ADDIS ABABA UNIVERSITY COLLEGE OF BUSINESS AND ECONOMICS

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Thesis

Assessment of Science, Technology and Innovation Policy and its implementation:

The Case of Ministry of Science and Technology of Ethiopia

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Assessment of Science, Technology and Innovation Policy and its implementation:

The Case of Ministry of Science and Technology of Ethiopia

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A thesis submitted to the College of Bossiness and Economics of Addis Ababa University in partial fulfillment of the requirements for the Degree of Masters in Public Management and policy (MPMP) in Department of Public Administration and Development Management.

Abstract

Assessment of the formulation and implementation of science, technology and innovation policy help to identify the effectiveness of STI policy and its Implementation . The scope of the research study was restricted to see only the policy formulation and implementation process in the MoST and the institutions or organizations that are accountable to MoST .To carry out the assessment study , extensive literature review was carried out which formed the background knowledge to the study as well as provided the necessary input to the discussion of the findings from the study . The instrument for data collection was an interview and a structured questionnaire that was designed on a 5-p0int Likert scale to be able to collect quantitative data. The data were analyzed using SPSS version 20. The reliability was determined 0.774 with Cronbach's alpha coefficient. Four dimensions, namely STI policy formulation process, STI policy content, STI policy monitoring and evaluation and overall effectiveness of STI policy formulation and implementation have been established. The finding of the study indicated that the science technology and innovation policy making process/formulation/ was effective where as its implementation was found ineffective. The study recommended that the development of STI Policy implementation strategy , good coordination mechanisms and monitoring and evaluation mechanisms should be implemented.

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My father Ato Tsegaye , brothers and sisters –special thanks. My Mother! May her soul rest in peace. Finally, I would express my appreciation to my beloved husband Tekle . Without him, I would not have begun this.

Acronym

Ministry of Science and Technology -MoST

National Quality Infrastructure -NQI

Intellectual Property -(IP)

Intellectual Property Right (IPR)

Research and Development –R&D

Research and innovation-(RRI**)**

Science, Technology and Innovation -STI

Science Technology and Innovation Policy –STIP

Science and Technology Information Center -STIC

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Chapter One

1. Introduction

1.1 Background of the Study

Science is part of almost every aspect of our lives. Its place in society, therefore, is not to unfold quietly at the side lines but to become a fundamental part of the game (European Science Foundation ,2013, p.156-165).

In contemporary society, science is no longer, an end in itself, but rather a requirement for innovation; in turn, innovation is a decisive instrument for promoting and fostering social and economic development (Pulido and Fontela, 2005, p. 5).
Science and technology policy is concerned with the use of scientific and technical knowledge to enhance the nation's response to societal challenges (UNESCO ,2009, p.72).

Science, Technology and Innovation (STI) are playing a key role in the socio –economic development of countries. Experiences of countries have shown that the government plays the major role in building the required technological capability. The Ethiopian government therefore been undertaking various activities aimed at guiding and effectively coordinating scientific and technological activities in the country (MoST, 2010 , p.1).

Many developed countries of the world today achieved their level of development through the adaptation of technology and development of an efficient S&T capacity. There is no doubt that the importance of S&T to national development has been recognized by nations who currently are in the forefront of human development index.

Science, technology and innovation can be the game changer of the socio economic situation of developing countries and economies in transition (Bokova I., 2012 ,p.10). Development of national STI capacities has been proven to be an important prerequisite for the social and economic transformations that enable sustainable economic growth, human development and poverty eradication (Report on UN Secretary, 2013). Policies to promote innovation lay the foundation for future growth, productivity improvements, entrepreneurial and employment

opportunities. Success in innovation requires a holistic approach with all elements in the innovation eco-system reinforcing one another.

The STI policy and Strategy, provides a frame work for harmonized and coordinated approach to create a robust knowledge based economy that is centered on self reliance and equitable development. Of course, while new developments can improve our quality of life and understanding of the world, scientists and policy makers may not always properly assess the potential risks or take full account of the public's concerns. Opportunities must be created for scientists and the general public to exchange views in a two-way dialogue of mutual respect and trust. In order to compete in the global arena, with the pace that the world keeps and the speed with which technology advances, an understanding of science is crucial part of a rounded education ((European Science Foundation ,2013, p.156-165).

Policy has been defined as a "statement of the goals and objectives of an organization or a state in relation to a particular subject matter as well as description of the strategies for achieving those goals and objectivities (Salako,1999,p.43-49). Policy making therefore covers everything relating to the preparation and taking of decisions of concern to the state, together with the monitoring of their execution, evaluation of the results of government activities and possible feedback from the decisions taken (UNESCO, 2009,p.72-79).

Policy formulation involves identifying and assessing possible solutions to policy problems ,weighing the pros and cons , and deciding which should be accepted and which rejected . The relationship between government and social actors thus exerts a significant influence on the formulation of public policies (GO-SPIN, p.8).

Policy formulation and implementation cannot be removed from the context in which they take place. The social, political, and economic contexts influence what policies are developed and whether and how those policies are put into practice (Grandle and Thomas, 1991,p.25)

It takes time for some outcomes to materialize; hence, it is a good idea to assess progress along the way to ascertain what is or is not being achieved and why .Consequently, a one

way to think about policy implementation is to consider the extent and form in which activities have been carried out and the nature of issues arising during implementation (Bhuyan , A., et al . 2010, p.3).

PA Brynord (2006) cited the definition of policy implementation is regarded as the accomplishment of policy objectives through the planning and programming is the realization on application or execution of plan , idea and design . In general, implementation is the act of providing a practical means for accomplishing something in to effect.

Implementation is the process of turning policy into practice. However, it is common to observe a 'gap' between what was planned and what actually occurred as a result of a policy.

The key to the effectiveness and improvement of performance in science and technology is the adoption and implementation of a properly designed national policy.

In general this study assess the effectiveness of STIP and its implementation in the case of MoST of Ethiopia.

1.2 Statement of the Problem

Investment in Science Technology and Innovation (STI) is seen by African countries as an essential element in responding to Africa's socio-economic development needs and challenges. Various platforms held at national, regional and continental level have echoed the need for committed investment to STI. Notable among these is the Addis Ababa Declaration on Science, Technology and Scientific Research for Development made at the African Union (AU) Summit in January 2007 in which Heads of State and Government committed to promote and support research and innovation activities and the development of the requisite human and institutional capacities (NEPAD/ASTII African Innovation Outlook Series March, 2012).

Ethiopia has adopted a policy that focuses mainly on implementing the Agricultural Development Led Industrialization (ADLI) strategy. ADLI aims to bring in an effective

economic growth and to build technological capability that enables the development of micro, small, medium and large industries. (FDRE-STI, Feb, 2012).

A wide variety of different policies have to be pursued in Ethiopia in an effort to foster technological development with the aim of accelerating the pace of economic development.

Furthermore, these development policies have to be formulated to guide the process of development in relevant areas of the economy. The national sectors significant to achievement of nation's development targets are Agriculture, Health, Trade and Industry, Human resource development, Infrastructure, Energy, Environment, and Information Communication Technology.

Though there are experiences of policy making, institution building, planning and implementation of Science, Technology and Innovation policy in Ethiopia , these experiences raise questions such as how successful they were , and whether or not they could be used as a guide line or building blocks of more comprehensive national capabilities in technological learning, adaptation and utilization.

This study intends to review the effectiveness of STIP and its implementation in MoST of Ethiopia.

In order to address the causes of the present crisis in the world, both in the developed and developing countries , it is important to look at knowledge , not only as a driver for the economy but as the main driver for empowerment of the people in different societies . The concept of knowledge societies is that it has a culture of science and use knowledge to act.
An effective science, Technology and Innovation system is required for country to harness the potential offered by science and technology to its social and economic advantages. Assessing the Science Technology and Innovation policy and its implementation process provide greater understanding of why programs work or do not work and the factors that contribute to program success" (Love , 2003,p.4).

This study therefore assess (review) the effectiveness of STI Policy and its implementation in MOST of Ethiopia .i.e. the fundamental role of government and other actors in policy making process and its implementation in Ministry of Science and Technology of Ethiopia.

1.3 Research questions

In regards to the problem statement , the following questions are drawn:

1. How is the Science, Technology and Innovation (STI) policy of MoST formulated?
2. What are the main contents of current Science, Technology and Innovation (STI) Policy of MoST?
3. How and to what extent is the Science Technology and Innovation (STI) policy of MoST implemented?
4. What factors are influencing the implementation of STI policy in MoST?

1.4 Objectives of the Study

1.4.1 General Objective

The general objective of the study is to assess (review) effectiveness of the current STI Policy and examine its Implementation in MoST.

1.4.2 Specific Objectives

The specific objectives of the study are:

1. To assess the Science, Technology and Innovation policy making (formulation) process.
2. To assess (review) the contents of current Science Technology and Innovation (STI) Policy.
3. To examine the Science, Technology and Innovation (STI) Policy Implementation of MoST.

4. Identify the factors influencing implementation of Science, Technology and Innovation (STI) policy in MoST.

1.5 Significance of the Study

The objective of the study is to assess (review) effectiveness of the current National (MoST) STI Policy and examine its implementation. Hence the findings can be used to see the effectiveness of the policy formulation implementation system of MoST.

The study will be greatly significant in various ways to the management, policy makers and stakeholders. To policy makers and management the findings and results of this study would provide invaluable insights and reliable guide to evaluate how far the policy is formulated, implemented and monitored .

To stake holders like government, investors, employees, and others, the study will provide the necessary information that allow them to further analyze and suggest ideas to improve the quality of implementation.

Moreover, the study would serve as a preliminary work or a stepping stone for further study on the issue.

The above issues underline the rationale for this study and it is expected that the outcome will provide strategies for establishment of frameworks for short-term, medium-term and long-term plan of action for operation of the current ST I policy.

1.6 Scope of the Study

Due to time and money constraint, the scope of the research study is restricted to see only the policy formulation and implementation process in the MoST and the institutions or organizations that are accountable to MoST which are located only at Addis Ababa where majority of the respondents were concentrated.

1.7 Organization of the study

The project paper comprises of five chapters. The first chapter presents background of the study, statement of the problem, research questions and objectives. The second Chapter review the related literature focusing on science, technology and innovation (STI) Policy and its implementation and Instruments related to literature. The third chapter discuss on the data description which includes research design, sampling technique, and instrument of data collection among others. The fourth chapter present Data interpretation and Analysis. The last chapter summarizes the findings, make conclusions and recommendations.

Chapter Two

2. Literature Review

2. 1 Introduction

Public policy, “broadly defined” is the relationship of governmental unit to its environment. Political scientist Carl J. Freidrich regards policy as “a proposed course of action of a person, group, or government within a given environment providing obstacles and opportunities which the policy was proposed to utilize and overcome in an effort to reach a goal or realize an objective or a purpose” (James E. Anderson, 1984, p.4).

Public policy is commonly embodied "in constitutions, legislative acts, and judicial decisions” (Newman & White, 2012, p.5)

Policy making is the act or process of setting and directing the course of action to be pursued by a government , business , etc… high-level development of policy , especially official government policy (OECD , 2006 ; Metacalfe , 2005 ; Lundvall and Borras, 2004). Policy making has its advantages like improving decision making in all macro level ; explaining why things need to change ; helping us to focus on what is important ;informing judgments and guide actions; managing risks and entitlements ; strengthening relationships and build capacity (Lall S., 1995 ; Fagerberg and Srholec , 2008 ; Fagerberg et al ., 2007 ; Nelson and Rosenborg, 1993).

Policy formulation involves identifying and/or crafting a set of policy alternatives to address a problem, and narrowing that set of solutions in preparation for the final policy decision, (Jack Rabin ,ed , 2007,p.79).

As Dye puts it, policy formulation takes place in government bureaucracies, in interest group offices, in legislative committee rooms, in meetings of special commissions, in think tanks – with details often formulated by staff (Day, 2002, p.40-42). The STI policy making process is different from other policies. It requires very special expertise and knowledge. STI policies need to be transversal, cross-cutting policies that support and build the structural pillars for

sustainable development and through dialogue, engage the wide range of development stakeholders (J.C. Bolay et al.(eds) , 2014 , p.13).

The successful implementation of Science, Technology and Innovation policy has a very important role in the prosperity of any nation in the global market.

The study therefore, assesses the effectiveness of STI policy and its implementation in MoST of Ethiopia.

This chapter contains definitions and concepts of STI policies, conceptual, theoretical and practical experience of STI issues and it includes the introductory remarks, historical development of STI policy and legal frame work in Ethiopia, and STIP formulation and its implementation in MoST of Ethiopia.

2.2 Definitions and concepts of Science technology and innovation (STI) and Policy Formulation and Implementation

2.2.1 Science Policy

According to A. Nadal (2005), science policy can be defined as a set of measures, decisions, interventions or activities realized by a determined society's distinct political powers, with the main and ultimate objective of favoring, stimulating or inhibiting the progress of research, as well as employing the results of this research in products with socioeconomic, political, cultural or military ends (p. 95). S. E. Cozzens (2003), in turn, understands science policy as government actions affecting the role of technology in the everyday life (p. 55). J. Sebastián (2007), analyzing this subject, adopts a similar approach, highlighting the fact that science policy is a "collection of strategies and instruments that permit the promotion of scientific and technical research in order to achieve objectives, which range from the production of the most relevant knowledge possible to its application in technological developments that can further socio-economic progress and improve the quality of life of citizens" (p.626). Perhaps the most important point to highlight from these definitions is that the aims of science are not restricted to the generation of knowledge but also include

objectives of economic and social nature, which places science and technology activities in the public arena as never before in history.

2.2.2 Technology Policy

Technology (from Greek techne, "art, skill, cunning of hand"; and - logia) is the collection of techniques, methods or processes used in the production of goods or services or in the accomplishment of objectives, such as scientific investigation. Technology can be the knowledge of techniques, processes, etc. or it can be embedded in machines, computers, devices and factories, which can be operated by individuals without detailed knowledge of the workings of such things. (Tarr, J.A. (ed.) (1997).

Technology is often a consequence of science and engineering although technology as a human activity precedes the two fields. The exact relations between science and technology in particular have been debated by scientists, historians, and policymakers in part because the debate can inform the funding of basic and applied science (UNESCO, 2009, p9). The issue remains contentious though most analysts resist the model that technology simply is a result of scientific research (Wise, 1985 and Guston, 2000).

Technologies are not usually exclusively products of science, because they have to satisfy requirements such as utility, usability and safety (UNESCO, 2009, p9).

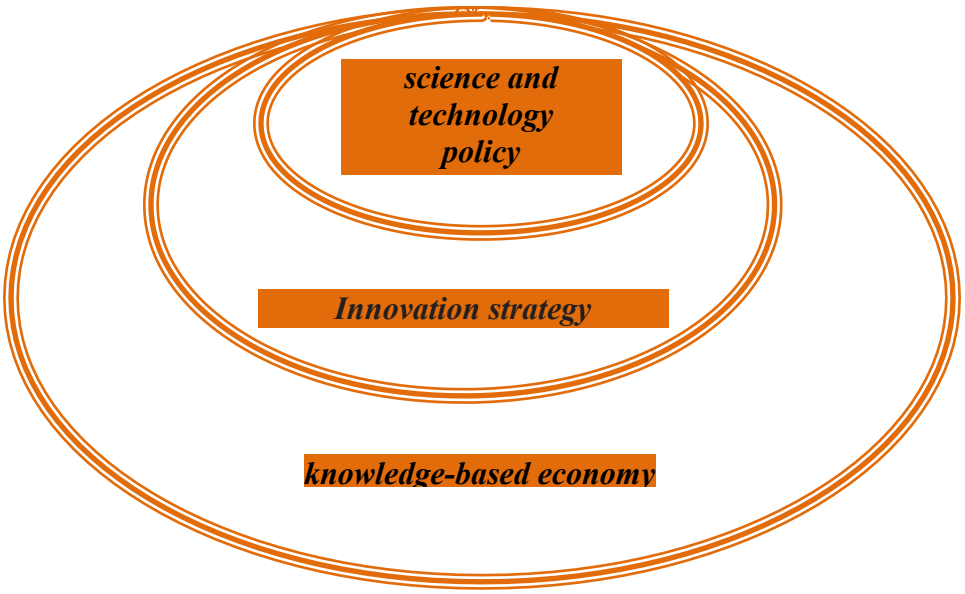
2.2.3 Innovation policy

Innovation is derived from the Latin word Novus, meaning new. It is defined as “introduction of something new” or a new idea, method or device (Tornatzky and Fleischer, 1990). Among the variety of definition, technological innovation is considered as a process which is science, technology and system based. This process includes several factors affecting and affected by the firm’s internal capabilities, its networking and its technological learning ability and influenced by its environmental factors. It would mobilize all existing potential resources to augment the firm’s innovation capacities, ending with the introduction of a new or better product and/or production process.

