njuguna, N. J. (2018). Effect of marketing mix strategies on export performance of avocado firms in Kenya. *Strathmore University*. http://su-plus.strathmore.edu/handle/11071/6174.

O'Cass, A., & Julian, C. (2003). Examining firm and environmental influences on export marketing mix strategy and export performance of Australian exporters. *European Journal of Marketing,* 37(3/4), 366–384.

Poulis, K., &Poulis, E. (2011). Promotional channels of FMCG firms and tourism: A standardisation/adaptation perspective. *Euro Med Journal of Business,* 6(1), 5–23.

Rao-Nicholson, R. & Khan, Z. (2017). Standardization versus adaptation of global marketing strategies in emerging market cross-border acquisitions. *International Marketing Review,* 34 (1). pp. 138-158. ISSN 0265-1335.

Rosenbloom, B., Larsen, T., & Mehta, R. (1997). Global marketing channels and the standardization controversy. *Journal of Global Marketing,* 11(1), 49–64.

Shoham, A. (1996). Marketing-mix standardization: determinants of export performance. *Journal of Global Marketing,* 10(2), 53–73.

Shoham, A., &Albaum, G. (1994). The effects of transfer of marketing methods on export performance: an empirical examination. *International Business Review,* 3(3), 219–241.

Shoham, A., Brencic, M. M., Virant, V., &Ruvio, A. (2008). International standardization of channel management and its behavioral and performance outcomes. Journal of International Marketing, 16(2), 120–151.

Sraha, G. (2016). Export Performance of Ghanaian Firms in the Agricultural, Handicraft and Manufacturing Industries (PhD Thesis). Victoria University of Wellington.

Stoian, M.C. (2010). Internationalization and international marketing on export behavior, international marketing strategy and export performance in Spanish SMEs. A Doctoral Thesis submitted to department of Business Economics, Faculty of Economic and Business Studies in University of Barcelona.

Stoian, M.C., Rialp, A. &Rialp, J. (2012). International marketing strategy and export performance in Spanish SMEs: a contingency approach, *International Journal of Entrepreneurship and Small Business*, Vol. 15, No. 2, pp.213–236.

Sousa, C.M. &Lengler, J. (2009).Psychic distance, marketing strategy and performance in export ventures of Brazilian firms. *Journal of Marketing Management,*Vol. 25, No. 5-6, pp. 591-610 ISSN0267-257X. doi: 10.1362/026725709X461876.

Theodosiou, M., &Leonidou, L.C. (2007). Standardization versus Adaptation of International Marketing Strategy: An Integrative Assessment of the Empirical Research, *International Business Review,* Vol. 12, Iss. 2, pp. 141–71.

Valeria, G. (2017). Are you Culturally Intelligent? Export Performance and Alliance Portfolio Performance of SMEs: A Managerial Perspective. *PhD thesis submitted to the LUISS Guido Carli University*.

Waheeduzzaman, A.N.M., &Dube, L.F. (2014). Trends and development in standardization adaptation research. *Journal of Global Marketing,* 17(4), 23-52.

Wang, X., Chen, A., Wang, H., & Li, S. (2017). Effect of export promotion programs on export performance: Evidence from manufacturing SMEs. *Journal of Business Economics and Management*, ISSN 1611-1699, Volume 18(1): 131–145. doi:10.3846/16111699.2016.1278031.

Worku, T. B. (2016). Competence Modelling for Export Performance Improvement in Ethiopia. Thesis submitted in fulfilment of the requirements for the degree of doctor at Wageningen University.

Zaiem, Z., &Zghidi, A. (2011). Product adaptation strategy and export performance: The Impact of the internal firm characteristics and business segment. *Contemporary Management Research,* 7(4), 291-312.

Zeriti, A., Robson, M.J., Spyropoulou, S &Leonidou, S.N. (2014). Sustainable Export Marketing Strategy Fit and Performance. *Journal of International Marketing,*American Marketing Association and Sage Publications, Inc.

Prolonging the Lifetime of WSN Using Fault Tolerance Algorithm

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Abstract

Wireless Sensor Networks are generally deployed in harsh environments to perform sensing operations and communication between sensors to report the events in applications like military surveillance, environmental monitoring, and etc. Sensor networks are resource constrained and the tiny size of sensors limits transmission power, bandwidth, and memory space. As sensors are battery operated and energy constrained, there is also a need to maintain energy efficiency of the network. Nodes in WSNs are prone to failure due to energy depletion, hardware failure, communication link errors, malicious attack, and so on. Therefore, fault tolerance is one of the critical issues in WSNs. In this paper we investigate various literatures that provide mechanisms for detection and recovery from nodes failure. Traditionally Wireless Sensor Networks contain single sink. Each node in the WSN sends their sensed data to the sink by using multi-hop path. If a sink failure occurs, the whole operation of WSN will halt. To avoid single point of failure here a partitioned WSN is considered and each partition is associated with dedicated sink. A fault tolerant algorithm is proposed to cope up the sink and immediate node failure. Moreover the life time of immediate nodes are evaluated with a given number of branch nodes .The simulation result shows that the proposed fault tolerant algorithm has prolonged the life time of WSN.

Key words:- *WSN, fault tolerance ,immediate neighbor node ,life time*

Introduction

Background

Wireless network technology has made the development of small, inexpensive, low power distributed devices, which are capable of local processing and wireless communication. Such devices are called sensor nodes. Sensors provide an easy solution to those applications that are based in the inhospitable and low maintenance areas where conventional approaches prove to be impossible and very costly. Sensors are generally equipped with limited data processing and communication capabilities and are usually deployed in an ad-hoc manner to in an area of interest to monitor events and gather data about the environment. Examples include environmental monitoring which involves monitoring air soil and water, condition based maintenance, habitat monitoring, military surveillance, inventory tracking etc. Sensor nodes are typically disposable and expected to last until their energy drains. Therefore, it is vital to manage energy wisely in order to extend the life of the sensors for the duration of a particular task. [1,6].

In WSN, fault occurrence probability is very high compare to traditional Networking,faults occurs due to many reasons such as malfunctioning hardware, software glitches, dislocation or environment hazards e.g. fire, flood etc. Higher frequency of fault occurrence decreases the performance as well as lifetime of WSN. To discuss fault tolerance it is necessary to discuss the importance of a WSN to be fault tolerant. The lifetime of a wireless sensor network depends on how efficiently the battery life of each sensor node is in use. Even in the presence of failures such as battery life depletion, node failures, resource scarcity, etc., the energy of each node must be reserved for longer use. In wireless sensor network (WSN) hundreds or thousands of sensor nodes perform their sensing and transmitting tasks independently. The ability of fault tolerance is a primary metric of good wireless sensor network. Energy is an imperative issue in WSN. The sensor nodes include very small battery power and once the nodes are deployed they cannot be recharged or replaced. A fault tolerant load balancing scheme should be employed to increase fault tolerability and lifetime of sensor network.[4]

Fault tolerance is the ability of a system to deliver a desired level of functionality in the presence of faults . Reliability of a WSN is affected by faults. For instant in a scenario where a WSN is deployed to monitor volcanic activity in a certain area, and if any fault occur. The WSN gives some erroneous result that everything is normal while there is very much possibility of a volcanic explosion. This may leads to a catastrophe. Also in case of military monitoring applications it is so important to give information of any intrusion instantly. So far as we discussed fault tolerance is one of the most important criteria that every WSN should satisfy. Actually, extensive work has been done on fault tolerance and it has been one of the most important research issues inWSNs[3].

Literature Review

In this section we will give an overview about existing fault detection and recovery approaches in wireless sensor networks.

The work in [4] has a survey on fault tolerance in wireless sensor networks. A detailed description on fault detection and recovery is available at [5].

The work in [6],[7] have developed techniques to maintain the cluster structure in the event of failures caused by energy-drained nodes. Initially, node with the maximum residual energy in a

cluster becomes cluster head and node with the second maximum residual energy becomes secondary cluster head. Later on, selection of cluster head and secondary cluster head will be based on available residual energy.

Neighboring co-ordination is another approach to detect faulty nodes. For Example, the work in [8] proposed an algorithm for faulty sensor identification which is based on neighboring co-ordination. In this scheme, the reading of a sensor is compared with its neighboring median reading, if the resulting difference is large or large but negative , then the sensor is very likely to be faulty.

A Self monitoring fault detection model on the bases of accuracy is developed in [9]. This scheme does not support network dynamics and required to be pre configured.

In the work [11] and [3], a fault tolerance approach has been discussed. Here also the research work is done on LEACH. Here fault recovery is suggested in two ways: inter-cluster recovery & intra cluster recovery

In the work [12] a technique for handling sink and node failure in a multi-sink WSN was proposed. In this method all sinks gather knowledge about the topology of WSN by collecting information from each node of the network. Then the sinks exchange their information to create a unique global topology. From this global topology, multiple redundant routes for each sensor node are computed, and forwarding tables are built. Finally, these forwarding tables are transmitted to the respective sensor nodes. Now maximum sensor nodes have more than one routing paths to different sink. So, when a sink fail the failure handled automatically by routing the data to other sinks using alternative routing paths. If a routing path becomes unavailable due to node failure then this situation can be handled by routing the data through redundant path. This technique incorporates a large overhead for collecting topology information, computing the global topology and transmitting the forwarding table

In the work [10], Detection scheme was proposed. an initiator starts fault detection mechanism by gathering information of its neighbors to access the neighborhood and this process continue until all the faulty nodes are identified. Gathering neighboring nodes information consumes significant energy and time consuming. It does not perform recovery in terms of failure.

In the work [11, 6], some sink deployment algorithms have been proposed with objectives to minimize and balance the energy consumption across networks reduce packet delivery latency meet the required lifetime

In the work [10], a fault tolerance management architecture has been proposed called MANNA (Management architecture for wireless sensor networks). This approach is used for fault diagnosis using management architecture, termed as MANNA. This scheme creates a manager located externally to the wireless sensor network and has a global vision of the network and can perform complex operations that would not be possible inside the network. However, this scheme performs centralized diagnosis and requires an external manager. Also, the communication between nodes and the manager is too expensive for WSNs. In Crash fault

In the work [15], was proposed a multiple sinks WSN architecture where the network is partitioned into clusters. All the sources in a cluster were assigned to send the data to the sink designated to that particular cluster.

the work in [5]the is fault recovery mechanism in single-hop sensor networks was proposed. This fault recovery scheme is to deal with failure of sensor nodes, including the sink node. The basic idea is to partition the sensor memory into two parts, namely, data memory and redundant memory. The data memory is used to store sensed data and data recovered from failures of other sensor nodes. The redundant memory is used to store redundant data for future recovery. The recovered data is distributed in the memories of the non faulty sensors to be sent to the sink when it becomes available

There are various fault tolerant mechanisms present in literatures. Some of them use mobile robot , node mobility for handling failure in WSN. The idea of mobile robot is not cost effective and node mobility is also tedious and energy consuming [45,46].

As we tried to see in the literature survey ,most of the researches on fault tolerance algorithm which

- usesmultipath routing techniques to handle sink failure but this also not energy efficient.
- uses topology control mechanism to handle sink failure but this also impossible to address the node in a very large network.

