FACTORS AFFECTING THE ADOPTION OF APPROPRIATE BUILDING MATERIALS AND TECHNOLOGIES (ABM&Ts) PROGRAMME IN NORTH EASTERN PROVINCE OF KENYA

BY

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DECLARATION

This research project is my original work and has not been presented for an award in any other university.

02/08/2012

Boniface Mutuku Mule **Date**

L50/64841/2011

This research project has been submitted for examination with my approval as the University Supervisor.

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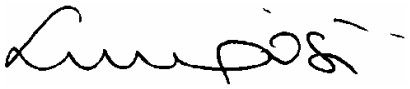

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DEDICATION

I would like to dedicate this Masters Research proposal to my wife, Mrs Hellen Mutuku. There is no doubt in my mind that without her continued support and counsel I could not have completed this process.

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First and foremost I thank the Almighty God for giving me this golden opportunity and good health till the completion of my studies. I would also like to acknowledge the inspirational instruction and guidance of Dr. Joash Migosi and the initial impetus to study the factors affecting the adoption of Appropriate Building Materials and Technologies in North Eastern province of Kenya. This man gave me a deep appreciation and love for the beauty and detail of this subject. I would also like to acknowledge the support and assistance given me by The Ministry of Housing and my co-workers there. The Ministry of Housing has been very generous in their support of my academic pursuits and many of my co-workers have contributed ideas, feedback and advise. Special thanks also goes to my brother-in-law Meshack, a third year Bachelor of Business Management and IT student in Kabarak University, who tirelessly went through the work for editing and correction. Finally, I would like to thank my children, Jeniffer, Brandy and Mcdonald for their support and encouragement. I could not have completed this effort without their assistance and tolerance.

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ABBREVIATIONS AND ACRONYMS

ABM&Ts	Appropriate Building Materials and Technologies.
BDD	Block Dry Density.
BMTPC	Building Material Technology Technology Promotion council.
CBO	Community Based Organization
HABRI	Housing and Building Research Institute
ISSB	Interlocking Stabilized Soil Block.
NEP	North Eastern Province
SIP	Structured Insulated Panels
SPSS	Statistical Package for Social Sciences.
TWA	Total Water Absorption.
UNHCR	United Nations High Commissioner for Refugees.
WCS	Wet Compressive Strength

ABSTRACT

Despite the government effort to introduce appropriate building materials and technologies to avert the poor housing situation in the country at large, the people of North Eastern Province have adopted but at slow rate compared to other provinces. This research is performed to determine the factors affecting the adoption of Appropriate Building Materials and Technologies (ABM&Ts) in North Eastern Province of Kenya for improved housing and shelter situation. The study was necessitated out of the problem that there had been low uptake of the appropriate building materials and technologies (ABM&Ts) in North Eastern province compared to other provinces of the Republic of Kenya.

This study reviewed existing literature and examined the motivation for this work and tried to justify why research in ISSB is of great importance to Kenya and the world. It is interesting to note that most of those who have researched on ISSB point out and agree that soil is a very important component of building construction. The conventional method of building construction has been that of stone, steel, corrugated sheets among others but very few people have thought about soil being a source of durable building blocks. This was the case in Kenya until the year 2006, when the Government launched an ambitious programme to sensitize the people on ABM&Ts programme including the North Eastern province. The population of study was the groups and individuals who were trained on this programme since 2008 when it started in the North Eastern province. The number of people tha had already been trained was 200. The researcher sampled 100 trained people selected using simple random sampling. Since it was not possible to cover the whole of North Eastern province, the researcher selected Garissa and Wajir counties as the study areas. Data was collected using the questionnaire as the main instrument although guided interviews and observations was also used to gather knowledge and information.

Since the study was a descriptive research survey design, analysis of data was done using SPSS software where descriptive statistics, tabulations, percentages, and percentages were generated. Most of the findings of this study agreed with the objectives as had been drawn. The objectives also agreed with literature review bu there were small deviations from the expected results.

The study concluded that ABM&Ts programme has a great potential in reducing the cost of building and help in the improvement of housing in North Eastern province. Therefore to improve its adoption, stringent evaluation of it adoption has to be carried out. However,

training on ABM&Ts will continue to play a pivotal role in the adoption of this programme as well as in an effort to raise a critical mass that can enhance wide application of ABM&Ts.

CHAPTER ONE
INTRODUCTION

1.1 Background to the Study

The struggle for housing and other basic needs has increased progressively as the human race advances in numbers and cultural diversity. The right to adequate housing is a universal right, recognized at the international level and in more than one hundred national constitutions throughout the world. It is a right recognized as valid for every individual person. The Universal Declaration of Human Rights of 1948 recognizes the right to adequate housing as an important component of the right to adequate standard of living (Ouda 2009). This has been further reaffirmed by subsequent various international instruments including the International Covenant on Economic, Social and Cultural Rights of 1966, the Istanbul Declaration and Habitat Agenda of 1996; and the Declaration on Cities and Other Human Settlements in the New Millennium of 2001. In all these instruments, housing is understood in the broader context of the shelter fabric together with the living environment (National Housing Policy for Kenya, 2004).

For the U. N. Commission on Human Settlements (UN-Habitat) and the Global Strategy for Shelter, "'shelter for all' means affordable shelter for all groups in all types of settlements, meeting the basic requirements of affordability, tenurial security, structural stability and infrastructural support, with convenient access to employment and community services and facilities". It is to be emphasized that the U.N. has organized two world conferences (in1976 in Vancouver and in 1996 in Istanbul) on human settlements during which declarations and action plans were adopted with the purpose of solving the problems of adequate housing in the world.

According to Ministry of Lands & Housing 2004, improvement of housing for the Kenyan population is a major concern not only to the Government but to all stakeholders. This concern has been influenced by the fact that the improvement in housing situation is a strategically important social and economic investment. In addition, well-planned housing and infrastructure of acceptable standards and affordable cost when combined with essential services affords dignity, security and privacy to the individual, the family and the community as a whole. Adequate shelter also prevents social unrest occasioned by depravity and frustrations of people living in slums and informal settlements.

Besides this social function, housing is also an investment good contributing both directly and indirectly towards poverty reduction through employment generation, raising of incomes, improved health and increased productivity of the labor force. Housing is one of the

principals sectors that would revitalize the economic growth in Kenya with the shelter being recognized as one of the tools of development. Investment in housing and the related infrastructure and services have effects on the national income that go far beyond the direct investment itself by triggering forward and backward linkages through additional investments in the building materials production, transportation, marketing and Jua Kali (fabrication of construction materials).

Investment in the sector has a multiplier effect of 7 to 9 times on Kenya's economic development.(Ministry of Housing 2006). It is therefore important that each and every individual or family lives in decent affordable housing, whether publicly or privately developed, to meet the necessary requirements of security, health and privacy. The construction industry is faced with escalation of prices of construction materials because of the rise in cost of Diesel and electricity. This situation is worsened by the fact that the manufacture of construction materials in bulky is centralized in some major towns and have to be transported up to rural areas. The end result is that most of the conventional materials available in the market today become unaffordable to the ordinary person and hence a decrease in production of decent housing stock to match the rapidly growing population in our country.

Other factors that contributes to the deficit of housing in Kenya includes low level of investment in the sector by both public agencies and the formal private sector with housing units produced by both sectors representing only an estimated 20 per cent of the total number of new urban households.(Ministry of Lands and Housing 2004) Likewise, rapid urbanization, inaccessibility to land and housing finance, stringent planning regulations, restrictive building standards, high cost of infrastructure, poor economic performance and increased poverty contributes to the national housing shortage.

Table 1.1 below shows the percentage of the walling materials used for constructing houses in Kenya which clearly shows that, a substantial number of houses require improvement and ABM & T can play an important role in their improvement.

Table 1.1: The percentage distribution of houses by walling material in rural and urban areas

	Stone	Brick/ Block	Mud/ Wood	Wood only	Corrugated iron sheet	Grass	Tin	Others
Kenya	14.3	16.7	45.4	10.2	3.5	2.9	0.3	1.6
Rural	6.5	14.5	54.0	12.1	2.3	3.7	0.2	2.0
Urban	37.9	23.3	19.4	4.7	7.0	0.4	0.4	0.2

Source: Kenya Integrated Household Budget Survey (2006)

This study examined the factors affecting the adoption of ABM & T programme in improving housing situation in North Eastern province and focussed on Stabilized Soil Blocks (SSBs) for walling.

1.2 Statement of the Problem

According to the Population and Housing Census of 2009, the number of households in Kenya stands at 8,738,097 households and only 34 % of these households have used stones and bricks as their walling material This means that, 64 % of uses will require improvement. The demand for housing in urban areas in Kenya is estimated at 150,000 but only an estimated annual average supply of only 30,000- 50,000 units is expected to be produced if the factors that constraints housing production are not addressed. A further 300,000 housing units will require to be improved annually in the rural areas (National Housing Policy for Kenya 2004). The housing deficit derives from low level of investment in this sector by both the public and private sector with both sectors accounting for 20 % of the total number of new urban households.

Most of the past strategies to address the housing shortage have failed and one of the strategies the Government of Kenya through the Ministry of Housing has employed in order to increase the housing stock as well as improve the dilapidated houses is the introduction of ABM & Ts programme which started in 2006. This programme aimed at addressing the high building costs by facilitating the provision of improved and affordable housing in both urban and rural areas. ABM & Ts addresses poverty reduction through enhanced living/housing conditions and promotion of related income generating activities. The Ministry of Housing has been able to establish Sixty two Centres countrywide and six centres in North Eastern by the end of the year 2012 and plans to construct one centre in every constituency by the year 2030.

By March 2010, 82 Hydraform machines for the production of ABM & T have been procured for use by Wananchi through the Centres. Training workshops have been conducted throughout the country to transfer skills and empower community groups to construct affordable houses, social facilities and other utilities. Ten ABM & T training workshops has been conducted in North Eastern five of which involves organized community based organizations like women groups and youth groups and one involves individuals coming together for training. A total of 200 people have been trained on the technology.

A study conducted by the ministry of Housing to assess the uptake Appropriate Building technology (ABM&T) in the eight provinces i.e. Coast, North Eastern, Eastern, Central, North Rift valley, South Rift valley, Western, and Nyanza provinces in March 2010, showed the North Eastern lagging behind in all the other provinces.

The study focused on key Areas like the rate of borrowing of Hydraform Machines, the prevalence of use Stabilized Soil Blocks, the rate of follow-up by trainees themselves on what they learn during training among other parameters. It was observed that the people of this region despite the Ministry of Housing attempt to ensure that they move at par with the rest of the other Kenyans in terms facilitation to access of decent, affordable shelter in a sustainable environment, things were sluggish (Provincial Housing officer 2012).

After scanning through literature, it was found that, no other study had been commissioned to investigate the low uptake of this wonderful technology by builders in the North Eastern Province. Therefore this study brought out more light as to the factors affecting the adoption of Appropriate Building Materials and Technology in North Eastern Area for the improvement of shelter. The target population was individuals already trained on Appropriate Building Materials and Technologies in North Eastern Province since 2008. The subject of study was these trained individuals since they are the ones who knew the existence of alternative building technologies (ABM&T). This, therefore study sought to establish the factors that affect the adoption of ABM & T programme in North Eastern Province (Provincial Housing officer NEP, 2012).

1.3 Purpose of the Study

The primary purpose of the study was to examine the factors influencing the adoption of ABM & Ts programme in the improvement of Housing situation in North Eastern Province and it focused on trained groups and individuals in the province.

1.4 Objectives of the Study

The broad objective of this study was to examine the factors influencing the adoption of Appropriate Building Materials and Technologies (ABM & Ts) programme in improving housing situation in the North Eastern province of Kenya.

The specific objectives of the study were:-

i. To assess the extent to which access to training on ABM & Ts influences the adoption of ABM & Ts programme.
ii. To determine the extent to which access to ABM & Ts equipments influences the Adoption of ABM & Ts.
iii. To assess how the cost of construction materials influence the adoption of ABM&Ts
iv. To establish whether transport costs influences the adoption of ABM & Ts.
v. To ascertain whether perception of the quality of ABM & Ts affects its adoption.

1.5 Research Questions

The study was guided by the following questions:-

i. How does ABM & Ts training influence its effective adoption?
ii. How does access to ABM & Ts equipments influences the adoption of ABM & T?
iii. Does the cost of construction materials influence the adoption of ABM & Ts?
iv. Do transport costs influence the adoption of ABM & Ts?
v. Does the perception on the quality of ABM & Ts affect its adoption?

1.6 Basic Assumption of the Study

The study was guided by the following assumptions:-

i. That there was to be co-operation from the officials of various groups, the members of these groups and the individuals trained on ABM & T.
ii. That the respondents would be able to understand the questions correctly and answer them well.
iii. The researcher would be able to access all the respondents that were sampled in this study.

1.7 Significance of the study

For the different stakeholders in the housing sector, the study on the factors that affect the Adoption of Appropriate Building Materials and Technologies (ABM & T) for improved housing situation are very important because it would be a means of disseminating this technology thus making the stakeholders aware of the availability of this technology.

For the Government of Kenya, the study would help in identifying the factors that influence the Adoption of ABM & T. It would help the Government in reviewing the adoption of the ABM & T programme and give guidance in decision making as well as policy formulation. It could also be used as a basis for packaging the ABM & T to benefit entrepreneurs interested in setting up small, medium and large scale plants for making building materials and equipments.

The study would likewise provide concrete information about ABM & T and especially to potential users of the ABM & T in order for them to make informed decisions about ABM & Ts. The study would contribute to the body of knowledge in the subject of ABM & T in improving housing situation and other students/scholars could use it as a reference.