Technological innovation and the appropriate implementation of new technologies are a fundamental part of development process of all nations.

Governments have traditionally played an important role in promoting technology, sometimes by directly supporting the development of technologies (in space, defense, and the like) or more indirectly by creating a climate favorable to innovation through various incentives or laws. Every society has to find the ways and means to innovate that correspond to its needs and capabilities. Its innovation climate is largely determined by its overall macroeconomic, business, and governance conditions. Despite the nature of these conditions in low- and medium-income countries, well-designed and well-implemented innovation policies are very relevant. Moreover, they can be an efficient policy tool for triggering change and improvement in the country's overall framework conditions.

Figure 1. Innovation Policy in a Broad Perspective



Government efforts in the 1960s and 1970s were largely inspired by a linear model of innovation and the idea that science and research needed to be pushed toward technological

and industrial applications; many policy initiatives therefore aimed at supporting enterprises in their R&D efforts or at improving university industry collaboration. Concomitant large-scale space and defense programs facilitated the development of breakthrough technologies that were later used in civilian applications.

Recognition of the importance of interactions in innovation processes led to the concept of innovation systems, which was introduced in the literature in the late 1980s. This concept has been particularly fertile and has been variously understood. Most often, it defines the sets of interacting actors and institutions that provide the knowledge and financial resources required for the successful development of innovations.

Therefore, the first generation of innovation policy was replaced by a second generation in which innovation policy became more complex and aimed at facilitating interactions between the various actors and institutions involved in innovation processes: universities, research laboratories, banks for venture capital, and government agencies in charge of various sectors.

The boundaries of an innovation system legitimately include the "framework conditions" that encompass elements as apparently distant from the innovation process as the educational system or the macroeconomic environment. The OECD, for instance, explicitly includes framework conditions in its reviews of innovation systems. Thus, a third generation of innovation policy has appeared. It is inspired by a "whole-of government" approach, in which all departments are potentially concerned.

Figure 2. Model for a Strong Innovation Policy

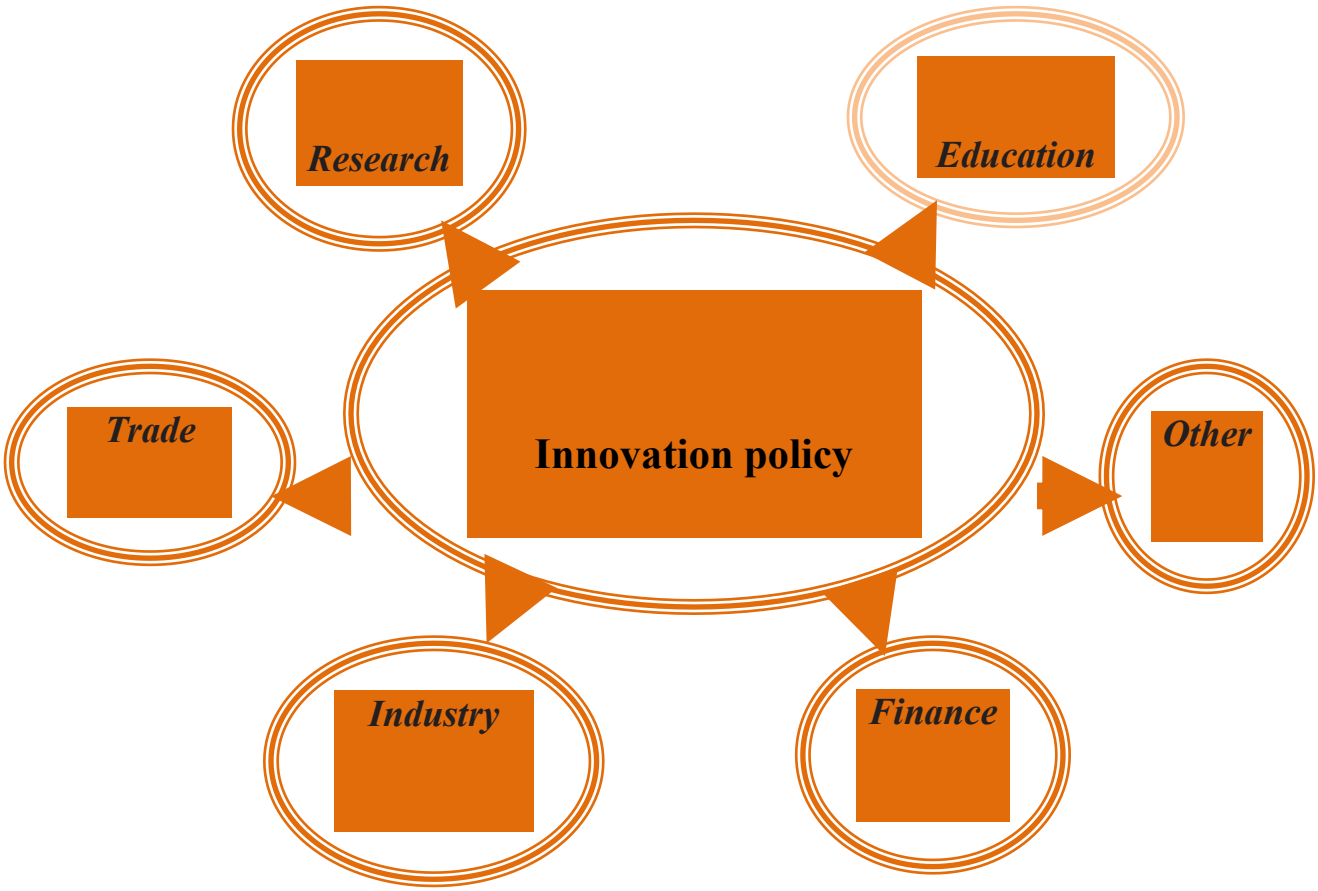


Figure 3: Science, Technology, and Innovation Policies

Science Policy: objective is the production of scientific knowledge

- To manage and fund the accumulation of knowledge in relation to natural phenomenon by creation and support of appropriate organizations-research labs and universities.

Technology Policy: objective is the commercialization of technical knowledge

- To manage and fund the accumulation and application of practical knowledge needed for particular productive activities, including transfer of technology from overseas and the transfer of scientific knowledge into wealth creation. Organizations are: research laboratories, universities, and firms.

Innovation Policy: objective is improvements in the overall performance of the economy

- To foster the transfer of S&T knowledge into application by ensuring that necessary complementary resources (capital finance) are available, by supporting entrepreneurship and by protecting IPR. The focus of innovation policy is on the interaction between actors and their in an institutional and policy context that influences their innovative behaviour and performance.

source: Lundvall 2004

2.3 Theoretical frame work of policy formulation and implementation

2.3.1 The policy formulation

The policy formulation is the critical phase of the policy process which also an explicit subject of policy design . The public policy formulation is pre-decision phase of policy making including to craft the goals and priorities and options , costs and benefits of each options , externalities of each option. The attention to policy formulation is also embedded in work on policy communities , who dose the design ? (Howlett ,2003) . On the other words , the formulation process will need the motivation and participation of different actors with their entrances of new actors and new ideas who will actually play their roles in the policy design process .

According to Hai Do (2010) , the dominant model of policy formulation in developing countries is the bureaucratic politics amongst the interrupted equilibrium , organizational process , and rational actor .

2.3.2 Policy Implementation

Top-down and Bottom-up Approaches within Implementation

There are three major theoretical models of policy formulation and implementation (Buse et al, 2005).

Top-down approach: This approach sees policy formation and policy execution as distinct activities. Policies are set at higher levels in a political process and are then communicated to subordinate levels which are then charged with the technical, managerial, and administrative tasks of putting policy into practice. Political scientists have theorized that the top-down approach requires that certain conditions be in place for policy implementation to be effective including:

- Clear and logically consistent objectives
- Adequate causal theory (to how particular actions would lead to desired outcomes) An implementation process structured to enhance compliance by implementers (incentives and sanctions)
- Committed, skilful implementing officials
- Support from interest groups and legislature
- No changes in socio-economic conditions that undermine political support or the causal theory underlying the policy
- Adequate time and sufficient resources available
- Good coordination and communication

Participation of stakeholders affords opportunities for administers to contribute in the rational planning model / top-down approach.

Problems associated with the top down approach:

- It is very unlikely that all pre-conditions would be present at the same time

- Only adopts perspective of those in higher levels of government and neglects the role of other actors
- And therefore, it risks over-estimating the impact of government action (neglects other factors)
- Difficult to apply where no single, dominant policy or agency is involved
- Policies change as they are being implemented

Bottom-up approach: This approach recognizes that individuals at subordinate levels are likely to play an active part in implementation and may have some discretion to reshape objectives of the policy and change the way it is implemented. The bottom-up approach sees policy implementation is an interactive process involving policy makers, implementers from various levels of government, and other actors. Policy may change during implementation.

Problems of the bottom-up approach:

- Evaluating the effects of a policy becomes difficult
- Difficult to separate the influence of individuals and different levels of government on policy decisions and consequences. (Important for bureaucratic accountability)

Principal-agent theory: In each situation there will be a relationship between principals (those who define policy) and agents (those who implement policy), which may include contracts or agreements that enable the principal to specify what is provided and check that this has been accomplished. The amount of discretion given to the agents and the complexity of the principal-agent relationship are affected by:

- The nature of the policy problem- including scale of change required, size of affected group, simple vs. complex intervention, ill-defined vs. clear policy, many cause vs. single cause, degree of political sensitivity, length of time before changes become apparent.
- The context or circumstances surrounding the problem- political and economic climate, technological change

- The organization of the machinery required to implement the policy- number of formal and informal agencies, amount of skills and resources required

In practice

Whether policies are implemented from the top-down, bottom-up or according to the principal agent theory, policy implementation involves 3 activities (Anderson and Sotir Hussey, 2006):

Interpretation: translation of the policy into administrative directives

Organization: establishment of administrative units and methods necessary to put a program into effect

Application: routine administering of the service

Interpretation of policy directives requires the translation of knowledge on interventions into the particular local context. Factors to take into account when interpreting policy include (Jenkin *et al* 2006):

- Local resources, including human resources and infrastructure
- Specific characteristics of the population
- Baseline incidence of the health problem
- The latency period before an effect of the intervention will be observed
- A balance between achieving targets that reflect process change and those that reflect risk factor change
- Local variations in the likely effectiveness of particular interventions

Gunn (1978 in Hunter 2003) has identified some common barriers to effective policy implementation:

1. The circumstances external to the implementing agency impose crippling constraints
2. Lack of adequate time and sufficient resources
3. The required combination of resources is not available

4. The policy to be implemented is not based on a valid theory of cause and effect
5. The relationship between cause and effect is indirect and there are multiple intervening links
6. Dependency relationships are multiple
7. There is a poor understanding of, and disagreement on, objectives
8. Tasks are not fully specified in correct sequence
9. There is imperfect communication and coordination
10. Those in authority are unable to demand or obtain perfect compliance

Table 2.1 The approach or the model used for the dimensions

Dimensions	Explanation	Approach
Science technology and innovation policy making/formulation/ process -actors participation	The attention to policy formulation is also embedded in work on policy communities , who dose the design ? (Howlett ,2003) . On the other words , the formulation process will need the motivation and participation of different actors with their entrances of new actors and new ideas who will actually play their roles in the policy design process . Political scientists have theorized that the top-down approach requires that certain conditions be in place for policy implementation to be effective including: • Committed, skilful implementing officials • Support from interest groups and legislature	(Howlett ,2003) the top-down approach and Bottom Up approach

Dimensions	Explanation	Approach
No involvement of stake holders in the STI policy making process	According to Hai Do (2010) , the dominant model of policy formulation in developing countries is the bureaucratic politics amongst the interrupted equilibrium , organizational process , and rational actor .	
Poor understanding of the essential characteristics of STIP among policy makers	Adequate causal theory (to how particular actions would lead to desired outcomes)	
Poor knowledge of STI among policy makers	participation of different actors with their entrances of new actors and new ideas who will actually play their roles in the policy design process	
No awareness creation prearranged to STI policy makers		
Science Technology and Innovation policy content	Political scientists have theorized that the top-down approach requires that certain conditions be in place for policy implementation to be effective including: • Clear and logically consistent objectives Adequate causal theory (to how particular actions would lead to desired outcomes)	
The policy indicates no Clear communication strategy for stakeholders	• Adequate time and sufficient resources available • Good coordination and communication	
The policy indicates no clear direction to promote innovation		
The policy indicates no clear direction about monitoring and evaluation process		

Dimensions	Explanation	Approach
The policy indicates no coordination mechanism with other sectors		
The policy indicates no implementation strategy	• Adequate causal theory (to how particular actions would lead to desired outcomes) An implementation process structured to enhance compliance by implementers (incentives and sanctions)	Top -Down and Bottom Up approach
No clear guide line for collaboration work with sectors (other than science)		
No clear influencing factors that affect formulation and implementation of STIP		
Doesn't clearly identify sectors that affect its implementation		
Science Technology and Innovation Policy monitoring and evaluation	• • Jenkins 1978, p .203). There are three distinct theoretical approaches to the study of plan and implementation: . Top-down models put their main emphasis on the ability of decision makers' to produce unequivocal policy objectives and on controlling the implementation stage./Top planning stage/ 2. Bottom –up critiques view local bureaucrats as the main actors in policy delivery and conceive of implementation as negotiation processes within networks of implementers./Implementation/ 3. Hybrid theories try to overcome the divide between the other two approaches by	(Jenkins 1978, p .203). There are three distinct theoretical approaches to the study of plan and implementation: 1. Top- down models put their 2. Bottom –up 3. Hybrid

Dimensions	Explanation	Approach
	incorporating elements of top-down, bottom –up and other theoretical models (Jack Rabin ,ed , 2007,p.89).	theories
No monitoring and evaluation system created	• principal agent theory, policy implementation involves 3 activities (Anderson and Sotir Hussey, 2006): Interpretation: translation of the policy into administrative directives Organization: establishment of administrative units and methods necessary to put a program into effect Application: routine administering of the service	
No clear performance indicators to monitor and evaluate implementation	There is a Strategic power of stakeholder in determining the aims and objectives of an organization in the setting of performance criteria and in evaluating the performance . There is operational power the stakeholder has in determining what services to provide ... and how the services should be provided . (CAG consultants , p.4)	
No feedback mechanism from private sector		
No feedback from government actors		
No involvement of sectors in the implementation process		
Overall effectiveness of Science Technology and Innovation Policy making (formulation)and Implementation		

Dimensions	Explanation	Approach
There were no effective mechanisms in the policy making (formulation) process	Hybrid theories try to overcome the divide between the other two approaches by incorporating elements of top-down, bottom –up and other theoretical models. In general key elements along the policy-to-action continuum, such as leadership, stakeholder engagement, the context, resources, and operational issues, shape decisions and actions at various levels (Bhuyan , A., et al . 2010 , p.2).	Hybrid theories(Jack Rabin ,ed , 2007,p.89).
There were no effective mechanisms to implement science technology and innovation policy		Hybrid theories (Jack Rabin ,ed , 2007,p.89).

2.4 Historical Development of STI Policy in Ethiopia and legal frame work

In the middle and late 1970s, ESTC established eight research councils to be responsible for the following research sectors:

Food and agriculture

Industry and technology

Natural science

Natural resources

Health

Construction, housing and urban development

Education and manpower development

Science and technology popularization (Johann Mouton and Nelius Boshoff

(Centre for Research on Science and Technology, Stellenbosch University)

In 1975, the Ethiopian Science and Technology Commission (ESTC) was created with the mandate to plan, encourage, guide, coordinate, select, approve and support research programs and projects of importance to national development. A key task was to distribute the very limited national research funds.

In 1977 the Ethiopian Science and Technology Commission (ESTC) was first to evolve with the plan to set up the National Scientific and Technological Information and Documentation Center (NSTIDC). The institution was designed as an apex body and agency for initiating, furthering, strengthening and coordinating various facilities and services concerning the collection, organization and dissemination of scientific and technological information (Seetharaman ,1988),

In the early 1990's, the prevailing conditions for effective research and S&T management in Ethiopia, and especially the lack of a clearly articulated S&T policy, prevented research from contributing to national development. The then transitional government commissioned the formulation of an S&T policy for Ethiopia that was finished in 1993. The specific goals listed in this policy document were:

To build a national capability to generate, select, import, develop, disseminate and apply appropriate technologies for the realization of the country's socio-economic objectives.

To improve and develop the knowledge, culture and scientific and technological awareness of the people of Ethiopia.

To make science and technology activities in Ethiopia more efficient and development oriented.