- uses redundant nodes to handle node failure .This is not cost wisely visible specially in very large network

Many fault tolerant algorithms for WSNs have been developed but most of them do not take into consideration of many challenging aspects of WSN such as the limited energy resources, scalability of the network and network life time etc. Therefore we propose two different energy efficient algorithms which are can beimplementing in a large WSN. One Algorithm provides mechanism for detection and recovery from sink failure in a partitioned WSN where each partition contains a dedicated sink .On the other hand the second algorithms provides detection and recovery from immediate neighbor node failure in same type of WSN. Our algorithms are energy efficientalgorithm which can prolong the life time of the network and also can be implemented in a large scale network.

Statement of the Problem

Generally most WSNs are deployed with a single sink. Most of sensor nodes in a WSN forward their data to the single sink by using long multi-hop paths. Therefore the relay nodes in a long multi-hop path have to send their own data to sink as well as forward data from other nodes to sink. These nodes deplete energy more quickly than nodes near the boundary. The situation is more worsen in case of the sensor nodes which are deployed near the sink called intermediate nodes. These nodes have to relay sensed data from the entire network to the sink. As these sensor nodes also contain a limited energy source, and also there is frequent data transmission through these nodes, these nodes die soon. In such situation, the other alive nodes in the network cannot send their data to the sink. The entire WSN becomes non-functional.

In large scale WSN with single sink if a distant node wants to send data packet to a sink then the packet has to follow a long multi-hop path which is subjected for fading and hence packet loss occur due to the long wireless communication medium. Long multi-hop path also increases delay for end to end packet delivery which is not desirable for time critical application like disaster management. The packet loss problem may be solved by retransmission of packet using a simple acknowledge scheme. But the packet retransmission energy and energy required for sending acknowledgement for each packet is very high. Retransmission also increases the delay in data delivery. To avoid packet loss,it is also possible to send data to the sink by using multiple paths which is also not cost effective in terms of energy consumption

Failure is very common thing in any wireless sensor network. In WSN sensor nodes, wireless communication link and even sink may fail due to harsh environment, hardware failure or software bugs. But maintaining quality of service (such as fast and accurate data delivery, a smaller amount of packet drop) are very important prerequisite for WSN, especially which are deployed for some time critical application like disaster management. In case of a time critical application, any delay or error in data delivery and packet drop due to failure of sink or nodes may cause severe damages. Therefore failure of sensor nodes, sink and communication link should not affect the overall task of the WSN. So detection and recovery from fault should be handled with extra care so that it can achieve energy efficiency, fast data delivery.

Hence, there is still wide research gap in filling the recovery of sensor or sink nodes in wireless sensor network.

Objectives

General Objective

- The main aim of the thesis is to develop new mechanism to prolong the lifetime of wireless sensor network by making the network fault tolerant

Specific Objectives

- To partitioning the WSN into small sub-partitions
- To deploying a sink in each partition in such a manner that it provides longer lifetime and energy efficiency
- To propose fault tolerant algorithm which can prolong the lifetime of WSN
- To simulate the proposed algorithm

Methodology

The methodology used in conducting this thesis work can be summarized into three basic steps. The major tasks performed in each step are described as follows.

Literature review: In this step, the issues and concepts that are closely related to this thesis work have been thoroughly studied in order to acquire a deep understanding and knowledge of the relevant areas and where the problem lies. Different literatures (books, standard journals, research papers, class lecture notes, research publications and other

information available on the Internet) that are conducted on WSN fault tolerance mechanism have been reviewed.

System Modeling and problem formulation: In this step, a network and energy model, transmitter, total energy consumption have been modeled and mathematically analyzed.

Simulation and Evaluation of Results: In this final step, deployment of static sensor nodes and one dedicated sink node in each partition ,apply the proposedfault tolerance algorithm to cope with sink and immediate node failure has been done . Also the life time of immediate nodes are evaluated with a given number of branch nodes . All of the algorithm are simulated according to the given system model by using math lab simulation software and conclusions are drawn based on the results.

Scope of the Project

Faults are very common in WSN. In WSN two main components node and sink fails frequently due to faults in different levels. In this thesis work we :

- Present an overview of WSN, the application areas of WSN, different and issues related to WSN
- Partition alarge scale network application area and deploy static sensor nodes in each partition which have equal status .
- Deploy in each partition a high powered sink node.
- Assume that in this partitioned WSN with multiple sink each sub-partition act as a small scale WSN with single sink.
- Assume that each sink node has enough capacity to be connected and serve all of the nodes in the network.
- Assume each sensor nodes are omi-directional with symmetric sensing range and each node has address of sink nodes and it's own location.
- Assume each Sink node has its own id and located at the center of the partition
- Propose a new approach fault tolerant algorithm which can detect and recover sink and immediate neighbor nodes failure and provide longer lifetime to the network .

- Node failure near the boundary is ignored in this work because it can be handled by most of the routing algorithms and also the do not have much impact on the life of the WSN as the immediate neighbor node.
- Implement all of the proposed algorithms in simulation environment.

Thesis Overview

The remainder of this thesis is organized as follows.

In Chapter 2, gives an overview of WSN. the applications of sensor networks, location awareness, different routing technique and security issues in WSN are also elaborated here.

In Chapter 3,multiple sink implementation and single sink problem is discussed

In Chapter 4,fault tolerance in WSN, sources of faults on WSN, fault tolerance at different levels, fault detection and recovery are elaborated here.

.**In Chapter 5,** proposed fault tolerance mechanism, system model, problem formulation assumptions, , energy model, and transmitter power model, energy consumption ,formulating the immediate neighbor node lifetime and discussed the proposed fault tolerance algorithm will be dealt .

In chapter 6, simulation and results, single sink deployment, single point of failure, multiple sink implementations, single sink and multi sink failure recovery will be discussed

In Chapter 7, conclusion will be drawn and recommendation for feature work will be forwarded.

Proposed fault tolerance mechanism

System Model

The networkmodel in Figure 5.1 has four partitions. In each partition have a high powered sink and six immediate neighbor nodes(one hop neighbor node of the sink). The model shows that any packets initiator nodes are forwarded their packet data towards sink nodes through intermediate neighbornodeswith the assumption of each sub-partition network act as a small scale WSN with single sink.Besides,we assume that each sink node has enough capacity to be connected to all of the nodes in the network model. Moreover the following assumptions are made.

- All the nodes are homogenous and random deployed in four partition of a given application area is assumed as shown in the figure 5.1

- All nodes are assumed stationary after deployment
- All sensor nodes assumed to have equal status
- Every nodes has its own location information
- Sensor nodes are omi-directional with symmetric sensing range
- Each Sink node has its own id and located at the center

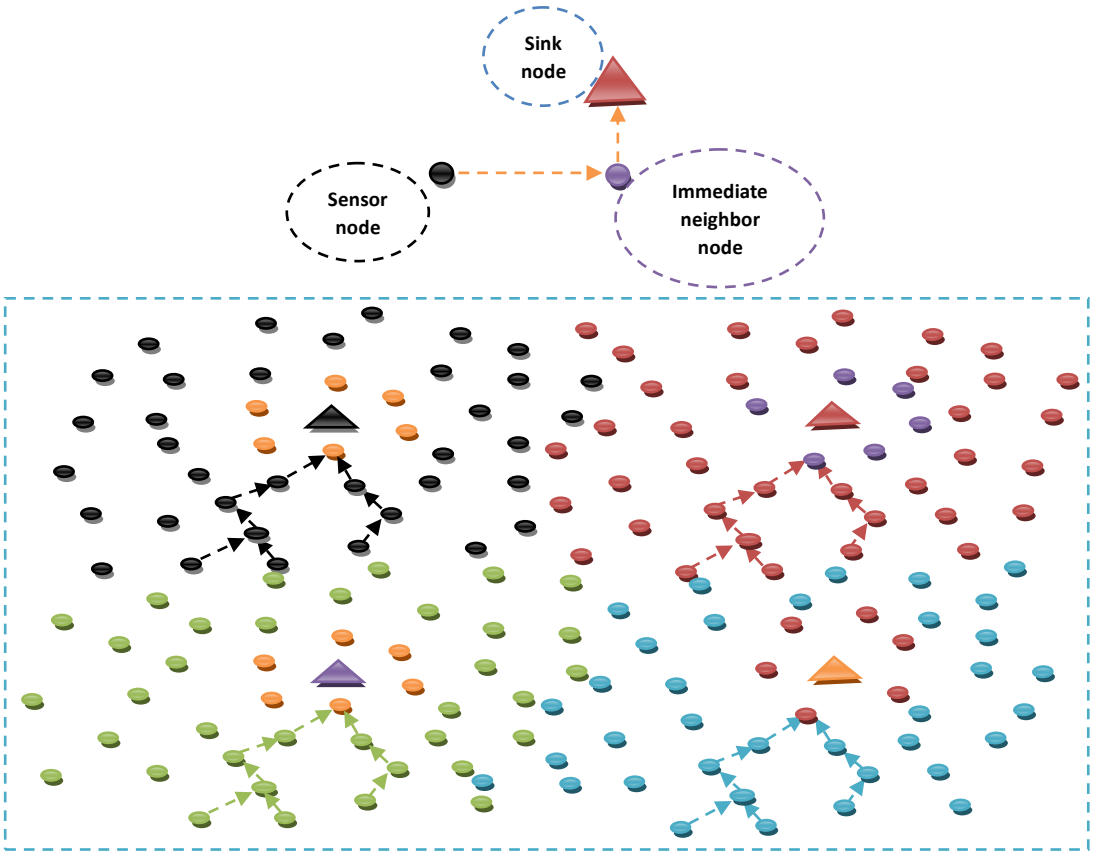

Figure 5.1 WSN Network Model With Four Sinks

Problem Formulation

Definition 5.1 Let N = {sensornodes}, the set of sensor nodes in the wireless sensor network, and S = {sinknodes}, the set of sink nodes. Then let V = N u S denote all possible nodes in the network. Let G = (V, A) be a directed graph representing the sensor network. In this graph, the vertex set V stands for the nodes, and the arc set A stands for valid communication links. Let (i, j) ∈ A denote arcs, where i, j ∈V .

Let dij denote the Euclidean distance between nodes i, j∈ V If we assume that the radio transmitters of the nodes have enough transmission power, where Pt→∞, then the radio signals of each node can reach to every other node in the network, resulting in a fully connected graph. In

the real world, however, there is a If we assume that the radio transmitters of the nodes have enough transmission power, where Pt→∞, then the radio signals of each node can reach to every other node in the network, resulting in a fully connected graph. In the real world, however, there is a physical limit for the maximum transmission power, with P Pmax t ≤ . Therefore, we cannot expect G being fully connected. On the contrary, there might be some disconnected nodes, whose radio signals cannot reach to any other node in the network. If we exclude these disconnected nodes from the vertex set, we obtain a new vertex set V ′ ∈V , where G' = (V', A) forms a connected graph. Since our aim is successfully managing the connected nodes in the network, without loss of generality, we can assume that the graph G is connected.[35]

Definition5.2 A path from a sensor node i0 ∈ N to a sink node s ∈ S is a non-empty sub graph $P_{0\to s}$ of G, where $P_{0\to s}$ =($V_{0\to s}$,$A_{0\to s}$), $V_{0\to s}$= { i_0, i_1. . . . i_n , s }, i_0, i_1. . . . i_n∈ N

$A_{0\to s}$ ={(i_0, i_1), (i_1 ,i_2) ,(i_{n-1}, i_n), (i, s)} A. The node i∈ N is called as the initiator node, and the nodes i_1, i_2,. . . .i_n ∈ N are called relay nodes.