1.8 Limitations of the Study

The study was to be faced by the following limitations.

i. Location of the respondents identified in the sample was a hindrance to the study and especially those who were trained much earlier in this programme and specifically in Garissa County.
ii. Early in the programme, telephone numbers were very rare and therefore, few participants indicated their telephone numbers.
iii. Transport constraint. Since the groups and the respondents were located in the vast areas of the province, a lot of time was wasted in travelling.
iv. Level of literacy was another constraint with some respondents unable to read and write and therefore they rely on other people to answer the questionnaire.
v. Time to conduct the research was also a limitation. This called for proper time management considering the vastness of the area to be covered.

1.9 Delimitations of the Study

The limitations that faced the study were overcome in these ways:-

i. The chairman of Garissa Youths, who is also the leader of many community Programmes and chairman of youth umbrella CBO, was instrumental in locating the

respondents. He was able to network and locate all the respondents through the photographs taken during the training and especially the group photo at the end of the training.

ii. The transport constraint was eased by arranging to visit groups that are located in one general area together so as to save on time.

iii. Those respondents who could not read and write were helped by their relatives. They read and interpreted the questions for them and wrote the answers for them as well.

iv. Time constraint was overcome by proper time management where groups in one general area were visited around the same time instead of making repeated visits.

1.10 Definition of Significant Terms

Appropriate Building Technologies and Materials (ABM&Ts)

Appropriate Building Materials and Technologies (ABM&T) refers to building processes, materials and tools that are cost-effective, safe, innovative, green/environmentally friendly as well as acceptable to the climate, socio-economic conditions, and natural resources of an area. In this study, ABM & T referred to Interlocking Stabilized Soil Blocks (ISSBs) for walling Interlocking Stabilized Soil Blocks (ISSBs).

Interlocking Stabilized Soil Blocks referred to construction blocks made of a mixture of soil and a stabilizing agent and it's compressed by different types of manual or mechanized press machines. For the purposes of this study, the machine of was the Hydraform machine of South Africa.

Stabilizing Agent

This refers to the supplements or forces to the soil in order to make the soil more water proof and stronger. The quality of the block depends on the properties and mix of soil types, the amount of force applied for compaction, and the addition of chemical or natural products to further stabilize and strengthen the blocks. For the purposes of this study, cement was our stabilizing agent.

Perception

This refers to the immediate or intuitive recognition or appreciation, as of, psychological, or aesthetic qualities; insight; intuition or discernment of Appropriate Building Materials and Technologies as compared to other conventional construction Materials. The perception

ABM&Ts by an individual also refers to the impression one has on the technology though one individual's perception may not necessarily be another one's perception.

Dissemination

To disseminate means to disperse throughout; to spread awareness. The Dissemination of Appropriate Building Materials and Technologies is done to communities through organized training to groups or individuals in order to for the information to reach as many people as possible.

Conventional Building Technology

This refers to the technologies pertaining to convention or general agreement; established by general consent or accepted usage. A conventional method of construction is one that has been in use for a long time. The most common conventional materials of construction are stone, timber, sand, Bitumen, steel among others.

Accessibility

Accessibility is strongly related to universal design when the approach involves "direct access". This is about making things accessible to all people. An alternative is to provide indirect access by having the entity support the use of a person's assistive technology to achieve access .When we refer to the accessibility of Appropriate Building Materials and Technologies to the communities; it means the direct provision of training and Equipment to everybody in the community without denial of the same.

Adequate Shelter for All

Is the provision of shelter and infrastructure for all communities as envisaged by both local and international groups of action to end the phenomenon of informal settlements like slums and Manyattas? This calls for participation at all levels by everyone and by Governments allocating resources to improve lives in terms shelter provision for all.

1.11. Organization of the Study

This study is organized into in five chapters. Chapter one outlines the background to the study, the statement of the study, the purpose and the objectives of the study, as well as the delimitation of the study and how they were overcame.

Chapter two outlines the key theories of the literature review as per the objectives of the study which are: - To assess the extent to which access to training on ABM & T influences the implementation of ABM& T., to determine the extent to which access to ABM & T equipments influences the implementation of ABM & T, to assess how the cost of construction materials influences the implementation of ABM & T., to establish whether transport costs influences the implementation of ABM & T. and to ascertain whether conceptions on the quality of ABM & T affects its effective implementation.

Chapter three gives the research design, the target population as well as sample size and sampling procedures. It also outlines the data collection methods, the validity and reliability of data collection instruments and the operational definition of variables.

In chapter four, the data collected is presented, analyzed and interpreted as per the objectives of the study while chapter five has given the summary and discussions of findings, recommendations and the areas for further research.

CHAPTER TWO
LITERATURE REVIEW

2.1 Introduction

This chapter briefly outlines the motivation for this work and explains why research in ISSB is of great importance to Kenya and human beings. It focuses on the characteristics, advantages and the disadvantages of the ISSBs. It also focuses on the need to understand the factors affecting the adoption of ABM & Ts so as to strengthen and harness this programme which is important for sustainable and cost effective construction and improvement of houses. In undertaking the literature review, the researcher relied greatly on written books, brochures, journals and various articles on the internet.

2.2 Background to Appropriate Building Materials and Technologies

Earth or soil is the oldest material used by man for construction purposes. People have used their native ingenuity to develop forms utilizing soil ranging from the extremely simple to highly complex. They have used the material in response to varying resources, social needs and site conditions (Al- Sakkaf, 2009)

Soil has always been the most widely used material for building in Kenya and is a part of its culture. Traditionally, mud construction varies enormously with topography, traditions and needs of different regions. The most commonly used earth construction however is mud and wattle and in some places burnt bricks (HABRI, 2003)

In Kenya soil is mostly considered as a poor man's material and it has some disadvantages such as:-

1. Low durability.
2. Water penetration.
3. Erosion of walls at level by splashing of water from ground surfaces
4. Attack by termites and pests
5. High maintenance requirement

According to the Housing and Building Research Institute (HABRI) of the University of Nairobi,(2003)the compressed earth block overcomes these limitations by an increase in block density through compaction using a mechanic press. The water content in the soil is low for compaction as compared to the puddle clay required for mud bricks and ensures much greater dimensional stability.

Ouda (2009), concurs and adds more advantages of soil blocks such as:-

1. Soil is easily available in virtually every community.
2. Easy to use and construct with.
3. Green and sustainable.
4. Highly affordable and especially in poor countries and cheap to transport.
5. Proven durability. Look at the past.
6. There is little waste generated. And the material is easy to re-use.
7. Energy efficient and fire resistant.
8. Non-stabilized wall could be used instantly, no transport or curing time required.
9. Fire and mold resistant

According to HABRI 2003, ISSB block has the following characteristics;-

1. Has high density which gives it more load bearing capacity and improved water resistance.
2. Is low cost.
3. Is easy to manufacture and can be done by a small group of people.
4. It has low energy consumption because it doesn't require burning.
5. it's also environmentally friendly unlike burnt bricks
6. One can use soil available at the site and
7. It has smooth surfaces

Ouda(2003) adds that, stabilized soil blocks have higher density than concrete blocks, they must be protected from moisture, they are uniform and they have no curing time.

Likewise, Sing and Sing (2011), notes that, stabilized soil blocks have the advantages of low energy and emission, have good thermal insulation, are versatile and they are cost effective. Interlocking Stabilized Soil Block (ISSB) technology is one such technology that is gaining growing recognition, notably in East Africa. Compared with alternatives such as fired brick, it offers lower construction costs at comparable quality, is suitable for a wide range of environments, and dramatically reduces the impact on the environment- (United Nations Centre for Human Settlement (UNHCR) -2009. It's worth to note that most of the buildings constructed using conventional building materials are unaffordable by a majority of our population. This has led to the development of alternative relatively cheap, decent and

durable on site produced materials. These materials include interlocking Stabilized Soil Blocks (ISSBs). (Ministry of Housing 2011).

According to the Building Materials & Technology Promotion Council (BMTPC) of India building materials account for approximately 60% of the total building costs. ABM & T can reduce costs by up to 50% of the materials cost thereby reducing the overall building cost. To be effective, ABM & T have to be complemented with efficiency in layout design, unit designs, appropriate construction specifications, optimization in infrastructure design and minimum project administrative overheads.

The Ministry of Housing in Kenya established the ABM &T Programme in 2006 to address the high building costs by facilitating the provision of improved and affordable housing in both urban and rural areas. ABM &T addresses poverty through enhanced living/housing conditions and promotion of related income generating activities.

There are more Appropriate Building Materials and Technologies available in Kenya such as:

Table.2.1 Materials and Technologies currently under use in the Country

Available from	Technology	Material/Solution
South Africa (SA)	Hydraform machine	Interlocking stabilized soil blocks for walling
Kenya	Manual block press	Interlocking stabilized soil blocks for walling
Kenya	Rammed earth	Walling
Ecuador	Tevi roofing tile vibrator	Micro-concrete roofing tiles
Kenya	Battery roofing tile vibrator	Micro-concrete roofing tiles
Kenya	Zinc/aluminum /silicon (ZAS	Rust-resistant sheets
Kenya	Aluminium	Rust-free sheets
Kenya/SA	Light gauge steel	Walling frames & roofing trusses
Kenya/India	Structural Insulated Panels (SIP)	Cement fibre/polyurethane walling panels
”	Prefabricated concrete panels	Walling
”	Recycled plastics	Posts
”	Powermax cement	Soil stabilization

Source www.housing.go.ke: 14/4/2008

2.3. Trainings on ABM & T and Improved Housing situation and poverty alleviation

Training on ABM & T forms an integral part of ensuring improved houses and impacting important skills which all the trained can use in income generating activities (Hydraform, 2004). It is aimed at disseminating the ABM & T to the general public and to those who need

better housing at reasonable costs. It also aims at increasing the production and utilization of these technologies and materials with a view to improve houses and provide a means of earning a living. (Ministry of Housing 2011).

This training programme is greatly boosted by the Government of Kenya through the Ministry of Housing which provides equipment, fuel and facilitates its officers to mount ABM& T training, demonstration and technical assistance to community groups for free. On the other hand, the beneficiaries are expected to meet the cost of training materials such as soil, cement and water as well as provide labour. Other organizations are also providing training though on a small scale such as ApproTech and Makiga Engineering and this is done mostly on purchase of their Action Pack Block Press machines (Provincial Housing Officer, 2012).

Awareness about the existence of the training is done by ministry of Housing officers, who are supposed to ensure that as many groups in the province are made aware and trained on this technology. It is then after the basics on ABM&Ts are conducted through training that the individuals and groups are supposed to make a follow up and borrow machines for free from the same ministry. The individuals and groups are then expected to produce blocks for their use in improving shelters.(Provincial Housing officer, 2012).

2.4. Access to ABM & T Equipments

Access to ABT & M equipments is critical to the improvement of houses in the province as well as creating a means of earning a livelihood. Access to Hydraform machine is limited to the ones provided by the Ministry of Housing. These machines have the capacity to produce up to One Thousand, Five Hundred (1500) blocks per day (Hydraform-2004) and they can be used for mass production of ISSBs (Hydraform 2005).

However, they are costly to purchase and maintain and they are far out of reach of the poor. The Ministry of Housing has come in handy as they are purchasing them. In North Eastern, the Ministry has twelve of them but they may not be enough to satisfy the growing demand. The ministry is letting people use them for a period for free which is a step forward though this may not be tenable in the long run if the Ministry plans to buy more and ensure this programme is sustainable. The Ministry may need to come up with a business plan for each of the finished ABM & T centres and funds realized used to purchase more of these machines as well as the maintenance of the existing ones. These machines are bought from South Africa (Provincial Housing Officer, 2012)

On the other hand, Action Pack block Press is locally made by local companies like Makiga Engineering. On purchase, a free training in operation and maintenance of the block press is provided as well as how to test the soil and produce Stabilized Soil Blocks.

Action Pack block press costs about Kshs 85,000 and can be accessed by organized groups such women groups and youth groups (Makiga Engineering 2011).

2.5. Cost of Construction Materials

The housing construction industry in Kenya requires affordable building materials and the use of appropriate building techniques to effectively generate more housing. Kenya requires an industrial policy that would promote production and availability of conventional and local building materials like cement, steel, stones, ISSBs and Micro Concrete Roofing Tiles.

Most of the materials produced at the large scale industries are usually expensive due to high electricity cost. Moreover, makers of cement, corrugated sheets, paints and steel products have seen prices of raw materials rise because of a surge in commodity prices brought home by the ongoing global economic recovery. The global recession that started in mid 2008 ended a five-year global commodity price boom of metals, fuels and food which kept the cost of building materials stable and low. The costs of key inputs such as coal, fuel oil and electricity have risen substantially and from this year there will be price increases,"(Pradeep Paunrana 2011).

The current upheavals in the Arab World will also affect negatively the cost of construction materials due to rise in fuel which will have a spiral effect on electricity and other commodities. The rising prices will likewise slow down the construction. The construction industry is facing a steep rise in costs as manufacturers of key building materials raise their prices to factor in high oil costs.

Producers of paints, corrugated sheets, cement and steel bars, all of which take about 30 per cent of construction costs, have seen their expenses soar sharply and they now warn consumers to brace for further price increases as they pass on the additional expenses to consumers (allafrica.com 14/3/2011).

It’s important that the Kenyan Government acts accordingly in order to bring down the cost of construction materials with the aim of increasing the production of housing units. Some of the measures the Government can undertake includes:-

1. Reviewing from time to time the taxation levels on building materials so as to reduce the housing construction cost arising from the building materials.
2. All research actors should harness and document existing locally available building materials and technologies as well as disseminating this information to the users as appropriate.
3. Promote and encourage small-scale enterprises to engage in production and application of the researched materials
4. Promote trainings in requisite skills and construction technologies through youth polytechnics, women groups, youth groups, community based organizations and appropriate building technologies and materials centres (Construction Kenya .com/1664).

2.6. Transport cost

Transport cost constitutes a major construction cost of materials in Kenya. This can be attributed to the long distance of procuring the conventional building materials as well as the bulkiness of the construction materials.