Following the change in government in 1991 and with the issuance of the new economic policy, the Commission was re-established in March 1994 by Proclamation No.91/94. The commission went into its 3rd phase of re-institution on the 24th of August 1995 by Proclamation No.7/1995, following the establishment of Federal Democratic Republic of Ethiopia as an Agency.

Later on, in 2008 the government upgraded the Agency as one of the Cabinet ministries accountable to the prime minister and the council of ministers by the proclamation No. 604/2008 and re-established recently too in October 2010 according to definition of powers and duties of the executive organs of the Federal Democratic Republic of Ethiopia proclamation No. 691/2010. In 2010, the Ministry attached top priority to the task of formulating a national STI policy. Review of the various national socioeconomic development policies, strategies and the implementation plans was made by a specialized team established by the Ministry to analyze the situation of the country. A benchmarking study was also carried out to draw lessons from the experiences of countries which achieved phenomenal economic growth in a short period of time. In the process, the STI situation of twenty countries was reviewed with particular emphasis on their success and failures in implementing policies and strategies. This was followed up by an in-depth analysis of the factors for successful achievements in the technological capability building efforts of Chile, China, India, Japan, Malaysia, Republic of Korea, South Africa and Tunisia (Green paper, MOST, 2010 p.1).

The process also involved a study of the socio economic and STI situation of the country through review of documents and interviews with heads of institutions, researchers, scientists and technologists. Reading and review of a number of documents on Science, technology and innovation produced over the last 50 years was also done to learn from countries' and discern extractable lessons. The policy drafting process was closely guided and supported by a weekly meeting of the team with the Ministers. The results of all these efforts have been synthesized in to the Green Paper (Green paper, MoST, 2010 p.1).

Subsequently to the introduction of the Growth and Transformation plan (GTP), aligning the STI policy was a necessity, and the STIP was revised in 2012 to accommodate the changes in strategy of the country.

The accountable organizations to MoST are: Science and Technology Information Centre ; Ethiopian Intellectual Property Office; Ethiopian Conformity Assessment Enterprise; Ethiopian National Accreditation Office; Ethiopian Radiation Protection Authority; Ethiopian Standards Agency; National Metrology Institute of Ethiopia; and, recently in addition to the above institutions other two Science and Technology universities are become

part of MoST. These are Addis Ababa Science and Technology University and Adama University .

2.5 Science, Technology and Innovation policy and its Implementation in Ministry of Science and Technology of Ethiopia

The Ethiopian national economic policy core of attention is on implementing the Agricultural Development Led Industrialization (ADLI) strategy. But there is no strong national technological capability, which can sustain the country economic growth, (FDRE, STI policy, Feb. 2012 p.1). Ethiopian STI policy mainly focuses on the creation of a national frame work that will define and support how Ethiopia will in future search for, select, adapt, and utilize appropriate and effective foreign technology as well as addressing the establishment of national innovation system.

To address the establishment of national innovation system and select adapt and utilize appropriate and effective foreign technology, Ethiopia formulate the STI policy. The vision statement of the policy indicates about the capability of rapid learning, adaptation and utilization of effective foreign technologies by the year 2022/23.

The STI policy of Ethiopia has seven major objectives and it focus on establishment and implementation governance frame work and National Technology Capability and Transfer (TeCAT) system , Technology learning and adaptation , indigenous knowledge and technologies , national science and technology landscape and actors in the national innovation system , coordination of STI activities with other economic and social development programs and plans , strengthening the role of private sector in technology transfer .

2.5.1 Policy directions and strategies

Depending on main STI problem analysis and assessment eleven critical policy issues are identified in the policy document. These are :

2.5.1.1 Technology transfer

In the policy it is indicated that most technology transfer activities in the country are not in line with the envisaged technology demands of development programs (FDRE, STI policy, Feb. 2012 p.5). So to fulfill the country economic national demand, the technology transfer issue is formulated to devise a system of learning, adapting and utilizing as well as disposing of imported technologies to support development needs.
There are five strategies to implement the technology transfer issue. The strategies indicate:

How to create capabilities of adaptation and utilization of manufacturing and service providing enterprises by establishing and implementing a system to search ,select, import effective technologies, adapt , utilize as well as dispose ;establishing and implementing a system to use foreign direct investment (FDI) and other ways of supporting technology transfer .Strengthen technology transfer and wide use of intellectual property ,standards and other related information in support of technology transfer (FDRE, STI policy, Feb. 2012 p.6).

However it lacks clear statements about the social inclusive strategies that address the socio–economic issues affecting the local community. It is indeed obvious that social inclusiveness is an important aspect of development.

The Ministry of Science and Technology of Ethiopia (MoST) has designed various projects for Technology Transfer and development .That is entitled enabling activities for the establishment of Ethiopian National frame work on selection , import , utilization and disposal of green technology; and 'Re-enforcing Ethiopian ongoing science Technology and innovation , activities that will advance the socioeconomic development'. To assist the realization of the Growth and Transformation Plan (GTP), the Ministry has prepared a draft strategy to address problems observed on the survey of technology transfer (Ethiopian year Book, 2012-2013).

However, the STIP of Ethiopia implementation strategy is finalized in February 2015 (MoST STIP implementation strategy, 2015) .This indicates that without implementation strategy problems are not properly addressed.

2.5.1.2 Human Resource Development

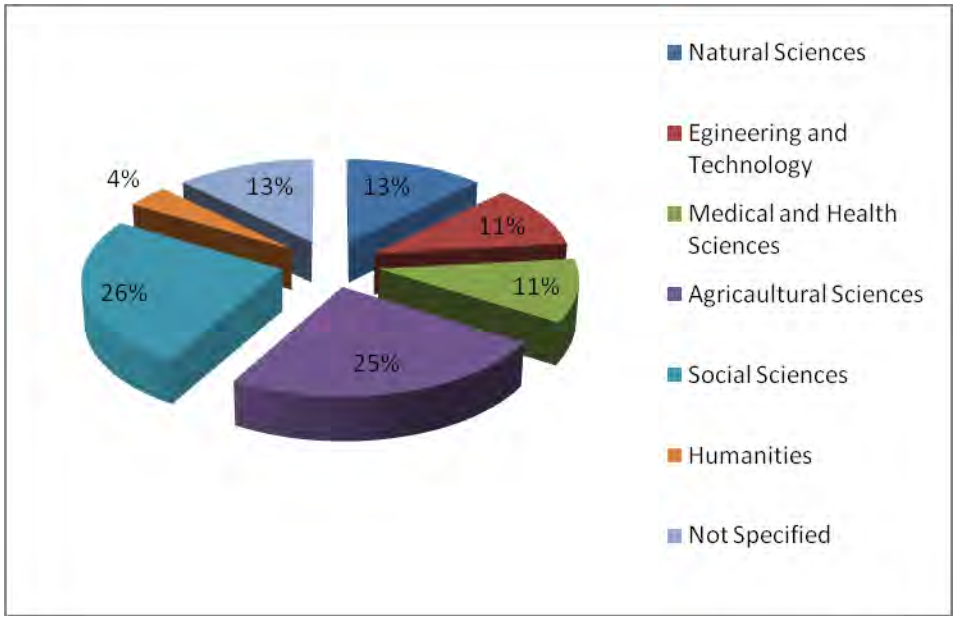
To use these selected imported technologies competent local human resources are needed .In Ethiopia , the level of qualified manpower capable of transferring foreign technology is low (FDRE, STI policy, Feb. 2012 p.6).So human resource is needed that is qualified in understanding and utilizing appropriate technologies.

There are four strategies to implement this human development policy issue.

The strategies are i) develop science and technology institutions, ii) focus on modifying the balance of enrollment numbers of higher education students in favor of the science and technology human resource development need, iii) increase the number of females enrolling in engineering, science and TVET institutions, iv) enable the establishment of work force with the knowledge and skills necessary to learn, adapt and utilize technology.

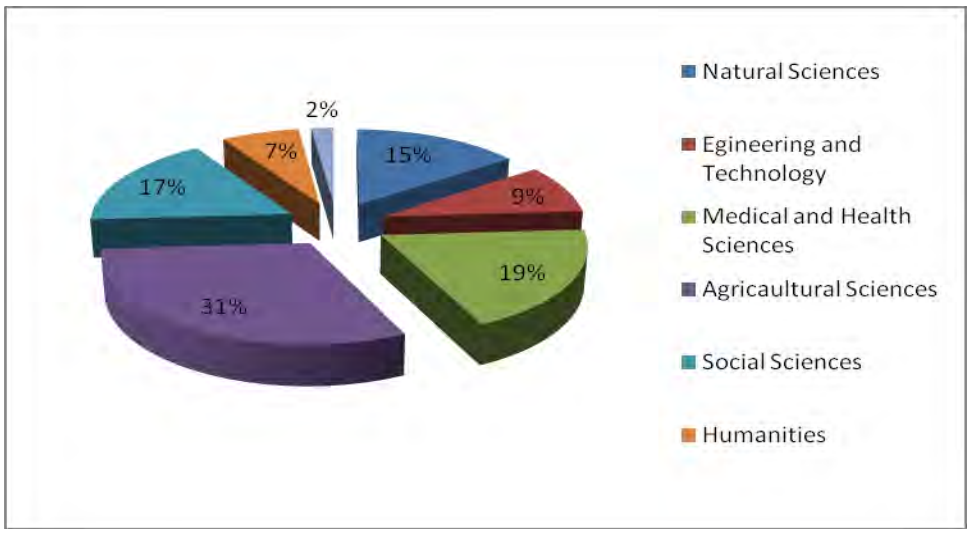
The government of Ethiopia has set a priority of meeting 70 percent of the graduates to have a background in the fields of natural science, engineering and technologies .This is supposed fill the gap of capable human resource in science and technology .The government has also set priorities in other related natural science fields, such as medicine and health sciences (Ethiopia Science and Technology indicators report, 2014).

Figure 4 .Research and Development personnel by science background



source Science and Technology indicators Report, 2014 ,p.29

Figure 5. science background of Researchers (head count as percentage)

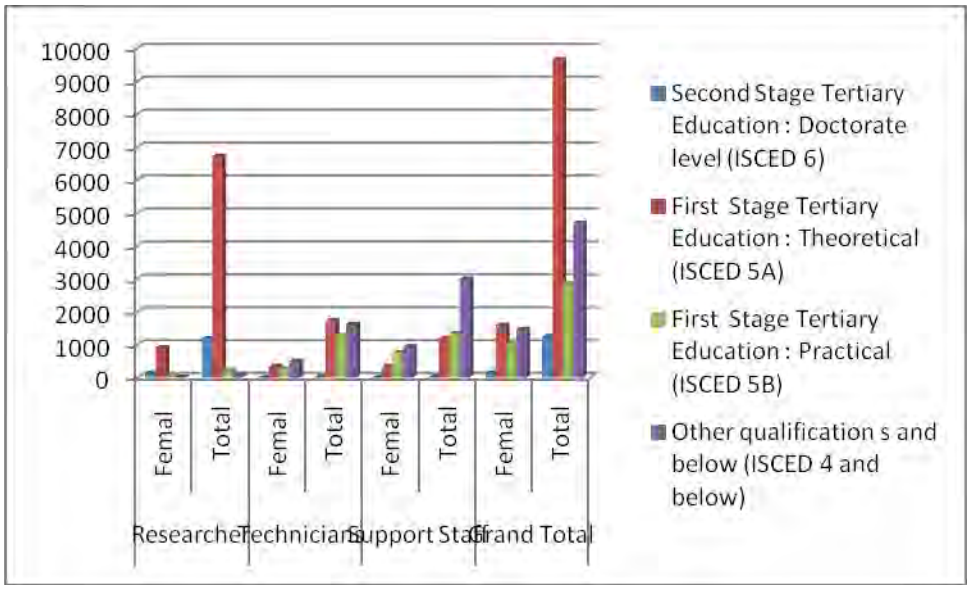


source Science and Technology indicators Report, 2014, p.30

Keun (2012) argued capability and technological development as the most important elements of South Korea's success. Without a strengthened R&D capability, sustaining economic growth is not possible.

Gender dimension of researcher qualification is one aspect that ought to be looked at carefully to understand the level of capacity and qualification of women operating in R&D activities. Women researchers represent around a quarter (23%) of the entire R&D personnel. Based on the qualification that women's have, most (38%) of them have first stage tertiary education (ISCED 5A) qualification and very few numbers of women (3%) have a Phd qualification (Ethiopia Science and Technology indicators report, 2014,p35).

Figure 6. Research and Development personnel by qualification and gender



source Science and Technology indicators Report, 2014, p.36

2.5.1.3Manufacturing and Service proving Enterprises

This issue is formulated to conduct and support research and technology transfer activities in manufacturing and service proving enterprise and implementing the policy frame work .The enterprises have no clear value adding linkages between them and their role in advancing the STI is not well defined in Ethiopia (FDRE, STI policy, Feb. 2012 p.8).

Hence, assistance will be provided to strengthen micro and small enterprises development to serve as basis for the expansion of medium and large enterprises. The strategies are focused on the provision of support and strength linkage between medium and large enterprises, industries and TVET institutions in order to allow them to play a vital role in technology transfer.

2.5.1.4Research

In order to have effective national research system, research is being the critical issue of effective learning, transfer, adaptation and utilization of technology in the STI policy.

In Ethiopia research is needed to address the resolution of major social and economical problems; contribute to the achievement of national development objectives; and to meet technology demand, (FDRE, STI policy, Feb. 2012 p.9).

Due to the identified gap between the research activities and focuses in higher education and research institutions and the national development need, the national research system should be strengthened and orientated to focus on the national technological demands for searching for, learning about, adapting and utilizing effective foreign technologies.

The strategies to implement this policy issue focuses on supporting research institutes to develop their capacity to search, learning, adapting and utilizing effective foreign technologies; ensure research work in higher education and research institutions is in line with the technological needs of national development programs; and lastly support joint research activities among universities, research institutes and industries and medium and large industries to establish research centers on technology adaptation.

The research focuses generally on expletive researches .The Gross Expenditure on Research and development by research type shows that 56% of the Budget was spent on applied research and 33% on experimental and the remaining on basic research which is consistent with the priorities of government (MoST Critical Mass Training, 2014) .

2.5.1.5Financing and Incentive Schemes

Financing and incentive schemes need to be established to support activities on searching for, learning about, adapting and utilizing of effective foreign technologies in line with national development needs , (FDRE, STI policy, Feb. 2012 p.10).

The formulated strategies in Financing and Incentive Schemes issue to support activities of STI policy are offer various incentives to medium and large enterprises and to award those manufacturing and service providing enterprises which show high performance gains through

technology transfer; Allocate resources for higher education and research institutes for their contribution to technology transfer .

The Gross Domestic Expenditure on R&D as share of GDP has reached 0.63% in 2013 from 0.24% in 2010 (MoST critical mass Training, 2014). About 97% of the source of fund for the R&D comes from the state and revenues generated by its institutions. The contribution of the private sector is meager. The government is the major funder of R&D and technology transfer projects (Science and Technology indicators Report, 2014, p.55) .

2.5.1.6National Quality Infrastructure

This issue focuses on solve problems related to productivity and quality that arise due to lack of implementing standards thereby creating competitive manufacturing and service providing enterprises, capacitating the standardization, metrology, conformity assessment service providers and accreditation bodies .

The strategies to implement National Quality Infrastructure are the ensure adoption of best practices on productivity, quality and safety management systems in all manufacturing and service providing enterprises and incorporate the issue on the curricula of higher education and TVET colleges; Establish a credible and internationally recognized metrology system , national conformity assessment system and national accreditation system; Promote and strengthen the use of standards and technical information as a tool ; Issue additional mandatory standards to ensure creation of strong regulatory capacities to conduct proper technical regulation.

2.5.1.7 Universities, Research Institutes, TVET Institutions and Industry Linkage

Core actors in the national innovation system identified as universities, research institutes, TVET institutions and industries and establishing linkages among these institutions is the issue. As far as technology learning is concerned, the current situation of our country confirms that universities are not taking the leading role and are lagging behind the

industries, (FDRE, STI policy, Feb. 2012 p.13). The strategies are establish a system that integrates and synergizes technology transfer issues; Create a conducive environment for university academia and students; Create strong linkages among actors and establish a system that enables universities to provide an advisory role to industry.

Universities are expected to be the pillars of the economy not only through training and educating people but also through other means that enhance the role of academia in a society such as establishing industrial internship, incubation centers , and science parks , university affiliated enterprises, patent licensing , consultancy and soon.

All universities in Ethiopia have established knowledge and Technology Transfer (KTT) offices to disseminate research outputs that had in the past were left 'on the shelf"). A lot of remains to be done in terms of commercializing of research findings .Besides , the industries and the MSEs in the country are not ready to take on and exploit research and technology outputs from the universities.