After the deployment phase, the sink nodes start to collect information from the sensor nodes. This data flow is performed through communication paths from sensor nodes towards the sink nodes. $P_{0\to s}$ (represents these data flow paths in the network. Figure 5.2 shows such a path where$V_{0\to s}$= { i_0, i_1. . . . i_n , s }

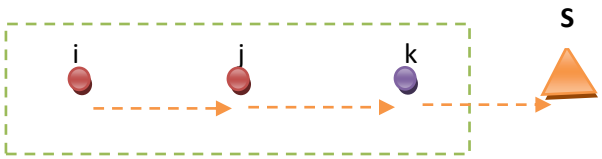

Figure 5.2 A Path from the Sensor i to The Sink S through Relay Nodes and Immediate Node k

Energy Model

Efficient energy consumption is one of the most important design constraints in wireless sensor network architecture . The life of each sensor node depends on its power dissipation. In applications where the sensors are not equipped with energy scavenging tools like solar cells, sensors with exhausted batteries cannot operate anymore. Moreover, since sensor nodes behave as relay nodes for data propagation of other sensors to sink nodes, network connectivity decreases

gradually This may result in disconnected sub networks of sensors, i.e., some portions of the network cannot be reachable at all. Therefore, the level of power consumption must be considered at each stage in wireless sensor network design

Transmitter Power Model

As mentioned before, the main concern in wireless sensor network design is power. The underlying architecture must consider power efficiency as a major constraint. A good evaluation of the available techniques can be found in [43]. To start, consider the radio propagation model in a single-path free-space channel. The relationship between transmitted power *Pt* and received power *Pr* is given by

(5.3) $$\frac{p_r}{p_t} = G_t G_r (\frac{\lambda}{4\pi d})^2$$

where Gt and Gr are the transmitter and receiver antenna gains respectively, d is the distance between the transmitter and receiver, λ = c / f is the wavelength of the transmitted signal, whereas f is its frequency, and c is the velocity of radio wave propagation in free space, which is equal to the speed of light. Equation 5.3 further generalized as :[35]

, (5.4) $$p_t = \omega d^{\alpha}$$

Where $\omega = (\frac{P_r}{G_r G_t})(\frac{4\pi}{\lambda})^2$ and $\alpha > 1$ is known as path loss exponent. For free-space channel$\alpha = 2$. Table 5.1gives a list of typical path loss exponent values obtained in various radio environments [35]. In many sensor applications, it is assumed that α ranges between 2 and 4, since the sensors have short antennae, which are very close to the ground

Table 5.1 path loss exponent values obtained in various radio environments

Environment	α
Free space	2
Urban area cellular radio	2.7 to 3.5
Shadowed urban cellular radio	3 to 5
In building line-of-sight	1.6 to 1.8
Obstructed in building	4 to 6
Obstructed in factories	2 to 3

Power is defined by the rate of change in the energy with time [41]. Therefore, the amount of energy that is necessary to operate for time *t* consuming power *P* can be found as follows.

$$\Delta E = P\Delta t \tag{5.5}$$

Energy Consumption

Energy consumption in an arbitrary sensor node has in general the following components depending on the operations performed within the node:[35]

- **Sensing Energy:**In order to activate sensing circuitry within the node, and gathering data from the environment, some amount of energy must be dissipated, which is called sensing energy, e_S. The magnitude of this energy depends on the task that is assigned to the sensor. Different sensors require different level of energy during operation.
- **Transmitter Energy:** Afterwards, this data must be transmitted towards the destination. Therefore, the transmitter circuitry must be operated. For this operation, the transmitter energy, e_T must be consumed which depends on the transmitter power, Pt, size of the data packet, and the data transfer rate.
- **Receiver Energy:** As a relay node, a sensor node is also in charge of forwarding data packets of other sensor nodes. For this operation, sensors must be able to receive those data packets. The receiver energy, e_R, will be consumed during this operation, which is irrelevant of the

distance between nodes. During reception, receiver power, Pr, will be spent during the reception of the data packet with the given data transfer rate.

- **Computation Energy:** To operate these circuitries, sensor's processing unit must be activated. Moreover, whenever data aggregation is performed additional computations must be realized. Compared to the previous items, computation energy, $e_{C,}$ is relatively low [35].

During the life cycle of a typical sensor node, each event or query will be followed by a sensing operation, performing necessary calculations to derive a data packet and transmitting this packet to the destination. In addition, sensor nodes often relay data packets received from other sensors. Thus, the total energy, e_{Total}, in an arbitrary active time frame can be presented as the sum of above energy requirements.[37]

$$e_{Total} = e_T + e_R + e_S + e_\tau \quad (5.7)$$

Efficient sensing circuitries and computation algorithms help to reduce e_S and e_C. The other two components e_T, and $e_R$are dependent on the communication architecture and underlying techniques. Therefore, power aware methods must be employed in order to reduce the energy consumption during communication .Only the transmitter energy, e_T, is related with the distance between the communicating sensor nodes. The other components of total energy remain constant with varying distance between communicating pairs. Therefore, we can rewrite Equation 5.7 as a function of *d* using Equation 5.4 and Equation 5.5 as follows [43].

$$e_{Total} = k\, d^{\alpha} + \tau \quad (5.8)$$

Where $k = \omega \Delta t$ with Δtbeing the duration of packet transmission process, and $\tau = e_R + e_S + e_C$ the overhead energy, which is a constant value with varying *d*. Any other energy consuming activity in the sensor node can be added to the overhead energy component that does not depend on the transmission distance .

Definition 5.3 : The energy cost of an arc (i, j)∈ A , eij is defined to be a real-valued function e : A→ℜ. The energy cost of a path $P_{i\to s}$from a sensor node i∈ N to a sink node s∈ S is given by

$$e(P_{i\to s}) = \sum_{(i,j)\in A_{i\to s}} eij \quad (5.9)$$

Using the energy cost function as the metric, energy aware routing algorithms might calculate the minimum energy paths in the network, in order to achieve the maximum energy saving. In other

words, each sensor node is going to deliver its data packets through a minimum energy path to a sink node. In our energy model, we use the energy cost [36]

$$e_{ij} = kd_{ij}^{\alpha} + \tau \quad (5.10)$$

Immediate Neighbor Node Lifetime

The lifetime of the sensor network is closely dependent to the lifetime of immediate sensor nodes in the network. The energy dissipated by an intermediate node depends on the number of nodes that are connected to the sink through itself. The packets of initiator nodes are forwarded towards sink nodes through intermediate nodes. The nodes that are close to the sink nodes carry a higher load. When the batteries of such a critical node run out of energy, then the whole branch that is connected through this node may become unreachable.. Therefore, we should have a fault tolerance mechanism which can use alternative node as immediate neighbor to maximize the network lifetime. Calculating the life time of an immediate neighbor nodes is very important to know the life time of the network.FCBM DSKMLSS

In order to calculate the life time of the immediate neighbor nodes we must have a mechanism to quantify the number of packets that these sensor nodes deal with during a time frame.

Definition 5.4 : Let s ∈ S,in Figure 5.4 the branch set of a immediate neighbor node k is B_K where k∈ Nis defined as set of a relay node includes all nodes in the routing tree, which are connected to a sink node through a path that is passing over immediate neighbor node k .

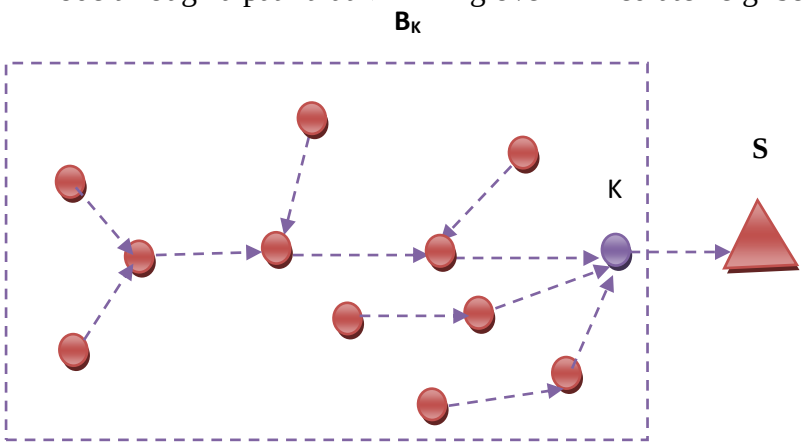

Figure5.4 Number of Branch Immediate Node of k

Because of the definition of the relay set, we assume that *k*also relays its own packets to the sink. Therefore, *k*is an element of its branch set.

Counting The Packets

In order to know the energy consumption of sensor nodes efficiently, we must have a mechanism to quantify the number of packets that these sensor nodes deal with during atime frame.

Definition 5.5 The number of packets going through an immediate node k ε N during a time interval (0,t] is denoted as n_i^K. Similarly, the number of packets generated by an initiator node iεN during a time interval (0,t] is denoted as n_i^G . Therefore the number of packet n_i^G can be calculated:

$$n_i^k = \sum_{B_K} n_i^G \qquad (5.11)$$

Definition 5.6 Let $i \in N$ be an arbitrary initiator node. Let $X_i(t)$ denote the number of packets generated during the time interval $(0,t]$. Then $\{X_i(t),\ t \geq 0\}$ is a family of random Variables, forming a stochastic process. Let $Z_i$denote the n[th] interarrival time, $n \geq 1$, [35]

$$z_i^n = t_n - t_{n-1} \qquad (5.12)$$

with a known cumulative distribution function, and known expected value

$$P(z_t^n \leq x) = F_I(X) \qquad (5.13)$$

$$E[z_i^n] = \mu_i \qquad (5.14)$$

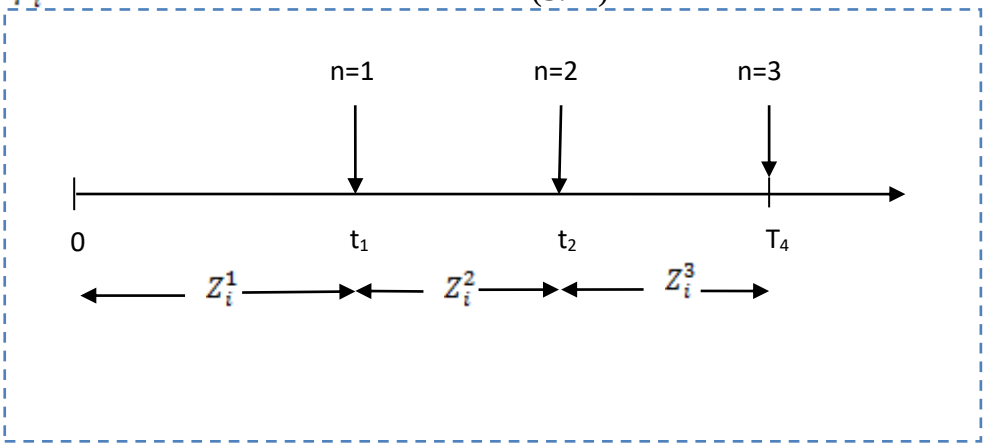

Figure 5.5 The Packet Generation Inter-arrival Times Zifor The Initiator Node i

For $t \to \infty$, we have

$$E[x_i] = \frac{t}{\mu_i} \qquad (5.15)$$

Proof:

For the proof, the reader may refer to [42].