ABM & T is usually produced at the point of use greatly reducing the transport cost of the building materials. It also avoids breakages while transporting the materials thus reducing wastages. (HABRI 2003)

In some instances, the users of these technologies may not find the appropriate soils in near the sites where one wants to construct a house. This leads to the issue of transporting the materials like sand and red soils from another distance place and issue of transport cost aspect (provincial Housing officer, 2012).

2.7. Perception of the quality of ABM & Ts Building Blocks

ISSBs has some basic merits and attractions associated with it such as;-

1. As the basic raw material is soil, its source will remain abundant. This facilitates direct site-to-service application, thereby, lowering costs normally associated with acquisition, transportation and production. Home ownership can then be delivered at comparatively low costs (Nkapa 1997).
2. Secondly, the initial performance characteristics of the material such as the wet compressive strength (WCS) dimensional stability, total water absorption (TWA), block dry density (BDD) and durability are technically acceptable (Hydraform, 2011).
3. Houses constructed of ISSBs also offer better internal climatic conditions than other modern materials (Fullerton, 1979; Hughes, 1983).

4. Thirdly, promoting the use of ISSBs generates more direct and indirect employment opportunities within the local populace than would be in the case with other materials.

Despite these advantages, there is the danger of incorrect perception that ISSBs are not permanent building materials. ISSBs may be strongly associated with the traditional none stabilized soil construction in the minds of many such as the mud and wattle construction.
The table 2.2 below illustrates the Properties of compressed stabilized earth blocks versus other walling materials (Adam, 2001)

Table 2.2 Properties of compressed stabilized earth blocks versus other walling materials)

Property	Compressed stabilized earth blocks	Fired clay bricks	Calcium silicate bricks	Dense concrete blocks	Aerated concrete blocks	Lightweight concrete blocks
Wet compressive strength (MN/m2)	1-40	5-60	10-55	7-50	2-6	2-20
Moisture Movement (%)	0.02 - 0.2	0.00 - 0.02	0.0 -0.035	0.02- 0.05	0.05-0.10	0.04 - 0.08
Density(kg/m3)	1700 - 2200	1400-2400	1600-2100	1700-2200	400 - 950	600 - 1600
Thermal Conductivity W/mºC	0.81 - 1.04	0.70 - 1.30	1.10- 1.60	1.00- 1.70	0.10-0.20	0.15 - 0.70
Durability Against rain	Good to Very poor	Excellent to Very poor	Good to Moderate	Good to Poor	Good to Moderate	Good to Poor

Source: (Adam, 2001; pg 7)

2.8. Problems in the use of ABM & Ts

In contrast to the various positive impacts, other studies have found some problems and negative impacts due to the use of ABM & Ts. Availability of suitable soil for block making is one such challenge. The quality of blocks depends much on the quality of the materials put into the moulds more than the machines. Moreover, more supervision of newly trained individuals in making the block and laying them is necessary to ensure good workmanship.

Re-use of the cavity after soil excavations is another challenge as well as Coping with community skepticism regarding the new technology.

Full impact of the use of this technology in Kenya however has not been documented and enough study has not been done to document the full impact of the use of the technology.

However methods derived from the traditional techniques are being developed to improve the quality of earth construction and broaden the potential for its application. Earth construction is very cost effective, energy efficient (excellent thermal properties and low energy input required for production), environmentally friendly, and safe, qualities which are particularly relevant and important with the ever growing need for increased awareness to reduce energy consumption worldwide (Adams & Agib 2010).

2.9 Conceptual Framework

The conceptual framework outlines the independent variables, the dependent variables and the moderating variables. The independent variables are: - trainings on ABM & T, access to ABM & T equipments, cost of construction materials, perception of the quality of the building blocks, transport cost, socio economic life and culture while the dependent variable is Appropriate Building Materials& Technologies (ABM & T).

The moderating variables are government policy, Local Government by laws and qualified trainers. This research however focused on the independent and dependent variables.

2.9 Conceptual Framework

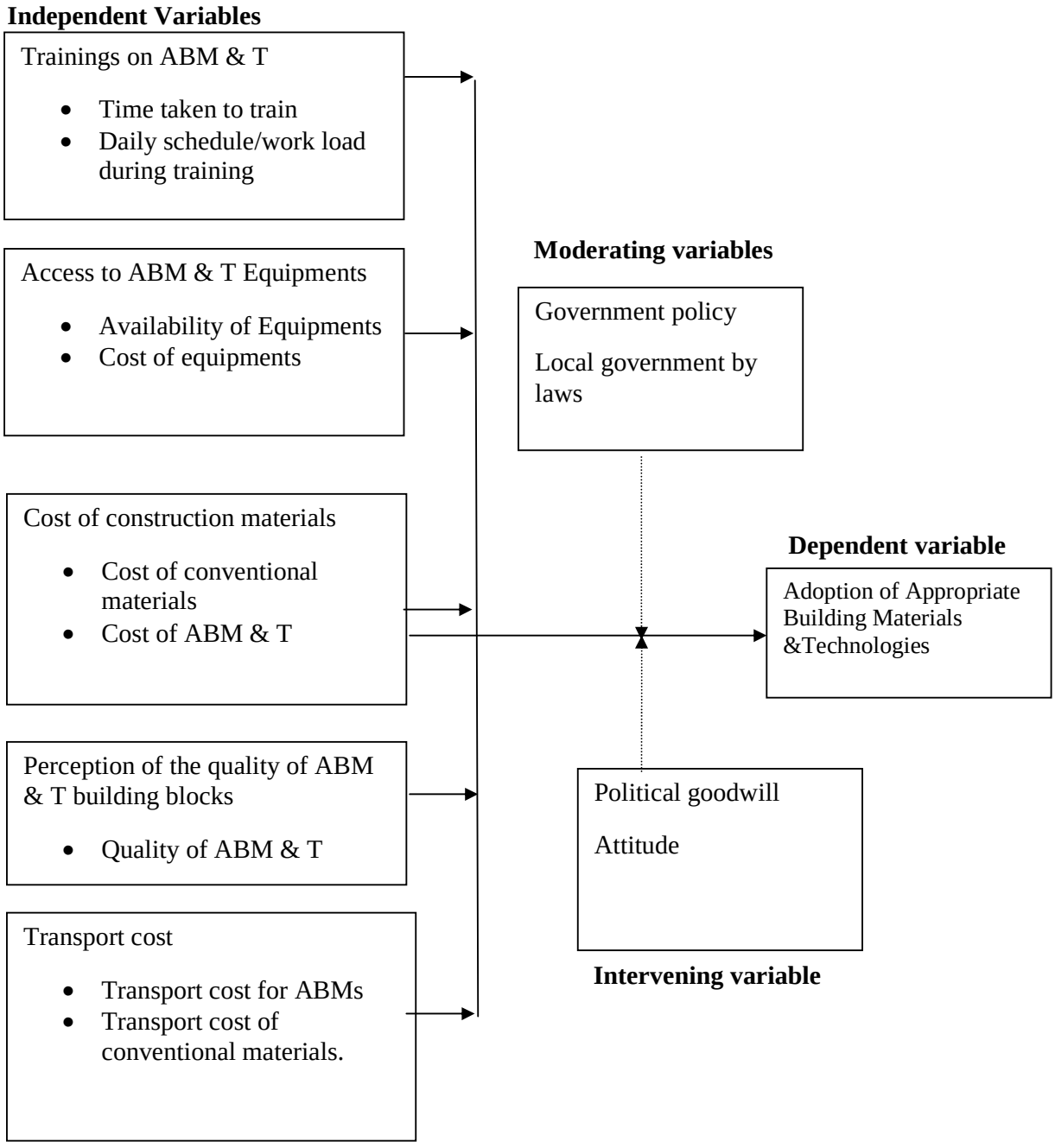

Figure 1: Conceptual Framework

The most critical independent variables are training on the use of ABM & T, access to ABM & T equipments, transport cost and the cost of construction materials. Training goes hand in hand with dissemination of the technologies thus raising awareness on the availability of these technologies. The implementation of ABM & T would be enhanced by creating a critical mass of trained individuals who will in turn be used in its implementation as well as dissemination agents for this technologies and materials.

Since the construction blocks are produced on site, there is minimal transport cost which is an advantage as compared with the transport cost of the other conventional materials like quarry stones. Access to ABM & Ts equipments on the other hand is a big hindrance to the implementation of ABM & Ts. There are no enough equipment and especially the Hydraform machines that are used to produce Interlocking Stabilized Soil Blocks ISSBs)

The implementation of ABM & Ts is likewise negatively affected by the people's perception towards ABM & Ts. There is the tendency to view the ISSBs as a' poor man's construction' (Al-Sakkaf 2009) material which may have a negative influence on the use of ABM & Ts.

Depending on locations, the cost of the construction materials would negatively or positively Influence the adoption of ABM & Ts. In some areas, the cost of the conventional materials is far much cheaper than ABM & Ts and therefore, this technology may not be used in such areas while on the other hand, where the conventional materials are not readily available, ABM & Ts may be utilized more.

2.10. Summary of Literature

The literature has covered the background to ABM & Ts, trainings on ABM & T and improved housing situation and poverty alleviation, access to ABM & Ts equipments, cost of construction materials., conception of the quality of the building blocks (ISSBs).transport cost and the problems in the use of ABM & Ts.

The implementation of ABM & Ts is dependent of the dissemination level in this programme so as to great awareness on the availability of this technologies and materials as well as how individuals and small enterprises will accept or reject the technologies. Its worth to note that, the aim of ABM & Ts is to reduce the cost of construction but this depends on specific localities which will influence the acceptance of or rejection of ABM & Ts.

CHAPTER THREE
RESEARCH METHODOLOGY

3.1 Introduction

The chapter focussed on applied research technique and methods that were used to validate the study objectives. It included research design, the target sample, sampling procedures and methods of data collection. It also looked at the validity and reliability of the data collected the collection tools, and how data was to be presented and the data analysis techniques.

3.2 Research Design

The study was a descriptive research survey design that was meant to describe the factors that affect the Adoption of Appropriate Building Materials and technologies (ABM & Ts) for improved housing situation. The researcher gathered information and attempted to explain the problem as it is found in the field. The study focused on what the respondents would say and do in order to improve their housing situation from ABM & Ts. Therefore, observation also played an important role in documenting any improved houses using ABM & Ts.

3.3. Target Population

The target population was the groups and individuals that have been trained on ABM & Ts in North Eastern province since 2008. The subject of the study was individuals in these trained groups. This is because by being trained the individuals know the existence of alternative building technologies (ABM & Ts) and it was imperative to know how they are using the newly acquired knowledge. The total number of people trained on this technology was 200 which constituted the researcher's target population.

3.4. Sample Size

The sample size was determined by calculating 50% of the total accessible population which was deemed to be representative (Kothari, 1985) and since the accessible population is 200 people, 50% of these were 100 people; therefore 100 trained people were selected for filling of questionnaire. In addition staff of the ministry of Housing was interviewed to provide more information to this study. In total therefore the researcher collected data from 110 respondents. Table 3.1, further illustrates this.

Table 3.1 Description of the Population and the Sample size

County Name	Name of Group	No. of Members	No. of sample
Garissa	Partnership Youth group.	70	35
	Pamoja Youth group	20	10
	Modogashe self help group	40	20
Wajir	Bidii Youth Group	60	30
	Individuals at Wajir Township.	10	5
Total		**200**	**100**

3.4.1 Sampling Procedure

Determining the sample size in quantitative surveys is essential. Holton and Burnett, (1997), state that one of the real advantages of quantitative survey method is the ability use smaller groups of people to make inferences about larger groups that would be prohibitively expensive to study. In this case, the sample was arrived at by establishing a sampling frame for each group that is trained and then conducted simple random sampling at each group so as to give each member of each group an equal opportunity to be included in the sample.

To ensure representation stratified random sampling was used to select the sample. This involved stratification of groups that are trained and thereafter an independent simple random sampling was drawn from each group. A total of three groups and one set of individuals have been trained. To get 100 trained people, the researcher used simple random sampling of several members from the trained groups and individuals (Kombo D. K & Trump D. L. A. (2006).

3.5. Data collection Instruments

Data collection tools involved designing questionnaires for people already trained on this technology and interview schedules of a few officers from the Ministry of Housing.

3.5.1 Questionnaire

The main tool of data collection was the questionnaire. The questions were open and closed ended items for ease of analysis and interpretation. The researcher visited the groups and explained to the chairman/secretary of the group the details of the study and what it entailed and involved before administering the questionnaires. The questionnaire for the already trained people in North Eastern province had 7 sections. Section 1 comprised of 4 items on the demographic and identification information of the respondent which included the age, gender, name of organization and number of group members.

Section B had 11 items which focused on the effects of training on the adoption of ABM&Ts. Section C had 4 items which sought to establish the effect of cost of construction materials to the adoption of ABM&Ts programme. Section D comprised of 6 items that sought to assess the effect of access to ABM&Ts equipments to the adoption of the programme. Section E entailed 3 items that focused on the effects of perception of quality of ABM&Ts blocks on the adoption of the programme. Section F of the questionnaire of trained people included 2 items which focused on how transport cost of ABM&Ts materials in the area affects the adoption of the programme. Section F had 4 items and sought to establish the effect of Government policy on the adoption of the ABM&Ts programme.

3.5.2 Interviews

The researcher conducted guided interviews with few members of staff from the ministry of Housing. The process involved the researcher asking each respondent the same question in the same way (Wengraf, 2001). This provided in-depth data, allowed probing and clarification and guard against confusion. The interview's flexible, personal and sensitive information was shared and higher yields of responses expected. (Mugenda & Mugenda, 1999).

3.6 Validity and Reliability of Data Collection Instruments

Validity of the data collection instrument was important in this study for it must be able measure the variables under study while its reliability ensured it was able to measure with consistency the variables among all the groups under study.