2.5.1.8 Intellectual Property System

Intellectual Property system is said to play a valuable role if it contributes to technology transfer as well as to technology capability building through FDI and technology licensing. Nevertheless, intellectual property system as a whole in Ethiopia is not playing a substantial role in accelerating technology transfer and expansion of local innovation activities. Hence, the Ethiopian IP system needs to be designed in such a way as to support the Endeavour of technology learning and adaptation as well as to protect the rights of inventors and creators and support the augmentation and application of indigenous knowledge, (FDRE, STI policy, Feb. 2012 p.14).

The strategies are formulate IP system are use IP information to build national technology capability ; Establish and implement a system that ensures effective protection of indigenous genetic resources and IP assets of the nation besides bringing benefit out of them; Develop and implement the application of IPR systems at national and institutional level; Strengthen and implement copyright protection in such a way to encourage and promote creative works; Strengthen trademark protection to create a healthy and competitive environment among manufacturing and service providing enterprises.

2.5.1.9Science and Technology Information

Collecting, organizing, analyzing, disseminating, and using information related to science and technology is of significant importance for successful technology transfer. In Ethiopia there was no well organized science and technology information source or system as required by manufacturing and service providing enterprises, higher education, researcher institutes and other entity.

Despite the fact that there are certain types of information which are prepared and kept in the form of statistics, databases, indicators and bibliography, there are no mechanisms to publish and update them regularly. Therefore, it is imperative to develop and establish a national science and technology information system to fill the gaps and bring expected results, including the acceleration of technology transfer.

Establishing and strengthen such a system will create a capacity that accelerates technology transfer through identifying, gathering, organizing, analyzing, disseminating and proper utilization of science and technology information.

1. Establish a National Science and technology information centre;
2. Support technology transfer through gathering, organizing, analyzing, and disseminating of Science and technology information;
3. Establish and implement up-to-date systems to link and exchange Science and technology information among national, regional and international information centers
4. Support research activities with respect to strategies and methodologies of gathering, analyzing, management and dissemination of Science and technology information (STIP, 2012).

Ethiopian Science and Information center (STIC) established in 2013, which was mandated to serve as an information hub for the country (S&T indicators report, 2014).

2.5.1.10Environmental Protection and Development

Environmental protection and development is crucial to maintain continual and sustainable economic growth. The major issues of the environment in Ethiopia are desertification, deforestation and soil erosion. In big cities lack of solid waste disposal and sewerage system are critical environmental challenges. Therefore, to address these and other environmental problems prevailing in the country, appropriate technologies will be applied in the course of natural resource utilization and implementation of various development activities. The strategies for this issue are : Establish a system that allows technology importation, adaptation, utilization, and disposal activities without polluting the environment; Create local capabilities to learn about, adapt and adopt green technologies; Establish and implement a system that addresses the safety of the environment and of society in relation to the use of equipment emitting radiation, the use of actually or potentially non ecologically-friendly chemicals and other industrial inputs actually or potentially threatening to the environment (STIP,2012).

2.5.1.11International Cooperation

International cooperation in the areas of science and technology is crucial for information sourcing, manpower training, expert assistance, scientific visits, collaborative research, joint ventures in technology transfer and funding of scientific and technological projects. However, the current cooperation practice of our country lacks focus, particularly on STI information sourcing, and exchange of scientists and engineers, thereby highlighting certain particular needs for cooperation to strengthen national technology capabilities. Therefore, the prime focus of international relations should be to encourage cooperation with developed and developing countries as well as with various international and regional organizations with the objective of building national technological capabilities. The strategies for this issue are: Ensure incorporation of STI capacity building elements in bilateral and multilateral agreements; Strengthen exchange of professionals and scientists through South- South and North-South cooperation initiatives; Initiate joint research programs with international partners, within Ethiopia, that have direct contribution to the national development agenda.

The governance structure of the national innovation system is being implemented in a way to lead, support and monitor the implementation of the policy. The main actors of innovation

system are: National Science, Technology and Innovation Council; Ministry of Science and Technology (MoST); and other related ministries and Innovation Support and Research System (STIP, 2012).

The science and Technology Bilateral Agreement is signed with different countries. From these agreements , the office (MoST) has gained benefits from bilateral research projects, scientific meetings ,symposiums , panel and short –term training and information exchange on the basis of science and Technology(Ethiopia year Book , 2013-2014 p.236).

2.5.2 Science and technology indicators

Science and technology Indicators are defined as a series of data designed to answer questions about S&T system, its internal structure, its relation with the economy and society and the degree to which it is meeting the goals of those who manage it, work within it, affected by its impacts. This is a reflection of the fact that changes in the National STI systems affect citizens who are industrialists, policy makers, researchers, government agencies, stakeholders involved in the understanding, as well as processing such as internalization and integration of public research, higher education, and other knowledge production nodes in the economy(science and technology information centre of Ethiopia,2014).

Anandakrishnan and Moritalou (1988) observed that in policy-making and planning in S&T, decisions are made based on past performance and on perceptions of emerging trends of importance to a country's overall development process.

Consequently, policy and planning decision for S&T are either based on experience of other developing countries.

Anandakrishnan and Moritalou (1988) stated that there is no single indicator representing all aspects of social or economic development. They averred that there is no such thing as a unique social and economic indicator and as such, a unique indicator for S&T does not have any real value. Indicators can be comparative among countries either with respect to other indicators such as productivity over given acre of land or with respect to time.

2.5.2.1 Research and experimental development

R&D is one of the science and technology indicators. It comprises creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society, and the use of this stock of knowledge to devise new applications. The term R&D covers three activities: basic research, applied research and experimental development (science and technology information centre of Ethiopia). In Ethiopia, the first national survey of R&D was undertaken by Ministry of Science and Technology in 2010(science and technology information centre of Ethiopia).In 2013 STIC was mandated to conduct this survey and also conducted the second national survey of R&D in 2014.

The survey covered areas which shows the country's investment & human resource on R&D in four sectors; namely in government, higher education, business enterprises and private non-profits (PNP). The 2014 survey indicates that the share of gross domestic expenditure on research and experimental development (GERD) to the GDP, or R&D intensity of the country is 0.61%. This result is not far from the continental target of 1% and shows a threefold surge compared to that of 2010 R&D intensity 0.24%.

2.5.2.2 Innovation survey

Innovation is also one of the science and technology indicators. It is defined as implementation of a new or significantly improved: product (good or service), process, a new marketing method, a new organizational method in business practices, workplace organization, external relations. Innovations are fundamental to economic growth, development and the well-being of nations. There are four types of innovations: product innovations, process innovations, marketing innovations and organizational innovations.

In Ethiopia, national survey of innovation has not been conducted. But, since the Science and Technology Information centre (STIC) is mandated in 2013 to conduct this survey , the survey conducted in 2015. The national innovation survey collects information about product and process innovation as well as organizational innovation and marketing innovation during a three year reference period. The principal variables collected relate to: product innovation, turnover from new market and new to firm product innovation, process innovation, ongoing

and abandoned innovation, innovation expenditure, innovation co-operation, innovation hampering factors, innovation objectives, organizational innovation, marketing innovation and creativity and skills .

2.5.3 Policy implementation and principles

Policy Implementation is the set of activities and operations undertaken by various stakeholders toward the achievement of goals and objectives defined in and authorized policy (Bhuyan , A., et al , 2010 , p.2).

This policy is an enabling framework for the establishment of a national innovation system as well as to bring in stakeholders as core actors contributing to its implementation.

The primary focuses in the implementation of the policy should be the establishment of a clear and effective STI governance structure, building technological capacity in learning about, adapting, and utilizing effective foreign technologies, as well as producing well trained technicians, engineers and scientists.

The policy will be led by the national STI council and the respective ministries will be responsible for its implementation.

The policy implementation will be based on the principles that can assure the competency and effectiveness of the national innovation system. The major principles are:

a) The government will lead the national STI capacity building process;
b) STI activities will be performed in an integrated manner with other social and economical activities;
c) Increase the inclusion and participation of the private sector in innovation activities by providing support which leads to competitiveness in learning about and utilization of technology;
d) Establish an effective, accountable and transparent system of allocation and utilization of resources for STI programs, projects and activities;
e) Promotion and encouragement of strong integration and cooperation among national and international stakeholders to utilize science and technology infrastructure as well as to use resources effectively and efficiently;

f) Compilation of other countries' relevant best practices and adapting them as appropriate to be compatible with the Ethiopian context (STIP,2012).

The major challenges of the STIP implementation issues are shared by most developing countries are as described by Padilla and Gaudin (2014). There is a common saying that "a policy is as good as its implementation" .One of the important challenges is found to be failure to effectively translate he policy into

Most policies that come from the top to the bottom have implementation issues . The "Top-Down" approach to policy formulation coupled with limited public awareness of the significances of STI has curtained efforts in effectively implementing the policy. Similarly the absence of programs that translate STI policy objectives in to action contributes to inefficiencies in the implementing processes practice.

2.5.4 Governance of National Innovation System

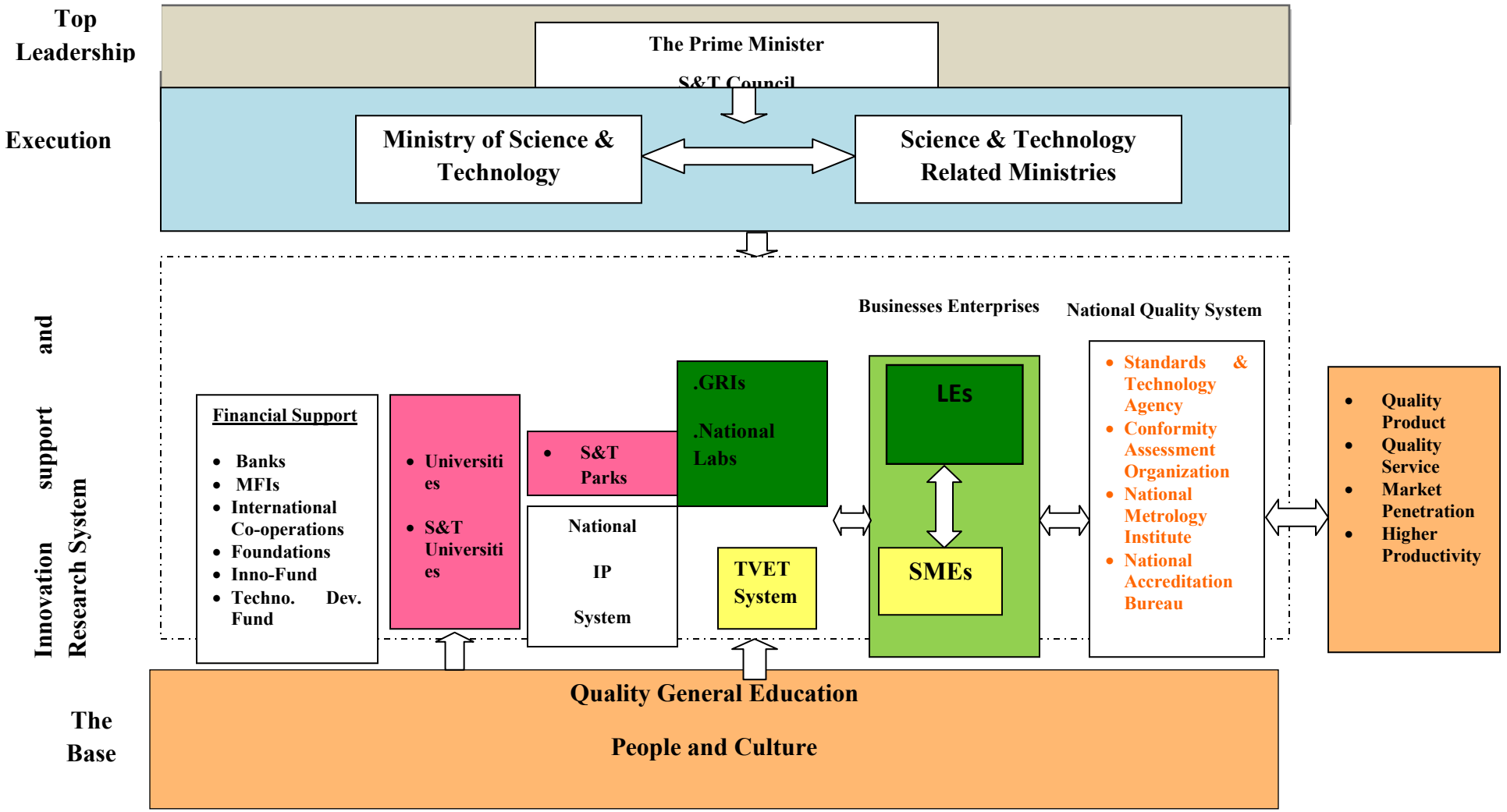
A National Innovation System (NIS) is defined as the various government and business institutions that make up the scientific and technological apparatus and the way in which each of these agents interacts to create, spread and use their knowledge It is a question of institutions in the broadest sense; in other words, the norms, practices and incentives that occur in these processes. That means that they include the market's existing incentives, competencies and shortcomings (Patel and Pavitt 1994).

The governance structure of the national innovation system will be implemented in a way to lead, support and monitor the implementation of the policy. The main actors of innovation system are: National Science, Technology and Innovation Council; Ministry of Science and Technology (MoST); and other related ministries and Innovation Support and Research System.

The national innovation support and research system comprises universities, government research institutions, national laboratories, TVET institutions, financial support service providers, science and technology parks, intellectual property office, manufacturing and service providing enterprises and the agencies of the national quality infrastructure. As the aforementioned bodies are main actors in technology transfer, dissemination and research

activities, they will be expected to provide financial, technical, legal and infrastructure development support for the national innovation system (STIP,2012).

Figure 7. National Innovation System of Ethiopia



2.5.5 National Science, Technology and Innovation Council (NSTIC)

The membership will comprise government officials, scientists and prominent individuals from the private sector. The Chairperson and members of the council will be appointed by the government (STIP, 2012).

Roles and responsibilities of the council

a) Based on consultation present recommendations on the selection and prioritization of national technology capacity building programs; Monitor and evaluate technology adaptation and utilization activities in all national priority programs;

b) Present recommendations for resource allocation for technology capacity building out of the gross domestic product (GDP); Monitor and evaluate its implementation

c) Recommend national priority areas where support should be provided in the creation of competent human resource in science and technology, and to subsequently monitor and evaluate the implementation of such recommendations;

d) Create and promote an environment of integration and synergy among all actors innovation system (STIP, 2012).

2.5.6 Ministry of Science and Technology and Other Innovation System Actors

The STI Policy and recommendations of the council will be implemented by the Ministry of Science and Technology (MoST) and other respective government bodies. Effort will be exerted to ensure clarity of roles and activities, thereby preventing unnecessary task overlapping, redundant responsibilities and resource wastage (STIP, 2012)

The Ministry of Science and Technology serves as secretariat of the council. According to its proclaimed power, MoST will provide and ensure the functions of coordination, monitoring and support to STI development activities based on the strategic direction of the council.

Thus, the ministry coordinates all actors of technology transfer activities involved in technology searching, selection, acquisition, learning, adaption and utilization. In addition, the ministry evaluates and provides commentary and recommendations as to whether or not the technology capacity building activities are aligned with development programs.

In addition to MoST, other ministries having science and technology related issues play a vital role in the national innovation system and participate in human resource development, research, and implementation of technology capacity building.

2.5.7 Monitoring and Evaluation

Monitoring and evaluation systems were implemented at each level in order to ensure the effectiveness of the policy implementation, efficient resource utilization and taking of corrective measure on weaknesses, with a specific responsibility resting on the council (STIP, 2012).