Therefore an arbitrary sensor node $i \varepsilon N$, having an average packet interarrival time μ_I

For $t \to \infty$

$$n_i^G = \frac{t}{\mu_i} \qquad (5.16)$$

As an example, assume a Poisson packet generation process with parameterλ_i, where the interarrival time has a cumulative distribution function$F_i(X) = 1 - e^{-\lambda_i x}$ Then, we know that

$n_i^G = \frac{1}{\lambda_i}$Hence$n_i^G = \lambda_i t$(5.17)

We further assume that the packet generation processes of each individual sensor node are independent of each other. For general-purpose continuous monitoring applications, this assumption clearly holds. Sensors are going to send their measurements in independent moments in time. For some applications, like seismic measurements, this assumption might not hold. That is, when a special event occurs in the field, then every node that is close to this node will try to send a packet to inform the sink node. Most of these applications, however, use a data aggregation mechanism where the data packets that are generated separately are joined into a single packet. Then, only this packet is forwarded to the sink. Considering only those packets as real packet generations for the sensor network, the assumption holds for these types of sensor networks too.

Using equation 5.11 and 5.16 The number of packets that a relay node has to forward towards a sink node can be found as follows.[35]

$n_i^k = \sum_{B_K} \frac{t}{\mu_i}$(5.18)

Definition5.7 Let E $(t)_\kappa$be the residual energy of a node k ε N at a given time t. Then E(0) denotes the initial battery capacity of the node k ε N . The node k is said to be alive whenever $E_k(t) > 0$. Similarly, the node k is said to be exhausted or dead whenever Ek(t)= 0. Let $e_k(t)$ denote the total energy dissipation of a node k εN during a time interval (0,t]. Then we have

$E_k(t) = E_K(0) - e_k$(t)(5.19)

Clearly, the residual energy of a sensor node $E_k(t)$ is a monotonically decreasing, real-valued function of time. We have to find the approximate time when an operational node becomes exhausted .

$E_k(t) = E_K(0) - e_k(t) = 0$(5.20)
Therefore

$e_k(t) = E_K(0)$(5.21)
Where
$e_k(t) = n_i^k e_k^s$(5.22)

Using equation 5.16 and 5.20 $e_k(t) = \sum_{B_K} \frac{t}{\mu_i} e_k^s$(5.23)

Assume all initiator nodes have the same average packet interarrival time μ that is for $\mu_i = \mu$all $i \in N$, then the equation 5.21 become

$e_k(t) = \frac{t}{\mu} \sum_{B_K} e_k^s$(5.24)

From equation (5.22) we can calculate the value of t

$$t = \frac{\mu E_K(0)}{\sum_{B_K} e_k^s} \qquad (5.25)$$

From energy cost model on Equation 5.10 e_k^s is the energy cost to deliver a packet from immediate neighbor node k to sink S. which is

$e_k^s = kd^\alpha + \tau$ (5.26)

If we are using same sensor nodes throughout the sensor field, then we can easily assume that their initial battery capacities are equal. Therefore, we can rewrite the maximization objective where we try to maximize the lifetime of sensor nodes, as a simpler minimization problem, where we try to minimize the denominator Equation 5.25

$\sum_{B_K} e_k^s$ (5.27)

Inorder to prolong the life time of the immediate neighbor nodes should have less number of branch nodes so that the energy consumption of the node can be to minimize.

In our network model ,multiple sinks are deployed in a WSN then the nodes can forward their data to their nearest sink only. Therefore this can significantly decrease the path length and number of branch nodes . It provides energy efficiency as well as quick data delivery to sink. Each node near a sink has to forward packets only from a part of WSN. So this loads the

increase of immediate neighbor node lifetime as the a result the life of the wsn will significantly increase .

Proposed Fault Tolerance Algorithms

In this section three proposed algorithms are described for detection and recovery of both sink and immediate neighbor nodes of each partition.

Proposed Algorithm at Each Immediate Neighbor Nodes for Sink Failure Detection

Initially the immediate neighbor nodes synchronize to receive hello message from their respective sink node as can be seen in Figure 5.6.Then after some time later, it listen the medium and check the hello message send by the sink node.If the message appear , it continue the cycle otherwise after n count of missed message,the immediate node initiates fault recovery phase bybroadcasting " sink failed message " towards the other sensor nodes.

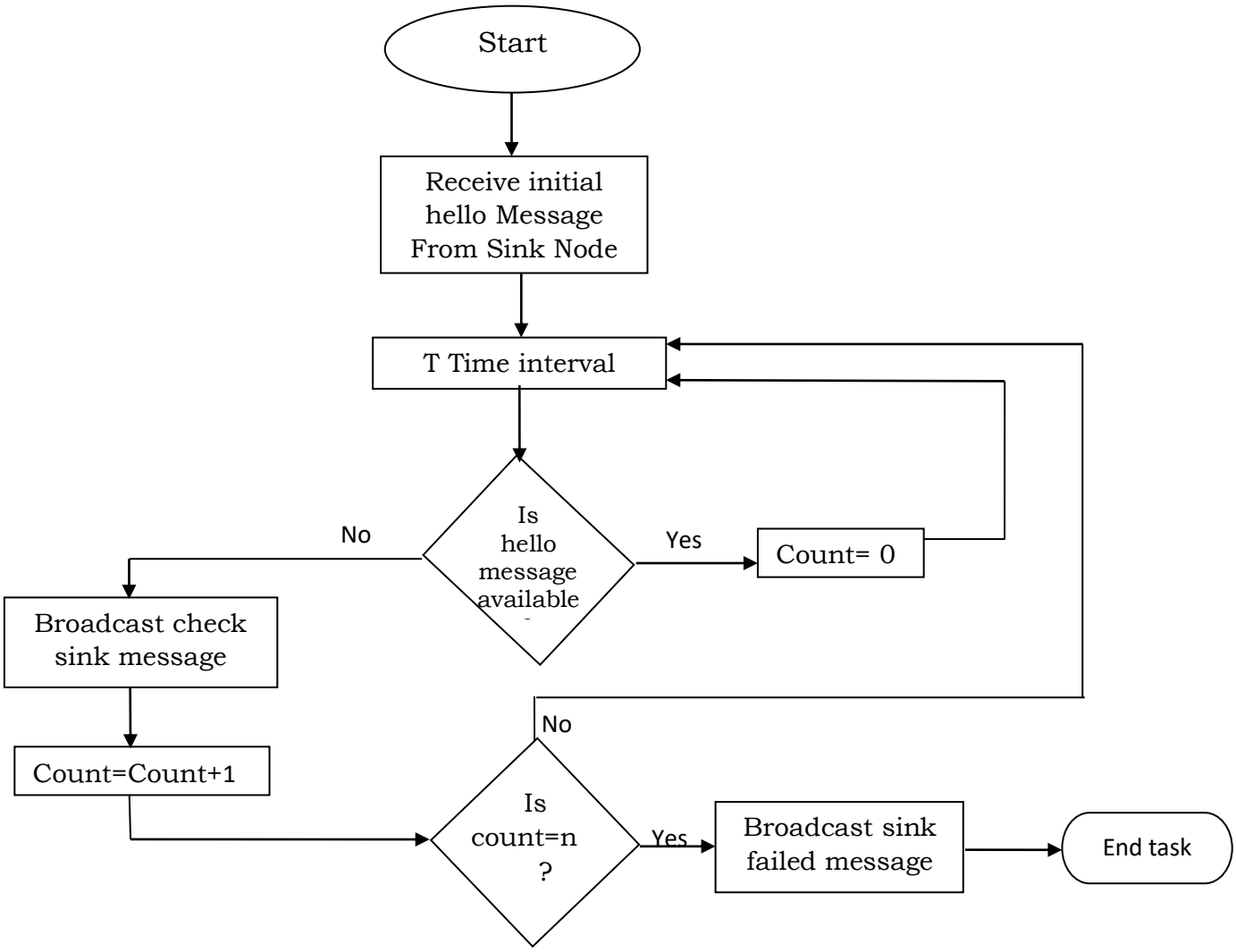

Figure 5.6 Proposed Algorithm for Sink Failure Detection

Proposed Algorithm at Every Sensor Node for Recovery of Failed Sink

When there is asink failure (figure 5.7), every sensor node will receive sink failed message from the immediate neighbor node using the proposed sink failure detection algorithm mentioned in section 5.6.1.Since sink failedmessage contains the sink id of the failed sink node. Nodes that receive sink fail message will check the home id with the failed node .If the id of failed sink is similar to their home id, it start the sink recovery phase by calculate the distance b/n the alive sink nodes and its position then change the its home id to the nearest node .