3.6.1 Validity of data Collection Instruments

Borg and Gall, (1989) define validity as the degree to which the sample of a test items represent the content that it is designed to measure. That is, research instruments measure the characteristics or traits for which it is intended to measure. To enhance validity in this study, the researcher used triangulation, where various instruments were used in data collection. These instruments were questionnaires, interviews and observation. The researcher in addition, discussed the instruments with his supervisor and other experts to test validity and ensure the data collected was relevant to the study. The feedback from these preliminary steps was used to approve the validity of the instruments.

3.6.2 Reliability of Data Collection Instruments

Reliability of the research instruments refers to the degree to which the instruments gives/yields consistency/ the same results or data when repeatedly administered (Mugenda & Mugenda, 2003). The researcher ensured reliability of the instruments by conducting a pilot study on 30 randomly selected trained individuals. The location for the pilot study was purposely chosen by the researcher to minimize costs. The questionnaire tested to ascertain whether the wording is clear and also to estimate the average time needed by the respondent to fill it. The researcher also carried out the test to retest in order to ascertain that the data collected is consistent and reliable.

Interview questions were useful in testing whether the researcher had structured them well to collect the intended data. The researcher improved on the instruments whenever there seemed to have inconsistency in the outcome of the pre-test to ensure the right data was be collected.

3.7 Data collection Procedures

After gaining permission to conduct research from the National council for science and technology, and from the University of Nairobi through his supervisor, the researcher proceeded to the field to administer the research instruments. The researcher booked appointments with the relevant community groups and arranged the most convenient venue to meet as many groups and trained individuals as possible. The researcher conduced focus group discussions with the trained people and then questionnaires were issued to be collected after a day.

3.8. Methods of Data Analysis and Presentation

Once the questionnaires were administered, the raw data collected was systematically organized in a manner that facilitated analysis. This involved Data cleaning; which entailed editing, coding and tabulation; data reduction, Data differentiation and explanation. Completed questionnaires were edited to ensure completeness and consistency. The data collected from the closed ended items of the questionnaire was assigned numerical values (coded) and checked for any errors (Kothari,1990) and finally analysed by use of computer package-Statistical Package for Social Scientists (SPSS). Responses from open-ended questions were classified and categorized by assigning all the responses numerical values too (coding). Analysis of data was done using SPSS software where descriptive statistics; tabulations, percentages, and frequencies were generated.

The researcher also used simple multiple regression analysis to analyze data. This is because the researcher involved more than one independent variable and wanted to see if it predicted one dependent variable (www. Researchconsultations.Com). The predictor variables were entered together in a statistical package. The statistical software treated each of the predictor as though it had been after each of the other predictor variables and then an analysis was run.

3.9 Ethical Considerations

The researcher applied for a research clearance permit from the National Council for Science and Technology before embarking on data collection. After obtaining the permit, the questionnaires were issued to the respondents who were assured that this study was for academic purposes and the researcher would not use the findings for any personal gains. The respondents were also assured that throughout the study, confidentiality was to be maintained and under no circumstances would their identity be disclosed.

3.10 Summary

Finally, a summary of the study was to state clearly the procedures to be followed and different rules guiding the study. It entailed; the findings, conclusions and recommendations that can be used for further studies on Appropriate Building Materials and Technologies (ABM&Ts) issues.

CHAPTER FOUR

DATA PRESENTATION, ANALYSIS AND INTERPRETATION

4.1. Introduction

The chapter is divided into two main sections. The first section deals with a description of the geographical layout of the area of study. The second section is concerned with description and analysis of data obtained from the study in a bid to explain the factors affecting the adoption of ABM & Ts programme in North Eastern province of Kenya.

Data is analyzed according to research questions formulation for this study.

4.2 Response Rate

Most of the questionnaires were distributed to the respondents through their officials either the secretary or the chairmen to the groups. 50 respondents returned their questionnaire out of 100 questionnaires that were sent representing a response rate of 50 %. This response rate is considered adequate according to Mugenda and Mugenda (2003) who considers a response rate of 50% as adequate for analysis and reporting, 60% as good and 70% and above as very good.

Table 4.1: Responses by Groups

GROUP	MEMBERS			
	TOTAL	ISSUED	RETURNED	%
Garissa partnership y/g(Garissa)	70	35	11	31.4
Pamoja y/group(Garissa)	20	10	7	70
Bidii y/h group(wajir)	60	30	14	46.7
Modogashe y/s/h/Group(Modogashe)	40	20	15	75
Individuals(Wajir)	10	5	3	60
TOTAL	200	100	50	50

Garissa partnership youth Group were the first groups to be trained on this technology. They also had the largest number of participants. Probably due to the fact that they were trained along time, some respondents did not find it fit to respond to the questionnaire. Modogashe youth group was also the hardest group to find and locate the respondents only 25% of the respondents did not return their questionnaires.

4.3 Demographic Characteristics of Respondents

The study set to determine the average age of the respondents in order to determine the age group that is keen in using this technology. The study found that most of the respondents were in their youth with range of 30-34 years.

Responses by age

Table 4.2: Responses by Age

	AGE (CLASSES)								
GROUP	20-24	25-29	30-34	35-39	40-44	45-49	50-54	TOTAL	%
Garissa partnership y/g(Garissa)	2	1	2	4	1	1		11	22
Pamoja y/group(Garissa)		2	3	2				7	14
Bidii y/h group(Wajir)		1		3	4	5	1	14	28
Modogashe y/s/h/Group(Modogashe)		7	7	1				15	30
Individuals(Wajir)		2		1				3	6
TOTAL(fr)	2	13	12	11	5	6	1	50	

Table 4.3: Responses by Gender

GROUP	**GENDER**		
	MALE	**FEMALE**	**TOTAL**
Garissa partnership y/g(Garissa)	7	4	11
Pamoja y/group(Garissa)	5	2	7
Bidii y/h group(Wajir)	12	2	14
Modogashe y/s/h/Group (Modogashe)	8	7	15
Individuals(Wajir)	1	2	3
TOTAL	33	17	50
%	66%	34%	

The study found that there was representation of both sexes by 66% and 34% by men and women respectively, revealing that both men and women were involved in ABM&Ts programme in this province.

Below is the data analysis and interpretation. This analysis is based on the objectives of the study which is to find the factors affecting the adoption ABM&Ts programme in North Eastern province.

4.4. Training on ABM & Ts

Training on ABM & Ts is aimed at disseminating as well as imparting important skills on this technology. The objective of the study was to find how long it took for a training to take place between the time it was requested for and the time it took place as well as whether the trainees found the training relevant in their quest to improve on their houses. The study also sought to establish whether the respondents found the trainers competent while undertaking the trainings.

(i)The findings on Government reaction after groups' application for training were as follows:-

Table 4.4: Reaction by Government after group's application for training

Item	**Frequency**				
	SA	A	U	D	SD
It took me a short time to be invited for training.	20	26	4		
They acknowledged my request for training.	16	30	3		1
I was notified of the training in good time.	17	29	3	1	
I had to keep pushing for my training to be done.	2	20	3	19	6
The training did not take place in good time as expected.	6	14	7	10	13

Further, the findings were analyzed and table 4.5 developed as follows;

Table 4.5: Descriptive Statistics for reaction by Government after group's application for training

	N	Mean	Std. Deviation
It took me a short time to be invited for training	50	4.32	.621
They acknowledged my request for training.	50	4.20	.728
I was notified of the training in good time.	50	4.24	.657
I had to keep pushing for my training to be done.	50	2.86	1.195

The training did not take place in good time as expected.	50	2.80	1.414	

Table 4.6: Correlations of Government reaction after groups application for training

		It took me a short time to be invited for training	They acknowledged my request for training.	I was notified of the training in good time.	I had to keep pushing for my training to be done.	The training did not take place in good time as expected.
It took me a short time to be invited for training	Pearson Correlation	1	.849(**)	.909(**)	.887(**)	.865(**)
	Sig. (1-tailed)		.000	.000	.000	.000
	N	50	50	50	50	50
They acknowledged my request for training.	Pearson Correlation	.849(**)	1	.964(**)	.736(**)	.713(**)
	Sig. (1-tailed)	.000		.000	.000	.000
	N	50	50	50	50	50
I was notified of the training in good time.	Pearson Correlation	.909(**)	.964(**)	1	.798(**)	.778(**)
	Sig. (1-tailed)	.000	.000		.000	.000
	N	50	50	50	50	50
I had to keep pushing for my training to be done.	Pearson Correlation	.887(**)	.736(**)	.798(**)	1	.925(**)
	Sig. (1-tailed)	.000	.000	.000		.000
	N	50	50	50	50	50
The training did not	Pearson	.865(**)	.713(**)	.778(**)	.925(**)	1

take place in good time as expected.	Correlation					
	Sig. (1-tailed)	.000	.000	.000	.000	
	N	50	50	50	50	50

** Correlation is significant at the 0.01 level (1-tailed).

Majority of the respondents (with a mean of 4.32) indicated that, it took a short time for them to be trained, were given an acknowledgement for their request for the training (mean of 4.20), were notified of of training time in good time (mean of 4.24), didn't have to keep pushing for their training to be done (mean of 2.86) , and training took place as expected (mean of 2.80). This is commendable on the part of the government considering the government bureaucracy. It is an indication of the commitment in to which the government has placed on this programme. Also based on Pearson correlation of the five items, it is found that there is positive correlation in between the items that support that the Government through the ministry of Housing has placed great importance on this programme.

(ii) The study also sought to find out how the respondents thought about the relevance of training content to improving their housing situation and the findings were as follows;

Table 4.7: Relevance of the training content to improving the respondents' housing situation

Item	Frequency					
	SA	A	U	D	SD	TOTAL
The knowledge attained can be used to uplift housing situation.	36	9	4	1		50
The training provides the future of construction in our area.	25	21	3	1		50
The training provides ideas of providing cheap housing.	20	21	8		1	50
The knowledge if properly used can improve housing situation greatly.	25	20	5			50
The training reveals that, you can make use of local materials to improve housing.	27	15	4	2	2	50

The results of the findings were then analyzed as follows;

Table 4.8: Descriptive Statistics for on researchers findings on how relevance of training to improving of housing situation

	N	Mean	Std. Deviation
The knowledge attained can be used to uplift housing situation.	50	4.60	.728
The training provides the future of construction in our area.	50	4.40	.700
The training provides ideas of providing cheap housing.	50	4.18	.850
The knowledge if properly used can improve housing situation greatly.	50	4.40	.670
The training reveals that, you can make use of local materials to improve housing.	50	4.26	1.046

The majority of the respondents, (with a mean of 4.60), indicated that the training is relevant because it can help uplift the housing situation in the area, provides the future of construction in the area (mean of 4.40), is cheap and relevant because it uses locally available materials (mean of 4.18). This is a clear indication that this technology has great potential to be widely accepted as an alternative means of improving houses in the province. Looking at the Pearsons correlation there is positive correlation between the items that try to suggest that the training on ABM&Ts can really improve the housing situation of the people of North Eastern province.

(iii) The study also sought to find out how the respondents thought about the level of the training and the following were the findings;

Table 4.9: Opinion on the level of the ABM & Ts training programme

Category	Frequency	Percentage
Adequate	50	100%
Too high	0	0
Total	**50**	**100%**

All of the respondents made indications that the training level was adequate (100%) . None of them thought it was high for them and therefore, the majorities were able to understand the concepts.

The majority of the respondents felt that the level of training was adequate. This is an indication that most of the respondents were able to grasp the essence of the technology. It also indicates that, most of their expectations were met by the training.

(iv) The study was also concerned about knowing whether the respondents would apply the newly acquired knowledge to improve their housing situation and the findings were as follows;

Table 4.10: Respondents' opinion on whether they will get an opportunity to apply newly acquired knowledge

Category	Frequency	Percentage
Yes	48	96%
No	2	2%
Total	**50**	**100%**

The majority of the respondents (96%), gave the opinion that they will get an opportunity to apply the newly acquired knowledge to improve their housing situation, while a small portion (2%) suggested otherwise. This is an indication that in terms of preference of construction methods, this one is one that is more preferred. The reasons for it could be on that the training was thorough and concepts were taught well. Also by majority of the respondents indicating that they will have an opportunity to apply the knowledge they have acquired, this is good for this programme as the trained individuals will act as its dissemination agents greatly helping in the spread of the technology.

(iii) The study also sought to know from the respondents on the areas they thought needed improvement during training by the Government and they suggested the following;

Table 4.11: Respondents suggestions on how training on ABM&Ts can be improved by government

Item	Frequency				
	SA	A	U	D	SD
The Ministry of Housing should add more training time on machine operation	23	16	8	3	
The soil selection procedures and mix ratios should be made more practical.	11	31	4	4	
Safety precautions when dealing with machine need to be more emphasized.	12	28	6	3	1
Setting out and general construction of the building using profiles should be given more time.	22	18	7	1	2
Advantages of the technology to other technologies ought to be given more emphasis and thorough coverage.	26	17	6	1	

The findings were further analyzed into descriptive statistics as follows;

Table 4.12: Descriptive Statistics for opinions on how training on ABM&Ts can be improved by the Government

	N	Mean	Std. Deviation
The Ministry of Housing should add more training time on machine operation	50	4.18	.919
The soil selection procedures and mix ratios should be made more practical.	50	3.98	.795
Safety precautions when dealing with machine need to be more emphasized.	50	3.94	.890
Setting out and general construction of the building using profiles should be given more time.	50	4.14	1.010

Advantages of the technology to other technologies ought to be given more emphasis and thorough coverage.	50	4.36	.776

It's also worth to note that, the respondents indicated some areas that they felt the trainings can be improved such as:-

The Ministry of Housing should allocate more time on training of this programme (mean of 4.18), the soil selection procedures in the field to be made more practical (mean of 3.98), safety precautions to be emphasized so as to avoid accidents during machine operation (mean of 4.14), setting out of foundations and general construction to be given more coverage(4.36). From the above suggestions it implies that if the areas suggested for corrections are implemented by the government the adoption of the programme would be even higher. This kind of suggestions are like a feedback to the government from the client whereby if well taken would mean improvement of service and therefore the government should view the suggestions as positive if the programme is to be more successful in terms of adoption.