2.6 Science, Technology and Innovation Policy Formulation and Implementation and conceptual frame work

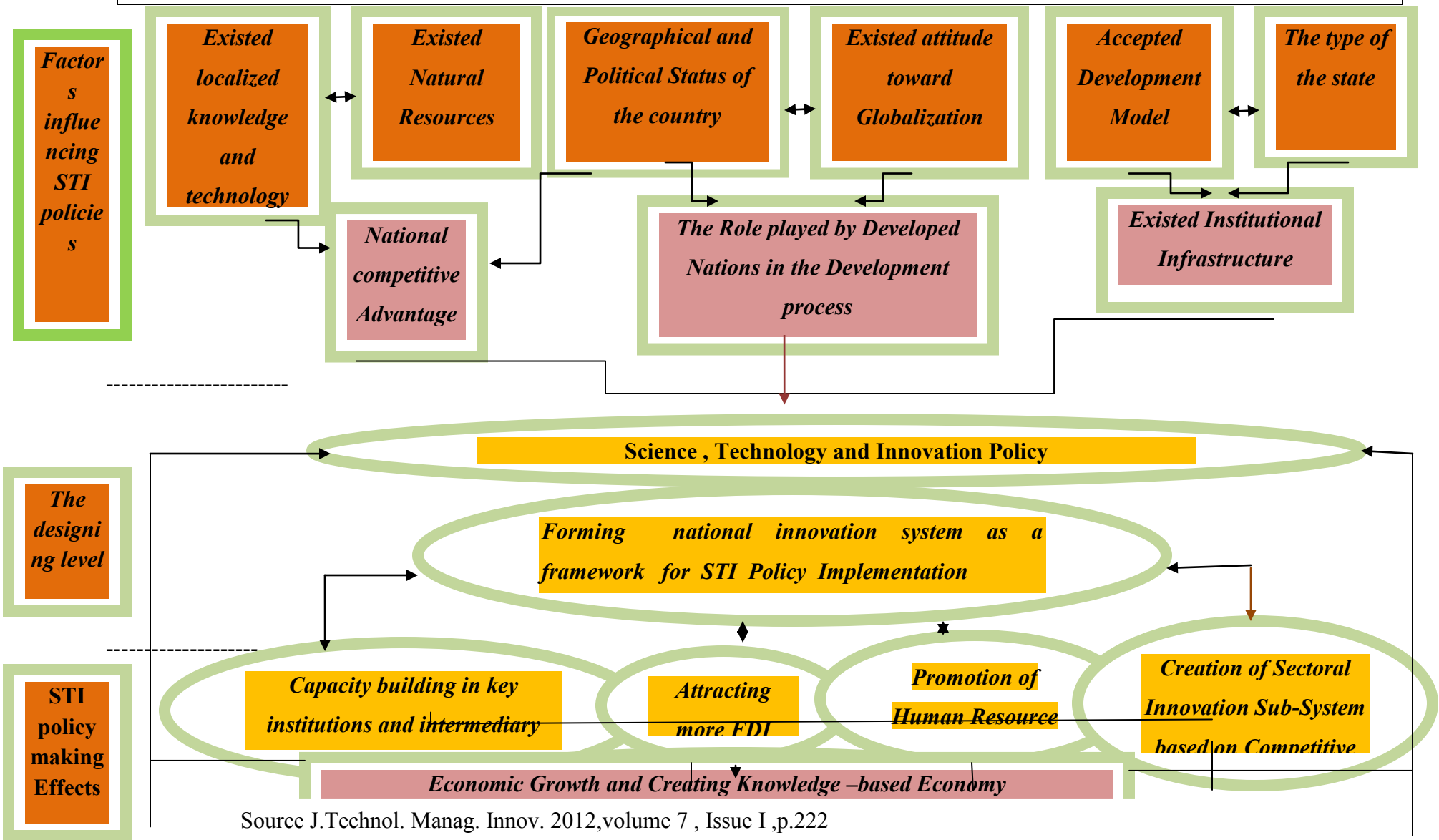
2.6.1 Science technology and innovation policy making process/Formulation

Science technology and innovation policy contribute a great deal to the development of society. During the first African Ministerial conference on science and technology (AMCOST I) , in 2003, countries committed themselves to developing adopting a common sets of STI indicators(UNESCO ,2014 ,p.3) , so in Ethiopia consideration is given to STI policy for its contribution to transforming the Agricultural led economy to Industrial led economy.

The STI Policy making process is different from other policies. STI policies need to be transversal, cross-cutting policies that support and build the structural pillars for sustainable

development and through dialogue, engage the wide range of development stakeholders. (J.C. Bolay et al.(eds), Technologies for sustainable development. , 2014 , p.13)

Figure 8 . Conceptual Model for designing STI Policy for LDCs(Less Developed Countries)



Source J.Technol. Manag. Innov. 2012,volume 7 , Issue I ,p.222

As shown in figure 8, the process of designing of STI policy making has taken place in three levels : first , the influencing factors on STI policy . These factors need to be clarified and illustrated by consideration of each country's conditions. Policy makers must answer to several questions (i.e. what are the indigenous and traditional knowledge and technology in country ...etc) . In the second level (designing phase) a framework needs to be made namely National Innovation System (NIS) which can also be considered is a policy tool for policy makers. In the final phase the outcome of an effective STI policy making may lead to creation of knowledge and innovation based economy.

The successful implementation of Science, Technology and Innovation policy has a very important role in the prosperity of any nation in the global market.

Science Technology and Innovation (STI) policy formulation and implementation point obviously to three basic subsystems consisting of the policy framework, the institutional framework for policy implementation (Research Institutions) and the user subsystem (Bwisa 1997, Tiffin 1994). The subsystems are expected to interact in such a manner as to create the necessary impact on national development.

In the policy formulation process, a policy designed without meaningful stakeholder engagement may be more difficult to implement because it does not consider the needs of nor engender buy-in and ownership from those who will implement or "benefit" from the policy (Klein and Knight , 2005, p.243).

2.6.2 Science technology and innovation policy Implementation

To identify the characteristics of policy implementation (IGNOU 2006) suggested that problem in public policy implementation are due to conceptual, political, administration problems and lack of public involvement .This time no policy response is likely to be effective without a clear definition.

PA Brynord (2006) cited the definition of policy implementation is regarded as the accomplishment of policy objectives through the planning and programming is the realization on application or execution of plan , idea and design . In general, implementation is the act of providing a practical means for accomplishing something in to effect.

Implementation studies are to be found at the intersection of public administration, organizational theory, public management research, and political science studies (Schofield and Sausman 2004, 235).In the broadest sense; they can be characterized as studies of policy change (Jenkins 1978, p .203). There are three distinct theoretical approaches to the study of plan and implementation:

1. Top- down models put their main emphasis on the ability of decision makers' to produce unequivocal policy objectives and on controlling the implementation stage./Top planning stage/

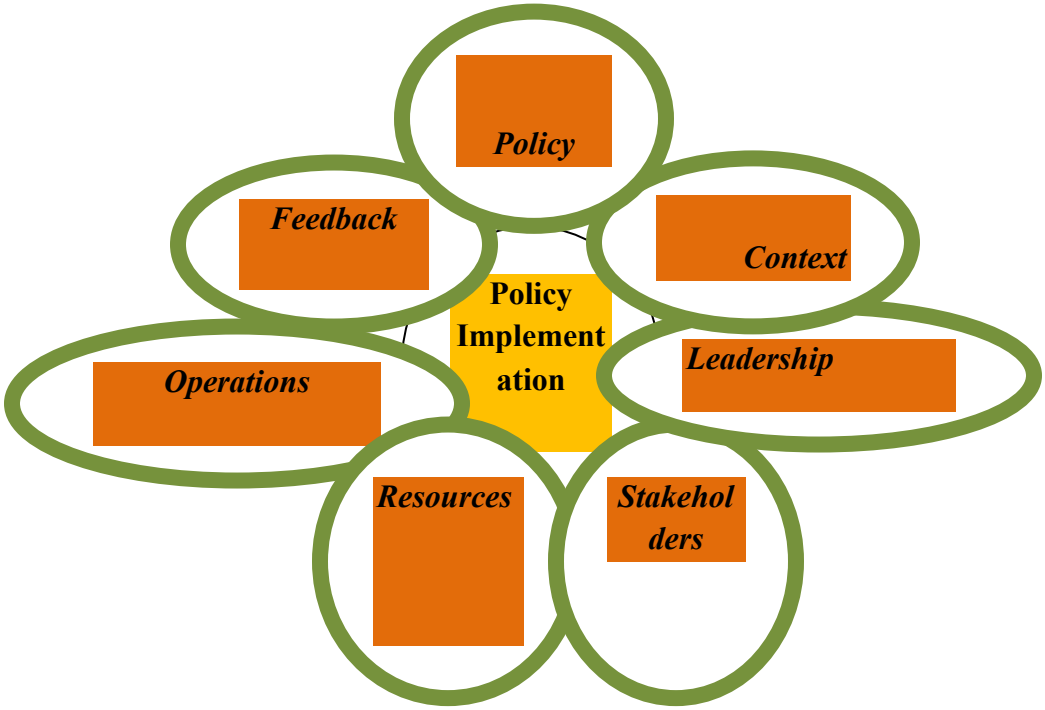
2. Bottom –up critiques view local bureaucrats as the main actors in policy delivery and conceive of implementation as negotiation processes within networks of implementers./Implementation/

3. Hybrid theories try to overcome the divide between the other two approaches by incorporating elements of top-down, bottom –up and other theoretical models (Jack Rabin ,ed , 2007,p.89).

Moreover, different stakeholders may have differing perspectives on what constitutes successful policy implementation. A top – down approach emphasizes the faithfulness with which implementation adheres to policy makers' intentions (Sabatier, 1986, Pp.21-48). Conversely, a bottom –up approach argues for local implementers to adapt policy strategies to meet local needs and concerns (Elmore, 1985 Pp.33; Palumbo et al., 1984; Maynard-Moody et al., 1990). These two perspectives can result in very different strategies and outcomes. Democratic policy systems support moving away from top-down or bottom up dichotomies to a centrist approach emphasizing how actors from different institutional contests influence what gets implemented (Bhuyan , A., et al , 2010, p.2).

Thus, while policies seek to codify a set of goals and actions, the manner in which a policy is implemented is not linear and may change over time for a variety of reasons – only some of which are controlled by policy makers. Policies are often redefined and interpreted throughout the implementation process as they confront the realities of implementation on the ground. Key elements along the policy-to-action continuum, such as leadership, stakeholder engagement, the context, resources, and operational issues, shape decisions and actions at various levels (Bhuyan , A., et al . 2010 , p.2).

Figure 9. Dimensions of Policy Implementation



Source Bhuyan , A., et al ., 2010 , p.3.

The effectiveness of the policy need to be assessed after a certain period of time and steps must be taken to ensure that there are resources and means to maintain a successful policy. Thus for a policy to support effective implementation, it should address the underlying problem through appropriate policy action; be based on strong stakeholder involvement; and be followed by dissemination to key audiences (Bhuyan , A., et al, 2010 , p.5).

Participation of stakeholders in policy implementation is influenced by a range of factors, including the context; the policy content; and stakeholders' needs and resources, level of knowledge of the policy, and their relative power and influence .Involvement of stakeholders in implementation can be challenging because it often requires "joint actions" in response to new partnerships that did not exist previously. In some cases, stakeholder groups and organizations that may be unrelated, or are not always committed to the same outcomes, must reach agreement to support implementation .Stakeholders may also enter the fray in ways not planned by the policy. As policy implementation unfolds, additional stakeholders may find themselves being affected by the changes and may seek to also insert themselves in the process.

Effective implementation requires planning and mobilization of resources. The "difficult decisions that were avoided when policies were drafted" must be resolved as plans and guidelines are developed. Strong strategic plans, work plans, budgets, and operational directives are often the missing link between policy formulation and actual implementation .Implementation is a challenging process, even written guide lines on goals, strategies, roles and responsibilities, and monitoring frameworks are provided; it is even more challenging in the absence of written guidance and clear action plans.

Once strategies are determined, implementing organizations need to estimate and mobilize the financial, human, and material resources required to effectively implement the policy. Because new policies often involve new strategies, organizations may be required to modify or even abandon old practices and undertake new activities. In many cases, this requires implementers to be trained in the content of the policy and required skills.

Chapter Three

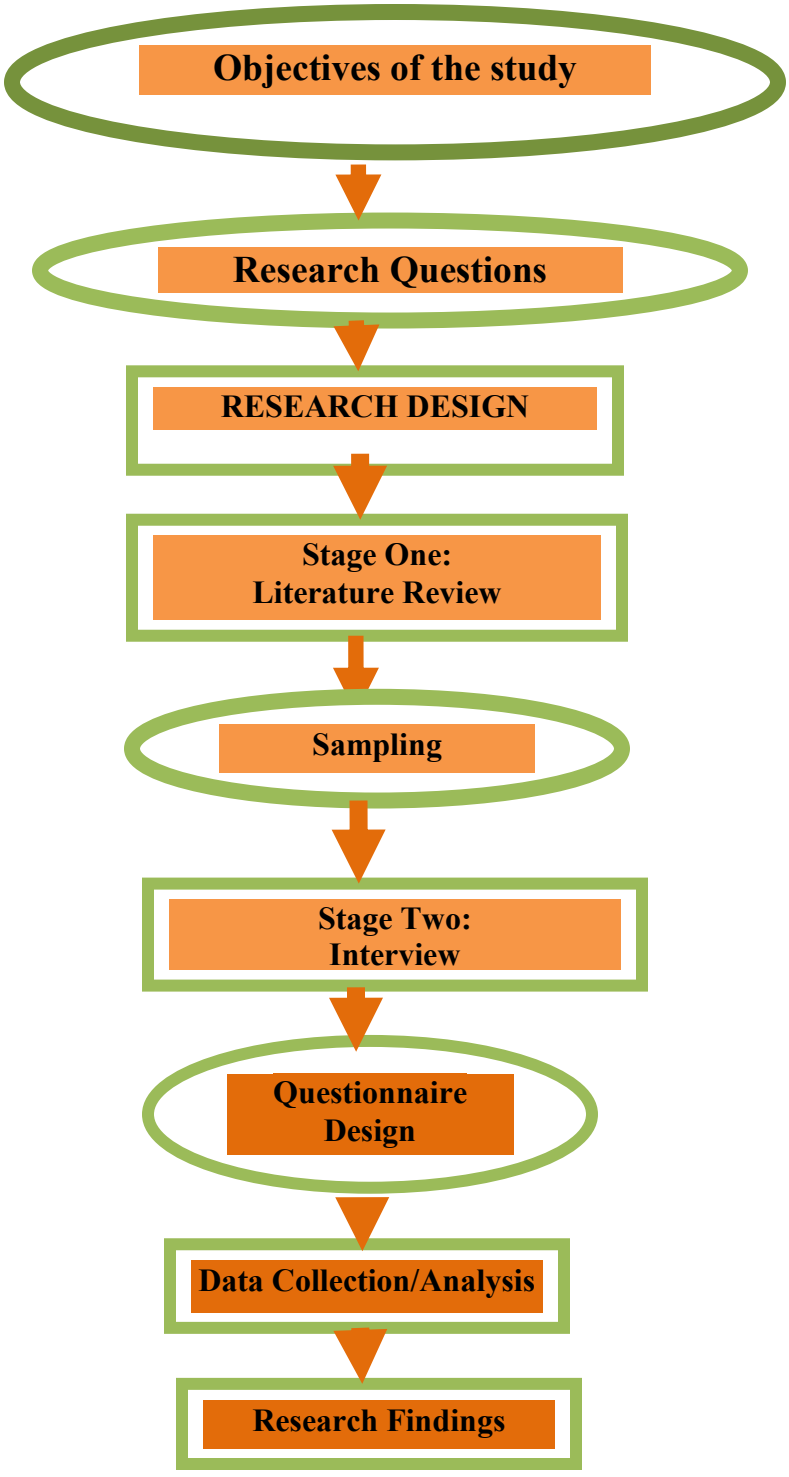
3. Data Description

3.1. Research Design

The goals of scientific researches, in broad terms are to answer questions and acquire new knowledge (Geoffrey Ma.rczyk and et al. P.16, 2005). This is typically accomplished by conducting relations that permits drawing valid inferences about the relationship between two or more variables. Most researchers agree that the three general goals of scientific research are description, prediction, and understanding /explanation.

In order to attain the objective of the study and answer the research questions, both descriptive and exploratory research method is used. Exploratory research method is preferred on the ground that it helps to collect primary data using semi-structured formal or informal procedures to interpret them. Descriptive research helps to determine the degree to which certain variables are related to actual phenomena. (Hair et al, 2000).

Figure 10.Research Design and Process



Sources: Cooper & Pamela (2008)

3.2. Research Approach

In the study both qualitative and quantitative research methods are employed. The study bases on the researcher's intension to conduct questionnaire and face to face interview. Qualitative research has come to refer to selected research methods used in exploratory research designs. One of the main objectives of qualitative research is to gain preliminary insights into decision problems and opportunities. Qualitative research tends to focus on the collection of detailed amounts of primary data from relatively small samples of subjects by asking questions or observing behavior (M.Saunders, et.al. 2009, p.126). Qualitative data will largely semi-structured interviews.

Quantitative approaches will be limited to statistical information and secondary data for analytical purposes. Quantitative data will largely be gathered through existing database and datasets on STI . Furthermore, other published reports and materials will be consulted to get an indication of recent trends and developments in STI activities in MoST.

3.3 Instrument of data collection

In the present study both primary and secondary sources of data were employed in order to obtain data relevant to the study. The secondary data source included: policy documents, journals, books, published and unpublished materials of FDRE Ministry of Science and Technology and different websites. On the other hand in order to collect primary data questionnaire survey technique and semi-structured interview were used and the questions were self-administered. The questionnaire employed the five point likert scale and fixed-response alternative questions from which require the respondent to select from a predetermined set of answers to every question. The study also adopt a face-face interview with semi structured open ended questions because it enables the researcher to ask the respondent a series of questions pertaining to the topic of the study (Ackroyd & Huges, 1981).