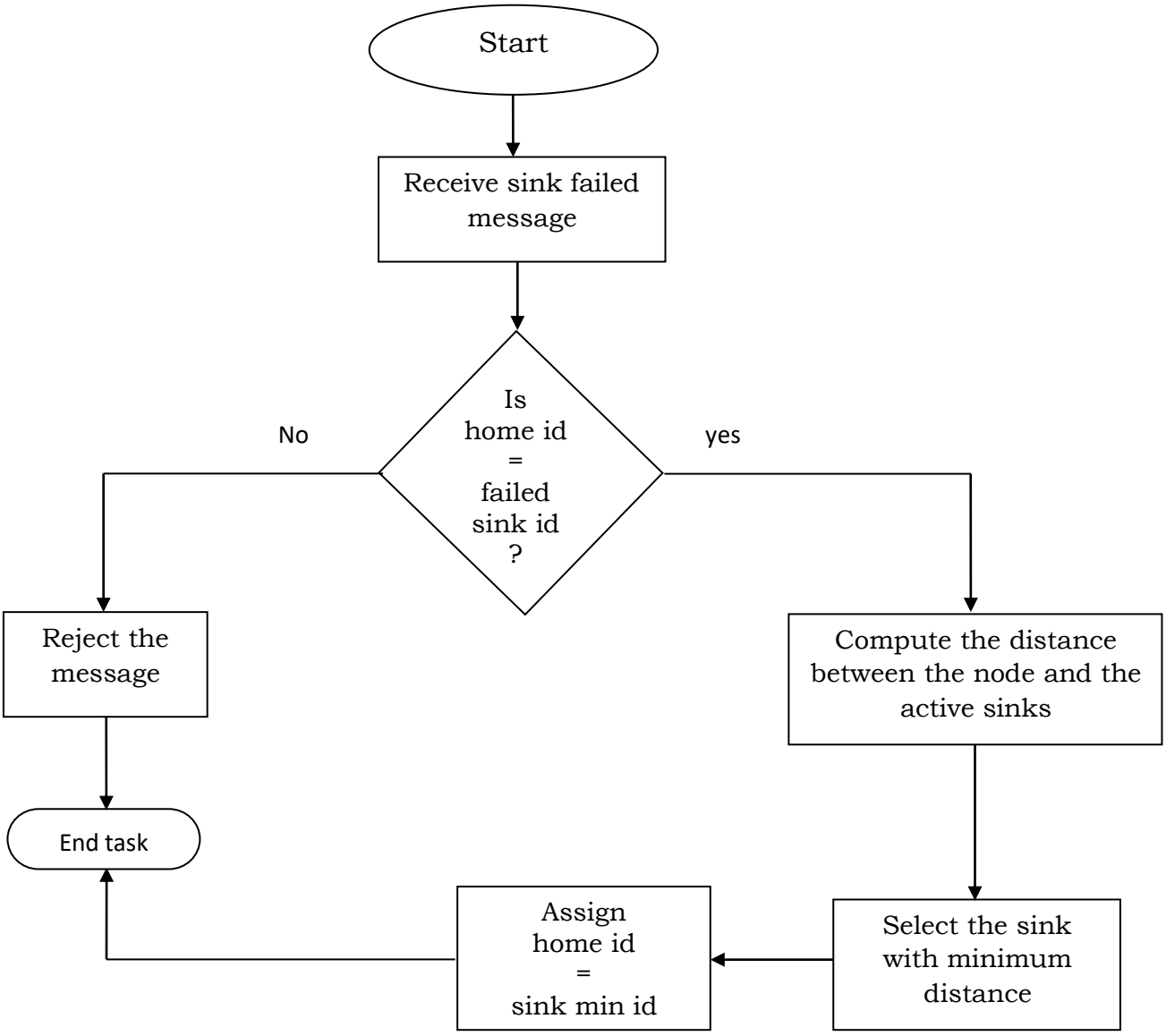

Figure 5.7 Proposed Algorithm at Every Sensor Node for Recovery of a Failed Sink

5.6.3 Proposed Algorithm for Detection and Recovery of a Failed Immediate Neighbor Nodes

As we have tried to see on the previouschapter,The lifetime of the sensor network is closely dependent to the lifetime of each immediate neighbor nodes .Whenever these node failure occurs, all the branch nodes would be unreachable until a new route discovery process is initiated. Therefore, we have to control the lifetime of immediate neighbor nodes and try to prolong it as

much as possible, or should have a fault tolerance mechanism in order to prolong the network lifetime.

On propose fault tolerance algorithm in Figure 5.8 , the sink continuously check the availability of its immediate neighbor nodes .if there is communication link failure or node failure ,the sink automatically detect and send check message set count then it recursively check whether the linkis reestablished until pre defined n number of iteration.if not, the sink select other node as immediate node from its neighbors which is closer to the failed node .

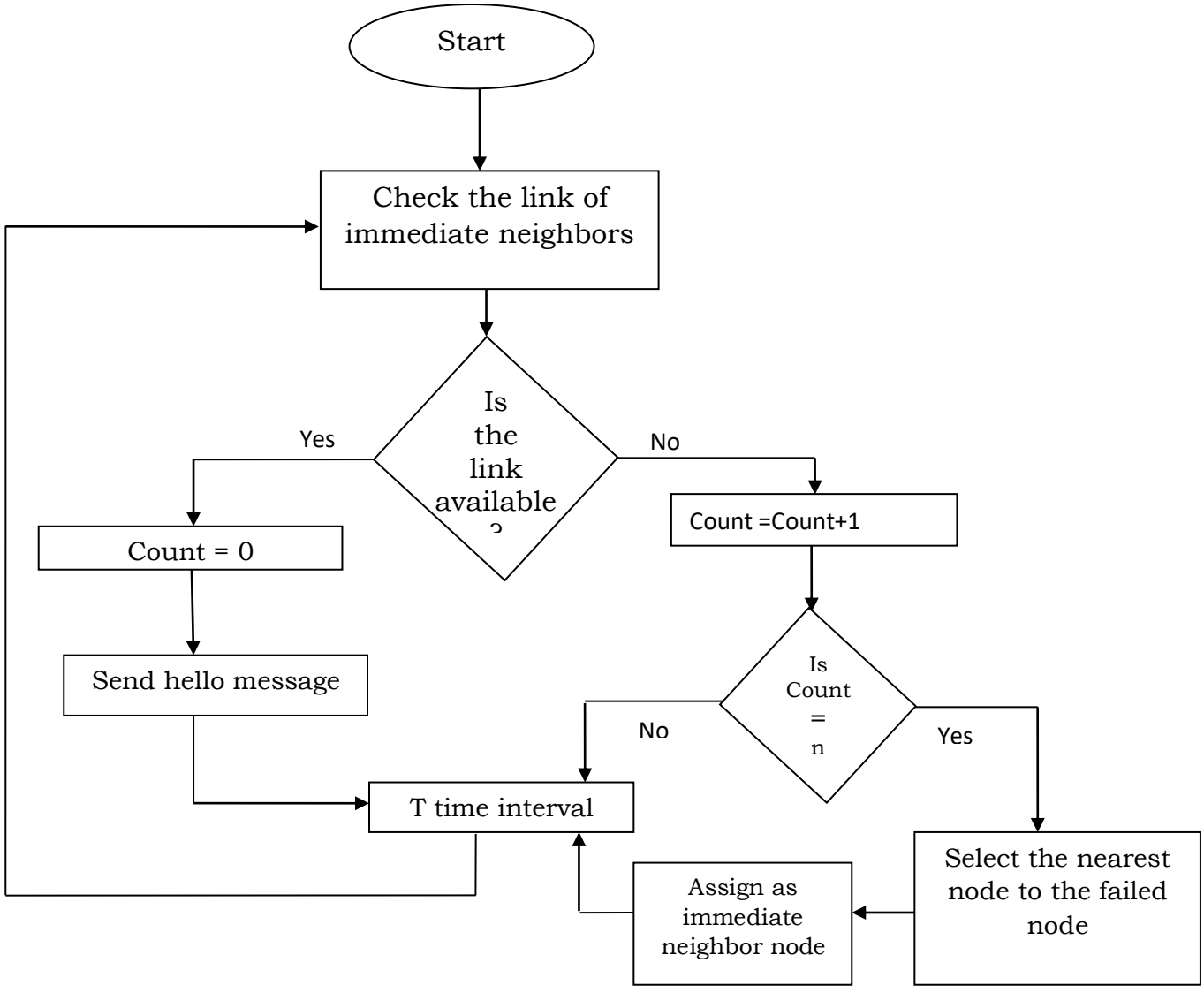

Figure 5.8 Proposed Algorithm at for Detection and Recovery of Failed Immediate Neighbor Nodes

Simulation results and Discussion

There are many network simulationenvironments available to simulate a wireless sensor network but the rich function library of MATLAB enables easy implement of different types of algorithms for WSN. MATLAB has a set of tools and facilities that help to use and MATLAB functions and files. Many of these tools are graphical user interfaces. It includes the MATLAB desktop and Command Window, an editor and debugger, a code analyzer, browsers for viewing help, the workspace, and files, and other tools. Several graphical and mathematical MATLAB functions are used for implementing algorithms of this thesis.

Single Sink Deployment in WSN

Consider wireless sensor network deployed in a square regionshown in the simulation output Figure 6.1. One hundred twenty node field is generated by randomly placing the nodes in a 200 m x 200 m square area.It is assumed that the area contains homogeneous sensor nodes with a communication range of 35m. Other sizes are generated by scaling the square and keeping the communication range constant in order to keep average density of sensor nodes constant. The sink node placed at the center with a blue color. The red color nodes are immediate neighbor of the sink.Therest black node sensor node which sense the environment and deliver the data to the sink in ad hoc manner

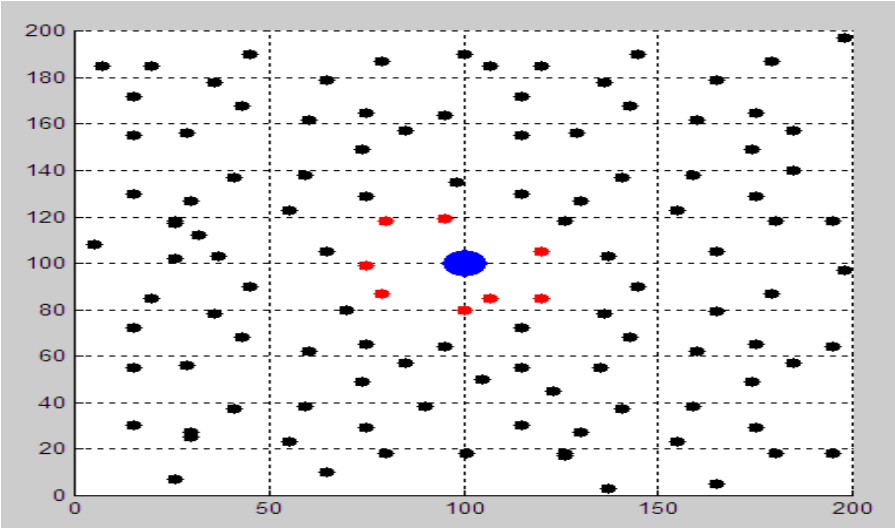

Figure 6.1 Single Sink Deployments in WSN

Single Point of Failure

Most WSNs are deployed with a single sink. Most of sensor nodes in a WSN forward their data to the single sink by using long multi-hop paths. As we see the simulation output below if a sink failure occurs in single sink, the whole operation of the WSN will be halted as it is shown in the simulation out put Figure 6.2