4.5 Access to ABM & Ts Equipments

The study sought to investigate whether the access to ABM&Ts equipment has any direct impact on the adoption of the programme in North Eastern province. The study focused on asking questions like whether the respondent was aware of the existence of the equipment in Government offices, the kind of equipment one has ever used, whether the machines in the Government offices are easy to borrow and also if the machines available in the government offices are enough.

(iv) The study sought to know from the respondents whether they knew of the existence of ABM&Ts equipments available in North Eastern province and table 4.13 was drawn to give findings as follows;

Table 4.13: Responses on which ABM&Ts machines available in North Eastern province one knows about

ITEM	FREQUENCY	%
Hydraform machines	43	86%
Manual block press machines	27	54%
Wheelbarrows	33	66%
Vibraform machines	3	6%
Tevi- tile making machine	15	30%
Curing tanks	24	48%
Block testing machines	27	54%
Soil testing machine	22	44%

The study found that respondents had an idea of the existence of government machines available in the province. Majority of the them knew of the existence of the Hydraform machine (86%), while (54%) claimed knowledge of the existence of the manual block making machine. Very few (6%) knew of the existence of the vibraform machine, 30% knew of the existence of Tevi tile machine, 48% testified knowledge of the availability of curing tanks, 54% claimed the knowledge of the existence of block testing machine, while 44% of the availability soil testing equipment. From the data on the knowledge of the existence of the ABM&Ts equipment, it implies that some reasonable number in the society of North Eastern province don't know of the existence of the equipment in Ministry of Housing offices. In my view, an ideal situation would have been that the people know about the machines, how many they are, and most importantly the conditions attached to the borrowing of the machines. From such valuable knowledge, it would then be easy for one to plan and make use of the machines to facilitate improvement of Housing in the area. From the data on knowledge of the existence of ABM&Ts equipment also one can deduce authoritatively that therefore access of the same equipment is limited because one cannot borrow a machine if one doesn't know of its existence. Therefore although the findings in terms of knowledge of the existence of the machines was not very encouraging, but we are saying it could be a better start for now, which needs improvement in terms of awareness to the people of the existence of this machines and where to get them in the province. Total awareness and knowledge of

existence of ABM&Ts equipment would mean more success in terms adoption of this programme.

(v) The researcher wanted to find out which out of the ABM&Ts equipment available in North Eastern one had operated and the findings were as follows;

Table 4.14: Responses on machines available one had operated or handled before

ITEM	FREQUENCY	%
Hydraform machines	43	86%
Manual block press machines	26	52%
Wheelbarrows	31	62%
Vibraform machines		0%
Tevi- tile making machine	16	32%
Curing tanks	24	48%
Block testing machines	28	56%
Soil testing machine	20	40%

Majority of the respondents have used the Hydraform machine (86%), while (52%) have indeed used the manual interlocking block making machine according to the researcher's findings, 62% of the respondents claimed use the wheelburrows according to the findings, while none of the respondents had ever used the vibraform machine (0%), 32% of the respondents confirmed having used the Tevi machine, 48% had used curing tanks and 56% claimed having used block testing machine while 40% testified having made use of the soil testing equipment. This is an indication that some respondents might have been trained on this programme but there after didn't bother to make any follow-up to apply to be issued with the machines. This implies therefore that if the utilization of this equipment is low as is derived from the data, then access to this same machines has issues which need to be addressed, one of them being the lack of enough sensitization on the availability of the same in the Ministry of Housing offices and centres. Another immediate conclusion the researcher made from analysis of data on whether the respondents have operated the ABM&Ts equipment or not is that there is laxity in the follow-up of respondents to borrow machines after training.

Most of those interviewed cited reasons like lack of small capital to buy basic materials cement, soil, polythene sheets etc for block production, but they agreed that the availability of the machines for free was a big step by the government in terms facilitation of access to affordable Housing.

(vi) The researcher strived to find out from the respondents how they thought about the accessibility of the ABM&Ts equipment available in North Eastern province and the following findings were made;

Table 4.15: Responses on whether ABM &Ts available are easy to access

	FREQUENCY	**%**
YES	44	88%
NO	6	12%

Majority of the respondents concurred that the machines available in the province are easy to access. The responses on whether the machines are easy to access were made regardless of whether the respondent has ever used the equipment or not, and therefore most of them agreed that the government's policy of giving the machines for free for a start made access very easy. The policy is that of issuing the machines for free at least for some years so that the awareness may be achieved first. The machines are available in the ministry of Housing offices and centres upon application for issue from the provincial Housing officer.

(vii) The study sought to know from the respondents on how they thought about the cost of acquiring ABM&Ts equipment and the table 4.16 provided results as follows;

Table 4.16: Respondents' Opinion on the cost of acquiring ABM & Ts equipment

Item	Frequency				
	SA	A	U	D	SD
The cost of equipment is not affordable by ordinary citizens	24	20		5	1
The cost is affordable by the government	25	19	3	2	1
The cost is worth and right	14	28	5	3	
The cost is too high	18	16	10	3	3
The cost can be reduced by lowering taxation	19	19	4	6	2

The findings were then analyzed as follows;

Table 4.17: Descriptive Statistics on the opinions on the cost of acquiring ABM&Ts equipment

	N	Mean	Std. Deviation
The cost of equipment is not affordable by ordinary citizens	50	4.22	1.016
The cost is affordable by the government	50	4.30	.909
The cost is worth and right	50	4.06	.793
The cost is too high	50	3.86	1.161
The cost can be reduced by lowering taxation	50	3.94	1.150

Table 4.18: Correlations on the opinion on the cost of acquiring ABM&Ts equipment

		The cost of equipment is not affordable by ordinary citizens	The cost is affordable by the government	The cost is worth and right	The cost is too high	The cost can be reduced by lowering taxation
The cost of equipment is not affordable by ordinary citizens	Pearson Correlation	1	.966(**)	.844(**)	.909(**)	.885(**)
	Sig. (2-tailed)		.000	.000	.000	.000
	N	50	50	50	50	50
The cost is affordable by the government	Pearson Correlation	.966(**)	1	.852(**)	.911(**)	.876(**)
	Sig. (2-tailed)	.000		.000	.000	.000
	N	50	50	50	50	50
The cost is worth and right	Pearson Correlation	.844(**)	.852(**)	1	.896(**)	.899(**)
	Sig. (2-tailed)	.000	.000		.000	.000
	N	50	50	50	50	50
The cost is too high	Pearson Correlation	.909(**)	.911(**)	.896(**)	1	.941(**)
	Sig. (2-tailed)	.000	.000	.000		.000
	N	50	50	50	50	50
The cost can be reduced by lowering taxation	Pearson Correlation	.885(**)	.876(**)	.899(**)	.941(**)	1
	Sig. (2-tailed)	.000	.000	.000	.000	
	N	50	50	50	50	50

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

Quite a large number of respondents agree that the machines are beyond the reach of ordinary citizens (mean of 4.22),while a big number also concur that the government can buy the equipment for the citizens(mean of 4.30). Another group of opinions on this think that the cost of these essential machines can be reduced by the government through tax incentives (mean of 4.06).From the data, there is a clear indication that though the machines are expensive. From the responses also, it is indicated that the government can afford to buy the machines for the citizens. This augers well with government policy on provision of an enabling environment for citizens to create affordable housing. Therefore, there is an indication that even if the machines are expensive and above the reach of the ordinary citizens, people are not scared of the adoption of the ABM&Ts programme simply because they know there is somebody who can provide the machines for them and that is the government which has all the money from tax payers. From the Pearsons correlation table, all the items compared depict positive correlation of the responses provided.

(viii) The study sought to know from the respondents whether they thought that the ABM&Ts equipment available in the study area were enough and they gave the following responses;

Table 4.19: Responses on whether machines available in the province are enough

	FREQUENCY	**%**
YES	35	70%
NO	15	30%

This section aimed at establishing whether there is enough equipment to sustain the implementation of ABM & Ts. It sought to establish whether the respondents can be able to acquire their own equipments for the adoption of ABM & Ts programme .

From this study, it's apparent that, though the equipment held by the government may be adequate at least for now, they may not be enough in future. Most of the respondents expressed their views that the cost of the equipment is not affordable by ordinary citizens, that the government can afford to avail these machines to the people, that the cost can be reduced by provision of government subsidies. It was also found that if the cost of ABM&Ts equipment was within the reach of many people in the province, some people would prefer to

have their own and hence this could lead reinforcement of government effort and hence high adoption of the programme.

The study found that, majority of the respondents finds the cost of acquiring the equipments expensive. This would mean reliance on the equipments provided by the Ministry of Housing which may be enough for now but insufficient in future a factor that would negatively affect the adoption of ABM & Ts at later stage when demand for the same goes up.

4.6. Cost of Construction Materials

The study sought to establish what the respondents thought about the cost of construction materials. The researcher asked some questions like what the respondents thought about the cost of construction using conventional materials, what they thought was the cost of construction using ABM&Ts, and then finally sked to make comments on which between the two was more affordable. The responses for the cost of construction using conventional materials were as follows;

Table 4.20: Responses on opinion on the cost of construction using conventional materials

Item	Frequency				
	SA	A	U	D	SD
Quarry stones are too expensive.	32	16	1		1
The transport cost is too high for these materials.	16	20	9	3	2
The materials are not within reach by the common citizen.	18	22	5	4	1
The materials were affordable formerly but not nowadays.	20	19	6	2	3
The materials need to be a lot of labour before they are ready for construction e.g. dressing.	19	19	6	6	

The responses were then subjected to descriptive statistics and analyzed as follows;

Table 4.21: Descriptive Statistics for opinion on cost construction using conventional materials

	N	Mean	Std. Deviation
Quarry stones are too expensive.	50	4.56	.733
The transport cost is too high for these materials.	50	3.90	1.055
The materials are not within reach by the common citizen.	50	4.04	.989
The materials were affordable formerly but not nowadays.	50	4.02	1.116
The materials need to be subjected to a lot of labour before they are ready for construction e.g. dressing.	50	4.02	1.000

Table 4.22:Correlations for opinions on cost of construction using conventional materials

		Quarry stones are too expensive.	The transport cost is too high for these materials.	The materials are not within reach by the common citizen.	The materials were affordable formerly but not nowadays.	The materials need to be a lot of labour before they are ready for construction e.g. dressing.
Quarry stones are too expensive.	Pearson Correlation	1	.813(**)	.785(**)	.785(**)	.736(**)
	Sig. (1-tailed)		.000	.000	.000	.000
	N	50	50	50	50	50
The transport cost is too high for these materials.	Pearson Correlation	.813(**)	1	.943(**)	.938(**)	.931(**)
	Sig. (1-tailed)	.000		.000	.000	.000
	N	50	50	50	50	50
The materials are not within reach by the common citizen.	Pearson Correlation	.785(**)	.943(**)	1	.961(**)	.949(**)
	Sig. (1-tailed)	.000	.000		.000	.000
	N	50	50	50	50	50
The materials were affordable formerly but not nowadays.	Pearson Correlation	.785(**)	.938(**)	.961(**)	1	.951(**)
	Sig. (1-tailed)	.000	.000	.000		.000
	N	50	50	50	50	50
The materials need to be a lot of labour before they are ready for construction e.g. dressing.	Pearson Correlation	.736(**)	.931(**)	.949(**)	.951(**)	1
	Sig. (1-tailed)	.000	.000	.000	.000	
	N	50	50	50	50	50

** Correlation is significant at the 0.01 level (1-tailed).

The study needed to establish whether the cost of the conventional materials as compared with the cost of production of ABM&Ts would encourage or discourage the use of ABM &Ts programme.Majority of the respondents believed that quarry stones are too expensive to purchase, (mean of 4.56),a good number thought that the materials are too expensive to transport(mean of 3.90), quite a big number were of the view that the materials were not affordable by the common citizens (mean of 4.04), others believed that the materials cost was affordable formerly but not the case nowadays, while others thought that the materials were cumbersome because they needed to be subjected to a lot of labour before they are ready for construction (mean of 4.02). It was noted that, the use of the conventional technology was largely dependent on the availability funds of by the individual who involved in the construction. It was also noted from what the respondents pointed, that the cost of quarry stones continued to rise because of the cost of transportation from the quarry sites to the North Eastern area. This reason therefore has necessitated the adoption of ABM&Ts as alternative means of achieving shelter. The Pearsons correlation methods further depicts this by giving a positive correlation when all the items are compared.

The responses on cost of construction using ABM&Ts were reflected in table 4.23 as follows;

Table 4.23: Respondent's opinion on cost of construction using ABM & Ts materials

Item	**Frequency**				
	SA	A	U	D	SD
ABM & Ts materials are used locally, available materials and are easy to transport.	24	18	6	2	
ABM & Ts materials are cheap to buy and obtain.	14	30	4	1	1
ABM & Ts materials (blocks) reduce the cost of making a wall.	27	18	1	1	3
ABM & Ts are environmentally friendly since they provide cool temperatures in the house.	24	21	1	2	2
ABM & Ts materials don't require a lot of expensive labour.	21	21	4	1	3

The responses were then subjected to descriptive statistics as follows;

Table 4.24: Descriptive Statistics for opinions of cost of construction using ABM&Ts materials

	N	Mean	Std. Deviation
ABM & Ts materials are produced locally, available materials and are easy to transport.	50	4.28	.834
ABM & Ts materials are cheap to buy and obtain.	50	4.10	.789
ABM & Ts materials (blocks) reduce the cost of making a wall.	50	4.30	1.055
ABM & Ts are cheaper and environmentally friendly since they provide cool temperatures in the house.	50	4.26	.986
ABM & Ts materials don't require a lot of expensive labour.	50	4.12	1.062

The study sought to find out how respondents felt about the cost of construction using ABM&Ts. Majority of the respondents were strongly of the view that ABM&Ts blocks reduce the cost of walling (mean of 4.30), a great number also thought they reduce cost construction because they are produced locally(mean of 4.28), others considered the blocks good saving cost and making environmentally acceptable houses(mean of 4.26), while a reasonable number believed that the ABM&T blocks do not require extra labour like dressing(mean of 4.12). From the data provided by the respondents, it is deduced that the cost of construction using ABM&Ts is cheaper compared to the conventional methods
In the North Eastern area. Only a small number thought thought otherwise, but majority were of the view that ABM&Ts materials are cheap, durable and attractive to use.