3.4 Population of the study

The full set of cases from which a sample is taken is called the population (M.Saunders, et.al.2009, ed. p.212).

Population can be defined as an identification of group or aggregation of elements (example: people, products, organizations, physical entities) that are of interest to the researcher and pertinent to the specific information problem (Hair et al.2003). For all research questions where it would be impracticable to collect data from the entire population, you need to select a sample (M.Saunders ,et.al. 2009 , p.212). The target population for the study consists of employees' from7 Science and Technology organizations including the Federal Ministry of Science and Technology.

3.5 Sample Size

The selection process of sampling in a given study requires considering of a number of issues which include the nature of the study, the objective of the study, the time and budget available to conduct the research . Moreover, the appropriate number of respondents chosen for research will depend on the type of research question, the type of research approach used in the study, material and time resources as well as the number of researchers involved in the study.

There are six public organizations, one government enterprise and two science and technology universities that are accountable to science and technology ministry spread all over the Addis Ababa city ,except Adama science and technology university. These are:

National Metrology Institute of Ethiopia, Radiation Protection Authority of Ethiopia, Ethiopia Standard Agency, Ethiopia Intellectual Property office, Ethiopian Conformity Assessment, Science and Technology Information Center, Ethiopian Accreditation office and the other two are Addis Ababa and Adama science and technology universities.
The respondents are from National Metrology Institute of Ethiopia, Radiation Protection Authority of Ethiopia, Ethiopia Standard Agency, Ethiopia Intellectual Property office,

Addis Ababa science and Technology University,, Adama University, and from FDRE Ministry of Science and Technology are sampled in order to have a sufficient knowledge of their perception of the STI Policy and its implementation.

In this regard, the sample for the research consists of management staffs and experts/ officers from each of the eight Science and technology accountable organizations to MOST. In addition to this it consists of management staffs, experts/ officers of the Federal Ministry of Science and Technology, and researchers from Universities.

Hence, based on the above sampling process the researcher select ninety respondents from the eight accountable organizations to MoST including the Federal Ministry of Science and Technology.

3.6 Sampling Techniques

In order to select a sample for a study there are two major alternatives: probability and non-probability sampling (M.Saunders (et.al.) 2009 (ed). p.213). Probability sampling gives every part of population equal probability of selection. Non probability sampling is sampling process where the probability of selection of each sampling unit is unknown. The selection of sampling units is based on some type of purpose, intuitive judgment, desire, or knowledge of the researcher (M.Saunders (et.al.) 2009 (ed). p.213). Based on this, Purposive or Judgment Sampling technique was applied on the research.

3.7 Procedure (Data collection procedure)

In order to achieve the objective the research employed Purposive or Judgment Sampling technique that is, the respondents are chosen specifically for the study and are criterion-based .The criteria among others includes the participants are employees of National Metrology Institute of Ethiopia, Radiation Protection Authority of Ethiopia, Ethiopia Standard Agency, Ethiopia Intellectual Property office, FDRE Ministry of Science and Technology and the other respondents are from the two ST Universities.

Besides, Stratified sampling procedure had been adopted by grouping the population under study into some definite characteristics called strata. The staff of MoST studied were stratified into the following groups:

a. Management staff
b. Experts(officers)
c. Researchers from ST universities

The choice of these groups of staff was based on the perceived level of their participation in management decision making process. Also, they form the core competence for policy formulation and implementation within the science and technology community in the organization (MoST).

For all the management staffs of the six public organizations a semi-structured interview was conducted. The questionnaire distributed to ninety experts and managers , from eight public organizations under MoST , Ministry of science and technology and the universities.

3.8 Data Analysis Technique

The data collected in the study were analyzed with the help of statistical package for social science /SPSS/ version 20 which is used to tabulate and analyzed the valid responses. In order to prove the internal reliability and validity of the instrument used, the cronbach's alpha test of reliability is employed and found to be reliable and valid (see table 4.7) The primary data collected about demographic characteristics of respondents is summarized by employing frequency distributions, tables and percentages. Moreover, the data collected from the other part of the questionnaire which focuses on the extent of the feelings of the respondents were analyzed using descriptive statistics which includes mean, standard deviation, and regression.

The mean score is used to identify the highest and lowest of the variables and to analyze the perception of respondents.

3.9 Analytical framework

In the STIP formulation and implementation, the main actors are ST universities, public organizations that are accountable to MoST, policy making bodies and the government in general, private enterprises, financial institutions, and technology support agencies. Assessing the effectiveness of STIP and its implementation in MOST of Ethiopia entails tracing the various institutional links and measuring the intensity of the interactions among various actors. The STIP is cross sector issue , government role is very important.

The different facets of planning and resource mobilization for implementation are

- New roles and responsibilities arising from the policy.
- The degree to which organizations must change, and their preparedness for change.
- The adequacy of capacity building received for implementing the policy.
- The usefulness of guidance provided for implementation (or, in the absence of and implementation plan, what is guiding the implementation process).
- The process of identifying funding sources and estimating the level of funding needed to implement organization specific activities.
- The quality and quantity of resources (e.g., human infrastructure, equipment, information) available for implementation.

Design of Interview Questions

The interview questions were designed based on size and location of the sample frame. Cooper and Pamela (2008) defined the sample frame of qualitative research as few of dozens of individual departmental interviews, close–ended questions, nominal scale, mutual response as well as a yes and no answer. Explained that good questions are free from ambiguity and produces only one answer to choose from (Bradburn et al., 2004). The three benefits of interview-administrator questions are clarity, converted questions and high-comment respondents (Bruce, 2004).

The question has two sections: Section I and Section II. Section I questionnaires were intended for the individual respondent's perception on STIP formulation and implementation

. And Section II interview questions intended for in order to obtain more detail information on STIP formulation and implementation. Section II is a combination of close and open-ended interview questions.

Chapter Four

4. Data Interpretation and Analysis

4.1Introduction

This chapter analyzed qualitative and the quantitative data derived from the study. The quantitative data were intended for the individual respondent's profile, the literacy level /Educational level/ ,duration in the work/ , type of work /core or support staff/ , position /management or expert/ ,age group and gender of the respondents.

The interview questions and the questionnaire were designed to capture as much information as possible on general issues : to find the effectiveness of science, technology and innovation policy making/formulation/ process and its implementation in MoST of Ethiopia .These issues formed the background that obtained responses on questions relating to science , technology and innovation policy in Ethiopia.

Several questions were asked in relation to STIP formulation /policy making process, implementation . The issues of funding and budgeting as they affect the implementation of STIP were considered as well as obstacles affecting the overall effectiveness of implementation process of STI in Ethiopia.

4.2 Responses to Questionnaire

The response rate enables to determine the margin of error in the sampling process.

$$\text{Response rate} = \frac{\text{Total N0. Of Institutions} \times 100}{\text{Total No. of Sample} - \text{No Response}}$$

Given the number of Sampled organizations = 8

Number that responded = 8

Number of organizations that did not responded = 0

Number of invalid response =0

$$\text{Response Rate} = \frac{8X\ 100}{8\text{-}0} = 100\%$$

Margin of error = 100% - 100% =0

In order to determine the actual size of sample for the study, the following calculation were made.

Assumed sample size (n) = 8 organizations

Response Rate (re) = 100%

$$\text{Actual sample size (N)} = \frac{n \times 100}{Re}$$

$$= \frac{8 \times 100}{100} = 8$$

Based on the number of questionnaires received from the eight organizations out of 90 questionnaires distributed, the following deduction was made:

Total no. of questionnaires retrieved = 78 .

The response rate for this is

$$\text{response rate} = \frac{\text{Number of response}}{\text{total number of questionnaires distributed}} \times 100\%$$

$$= \frac{78}{90} \times 100\%$$

= 86.6%

Response rates between 50% and 92% for questionnaire surveys have been reported as valid (Duman, 1978, Saunders et al 1997 and Ngesa et al, 2003). In a difficult environment where apathy for completing questionnaire is quite prominent, the response rate of 86.6% gives credibility and validity to the data used in the analysis.

Total number of distributed = 90

$$\text{Retrieval Rate} = \frac{78 \times 100}{90} = 86.6\%$$

The list of organizations that are accountable to the ministry of science and technology of Ethiopia are listed on Appendix 1, including their mission vision, primary functions and their objectives.

4.2.1Distribution pattern of Responses

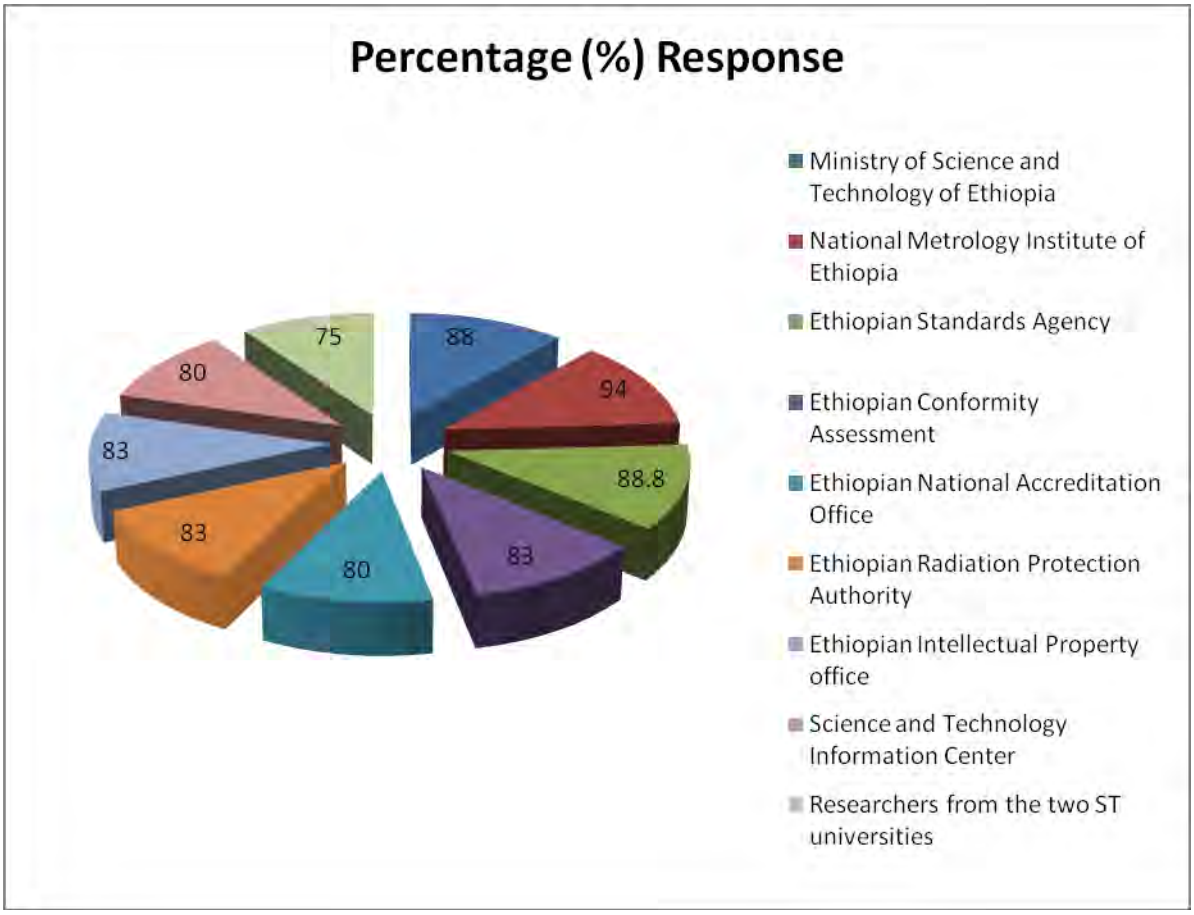
In distributing the questionnaire, efforts were made to reach organizations that are accountable to the Ministry of Science and Technology of Ethiopia (MoST) and MoST itself as the major actor of STI Policy formulation and implementation

The analysis of the responses to the questionnaire is presented in table 4.1, while the distribution pattern of the responses is illustrated in figure 12.

Table 4.1 Analysis of Responses

S/N	Ministry of Science and Technology and accountable institutions	No. of distributed Questionnaires	No. of Respondents	Percentage (%) Response
1	Ministry of Science and Technology of Ethiopia	25	22	88
2	National Metrology Institute of Ethiopia	18	17	94.4
3	Ethiopian Standards Agency	9	8	88.8
4	Ethiopian Conformity Assessment	6	5	83.3
5	Ethiopian National Accreditation Office	5	4	80
6	Ethiopian Radiation Protection Authority	12	10	83.3
7	Ethiopian Intellectual Property office	6	5	83.3
7	Science and Technology Information Center	5	4	80
8	Researchers from the two ST universities	4	3	75
	Total	90	78	86.6

Figure 12. The distribution pattern of the responses



Source : survey result

The average response per total response is nine which was considered to be good response .Each of the 8 accountable public organizations to MoST surveyed were given on average 10 questionnaires , while some returned from the given number of questionnaires below average . Nevertheless, the responses did not in any way prejudice the findings from the study. The distribution pattern of the responses as represented in figure 4.1 is considered a fair spread covering science and technology minister and from accountable public organizations to the ministry.

4.2.2Evolution of accountable public organizations of Ministry of Science and Technology of Ethiopia

In order to assess effectiveness of science, technology and innovation policy and its implementation in MOST of Ethiopia, respondents were asked to indicate year of establishment of their organization. Their responses are presented in table 4.2.

Table 4.2 Evolution of Public organizations accountable to MoST .

S/N	Year of Establishment	*NQI organizations	Offices	Government authority	ST Universities	Ministry	ST Information Centers	Total
1	Before 2010s		1	1		1		3
2	2010s	4			2		1	7
	Total	4	1	1	2	1	1	10

*National Quality Infrastructure

source* legal frame work of the organizations

The analysis indicates , up to 2015 , there were seven organizations and two universities that are accountable to MOST . Out of these the four organizations are formulated to implement one of the eleven policy issues i.e. national quality infrastructure . The other two are formulated to implement the policy issues of environment and intellectual property the rest one is to organize and disseminate the overall information of STI in the country .The two universities are ST universities and their main objective is to produce capable ST human resource , therefore, they contribute to the effective implementation of STIP issue i.e. STI human development of the country. In addition to this, the above table indicates considerable consideration of government for effective implementation of science technology and innovation policy . In general this institution formulation is one of the effective mechanism for proper STIP implementation. The study also identified the Federal Ministry of Science

and Technology, and the accountable organizations to this ministry as major stakeholders to STI development in the country. The study revealed that most of the accountable organizations to MoST were reestablished after 2010s.This indicates that the largest part of the current S&T capability was built during this time.

The other factor identified was the concern of the Government with the need to rebuild up the country's S&T competence for effective STIP implementation for the contribution of national growth ;and as indicated below in the table ,the economic expansion at that time in which Ethiopia's economy grew between 2006-2013G.C at an annual average rate of 10.6% , this favored the establishment and reestablishment of new organizations.

Table 4.3 Economic growth of Ethiopia and some African countries between 2006 -2013 G.C

Year	Ethiopia	Kenya	Uganda	Nigeria	South Africa
2006	11.5	6.3	7	6.2	5.6
2007	11.8	7	8.1	7	5.5
2008	11.2	1.5	10.4	6	3.6
2009	10	2.7	4.1	7	-1.5
2010	10.6	5.8	6.2	8	3.1
2011	11.4	4.4	6.2	7.4	3.6
2012	8.5	4.6	2.8	6.6	2.5
2013	9.7	5.6	6	6.3	1.9
Average Growth	10.6	4.7	6.4	6.8	3

Source :IMF report , 2014

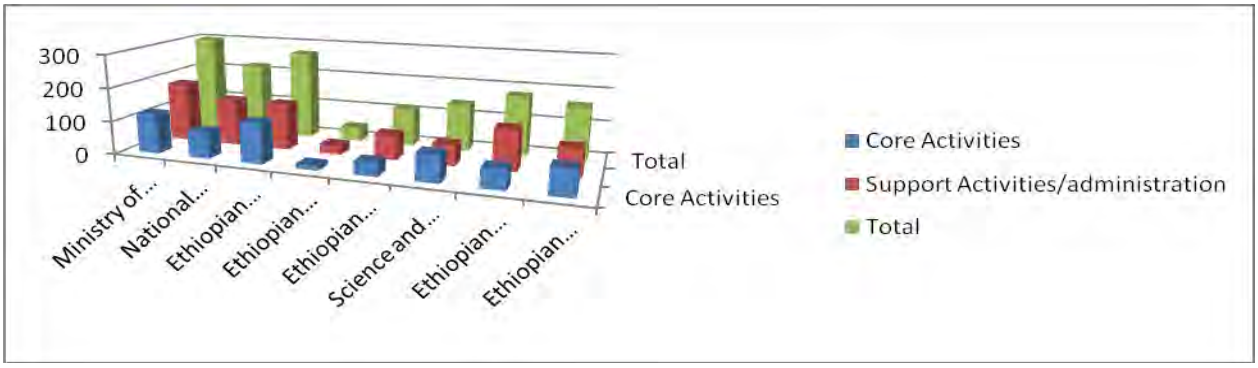
4.2.3Staff distribution based on activities

In order to analyze the effectiveness of STIP and its implementation , the number of personnel involved in core and support activities data are gathered and analyzed. In the context of this study ,to determine the effectiveness of STIP , institutional capacity for S&T was examined from two major perspectives. First, was the staff strength distribution aimed at determining the ST capability. Second, was the distribution of staff based on core and support activities.