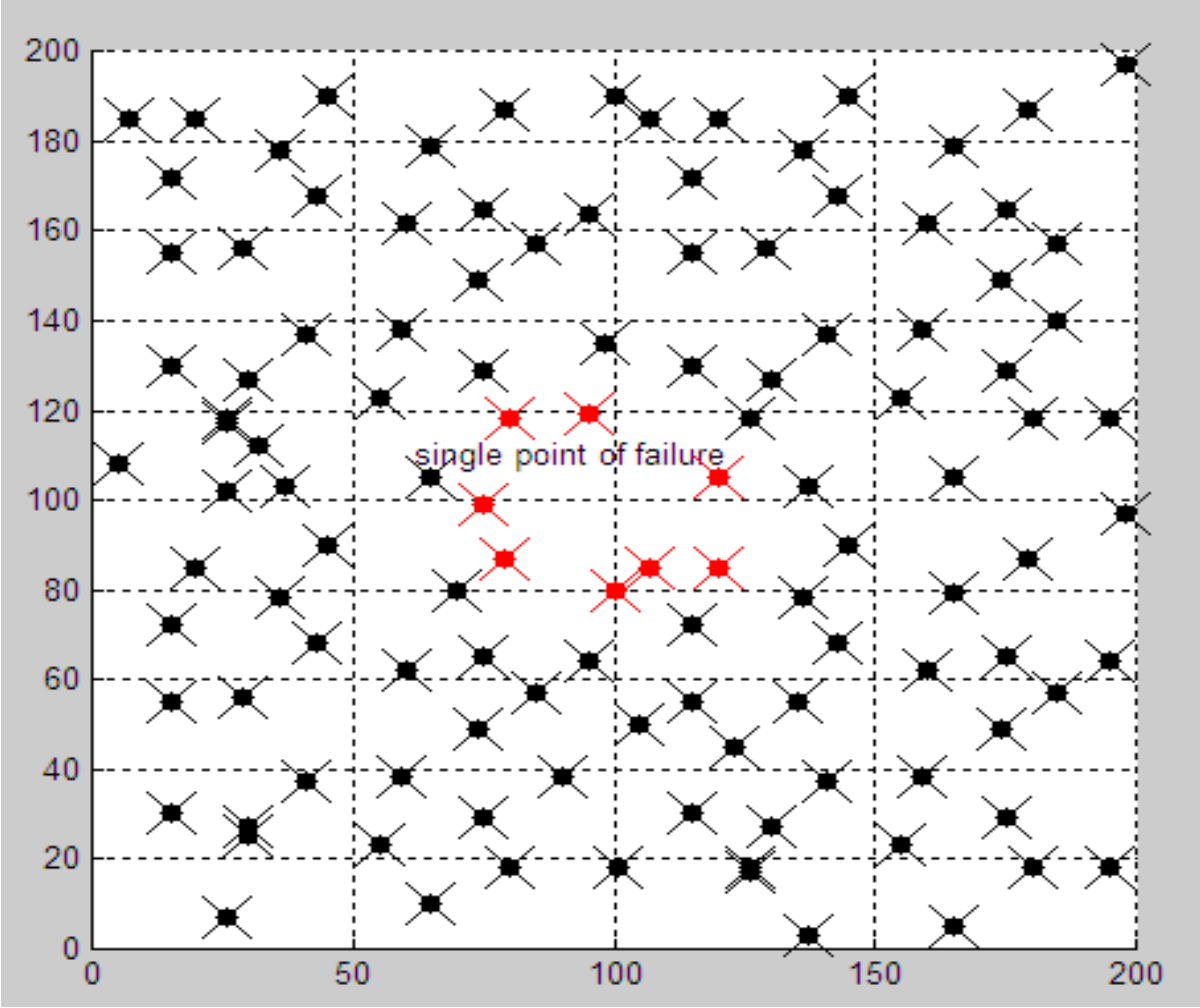

Figure 6.2Single Point of Failure

Partitioning Large Scale WSN into Sub-Partitions

It is clear that this partitioned WSN with multiple sink provide energy efficiency, longer lifetime and quick data delivery to sink. In this partitioned WSN with multiple sink, each node of a particular partition send data to the sink associated with that partition only. In other words it can be assumed that in this partitioned WSN with multiple sink each sub-partition act as a small scale WSN with single sink.In the simulation output shown in figure 6.3 each partition have thirty nodes and singe sink node at the center. In each partition six closest nodes are selected as immediate neighbor nodes .

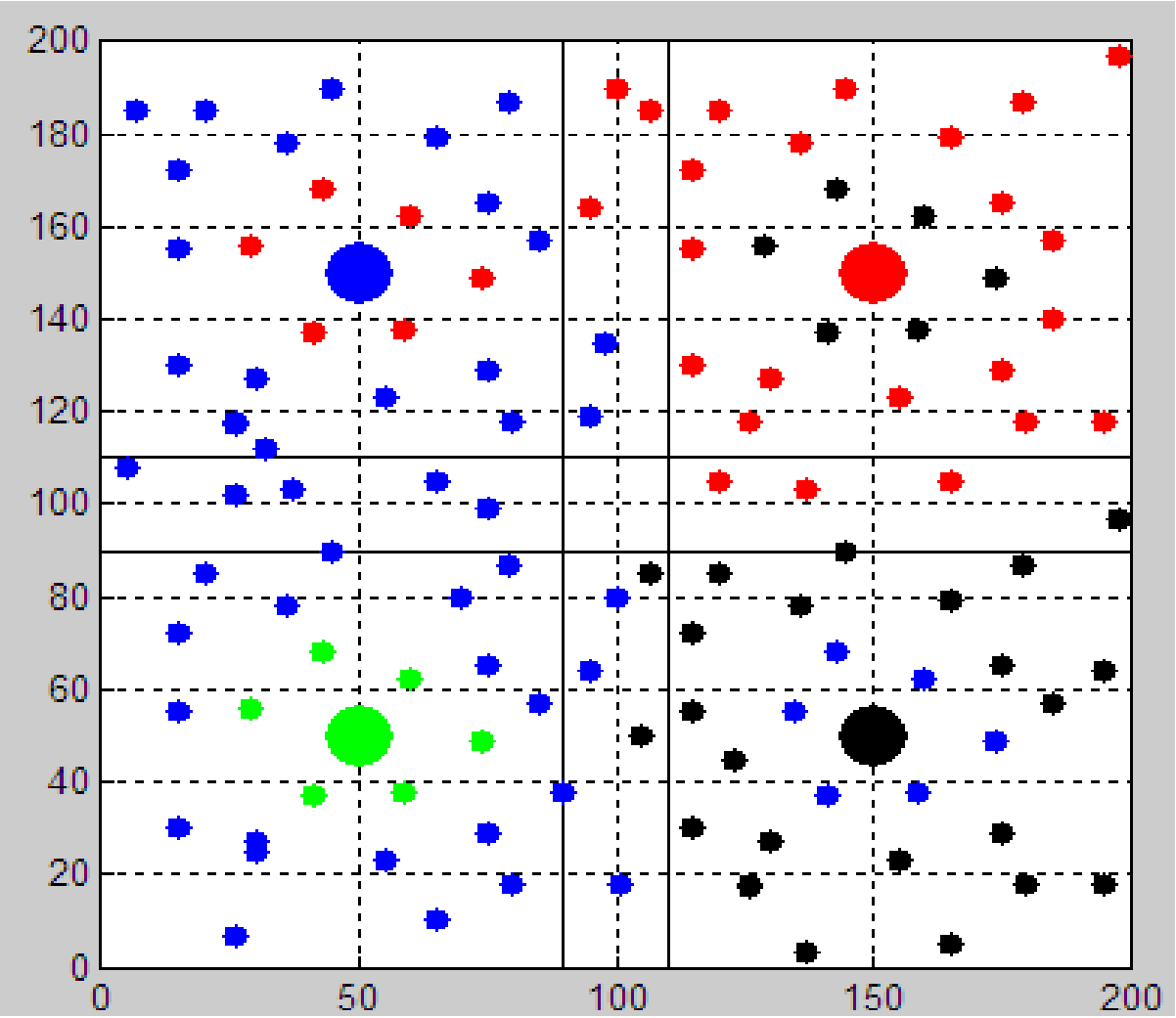

Figure 6.3Multiple Sink Implementations

Single Sink Failure Recovery

Sinks are considered as very robust against failure but sometime due to harsh environment or hardware or software failure sink may fail. If the WSN had single sink, then failure of that sink halts the operation of whole WSN. To solve this problem multiple sinks are deployed. But when one sink fails, the whole operation in that sub partition will be halt .As we see the simulation results in Figure 6.4 our proposed sink fault detection and recovery algorithms overcome the sink failure .Each nodes in the failed sub partition are selected and attach themselves with the nearest alive sinknode .

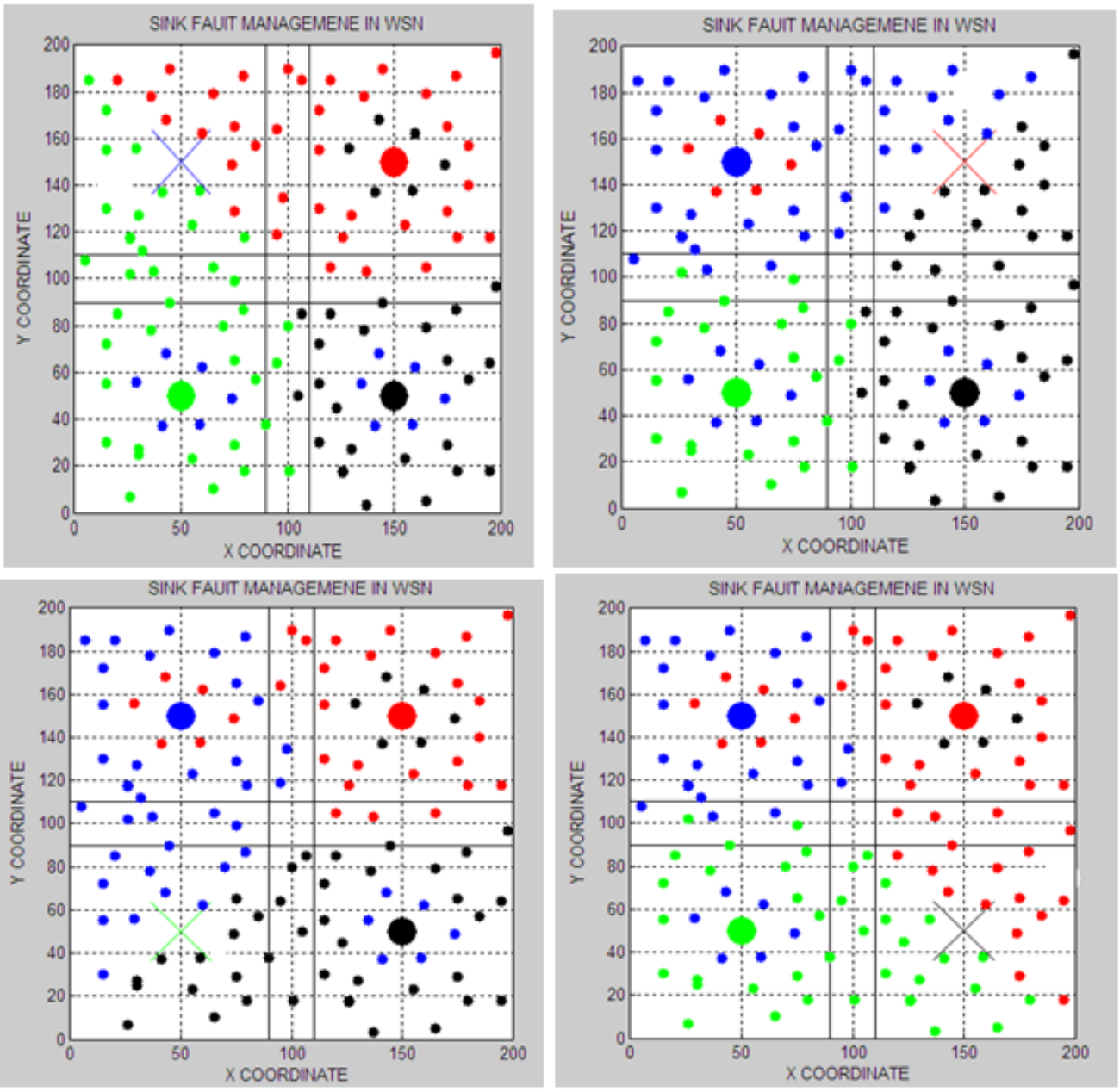

Figure 6.4Single Sink Failure Recovery

Multi Sink Failure detection and recovery

In the simulation output of Figure 6.5 and 6.6 can be seen that the proposed fault tolerance algorithm discussed in Section 5.6.1 and 5.6.2 can recover multiple sink failures until a single sink is left. From the simulation output Figure 6.6.we can see that 3 sinks of the WSN is failed and all nodes are attached to the partition of last active sink.