The findings on the responses on which type construction was more affordable were analyzed as follows;

Table 4.25: Table on the responses on type of construction materials being more affordable

	FREQUENCY	%
Conventional materials e.g. quarry stones)	8	16%
ABM & Ts Materials	42	84%

Most of the respondents (84%) find ABT & M as the most affordable while 16% finds the conventional materials. This could mean that most people would find ABM &Ts materials more cost effective than the conventional materials a factor that would encourage the adoption of ABM & Ts programme.

The main reason given for this view is that soil which is the main ingredient in the making of ABM & Ts is readily available.

4.7 Conception on the Quality of ABM & Ts Building Blocks

The study sought to find out whether conception on the quality of ABM &Ts building blocks would affect the adoption of ABM &Ts . It sought to find out whether the respondents would construct their own houses using ABM &Ts and which qualities of ABM&Ts they view as cost effective as compared with the conventional materials.

The responses on whether one would consider using ABM&Ts to construct their own houses was put in tabular form as follows in table 4.26;

Table 4.26: Responses on whether one would consider using ABM&Ts to construct their houses

	FREQUENCY	%
YES	45	90%
NO	5	10%

Majority the respondents (90%) gave an indication that, they would consider constructing their own houses using ABM &Ts. This is a big boost to the implementation of ABM &Ts as it is an indication that, the respondents have faith in the technology in improving their houses. Interlocking of blocks and non-use of mortar in the joints, the manufacture of blocks at the construction site, a thin layer of plaster being required, construction being faster and the attractiveness of the finished house as some of the qualities of ABM&Ts that are perceived to be very attractive to build with.

The respondents felt that, ABM & Ts is cost effective and it can be used for gain and especially by the youth by making blocks for sale. Likewise, some indicated that the blocks are durable as they are beautiful. A small number of the respondents felt otherwise and from the findings and observation by the researcher, it was found that this are the people who can afford to transport building materials from long distances to North Eastern province.

The responses on which qualities of ABM&Ts were considered to be cost effective were provided in tabular form as in table 4.27;

Table 4.27: Responses on which qualities of ABM&Ts considered to be cost effective

Item	Frequency				
	SA	A	U	D	SD
The interlocking of blocks and non-use of mortar in the joints reduces cost of walling.	39	9	2		
Blocks can be manufactured at-sit thus reducing transport cost.	21	24	3	1	1
A thin layer of plaster is required hence reducing cost.	23	21	3	2	1
Finishing for the wall is cheap.	24	21	3	1	1
Environment friendly since blocks provide cool climate inside the house.	20	24	6		
Construction is faster since walling can take a lot of courses per day	28	16	3	2	1

during construction.					
Easy to construct since ever body becomes a fundi after setting out is done.	22	23	2	2	1
Provides a very attractive walling to look at.	29	17	3		1

The responses were then subjected into descriptive statistics and analyzed as follows;

Table 4.28: Descriptive Statistics for opinion on which qualities of ABM&Ts considered to be cost effective

	N	Mean	Std. Deviation
The interlocking of blocks and non-use of mortar in the joints reduces cost of walling.	50	4.74	.527
Blocks can be manufactured at-site thus reducing transport cost.	50	4.26	.828
A thin layer of plaster is required hence reducing cost.	50	4.26	.899
Finishing for the wall is cheap.	50	4.32	.844
Environment friendly since blocks provide cool climate inside the house.	50	4.28	.671
Construction is faster since no limit on number of courses to be built per day.	50	4.36	.921
Easy to construct since ever body becomes a fundi after setting out is done.	50	4.26	.876
Provides a very attractive walling to look at.	50	4.46	.788

This study sought to establish how the respondents perceive about the qualities of ABM&Ts which were believed to be cost effective. Majority of the respondents believed that the interlocking aspects and non use of mortar in the joints reduces the cost walling (mean of 4.26), a great number of thought that since blocks are produced on site transport cost is greatly reduced(mean of 4.26), quite a big number belief that by using the blocks, finishing for the walls is greatly reduced (mean of 4.32), others thought that especially for the North

Eastern region the walls produced by the blocks are environmentally friendly since they provide a cool climate(mean of 4.28), a great number thought that by using ABM&Ts blocks, construction is faster since there is no limit on the number of courses to be built per day(mean of 4.36), while others were of the view that by using the ABM&Ts blocks, construction is easy since everybody becomes a "fundi" after the first course. From the study, it becomes clear that ABM&Ts has many advantages over other construction techniques and is preferred in the area.

4.8 Transport Cost

The study sought to find out the transport cost implication on the adoption of ABM&Ts programme in the North Eastern province. The respondents were asked questions like what they thought about the cost of transporting conventional building materials and what they thought was the cost of transporting the ABM&Ts materials. The responses on what they thought about the cost of transport of ABM&Ts materials was given as follows;

Table 4.29: Responses on cost of transport of ABM & T Materials

Item	Frequency				
	SA	A	U	D	SD
Transport cost is affordable	30	11	5	3	1
Transport cost is cheap compared to other materials.	24	21	1	2	2
Transport cost is minimal cost of availability materials at site.	22	20	8		
Transport cost is within the reach of the ordinary Kenyan.	17	23	5	4	1
Transport cost is attractive to the person wishing to build.	21	20	9		
The cost is low.	20	20	6	2	2

The findings were then subjected to descriptive statistics as follows;

Table 4.30: Descriptive Statistics for opinions on the cost of transporting ABM&Ts material

	N	Mean	Std. Deviation
Transport cost is affordable	50	4.32	1.019
Transport cost is cheap compared to other materials.	50	4.26	.986

Transport cost has minimal cost due to availability materials at site.	50	4.28	.730
Transport cost is within the reach of the ordinary Kenyan.	50	4.02	.979
Transport cost is attractive to the person wishing to build.	50	4.24	.744
The cost is low.	50	4.08	1.027

Transport cost is another factor that affects the adoption of ABM & Ts. This study aimed at establishing whether ABM & Ts affords savings in transportation cost when compared with the transportation cost of the conventional materials. Majority of the respondents agreed that transportation cost of ABM&Ts materials is affordable (mean of 4.32), a relatively big number also was of the view that transport of same materials is cheap compared to other materials (mean of 4.26), while others said that transport is within the reach of ordinary Kenyans. It was noted that due to long distances situation of the North Eastern area, the ABM&Ts type of technology is the best for the improvement of housing and shelter in general.

The responses on what they thought about the transport of conventional building materials was given as follows;

Table 4.31: Responses on cost of transport of conventional materials

Item	**Frequency**				
	SA	A	U	D	SD
The cost is too high for ordinary Kenyans.	35	10	3	1	1
The cost is affordable but transportation is expensive	26	16	3	4	1
The cost of transportation has been raised due to rise in the cost of fuel.	17	24	4	5	
The cost is low compared to use of ABM & T materials.	13	21	8	4	4
The cost is too high compared to ABM & T materials.	19	17	7	4	3
The cost is inevitable if you have to build	18	17	6	5	4
The cost is easy.	18	14	7	4	7

The responses were then subjected into descriptive statistics as follows;

Table 4.32: Descriptive Statistics for opinion on cost of transport of conventional materials

	N	Mean	Std. Deviation
The cost is too high for ordinary Kenyans.	50	4.54	.862
The cost is affordable but transportation is expensive	50	4.24	1.021
The cost of transportation has been raised due to rise in the cost of fuel.	50	4.06	.913
The cost is low compared to use of ABM & T materials.	50	3.70	1.182
The cost is too high compared to ABM & T materials.	50	3.90	1.182
The cost is inevitable if you have to build	50	3.80	1.262
The cost is easy.	50	3.64	1.411

Table 4.33: Correlations for opinions on cost transport of conventional materials

		ITEM1	ITEM2	ITEM3	ITEM4	ITEM5	ITEM6	ITEM7
ITEM1	Pearson Correlation	1	.893(**)	.814(**)	.863(**)	.875(**)	.871(**)	.818(**)
	Sig. (1-tailed)		.000	.000	.000	.000	.000	.000
	N	50	50	50	50	50	50	50
ITEM2	Pearson Correlation	.893(**)	1	.904(**)	.906(**)	.916(**)	.909(**)	.897(**)
	Sig. (1-tailed)	.000		.000	.000	.000	.000	.000
	N	50	50	50	50	50	50	50
ITEM3	Pearson Correlation	.814(**)	.904(**)	1	.925(**)	.932(**)	.950(**)	.921(**)
	Sig. (1-tailed)	.000	.000		.000	.000	.000	.000
	N	50	50	50	50	50	50	50
ITEM4	Pearson Correlation	.863(**)	.906(**)	.925(**)	1	.942(**)	.958(**)	.937(**)
	Sig. (1-tailed)	.000	.000	.000		.000	.000	.000
	N	50	50	50	50	50	50	50
ITEM5	Pearson Correlation	.875(**)	.916(**)	.932(**)	.942(**)	1	.971(**)	.957(**)
	Sig. (1-tailed)	.000	.000	.000	.000		.000	.000
	N	50	50	50	50	50	50	50
ITEM6	Pearson Correlation	.871(**)	.909(**)	.950(**)	.958(**)	.971(**)	1	.968(**)
	Sig. (1-tailed)	.000	.000	.000	.000	.000		.000
	N	50	50	50	50	50	50	50
ITEM7	Pearson Correlation	.818(**)	.897(**)	.921(**)	.937(**)	.957(**)	.968(**)	1
	Sig. (1-tailed)	.000	.000	.000	.000	.000	.000	
	N	50	50	50	50	50	50	50

** Correlation is significant at the 0.01 level (1-tailed).

In the data availed, most respondents (mean of 4.54) consider the transport cost of conventional material as prohibitive, while (3.70) of the responses consider it as affordable. It was noted in the society there are those who are able to transport materials and afford the costs but the majority belief that the transport costs are unaffordable and this impacts positively in as far as ABM&Ts is concerned. Also according to pearsons correlation it shows that most of the items relate positively.

4.9 Government Policy

The National Housing Policy for Kenya is a government policy document that gives guidelines on the implementation of ABM & T's programme. This study needed to establish whether the respondents are aware of the policy document as well as establish what they felt the government is doing enough in the dissemination of ABM & Ts programme. The responses on whether the Government is doing enough in promotion of adoption of ABM&Ts were given as follows;

Table 4.34: Responses on whether the government is doing enough in promotion of adoption of ABM & T's for improvement of housing in North Eastern area

	FREQUENCY	%
YES	38	76%
NO	12	24%

While the responses on which measures one wished the Government would undertake to ensure quality and adequate housing for all Kenyans was given as follows;

Table 4.35: Responses on opinion on the measures one would like to the government to undertake to ensure quality and adequate housing for all Kenyans

Item	Frequency				
	SA	A	U	D	SD
Reduce tax on building materials.	25	14	8	2	1
Purchase more ABM & T equipments.	20	19	6	3	2
Encourage macro-finance institutions to provide	18	17	8	3	4
Provide incentives for home ownership	19	19	7	4	1
Be in partnership with public and cost share provision of building materials.	24	5	14	3	4
Partner with NGOs and investors to put up adequate housing.	21	14	11	3	1

The responses on opinions on what one would wish the Government to do to promote adoption of ABM&Ts programme were subjected to descriptive statistics and produced the following results;

Table 4.36: Descriptive Statistics for opinions on what one would wish the Government to undertake to promote adoption of ABM&Ts programme

	N	Mean	Std. Deviation
Reduce tax on building materials.	50	4.20	.990
Purchase more ABM & T equipments.	50	4.04	1.068
Encourage macro-finance institutions to provide	50	3.84	1.218
loans for home ownership	50	4.02	1.020
Be in partnership with public and cost share provision of building materials.	50	3.84	1.315
Partner with NGOs and investors to put up adequate housing.	50	4.02	1.040

Table 4.37: Correlations for the opinion on what one would wish the Government to undertake the promotion of ABM&Ts programme

		ITEM1	ITEM2	ITEM3	ITEM4	ITEM5	ITEM6
ITEM1	Pearson Correlation	1	.938(**)	.907(**)	.926(**)	.935(**)	.928(**)
	Sig. (1-tailed)		.000	.000	.000	.000	.000
	N	50	50	50	50	50	50
ITEM2	Pearson Correlation	.938(**)	1	.946(**)	.973(**)	.905(**)	.936(**)
	Sig. (1-tailed)	.000		.000	.000	.000	.000
	N	50	50	50	50	50	50
ITEM3	Pearson Correlation	.907(**)	.946(**)	1	.955(**)	.926(**)	.953(**)
	Sig. (1-tailed)	.000	.000		.000	.000	.000
	N	50	50	50	50	50	50
ITEM4	Pearson Correlation	.926(**)	.973(**)	.955(**)	1	.900(**)	.942(**)
	Sig. (1-tailed)	.000	.000	.000		.000	.000
	N	50	50	50	50	50	50
ITEM5	Pearson Correlation	.935(**)	.905(**)	.926(**)	.900(**)	1	.928(**)
	Sig. (1-tailed)	.000	.000	.000	.000		.000
	N	50	50	50	50	50	50
ITEM6	Pearson Correlation	.928(**)	.936(**)	.953(**)	.942(**)	.928(**)	1
	Sig. (1-tailed)	.000	.000	.000	.000	.000	
	N	50	50	50	50	50	50

** Correlation is significant at the 0.01 level (1-tailed).

Majority of the respondents feels that, the government is doing enough in promoting the use of this technology citing examples such as offering free training on ABT & M, the construction of constituency ABT & M centres as well as offering the equipments at no cost at all. However, the respondents gave suggestions on how the government could further help to improve the programme. A greater majority thought that the government could reduce tax on building materials in general, another group felt that the government could purchase more ABM&Ts machines, while others believed that if the government could partner with macro-finance institutions for the purpose availing affordable loans for construction of houses it could be a further improvement on this programme. The table on Pearsons correlation further supports this as it portrays a positive correlation of the items in question.