Table 4.3 Distribution of staff Based on Activities

S/N	Organizations	Core Activities	Support Activities/administration	Total
1	Ministry of Science and Technology of Ethiopia	120	180	300
2	National Metrology Institute of Ethiopia	80	140	220
3	Ethiopian Standards Agency	122	140	270
4	Ethiopian National Accreditation Office	14	28	42
5	Ethiopian Radiation Protection Authority	40	75	115
6	Science and Technology Information Center	80	62	142
7	Ethiopian Conformity Assessment	58	122	180
8	Ethiopian Intellectual Property Office	78	84	162
	Total	582	849	1431
	percentage	40.6	59.4	100

Figure 13. Distribution of staff Based on Activities of Surveyed organizations



Source: MoST 2007 annual plan

The analysis of the data gathered shows that more personnel were involved in support activities . The support staff recorded the highest number of personnel (59.4%) .
Generally there were more support staff in the eight Public organizations , including the ministry , that are accountable to MoST and MoST .This indicates that the personnel that involved in core activities is only 40.6 % i.e. less than the support personnel .This has an impact on effective implementation of STIP and indirectly it indicates the lower number of human resource and capacity in the S&T sector so this contributes there is less knowledgeable number of science personnel .The study revealed that the ST human capacities were very weak.

The assessment of core staff strength indicates a limited number of personnel with requisite qualifications for effective STI work. The greater numbers of personnel were support staff with limited ST competence

From the research results, it was obvious that the distribution of core staff personnel in the organizations accountable to MoST was not favorable to effective STI activities and therefore, hinders the effectiveness of STIP and its implementation in MoST of Ethiopia.

It must be bear in mind that STI requires ST qualified and skilled personnel. Muturi (2002) observed that this caliber of skilled personnel requires substantial resources to develop and

maintain and is in short supply in developing countries due to scarcity of resources.

The strengths and weaknesses of S&T capacities in MOST Ethiopia show that while the general strength lie in the existence of institutional framework already established for STIP implementation, the major weaknesses include the following:

- lack of a comprehensive set of science and technological indicators to guide action and monitor progress;
- ineffective planning, programming, dissemination and coordinating functions STIP;
- poor remuneration of personnel;
- general obsolescence of infrastructure, laboratory facilities and other support facilities.

4.3 Demographic characteristics of respondents

Descriptive statistics was applied to summarize frequencies and percentages of profiles of respondents related to the Educational level ,duration in the work, type of work /core or support staff/ , position /management or expert/ ,age group and gender of the respondents**.**

Table 4.4 Statistics

		Gender	Age Group	Educational level	Duration in the work	Position	Type of activity
N	Valid	78	78	78	78	78	78
	Missing	0	0	0	0	0	0

source : Survey Result

Therefore based on the descriptive analysis; from the ninety distributed questionnaires, 78 (86.6%) have been collected. From these respondents seventy eight (62.2%) of them are male and twenty four (30.8%) of them are female. With regard to the age of the respondents fourteen (17.9%) are from 18-29 years, forty seven (60.3%) are from 30-39 years, seventeen (21.8%) are from 40-49 years, and thirty four (16.4%) are from 50-60 years.

The educational levels of the respondents are categorized in to four. Twenty five (31.2%) of the respondents are BA, thirty one (39.7%) of the respondents have BSC, thirteen (16.7) of them have MSC and the other nine (11.5%) of the respondents are MA post graduate degree holders.

Table 4.5 Gender, Age Group, and Educational Level

		Frequency	Percent	Valid Percent	Cumulative Percent
Gender	**Male**	54	69.2	69.2	69.2
	Female	24	30.8	30.8	100.0
	Total	78	100.0	100.0	
Age Group	**18-29**	14	17.9	17.9	17.9
	30-39	47	60.3	60.3	78.2
	40-49	17	21.8	21.8	100.0
	Total	78	100.0	100.0	
Educational level	**BA**	25	32.1	32.1	32.1
	BSC	31	39.7	39.7	71.8
	MSC	13	16.7	16.7	88.5
	MA	9	11.5	11.5	100.0
	Total	78	100.0	100.0	

source : Survey Result

The duration time of respondents with the MoST and accountable organizations implies that twenty six (33.3%) of them have stayed with in the MoST and accountable organizations to MoST only for below five years. Nineteen (24.4%) of the respondents have5 to 10 years

of experience in MoST. Thirty three (42.3%) of the respondents have got an experience of above ten years.

The type of activity performed by the respondents was categorized in to two. Thirty three (42.3%) are found to be performing core activities followed by support activity performers which are forty five (57.7%).

Table 4.6 Duration in the work, Position, and Type of activity

		Frequency	Percent	Valid Percent	Cumulative Percent
Duration in the work	**between 1-5**	26	33.3	33.3	33.3
	between 5-10	19	24.4	24.4	57.7
	above 10 years	33	42.3	42.3	100.0
	Total	78	100.0	100.0	
Position	**Management level**	31	39.7	39.7	39.7
	Expert level	47	60.3	60.3	100.0
	Total	78	100.0	100.0	
Type of activity	**core process**	33	42.3	42.3	42.3
	support process/staff	45	57.7	57.7	100.0
	Total	78	100.0	100.0	

source : Survey Result

4.4 Perception of respondents

4.4.1 Perception of respondents on No involvement of stake holders in the STIP making process

Table 4.7 No involvement of stake holders in the STIP making process

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly disagree	31	39.7	39.7	39.7
	Disagree	39	50.0	50.0	89.7
	Neutral	5	6.4	6.4	96.2
	Agree	3	3.8	3.8	100.0
	Total	78	100.0	100.0	

Source :analysis result

Table 4.7 indicates that thirty one (39.7%) of the respondents strongly disagree , thirty nine (50%) of the respondents disagree, five (6.4%) of the respondents remain neutral , and three (3.8%) of the respondents agree on the no involvement of stake holders in STIP making process (formulation) . Therefore it can be concluded that the majority of the respondents which accounts for 39.7% confirmed that there were involvement of stakeholders in the STIP making process.

4.4.2 Perception of respondents on Poor understanding of essential characteristics of STIP among Policy makers

Table 4.8Poor understanding of essential characteristics of STIP among Policy makers					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly disagree	23	29.5	29.5	29.5
	Disagree	45	57.7	57.7	87.2
	Neutral	8	10.3	10.3	97.4
	Agree	2	2.6	2.6	100.0
	Total	78	100.0	100.0	

Source :analysis result

Table 4.8 indicates that twenty three (29.5%) of the respondents strongly disagree , forty five (57.7%) of the respondents disagree, eight (10.3%) of the respondents remain neutral , and two (2.6%) of the respondents agree . Therefore it can be concluded that the majority of the respondents which accounts for 57.7% confirmed that there were understanding of essential characteristics of STIP among Policy makers.

4.4.3 Perception of respondents on Poor knowledge of STI among policy makers

Table 4.9 Poor knowledge of STI among policy makers					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly disagree	24	30.8	30.8	30.8
	Disagree	36	46.2	46.2	76.9
	Neutral	16	20.5	20.5	97.4

	Agree	2	2.6	2.6	100.0
	Total	78	100.0	100.0	

Source :analysis result

Table 4.9 indicates that twenty four (30.8%) of the respondents strongly disagree , thirty six (46.2%) of the respondents disagree, sixteen (20.5%) of the respondents remain neutral , and two (2.6%) of the respondents agree . Therefore it can be concluded that the majority of the respondents which accounts for 46.2% confirmed that there were knowledge of STI among policy makers.

4.4.4 Perception of respondents on No awareness creation prearranged to STI policy

Table 4.10 No awareness creation prearranged to STI policy

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly disagree	13	16.7	16.7	16.7
	Disagree	48	61.5	61.5	78.2
	Neutral	12	15.4	15.4	93.6
	Agree	3	3.8	3.8	97.4
	strongly agree	2	2.6	2.6	100.0
	Total	78	100.0	100.0	

Source :analysis result

Table 4.10 indicates that thirteen (16.7%) of the respondents strongly disagree , forty eight (61.5%) of the respondents disagree, twelve (15.4%) of the respondents remain neutral , three(3.8%) of the respondents agree, and two (2.6%) of the respondents strongly agree . Therefore it can be concluded that the majority of the respondents which accounts for 61.5% confirmed that there were awareness creation prearranged to STI policy for policy makers.

4.4.5 Perception of respondents on No The policy indicates no clear communication strategy for stake holders

Table 4.11 The policy indicates no clear communication strategy for stake holders

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly disagree	17	21.8	21.8	21.8
	Disagree	34	43.6	43.6	65.4
	Neutral	6	7.7	7.7	73.1
	Agree	18	23.1	23.1	96.2
	strongly agree	3	3.8	3.8	100.0
	Total	78	100.0	100.0	

Source :analysis result

Table 4.11 indicates that seventeen (21.8%) of the respondents strongly disagree , thirty four (43.6%) of the respondents disagree, six (7.7%) of the respondents remain neutral , eighteen (23.1%) of the respondents agree, and three (3.8%) of the respondents strongly agree . Therefore it can be concluded that the majority of the respondents which accounts for 43.6% confirmed that the policy indicates clear communication strategy for stake holders.

4.4.6 Perception of respondents on The policy indicates no clear direction to promote innovation

Table 4. 12 The policy indicates no clear direction to promote innovation					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly disagree	15	19.2	19.2	19.2
	Disagree	35	44.9	44.9	64.1
	Neutral	11	14.1	14.1	78.2
	Agree	16	20.5	20.5	98.7
	strongly agree	1	1.3	1.3	100.0
	Total	78	100.0	100.0	

Source :analysis result

Table 4.12 indicates that fifteen (19.2%) of the respondents strongly disagree , thirty five (44.9%) of the respondents disagree, eleven (14.1%) of the respondents remain neutral , sixteen (20.5%) of the respondents agree, and one(1.3%) of the respondents strongly agree . Therefore it can be concluded that the majority of the respondents which accounts for 44.9% confirmed that the policy indicates clear direction to promote innovation.

4.4.7 Perception of respondents on The policy indicates no clear direction about monitoring and evaluation

Table 4.13 The policy indicates no clear direction about monitoring and evaluation					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly disagree	15	19.2	19.2	19.2
	Disagree	50	64.1	64.1	83.3
	Agree	5	6.4	6.4	89.7
	St.agree	8	10.3	10.3	100.0
	Total	78	100.0	100.0	

Source :analysis result

Table 4.13 indicates that fifteen (19.2%) of the respondents strongly disagree , fifty (64.1%) of the respondents disagree, five (6.4%) of the respondents strongly agree , and eight (10.3%) of the respondents agree. Therefore it can be concluded that the majority of the respondents which accounts for 64.1% confirmed that the policy indicates clear direction about monitoring and evaluation.

4.4.8 Perception of respondents on The policy indicates no coordination mechanism with other sectors

Table 4.14 The policy indicates no coordination mechanism with other sectors

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly disagree	22	28.2	28.2	28.2
	Disagree	35	44.9	44.9	73.1
	Neutral	9	11.5	11.5	84.6
	Agree	11	14.1	14.1	98.7
	strongly agree	1	1.3	1.3	100.0
	Total	78	100.0	100.0	

Source :analysis result

Table 4.14 indicates that twenty two (28.2%) of the respondents strongly disagree , thirty five (44.9%) of the respondents disagree, nine (11.5%) of the respondents remain neutral , eleven (14.1%) of the respondents agree, and one(1.3%) of the respondents strongly agree . Therefore it can be concluded that the majority of the respondents which accounts for 44.9% confirmed that the policy indicates coordination mechanism with other sectors.

4.4.9 Perception of respondents on The policy indicates no implementation strategy

Table 4.15 The policy indicates no implementation strategy					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly disagree	29	37.2	37.2	37.2
	Disagree	42	53.8	53.8	91.0
	Neutral	1	1.3	1.3	92.3
	Agree	3	3.8	3.8	96.2
	strongly agree	3	3.8	3.8	100.0
	Total	78	100.0	100.0	

Source :analysis result

Table 4.15 indicates that twenty nine (37.2%) of the respondents strongly disagree , forty two (53.8%) of the respondents disagree , one (1.3%) of the respondents remain neutral , three (3.8%) of the respondents agree, and three(3.8%) of the respondents strongly agree . Therefore it can be concluded that the majority of the respondents which accounts for 53.8% confirmed that the policy indicates implementation strategy.

4.4.10 Perception of respondents on No clear guide line for collaboration work with sectors (other than science)

Table 4.16 No clear guide line for collaboration work with sectors (other than science)					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly disagree	17	21.8	21.8	21.8
	Disagree	18	23.1	23.1	44.9
	Neutral	11	14.1	14.1	59.0
	Agree	23	29.5	29.5	88.5
	strongly agree	9	11.5	11.5	100.0
	Total	78	100.0	100.0	

Source :analysis result

Table 4.16 indicates that seventeen (21.8%) of the respondents strongly disagree , eighteen (23.1%) of the respondents disagree , eleven (14.1%) of the respondents remain neutral , twenty three (29.5%) of the respondents agree, and nine (11.5%) of the respondents strongly agree . Therefore it can be concluded that the majority of the respondents which accounts for 29.5% confirmed that the policy indicates no clear guide line for collaboration work with sectors (other than science).

4.4.11 Perception of respondents on No clear influencing factors that affect formulation and implementation of STIP

Table 4.17 No clear influencing factors that affect formulation and implementation of STIP

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly disagree	9	11.5	11.5	11.5
	Disagree	22	28.2	28.2	39.7
	Neutral	6	7.7	7.7	47.4
	Agree	28	35.9	35.9	83.3
	strongly agree	13	16.7	16.7	100.0
	Total	78	100.0	100.0	

Source :analysis result

Table 4.17 indicates that nine (11.5%) of the respondents strongly disagree , twenty two (28.2%) of the respondents disagree , six (7.7%) of the respondents remain neutral , twenty eight (35.9%) of the respondents agree, and thirteen (16.7%) of the respondents strongly agree . Therefore it can be concluded that the majority of the respondents which accounts for 35.9% confirmed that the policy indicates no clear influencing factors that affect formulation and implementation of STIP.

4.4.12 Perception of respondents on STIP Doesn't clearly identify sectors that affect its implementation

Table 4.18 STIP Doesn't clearly identify sectors that affect its implementation					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly disagree	8	10.3	10.3	10.3
	Disagree	23	29.5	29.5	39.7
	Neutral	11	14.1	14.1	53.8
	Agree	25	32.1	32.1	85.9
	strongly agree	11	14.1	14.1	100.0
	Total	78	100.0	100.0	

Source :analysis result

Table 4.18 indicates that eight (10.3%) of the respondents strongly disagree , twenty three (29.5%) of the respondents disagree , eleven (14.1%) of the respondents remain neutral , twenty five (32.1%) of the respondents agree, and eleven(14.1%) of the respondents strongly agree . Therefore it can be concluded that the majority of the respondents which accounts for 32.1% confirmed that the policy doesn't clearly identify sectors that affect its implementation.

4.4.13 Perception of respondents on No monitoring and evaluation system created

Table 4.19 No monitoring and evaluation system created					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly disagree	18	23.1	23.1	23.1
	Disagree	32	41.0	41.0	64.1
	Neutral	11	14.1	14.1	78.2
	Agree	15	19.2	19.2	97.4
	strongly agree	2	2.6	2.6	100.0
	Total	78	100.0	100.0	

Source :analysis result

Table 4.19 indicates that eighteen (23.1%) of the respondents strongly disagree , thirty two (41.0%) of the respondents disagree , eleven (14.1%) of the respondents remain neutral , fifteen (19.2%) of the respondents agree, and two(2.6%) of the respondents strongly agree . Therefore it can be concluded that the majority of the respondents which accounts for 41% confirmed that monitoring and evaluation system were created.