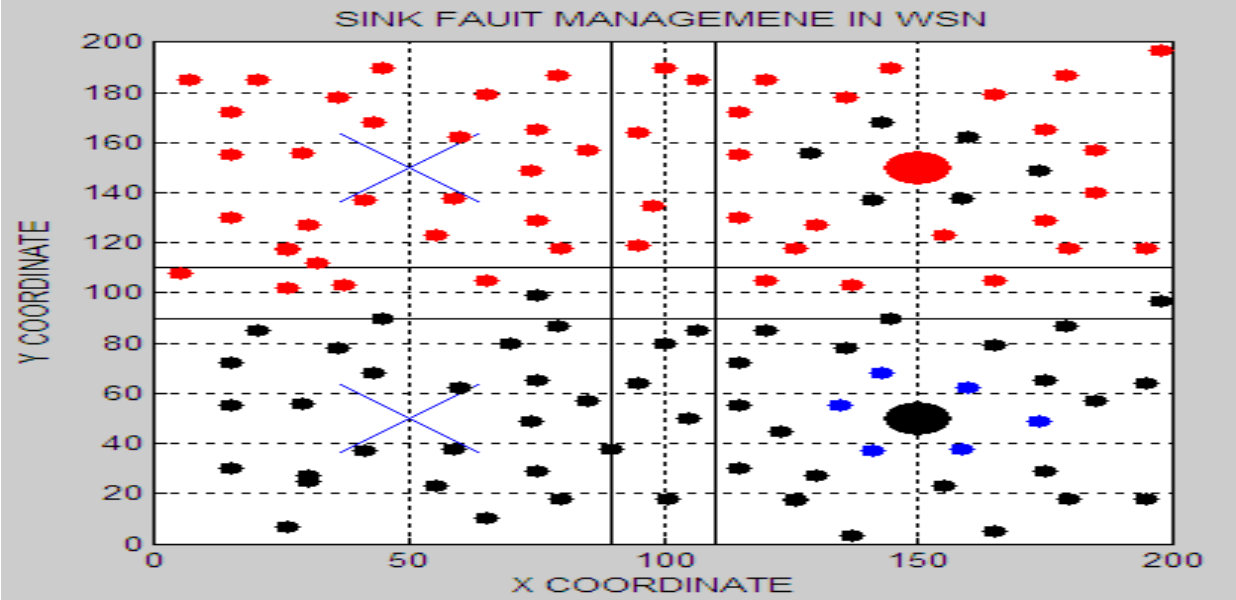

Figure 6.5 Two Sink Failure Detection and Recovery

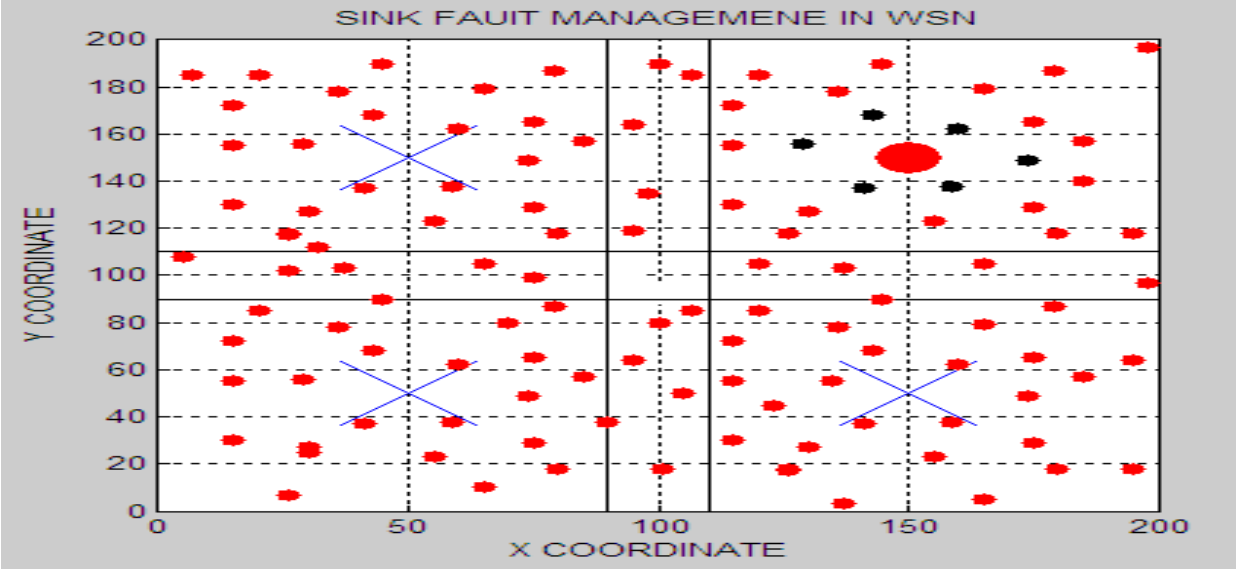

Figure 6.6 Three Sink Failure Detection and Recovery

Immediate neighbor node fault detection and recovery

After the deployment of the sensor network together in a sub partition with all the sensor nodes andthe sink nodes, the minimum energy tree can be calculated according to an energy cost.This tree, however, may need some modifications during the lifetime of thenetwork. The Immediate neighbor sensor nodes that are close to the sink nodes are loaded more compared tothe leaf nodes, resulting the nodes may die soon because they relatively have higher energy consumption than other nodes .Not only because of energy dissipation and also many cause of faults mentioned in

Section 4.2.Thereforeto prolong the life time of WSN according to our proposed algorithmmentioned in Section 6.6.3,the sink will select the nearest node to the failed node as its on hope neighbor as the simulation result shown in Figure 6.7.

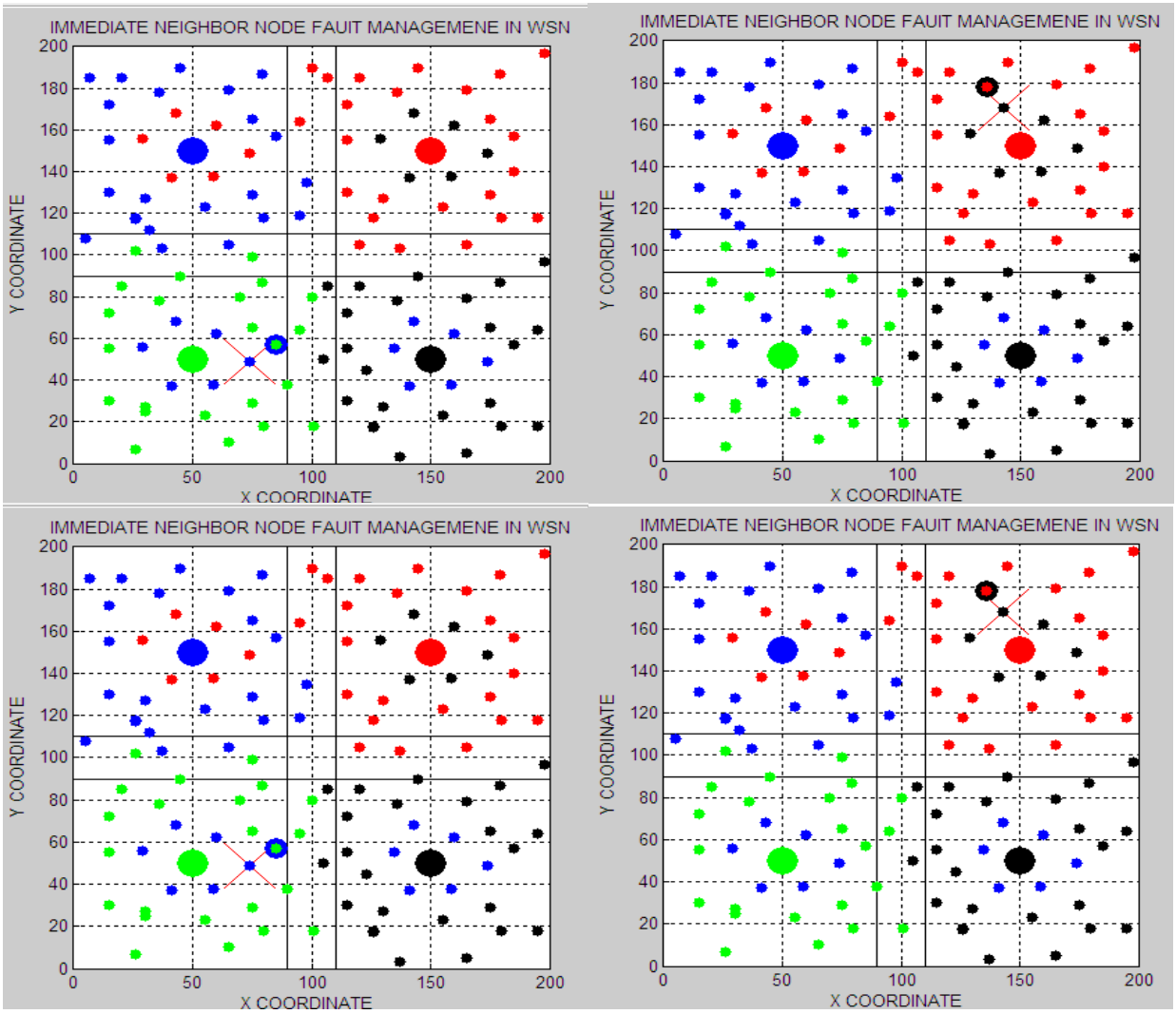

Figure6.7 Immediate Neighbor Node Fault Detection and Recovery

Simulation on Life Time of An Immediate Neighbor Nodes Versus Number of Branch Nodes

Parameter Values and assumption

The sensors are assumed to use 800 mW transmission power for a 200 m radio range in open air ($\alpha = 2$). The initial battery capacity of the sensors is chosen to be 1540 J. In [43], it is given that for an alkaline-manganese dioxide battery, the typical volumetric energy density is 428 Watt hour per liter. In other words, a battery of size one cubic centimeter would have the capacity 1540 J. The sensors are assumed to perform independent readings, and therefore independent packet generations. The packet generation process is assumed to be a Poisson process with rate $\lambda = 1$ packets per hour. The energy model in Equation 2.6 is used to calculate the average energy spent at each sensor node for one packet transmission. We have considered 20 overhead energy. Using the Equation 5.23, we can evaluate the life time of the immediate neighbor node with respect to the number of branch node attached it