4.10. Qualified Trainers

The study sought to establish how the ability of the trainers to conduct the training on this programme would affect its adoption. The researcher asked questions so as to let respondents express their opinions on the ability of the trainers in terms of knowledge and methodology. The responses on comments on the ability of trainers in respect to language was as follows;

Table 4.38: Respondent's comments on overall standard of the trainers in respect to command of language

Item	Frequency				
	SA	A	U	D	SD
The trainers were well conversed with the topics.	27	17	5	1	
The trainers used appropriate examples in their presentation.	22	24	2	2	
The trainers use appropriate language.	19	22	6	2	1
The trainers did theory classes and practical classes well.	21	23	3	2	1
The trainers know how to approach the training issues well.	20	25	4	1	

The responses were then put into descriptive statistics and gave the following results;

Table 4.39: Descriptive Statistics for opinions

	N	Mean	Std. Deviation
The trainers were well versed with the topics.	50	4.40	.756
The trainers used appropriate examples in their presentation.	50	4.32	.741
The trainers used appropriate language.	50	4.12	.918
The trainers did theory classes and practical classes well.	50	4.22	.887
The trainers know how to approach the training issues well.	50	4.28	.701

Table 4.40: Correlations for opinions on ability of trainers in respect to command of language

		ITEM 1	ITEM 2	ITEM 3	ITEM 4	ITEM 5
ITEM 1	Pearson Correlation	1	.860(**)	.871(**)	.901(**)	.863(**)
	Sig. (1-tailed)		.000	.000	.000	.000
	N	50	50	50	50	50
ITEM 2	Pearson Correlation	.860(**)	1	.903(**)	.946(**)	.924(**)
	Sig. (1-tailed)	.000		.000	.000	.000
	N	50	50	50	50	50
ITEM 3	Pearson Correlation	.871(**)	.903(**)	1	.944(**)	.930(**)
	Sig. (1-tailed)	.000	.000		.000	.000
	N	50	50	50	50	50
ITEM 4	Pearson Correlation	.901(**)	.946(**)	.944(**)	1	.949(**)
	Sig. (1-tailed)	.000	.000	.000		.000
	N	50	50	50	50	50
ITEM 5	Pearson Correlation	.863(**)	.924(**)	.930(**)	.949(**)	1
	Sig. (1-tailed)	.000	.000	.000	.000	
	N	50	50	50	50	50

** Correlation is significant at the 0.01 level (1-tailed).

The quality of training and the ability for the trainees to comprehend the concepts of ABM&Ts is important in the implementation of ABM &Ts. It's the trainees who are expected to propagate and utilize the knowledge acquired in a bid to improve the housing situations in North Eastern province.

The study sought to establish how the respondents would qualify the level of the trainers in terms of knowledge, the training methodology and the command of language during the trainings. Majority of the respondents thought that the trainers were well versed with subjects and objects of the training(mean of 4.4), a great number was of the view that the trainers used appropriate examples during presentation(mean of 4.32), a large number also maintained that the trainers used appropriate language(mean of 4.12) ,while others accepted that the trainers knew how to approach the issues well(mean of 4.28). It was found that the trainers were doing what is expected of them in so far as the propagation of this programme is concerned. The responses given on comments on ability of trainers with respect to methodology were as follows;

Table 4.41: Respondent's comments on overall standard of the trainer in respect to methodology

	FREQUENCY	%
VERY GOOD	23	46%
GOOD	22	44%
FAIR	5	10%
POOR	N/A	
VERY POOR	N/A	

While the responses given for comments on overall standard of trainers in respect to knowledge were as follows;

Table 4.42: Respondent's comments on overall standard of the trainer in respect to knowledge

	FREQUENCY	%
VERY GOOD	21	42%
GOOD	26	52%
FAIR	2	4%
POOR	1	2%
VERY POOR	N/A	

Most respondents (52%) indicated that the trainers' level of knowledge was good while quite a large number (42%) indicated that, the trainer's level of knowledge was very good. Only one respondent indicated the trainer's level of knowledge as poor or very poor. This is an indication that, the respondents were able to grasp the knowledge as presented which is a prerequisite to effective implementation of ABM &Ts.

The teaching methodologies in the trainings were well articulated as was indicated by 46% and 44% of the respondents for the very good and good respectively in terms of methodology. There was no language barrier during the trainings as indicated by mean of 4.12 of the command of language by the trainers.

CHAPTER FIVE
SUMMARY OF FINDINGS, DISCUSSIONS, CONCLUSIONS AND RECOMMENDATIONS

5.1. Introductions

This chapter gives the summary of findings as per the objectives of this study. It's followed by a brief discussion of the findings which shows that, most of the findings were in agreement with the literature review. This chapter also gives the conclusions, the recommendations of the study as well as the areas of further research.

5.2. Summary of the Study Findings

This study was carried out to find out the factors affecting the adoption of ABM&Ts programme in North Eastern province.

Training on ABM & Ts was found to be one critical area that positively affects the adoption of ABM&Ts programme. It's also an avenue for disseminating this technology as well as a means of producing qualified personnel who in turn will be the agents for the dissemination of the technology as well as in improving the housing situation in North Eastern province. Most of the respondents agree that, the trainings were relevant.

The cost of construction materials has been seen to affect the adoption of the programme, in that, the conventional materials are seen to attract high transport cost a factor that may work in favor of ABM & Ts.

On the other hand, good access to ABM & Ts equipments in the province is a plus and a factor that is supposed to boost the programme. Probably the grassroots campaigns and dissemination have not made impact on this programme. One of the reasons being that those who have been trained don't make a follow-up to borrow machines to help in putting up affordable housing. The prohibitive cost of these equipments was found to hinder adoption of ABM &Ts.

The study likewise found that, conception on the quality of ABM & Ts and especially ISSBs has effect on the adoption of ABM & Ts. This is much so due to the fact that, the people view ABM & Ts as of high quality, cost effective and beautiful with all the respondents indicating they would build their houses using ABM & Ts. Majority of the

respondents indicated they would consider constructing their own houses using ABM & Ts.

It is also important to note that, the study found the cost of transport of the construction materials affects the adoption of ABM & Ts. Most respondents found the transport cost in the production of ABM & Ts lower than when they are transporting the conventional materials like the quarry stones.

5.3. Discussions of Findings

In this study, most of the objectives agrees with the literature review but there were small deviations from the expected results.

5.3.1 Training on ABM & Ts

This objective was meant to impart skills on the trainees who are expected to use the skills to improve their houses as well as for others. All the respondents agree that the training content was relevant to the aim of improving their housing situation. This is an indication that, this technology has a great potential for its implementation. The findings found that, the aim of imparting skills on the trainees was met where all of the trainees (100%) felt the trainings were adequate.

The aim of rolling out trainings on ABM & Ts by the Ministry of Housing was likewise to provide a means of livelihood and especially to the youth. This is a fact the researcher was able to verify as the researcher was distributing the questionnaires and was able to see some of the houses built using the technology and offering a means of income to the respondents. The trainings have great impact on the implementation of ABM & Ts as indicated by all the respondents that they would consider building their own houses using this technology.

There was minimal presence of the other players in the dissemination of this technology such as Approtech and Makiga Engineering works just like it was mentioned in the literature review.

The findings by the researcher agree totally with the literature review where the aim of dissemination of ABM & Ts and imparting skills to the members of the community was met. The aim of the trainings is to show the trainees how the limitations of soil as a

building material can be overcome. Habri 2003 notes that, the limitations of soil such as having low durability, greater water penetration and high maintenance requirements can be overcome by an increase in block density through compaction using mechanic press. Likewise, Ouda 2003, agrees that ABM & Ts blocks have higher density than concrete blocks.

All these arguments are supported by the this research report whereby , the aim of the trainings on ABM & Ts was to give soil better qualities for construction as the machines provided during the training compacts the soil to give the blocks these better qualities.

5.3.2 Access to ABM & Ts Equipments

As expected from the literature review, the cost of the ABM & Ts equipments is prohibitive to the majority of the respondents. Only one group owns a manual machine and the rest fully rely on the equipments provided by the Ministry of Housing. Majority of the respondents (88%) agree that, it is easy to access the equipments while 70 % agree that, the cost of this machine are expensive. This is understandable as there are fifteen Hydraform machines as indicated by the Provincial Housing Officer which can't meet the demand. The 15 machines are available all over the constituencies of the province in centres constructed by the ministry of Housing. The centres act as avenues for promotion of ABM&Ts programmes, which among them is the issuance of ABM&Ts equipment to public(provincial Housing officer, 2012).

Apparently, majority of the respondents indicated that the cost of acquiring these machines is not affordable while 10% said it is too cheap to acquire the machines. This was found in the organized groups who have been able to buy the manual Action Pack machine which is locally assembled by Makiga Engineering works and they are producing blocks for sale. The Action Pack Block Press cost about Eighty five thousands Kenya shillings thus a well organized group can be able to purchase.

UN-HABITAT 2009 in the literature review agrees that the manual machine is the most affordable option for block making and also the most convenient in rural settings due to the fact that it is manually operated and easy to use.

On the other hand, the mechanized Hydraform machine is imported from South Africa and their prices are prohibitive for community based organizations. This was confirmed

during the literature review by the provincial housing officer who gave the cost of acquiring one Hydraform machine at not less than three million Kenya shillings an amount that is way beyond the reach of the majority.

5.3.3 Cost of Construction Materials

The cost of construction materials has a direct bearing on the use and implementation of ABT & M. It's expected that, the use of ABM & Ts would lower considerably the cost of construction material which would boost the implementation of ABM & Ts. The study however found that, still 30% of the respondents consider conventional materials to be cheaper than ABM & Ts.

This was found to be in areas where conventional materials namely quarry stones are readily available. This means that, ABM & Ts is not necessarily cheaper than quarry stones but this depends on specific localities. However, majority of the respondents considers ABM & Ts to be cheaper than the conventional materials.

This finding to a large extent agrees with the literature review where the cost of the conventional materials was expected to be more than ABM & Ts. The high cost of inputs in making of the conventional materials such as coal and electricity have continued to rise thus increasing the cost of the construction materials according to Pradeep 2011. UN-HABITAT, 2009 agrees that ABM & Ts offers lower construction costs at comparable quality and that it is suitable for a wide range of environments.

5.3.4. Conception on the Quality of ABM &Ts Building Blocks

Probably the greatest boost to the implementation of ABM & Ts is the faith in which most of the respondents have on this technology by indicating that they would build using ABM & Ts. This finding was totally unexpected during the literature review where Adams 2001 argued that, there was the danger of perceiving ABM & Ts as not being permanent building materials. He argued that, ABM & Ts may be associated with the traditional none stabilized soil construction in the mind of many people such as the mud and wattle construction.

As it turned out in this study, the fear was unfounded and all the respondents gave this technology a clean bill of health.

5.3.5 Transport Cost

The basic material for use in ABM & Ts is soil whose source is abundant and it facilitates direct site application thereby lowering the cost associated with transport. Since ABM & Ts is produced on site, it's expected that the use of ABM & Ts is enhanced by the reduced transport cost. The study confirmed that, conventional materials are costly to transport with majority indicating that, the cost of transporting the conventional materials is very high.

However, others consider the transport cost of conventional materials affordable. These are the respondents close to quarries or have alternative methods of affordable construction.

The findings are consistent with the literature review. Habri 2003 argues that, ABM & Ts is usually produced at the point of use greatly reducing the transport cost. It also avoids breakages while transporting the materials thus reducing wastages associated with transporting the materials.

5.4 Conclusions of the study

The Appropriate Building Materials and Technologies has great potential in reducing the cost of building and help in the improvement of housing in North Eastern province.

The researcher is encouraged by the increasing interest and demand for the use of ISSBs and its ability to address the housing situation and creating employment and especially to the youth. It's even more encouraging to find the technology being used by the private sector to construct high rise buildings.

However, despite the increasing popularity of these technologies, stringent evaluation of the effectiveness of the technologies has to be carried out. Most of the studies conducted use case study approach in looking at the effects of ABM & Ts of a given program in a given region but few looks at the impact of multiple regions. To be able to say that, ABM & Ts programs are effective at improving the housing situation and much more in reducing poverty, a large sample from multi regions with data that can be rigorously analyzed with replicable methods and generalizable findings needs to be conducted.

However, trainings on ABM & Ts will continue to play a pivotal role in the implementation of this technology as well as in an effort to raise a critical mass that can enhance wide application of ABM & Ts.

It's also apparent that, more equipments are required for effective implementation of ABM & Ts. Likewise, the Ministry of Housing will continue to play a major role in the implementation of the technology as most of the respondents indicated that, they can't afford these equipments.The technology is gaining confidence among the users which in turn would ensure its effective implementation. This is shown by the fact that, all the respondents would not hastate to use this technology to construct their own houses.

The findings from the study however indicates that, the trainings can be improved by allocating more training time and offering more practical lessons during the training as well as bringing the offices of the Ministry of Housing closer to the people as suggested by the respondents. One way of doing that is the ongoing construction of Constituency ABT & M Centres. Another challenge for the government is how to increase access to the equipments. The majority of the respondents can't afford these equipments and will greatly rely on the government equipments.

5.5. Recommendations

The study makes the following recommendations:-

Allocation should be increased to research institutions to facilitate research on building materials and technologies, and also consider imposing a research levy on the building construction industry.

The Government should increase allocation for purchasing more equipments to cope with the future demand.

All research actors should harness and document existing locally available building materials and technologies as well as disseminate this information to the users as appropriate;

Promote and encourage small-scale enterprises to engage in production and application of researched materials;

The public, private and voluntary sectors should be encouraged to utilize the research materials in their housing and other development programmes.

More efforts should be made to promote intensified training in requisite skills and construction technologies through Youth Polytechnics, Women and Youth Groups, Community-Based Organizations and Appropriate Technology Building Centres.

The government should consider promoting the local Jua Kali sector so as to modify ABM & Ts equipments with the view of bringing down the cost of these equipments.

Large scale builders and constructors should also be sensitized on this technology.

5.6 Suggestions for Further Research

ABT & M is being mostly trained on the youth more so young men and therefore more research needs to be done on gender training of these technologies and the incentives that can be given to encourage gender parity.

Much of this technology focuses on walling materials and for holistic improvement of houses, research, documentation and dissemination of appropriate roofing technologies needs to be conducted.

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APPENDICES

APPENDIX 1

Letter of transmittal of data collection instruments

THE CHAIRPERSON/SECRETARY,

RE: QUESTIONNAIRE SCHEDULE FOR TRAINED PERSONS.

The above subject refers

I am a student at the University of Nairobi and intend to visit selected members of your group this will apply only to those who have been offered training on the same previously.

The purpose of the data is for research on this technology.

I kindly request you to respond to the questionnaire items by filling in and ticking against a given option. All information given is for academic purpose and will be treated with ultimate confidentiality. Thank you.

Mule B. M.

Department of Extra Mural studies

University of Nairobi.

APPENDIX 2

QUESTIONNAIRE FOR TRAINED PERSONS

May you please fill this form**.** Your complete and honest answer will be highly appreciated.

Section A: Identification

Age (Optional)……

Gender (Optional)……

Demographic information

Respondent's full names (Optional)……

Name of the Organization ……

Location of the organization ……

Number of group members …….

Section B: Training on ABM & Ts

1. How long did it take for you to be trained from the time you requested for training?

Please use the statements below to indicate your response.

Item	**SA**	**A**	**U**	**D**	**SD**
It took me a short time to be invited for training.					
They acknowledged my request for training.					
I was notified of the training in good time.					
I had to keep pushing for my training to be done.					
The training did not take place in good time as expected.					

2. Did you find the content of the training relevant to improving your housing situation?

Please use the statements below to indicate your response.

Item	SA	A	U	D	SD
The knowledge attained can be used to uplift housing situation.					
The training provides the future of construction in our area.					
The training provides ideas of providing cheap housing.					
The knowledge if properly used can improve housing situation					

greatly.					
The training reveals that, you can make use of local materials to improve housing.					

3. What is your opinion on the overall level of the ABM & Ts Training Programme? Please choose from the key provided.
   long 2. Too long 3. Not long 4. Slightly long 5. undecided

What is your opinion on the overall level of the ABM & Ts Training Programme?	1	2	3	4	5

4. Which areas were you trained on during the workshop?

Please tick from the options provided;

- Soil selection and testing [ ]
- ISSB material mix ratios [ ]
- Safety precautions during machine operations [ ]
- Block curing and stacking [ ]
- Machine operations & maintenance [ ]
- Site preparation [ ]
- Block strength testing [ ]
- Construction [ ]

5. Were there in your opinion any areas of the construction that were not adequately covered in the training programme?
   - Yes [ ]
   - No [ ]

Kindly name the areas not covered.

6. Please indicate how strongly agree or disagree with statements regarding the issue of areas of construction covered during the training. (SA – Strongly agree; A –Agree; U –Undecided/No opinion; D – Disagree; SD – Strongly Disagree

Item	SA	A	U	D	SD
The Ministry of Housing should add more training time on machine operation					
The soil selection procedures and mix ratios should be made more practical.					
Safety precautions when dealing with machine need to be more emphasized.					
Setting out and general construction of the building using profiles should be given more time.					
Advantages of the technology to other technologies ought to be given more emphasis and thorough coverage.					

7. Do you think you will have an opportunity to apply the newly acquired knowledge?
   - Yes [ ]
   - No [ ]
8. Give your suggestion on the ways you think the training workshop can be improved. Please indicate how strongly agree or disagree with statements regarding the issue of how the training workshop can be improved. (SA – Strongly agree; A –Agree; U – Undecided/No opinion; D – Disagree; SD – Strongly Disagree).

Item	SA	A	U	D	SD
The Government to allocate more resources on training on ABM&Ts.					
The training schedule workload to be spread over a bigger duration					
The Government to use more skilled professionals in the training as trainers.					
Awareness about training to be created a few weeks before training through barazas.					
The Government to reach as many people as possible in the interior of the province not necessarily urban centres					
Involvement of all key stakeholders in the housing sector to be done so that the trainings can be more effective.					

9. How did you find the overall standard of the trainers in the ABM & T training work shop that you attended in respect to knowledge

Please use the statements below to provide your response.

Item	**SA**	**A**	**U**	**D**	**SD**
The trainers were well conversed with the topics.					
The trainers used appropriate examples in their presentation.					
The trainers use appropriate language.					
The trainers did theory classes and practical classes well.					
The trainers know how to approach the training issues well.					

10. How did you find the overall standard of the trainers in the ABM & T training work shop that you attended in respect to methodology

Very good [ ]
Good [ ]
Fair [ ]
Poor [ ]
Very poor [ ]

11. How did you find the overall standard of the trainers in the ABM & T training work shop that you attended in respect to command of language.

Very good [ ]
Good [ ]
Fair [ ]
Poor [ ]
Very poor [ ]

Section C: Cost of Construction material

12. What is your opinion on the cost of construction using the conventional building materials like quarry stones?

Please use statements provided to indicate your response.

Item	**SA**	**A**	**U**	**D**	**SD**
Quarry stones are too expensive.					

The transport cost is too high for these materials.					
The materials are not within reach by the common citizen.					
The materials were affordable formerly but not nowadays.					
The materials need to be a lot of labour before they are ready for construction e.g. dressing.					

13. What is your opinion on the cost of construction using ABM&T?

Item	SA	A	U	D	SD
ABM & Ts materials are used locally, available materials and are easy to transport.					
ABM & Ts materials are cheap to buy and obtain.					
ABM & Ts materials (blocks) reduce the cost of making a wall.					
ABM & Ts are environmentally friendly since they provide cool temperatures in the house.					
ABM & Ts materials don't require a lot of expensive labour.					

14. In your experience, which construction material is the most affordable?

Conventional materials e.g. quarry stones) [ ]

ABM & Ts Materials [ ]

15. Give reasons for question 14.

……

……

……

……

<u>Section D: Access to ABM & Ts Equipments</u>

16. Which ABM&T equipments are available in your province?

Please choose from the options given

Hydraform machines	[ ]
Manual block press machines	[ ]
Wheelbarrows	[ ]
Vibraform machines	[ ]
Tevi- tile making machine	[ ]
Curing tanks	[ ]
Block testing machines	[ ]
Soil testing machine	[ ]
Any other (please specify)	[ ]

17. Which kind of ABM & Ts equipment available in North Eastern have you used?

Please choose from the options given

Hydraform machines	[ ]
Manual block press machines	[ ]
Wheelbarrows	[ ]
Vibraform machines	[ ]
Tevi- tile making machine	[ ]
Curing tanks	[ ]
Block testing machines	[ ]
Soil testing machine	[ ]
Any other (please specify)	[ ]

18. Are the ABM & Ts Equipments available in the Province easy to access?

Yes	[ ]
No	[ ]

19. What is your opinion on the cost of acquiring the ABM & Ts Equipments?

Expensive, 2. Less expensive, 3. Too expensive 4. Inexpensive 5. Undecided

Please indicate how strongly agree or disagree with statements regarding the issue of cost of acquiring the ABM & Ts equipment. (SA – Strongly agree; A –Agree; U – Undecided/No opinion; D – Disagree; SD – Strongly Disagree).

Item	SA	A	U	SD	D
The cost of equipment is not affordable by ordinary citizens					
The cost is affordable by the government					
The cost is worth and right					
The cost is too high					
The cost can be reduced by lowering taxation					

20. In your opinion, do you consider the ABM & Ts equipments provided by the Ministry of Housing enough to serve North Eastern Province?

Yes [ ]

No [ ]

21. What are your suggestions on how access to the ABM & T equipment can be improved?

……

……

Section E: Perception on the quality of ABM & T Blocks

22. Would you consider constructing your own house using ABT & M Blocks (ISSBs)

Yes [ ]

No [ ]

23. Give reasons for question number 22.

……

……

24. What are the qualities of ABM & T that you consider attractive to build with?

Please indicate how strongly agree or disagree with statements regarding the issue of cost of acquiring the ABM & Ts equipment. (SA – Strongly agree; A –Agree; U – Undecided/No opinion; D – Disagree; SD – Strongly Disagree).

Item	SA	A	U	SD	D
The interlocking of blocks and non-use of mortar in the joints reduces cost of walling.					
Blocks can be manufactured at-sit thus reducing transport cost.					
A thin layer of plaster is required hence reducing cost.					
Finishing for the wall is cheap.					
Environment friendly since blocks provide cool climate inside the house.					
Construction is faster since walling can take a lot of courses per day during construction.					
Easy to construct since ever body becomes a fundi after setting out is done.					
Provides a very attractive walling to look at.					

Section F: Transport cost

25. What is your opinion on the transport cost of the conventional materials (e.g. quarry stones) in your area?

    Please indicate how strongly you agree or disagree with statements regarding the issue of cost of transport of the conventional materials. (SA – Strongly agree; A – Agree; U –Undecided/No opinion; D – Disagree; SD – Strongly Disagree).

Item	SA	A	U	D	SD
The cost is too high for ordinary Kenyans.					
The cost is affordable but transportation is expensive.					
The cost of transportation has been raised due to rise in the cost of fuel.					
The cost is low compared to use of ABM & T materials.					
The cost is too high compared to ABM & T materials.					
The cost is inevitable if you have to build.					
The cost is easy.					

26. What is your opinion on the transport cost of the ABM & T Materials in your area?

Please indicate how strongly you agree or disagree with statements regarding the issue of cost of transport of the ABM & T materials. (SA – Strongly agree; A –Agree; U – Undecided/No opinion; D – Disagree; SD – Strongly Disagree).

Item	**SA**	**A**	**U**	**D**	**SD**
Transport cost is affordable.					
Transport cost is cheap compared to other materials.					
Transport cost is minimal cost of availability materials at site.					
Transport cost is within the reach of the ordinary Kenyan.					
Transport cost is attractive to the person wishing to build.					
The cost is low.					

Section G: Government Policy

27. Have you ever heard or read the government's policy document. "The National Housing Policy for Kenya 2004"?
28. Do you think the Government is doing enough in promotion of adoption of ABM & T for improving housing situation in North Eastern?

    Yes [ ]

    No [ ]

29. Do you think the Government is doing enough in promotion ABM & T for improving housing situation?

    Yes [ ]

    No [ ]

30. Give reasons for question number 28.

……

……

……

31. In your opinion what are the measures you would like the government to undertake in order to ensure quality and adequate housing for all Kenyans.

Please indicate how strongly you agree or disagree with statements regarding the issue of how you would like the government to undertake in order to ensure quality and adequate housing for all Kenyans. (SA – Strongly agree; A –Agree; U – Undecided/No opinion; D – Disagree; SD – Strongly Disagree).

Item	**SA**	**A**	**U**	**D**	**SD**
Reduce tax on building materials.					
Purchase more ABM & T equipments. Encourage macro-finance institutions to provide small loans to citizens for building homes.					
Provide incentives for home ownership.					
Be in partnership with public and cost share provision of building materials.					
Partner with NGOs and investors to put up adequate housing.					

THANK YOU FOR FILLING THIS QUESTIONNAIRE.

APPENDIX 3

INTERVIEW GUIDELINE: INSITITUTIONAL AND REGULATORY FRAMEWORK ON ABM&Ts PROGRAMME FOR MINISTRY OF HOUSING OFFICERS.

1. Which programmes have been initiated by the government to attract improvement of housing/shelter in North Eastern province?
2. In your view, do you think ABM&Ts programme is appropriate for North Eastern province?
3. What are some of the challenges the ministry is encountering in delivery of ABM&Ts programme in North Eastern province.
4. What measures have been put in place to address these challenges?
5. Do you have the necessary skills required for to become on ABM&Ts trainer?
6. What in your opinion would be the role of a skilled trainer/professional in promoting access of ABM&Ts in North Eastern province?
7. Who are your main clients as far as ABM&Ts is concerned in the North Eastern region?
8. Do you encourage or advise your clients to use ABM&Ts?
9. How do you think ABM&Ts, if well adopted could bring an effect on housing for the North Eastern region?
10. Do you think the cost of transport of materials could be a hindrance to the use of and hence adoption of ABM&Ts?
11. In your view, has the government through the ministry of housing provided enough ABM&Ts equipment for use by the people of North Eastern province?
12. Do you think the cost of construction materials has any negative effects on the adoption of ABM&Ts?

APPENDIX 4

PHOTOGRAPHS

Samples of photos of the poor housing condition in the north eastern area.

A house in Bula Iftin

Sample of stick houses (Manyatta) in Wajir County.

Samples of Houses Constructed using ABM&Ts.

Samples of Houses Constructed using ABM&Ts.

APPENDIX 5.

MAP OF KENYA