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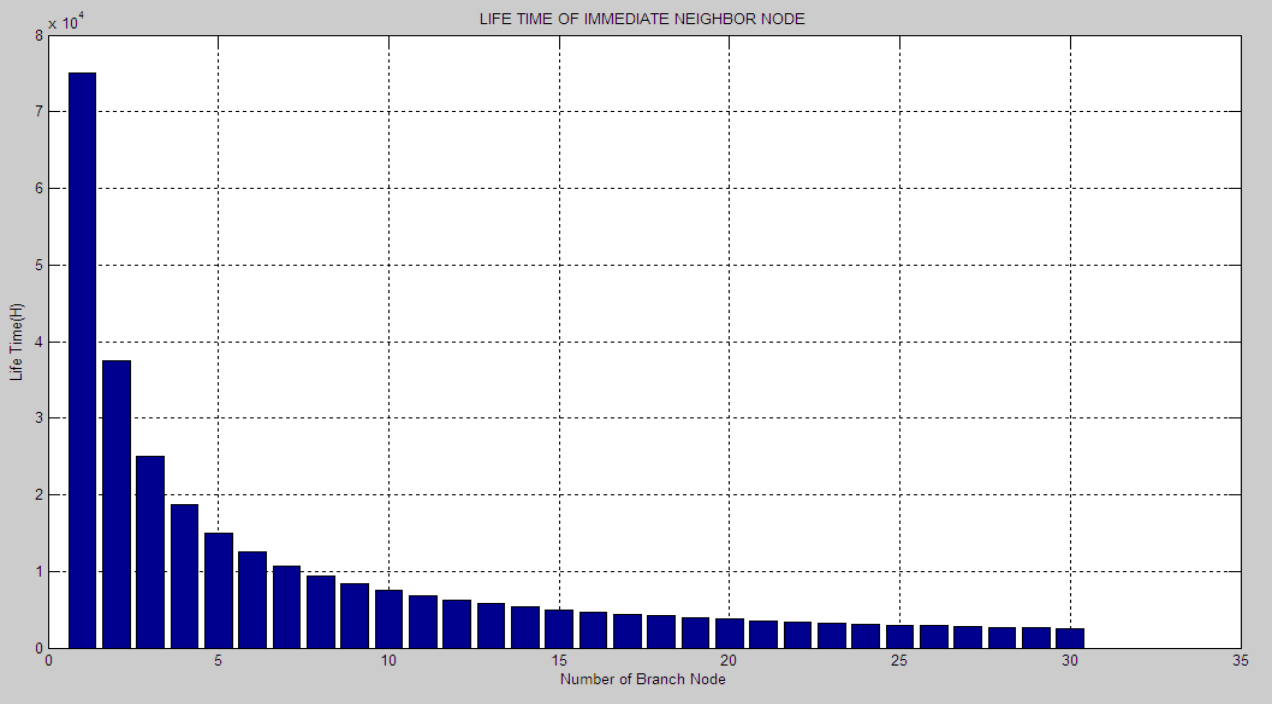

Figure 6.8 Simulation Graph of an Immediate Neighbor Nodes Life Time Versus Number of Branch Nodes

As we have discussed in chapter five, each intermediate node in the multi-hop path has to transmit and receive the packet which consumes energy. The energy consumption of intermediate neighbor node depends on the number of branch node employed to them. As the number of branch nodes increases, the energy consumption of the immediate neighbor nodes also increase. This will decrease the life time of immediate neighbor node and as well as the life of the network.

In the Figure 6.8 Simulation result we can see that as the number of branch of immediate node increase, the life of these nodes will highly decrease or diesoon. Take a single sink scenario in Figure 6.1, we have 120 nodes .Out one hundred twenty nodes six of them are immediate nodes so if we consider that an average number of branch node employed in a each immediate nodes,each of them would have twenty branch nodes.From the simulation result we can see that each of immediate nodes will have 3570 hour life time

Take multiple sink scenarios in Figure 6.2, thirty nodes are deployed in each partition six of them are immediate neighbor nodes . If we consider that an average number of branch node employed in an immediate node ,each of them would have five branch . From the simulation result we can see that eachof them will have more than 15000 hour life time . Therefore deploying multiple sink increases the life time of the WSN. As we can see from the simulation result in Section 6.7, In addition to deploying multiple sink ,the propose fault tolerance algorithm prolong the life time of the immediate neighbor nodes by selecting another nodes as its one hop neighbor if faulty node is detected due to energy dissipation or other fault source discussed in Section 4.2

Conclusion and Recommendation for Future Work

Conclusion

WSN consist of a large number of low power low cost tiny sensor nodes. These sensor nodes randomly deployed in a region and they collect information and send them to the sink using multi hop path.Inorder to minimize the number of relay nodes and the distance between the source sensor node and sink node, alarge scale WSN should be partitioned and use multi-sink. From the simulation results and analysis it is clear to see that partitioning WSN with multiple sink will minimize the number of branch nods of immediate neighbor nodes .This will maximize the life time of each immediate neighbor node.

The lifetime of the sensor network is closely dependent to the lifetime of each immediate neighbor nodes. Whenever these node failure occurs, all the branch nodes would be unreachable until a new route discovery process is initiated. Therefore, the proposed fault algorithm further prolongs the lifetime immediate neighbor nodes even if there is nodefailure occurreddue to various reason mention before.

Sink nodes are prone to failure due to various challenges. The Wireless communication links of the sink node are often fails. Even the high powered sinks can fail due to harsh environment or hardware or software failure. Therefore fault tolerance is very important in WSN for maintaining QoS for time critical application.This thesis has presented algorithms for WSN which are capable of addressing fault tolerance mechanism of WSN. The algorithm provides a mechanism for detection and recovery from sink failure in a WSN partitioned by approaches described in previous parts.

Recommendation for Future Work

The thesis can be extended to introduce some new concepts to solve different challenges and issues of WSN.

- One future scope of this thesis is to introduce sink mobility. If sink mobility is introduced then it may help to further achieve energy efficiency, increase network lifetime and support quick data delivery. After recovery from sink failure the sub network size increases and as a result the minimum path to sink and the number of brunch node of the immediate node also increases. Accordingly the lifetime WSN will decrease. Sink mobility can solve this problem by collecting data by moving from one location to another using some mobility pattern.

- Another prominent future scope of this thesis is introducing node mobility. If node mobility is achieved then node failure can be handled by moving a node from a dense area to the failed area.

Reference

A Survey of Geocast Routin Protocols, www.comsoc.org/livepubs/surveys/public/2004/apr/maihofer.html

Braginsky D, Estrin D (2002) Rumor routing algorithm for sensor networks Proceedings of the *1st ACM international workshop on Wireless sensor networks and applications*, Atlanta, Georgia, USA

Bulusu, N., J. Heidemann and D. Estrin , "GPS-less Low Cost Outdoor Localization for Very Small Devices," *IEEE Personal Communications Magazine*, Vol. 7, No. 5, pp. 28-34, October, 2000.

Camalie Vineyards, www.camalie.com

Capkun S, Hamdi M, Hubaux J (2001) GPS-free positioning in mobile ad hoc networks. *IEEE*, Washington, DC

Chan H, Perrig A (2003) Security and privacy in sensor networks, *IEEE Computer*, October, 2005

Chessa, S. and P. Santi, 2002. "Crash faults . identification in wireless sensor networks", *Compute. Communication*. 25(14): 1273-1282.

Ding, M., D. Chen, K. Xing and X. Cheng, 2005. "Localized fault-tolerant event boundary detection in sensor networks", in Proceedings of the 24th . Annual Joint Conference of the *IEEE Computer and Communications Societies* (INFOCOM '05), 2: 902-913, Miami, Fla, USA, March 2005

Doherty, L., K. S. J. Pister and L. E. Ghaoui, "Convex Position Estimation in Wireless Sensor Networks," Proceedings of the *20th Annual Joint Conference of the IEEEComputer and Communications Societies (INFOCOM 2001),* pp. 1655-1663, Anchorage, Alaska,

USA, April 22-26, 2001.

Dr. Thomas Hanselmann (2007) "*Sensor Networks*" http://pi4.informatik.uni-mannheim.de/~haensel/sn_book.pdf

E. I. Oyman and C. Ersoy, "Multiple sink network design problem in large scale wireless sensor networks," in Proc. of *IEEE ICC, Paris France*, June 2004.

Elson J (2003) *Time synchronization in wireless sensor networks*, UCLA

G. Venkataraman, S. Emmanuel, and S. Thambipillai. "Energy-efficient cluster-based scheme for failure management in sensor networks". *IET Communications*, Vol. 2, Issue 4, pp. 528-537, April 2008

H. liu, A. Nayak, I. Stojmenovi´c, "Fault Tolerant Algorithms/Protocols in Wireless Sensor Networks", *Guide to Wireless Sensor Networks, Springer*, 2009.

Hai Liu, Amiya Nayak, and Ivan Stojmenovi´c "*Fault-Tolerant algorithms/Protocols in wireless Sensor Networks*" Department of Computer Science, Hong Kong Baptist University, Hong Kong 2009

Hsin, C. and M. Liu, 2005. "Self-monitoring of Wireless Sensor Networks", *Computer Communication*29: 462-478.

Ilyas M, Mahgoub I (eds) (2005) Handbook of sensor networks: *compact wireless and wired sensing systems*. CRC Press, Boca Raton, FL

Integrated UnderseaSurveillance System (IUSS) http://www.fas.org/irp/program/collect/iuss.htm

J. C. Dagher, M. W. Marcellin, and M. A. Neifeld, "A theory for maximizing the lifetime of sensor networks," *IEEE Trans. on Communications*, vol. 55, pp. 323–332, Feb. 2007

J. Chang and L. Tassiulas, “Routing for maximum system lifetime in wireless ad-hoc networks,” in Proc. of *Allerton Conference communication, Control, and Computing, Urbana, Illinois*, Sept. 1999.

J. Zhu, S. Chen, B. Bensaou, and K. Hung, “Tradeoff between lifetime and rate allocation in wireless sensor networks: A cross layer approach,” in Proc. of IEEE *INFOCOM, Anchorage, Alaska*, May 2007

Lee, W.L. and R. Cardell-Oliver, 2006 WinMS: Wireless Sensor Networ Management System, An Adaptive Policy-Based Management for Wireless Sensor Networks

M. Demirbas, “Scalable Design of Fault-Tolerance for Wireless Sensor Networks,” PhD Dissertation,*The Ohio State University, Columbus, OH*, 2009.

Meena Malik, Dr. Yudhvir Singh, Anshu Arora. Analysis of LEACH Protocol in Wireless Sensor Networks. In proceedings of *International Journal of Advanced Research in Computer Science and Software Engineering*, Volume 3, Issue 2, February 2013.

Paradis, L. and Q. Han, 2007. “A Survey of Fault Management in Wireless Sensor Networks J. Network and Systems Management, *Computer Communication*15(2): 171-190

Savvides, A., C. Han and M. B. Srivastava, “Dynamic Fine-Grained Localization in Ad-Hoc Networks of Sensors,” Proceedings of the *7th Annual Intl. Conf. on Mobile Computing and Networking (MOBICOM ’01)*, pp. 166-179, Rome, July 16-21, 2001.

Savvides, A., H. Park and M. B. Srivastava, “The Bits and Flops of the N-hop Multilateration Primitive for Node Localization Problems,” Proceedings of the First *ACM International Workshop on Wireless Sensor Networks and Applications (ACM WSNA 2002*), pp. 112-121, Atlanta, September 28, 2002.