4.4.14 Perception of respondents on No clear performance indicators to monitor and evaluate implementation

Table 4.20 No clear performance indicators to monitor and evaluate implementation

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly disagree	10	12.8	12.8	12.8
	Disagree	28	35.9	35.9	48.7
	Neutral	8	10.3	10.3	59.0
	Agree	30	38.5	38.5	97.4
	strongly agree	2	2.6	2.6	100.0
	Total	78	100.0	100.0	

Source :analysis result

Table 4.20 indicates that ten (12.8%) of the respondents strongly disagree , twenty eight (35.9%) of the respondents disagree , eight (10.3%) of the respondents remain neutral , thirty (38.5%) of the respondents agree, and two(2.6%) of the respondents strongly agree . Therefore it can be concluded that the majority of the respondents which accounts for 38.5% confirmed that there were clear performance indicators to monitor and evaluate implementation .

4.4.15 Perception of respondents on No feedback mechanism for private sectors

Table4.21 No feedback mechanism for private sectors					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly disagree	9	11.5	11.5	11.5
	Disagree	12	15.4	15.4	26.9
	Neutral	9	11.5	11.5	38.5
	Agree	36	46.2	46.2	84.6
	strongly agree	12	15.4	15.4	100.0
	Total	78	100.0	100.0	

Source :analysis result

Table 4.21 indicates that nine (11.5%) of the respondents strongly disagree , twelve (15.4%) of the respondents disagree , nine (11.5%) of the respondents remain neutral , thirty six (46.2%) of the respondents agree, and twelve (15.4%) of the respondents strongly agree . Therefore it can be concluded that the majority of the respondents which accounts for 46.2% confirmed that there were no feedback mechanism for private sectors.

4.4.16 Perception of respondents on No feedback mechanism for private sectors

Table 4.22 No feedback from government actors					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly disagree	8	10.3	10.3	10.3
	Disagree	44	56.4	56.4	66.7
	Agree	24	30.8	30.8	97.4
	strongly agree	2	2.6	2.6	100.0
	Total	78	100.0	100.0	

Source :analysis result

Table 4.22 indicates that eight (10.3%) of the respondents strongly disagree , forty four (56.4%) of the respondents disagree , twenty four (30.8%) of the respondents agree, and two (2.6%) of the respondents strongly agree . Therefore it can be concluded that the majority of the respondents which accounts for 56.4% confirmed that there were feedback from government actors.

4.4.17 Perception of respondents on No involvement of sectors in the implementation process

Table 4.23 No involvement of sectors in the implementation process

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly disagree	15	19.2	19.2	19.2
	Disagree	36	46.2	46.2	65.4
	Neutral	8	10.3	10.3	75.6
	Agree	17	21.8	21.8	97.4
	strongly agree	2	2.6	2.6	100.0
	Total	78	100.0	100.0	

Source :analysis result

Table 4.23 indicates that fifteen (19.2%) of the respondents strongly disagree , thirty six (46.2%) of the respondents disagree , eight (10.3%) of the respondents remain neutral , seventeen (21.8%) of the respondents agree, and two(2.6%) of the respondents strongly agree . Therefore it can be concluded that the majority of the respondents which accounts for 46.2% confirmed that there were involvement of sectors in the implementation process.

4.4.18 Perception of respondents on ineffective mechanisms in the STI Policy making (formulation) process

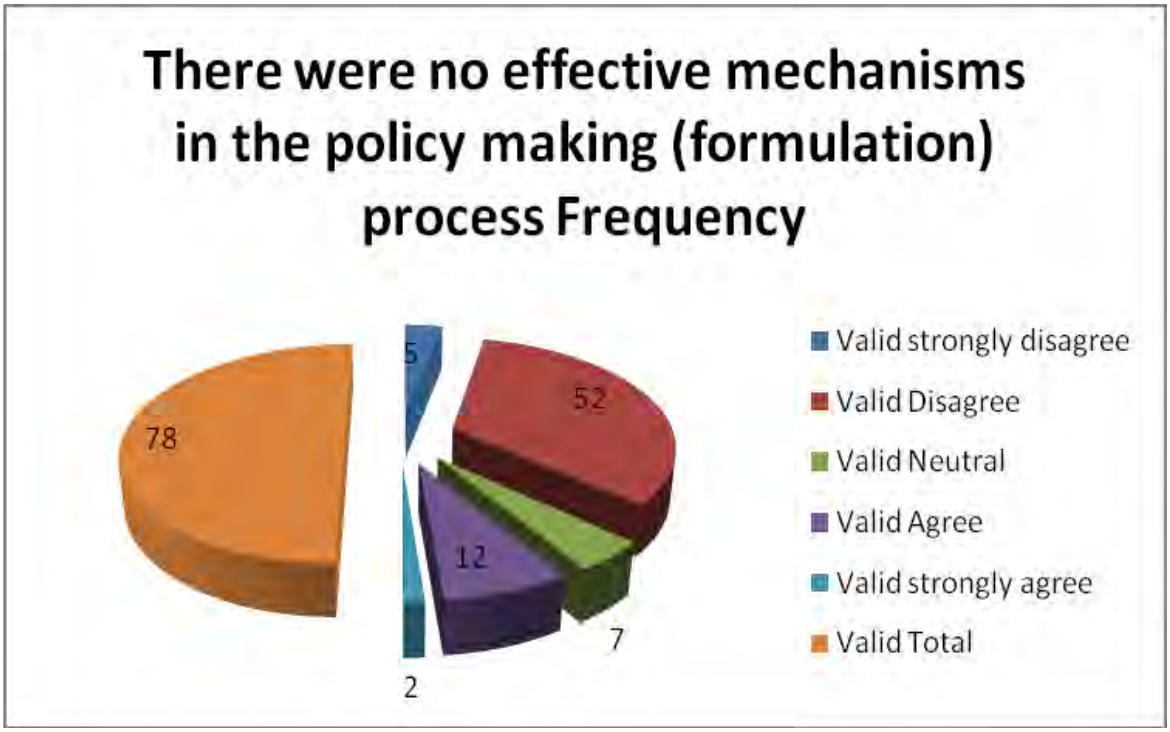
Table 4.24 Perception of respondents on ineffective mechanisms in the STI Policy making (formulation) process

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	**strongly disagree**	5	6.4	6.4	6.4
	Disagree	52	66.7	66.7	73.1
	Neutral	7	9.0	9.0	82.1
	Agree	12	15.4	15.4	97.4
	strongly agree	2	2.6	2.6	100.0
	Total	78	100.0	100.0	

Source :analysis result

Table 4.24 indicates that five (6.4%) of the respondents strongly disagree, 52 (66.7%) of them disagree, 7 (9 %) of the respondents remained neutral, 12 (15.4%) agree, and 2 (2.6%) of the respondents strongly agree on the no effective mechanisms on the policy making (formulation) process . Therefore, it can be concluded that majority of the respondents which accounts for 66.7% confirmed that the there were effective mechanisms in the policy making process .

Figure 14. Perception of respondents on effective mechanisms in the STI Policy making (formulation) process



Source :analysis result

4.4.19 Perception of respondents on effectiveness of implementation of STIP

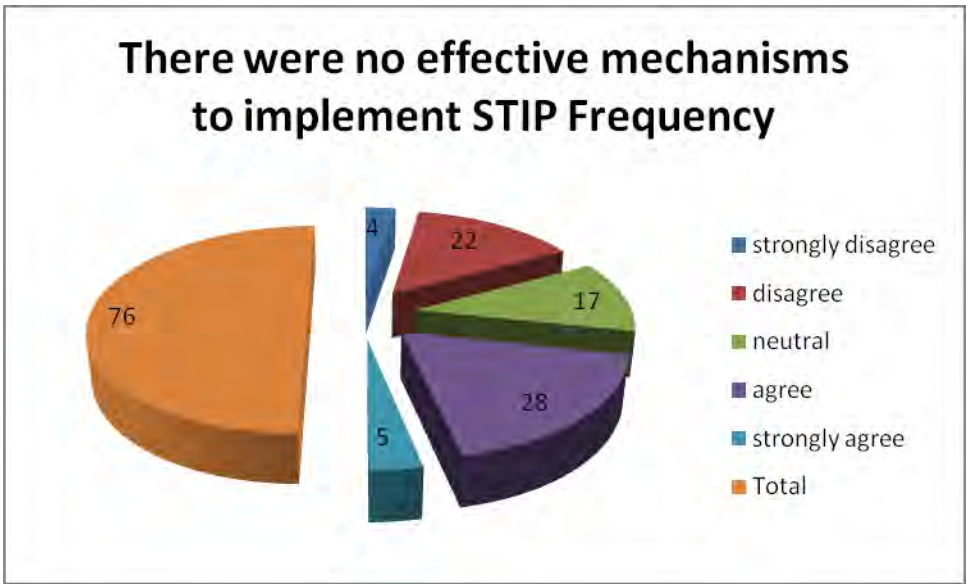
Table 4.25 Perception of respondents on ineffective mechanisms to implement STIP

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	**strongly disagree**	4	5.1	5.3	5.3
	Disagree	22	28.2	28.9	34.2
	Neutral	17	21.8	22.4	56.6
	Agree	28	35.9	36.8	93.4
	strongly agree	5	6.4	6.6	100.0
	Total	76	97.4	100.0	
Missing	**System**	2	2.6		
Total		78	100.0		

source: survey result

Table 4.25 indicates that four (5.1%) of the respondents strongly disagree, twenty two (22.8%) of them disagree, seventeen (21.8%) of the respondents remained neutral, twenty eight (35.9%) agree, and five (6.4%) of the respondents strongly agree on question 19 which was about effectiveness of STIP implementation. Therefore, it can be concluded that majority of the respondents which accounts for 42.3% confirmed that the implementation mechanism is ineffective.

Figure 15. Perception of respondents on effective mechanisms to implement STIP



Source : survey result

4.5 Validity and Reliability of scale

Validity and Reliability are two important characteristics of measurement procedures. Validity is defined as "the degree to which measures accurately represent what it is supposed to" (Hairetal, 2007) as cited by Kazi(2010).Validity is concerned with how well the concept is defined by the measure. Validity also means that the measuring instrument actually measures the probability it is supposed to measure (Ajais.s. Gaur and Sanjaya S.Gaur, 2009). The other important characteristics of measurement procedure that is reliability refers to the confidence one can place on the measuring instrument to give the researcher the same

numerical value when the measurement is repeated on the same object. The reliability measure indicates the extent to which it is without bias or error free. Hence reliability ensures the consistency of measurement across time and across various items in the instrument. Therefore, in this study multiple items in all construct except effective mechanisms in the formulation of STIP making process(formulation) and effective mechanisms in the implementation of STIP were used. And also the internal consistency method is applied. The rational for internal consistency (Hair et al., 2007) as cited from Kazi, (2010) is that the individual items or indicators of the scale should all be measuring the same construct and thus be highly inter-correlated.

In the present study in order to review the internal consistency of each dimension, the most popular test of internal consistency, reliability measure Cronbach coefficient alpha were used. Regarding the result the higher the coefficient, the better is the measuring instrument (Andy, 2010). In accordance with this, if the Cronbach alpha is closed to one, it means that the internal consistency of reliability is high. With regard to the cut-off value; many researchers agree that alpha should be at least 0.70 or higher to retain an item in an "adequate" scale. As cited by Kazi (2010), Funji et al., (2007) suggests that the Cronbach alpha with acceptable cut-off point 0.70 demonstrate that all attributes are internally consistent. Similarly, for Nunnally (1978), a scale with 0.70 alpha coefficients and above is considered acceptable.

In this study the Cronbach coefficient alpha were found to be 0.771 (Table 4.26), which indicates that the internal consistency of each scale items is acceptable.

Table 4.26 Reliability Statistics/ Cronbach's Alpha/

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.771	.781	5

Source: Survey Result

In addition to this, as shown in table 4.20 the Cronbach coefficient alpha ranges from 0.7 21to 0.742 which is higher than the cut-off value or point. The reliability analysis also considered the "Item-total statistics" by focusing on the two columns which are the "corrected Item-total correlation" and the "Cronbach's Alpha if item deleted".

The value in the column labeled "corrected Item-Total correlation" implies the correlation that exists between each item and the total score from the questionnaire. In line with this all items in the reliability scale are expected to correlate with the total. If in case any item does not correlate with overall score that is found to be less than 0.3 ; that particular item should be dropped; as it is suggested by Andy,(2010) that items with low correlation may have to be dropped. However, in this study all items have values greater than 0.3 (all items' value ranges from 0.406 to 0.645 as a result, no items were deleted.

With regard to the other column of the item-total statistics, the values in the column labeled "Cronbach's Alpha if Item Deleted" refers to the values of the total (overall) alpha if that particular item is not included in the computation of the statistics. Therefore, it reflects the change in the total Cronbach's alpha that could have been resulted, had that particular item (with its value of alpha greater than the overall alpha) was deleted or excluded. Hence, any item that results in significantly greater values of alpha than the overall alpha may need to be deleted from the scale in order to improve the overall reliability.

When we come to this study again no item needs to be deleted as the Cronbach's value of all items is less than the Crobach's value of the overall items. (See table4. 27)

Table 4.27 Reliability Statistics/ Item-Total Statistics/

Item-Total Statistics					
	Scale Mean if Item Deleted	**Scale Variance if Item Deleted**	**Corrected Item-Total Correlation**	**Squared Multiple Correlation**	**Cronbach's Alpha if Item Deleted**
science technology and innovation policy making /formulation/ process	10.32	10.406	.568	.563	.721
STI content	10.64	11.139	.406	.417	.783
STI monitoring and evaluation	10.46	10.118	.645	.572	.693
There were no effective mechanisms in the policy making (formulation) process	10.61	11.415	.642	.549	.707
There were no effective mechanisms to implement STIP	9.87	11.316	.506	.446	.742

source: survey result

4.6 Perception of respondents towards science technology and innovation policy making/formulation/ process and its implementation

The main objective of the research is to assess the effectiveness of STIP formulation and its implementation in MOST of Ethiopia. Therefore in order to measure the perception level of respondents towards the effectiveness of STIP formulation and its implementation five point Likert scale were employed in this study .The two extreme points for perception for this study are "1" which means "strongly disagree" and "5" which is "strongly agree" .In this case, the higher the "mean" score for perception (more than the middle value "3") indicates the higher the respondents'' agreement for the stated items. The stated items taken from the identified three STIP /STIP formulation, its content and implementation/ dimensions are telling about the MoST's effectiveness or ineffectiveness of STIP formulation and its

implementation as perceived by the respondents. Hence, the score below '3' for the items which corresponds to the effectiveness dimension is interpreted as MOST isn't ineffective in the STIP formulation and its implementation the stated criteria as perceived by the respondents because it indicates towards disagreement; on the other hand the score above '3' indicates agreement which becomes strong as the scale approaches '5' point. And the score '3' indicates that the respondents either do not know or want to stay neutral.

As shown in Table 4.27, the perception of respondents towards ineffectiveness of STIP making /formulation/ and its implementation in MOST of Ethiopia ranges from a mean score of 2.41 to 3.11 on a five-point scale. The mean value shows the average all respondents' response to a certain dimension. Moreover, the respondents perceived that MOST performs best in science technology and innovation policy making /formulation/ dimension, with the mean perception score of (2.41) because the dimension was indicated in the form of ineffectiveness ,so most of the respondents disagreed with the statement the mean become less than 3 .For the second dimension i.e. ineffective STI Policy implementation the mean is greater than 3 i.e. 3.11.This indicates that , the respondents agree with the statement that the STIP implementation mechanism is ineffective Regarding the standard deviation, as it is observed from Table 4.27 that almost all of the standard deviation of the two dimensions are found to be similar ; it tells us that how well the mean represent the given data. Generally, small standard deviation implies that data points are close to the mean. Whereas ,large standard deviations relative to the 'mean' value shows that the data points are far from the mean that is, the mean is not an accurate representative of the data (Andy ,2010). In the current study, as the value of standard deviation is moderate, it can be said that customers have expressed their opinion somewhat closely.

Table 4.28 The analysis of the respondent's views is summarized as follows

S/N	Statement	Decision
1	No involvement of stake holders in the STIP making process	39 respondents disagreed with the statement.
2	**Poor understanding of essential characteristics of STIP among Policy makers**	45 respondents disagreed with the statement.
3	**Poor knowledge of STI among policy makers**.	36 respondents disagreed completely with the statement.
4	**No awareness creation prearranged to STI policy**	48 respondents disagreed with the statement.
5	**The policy indicates no clear communication strategy for stake holders**	34 respondents disagreed with the statement.
6	**The policy indicates no clear direction to promote innovation**	35 respondents disagreed with the statement.
7	**The policy indicates no clear direction about monitoring and evaluation**.	50 respondents disagreed with the statement.
8	**The policy indicates no coordination mechanism with other sectors**	26 respondents disagreed with the statement.
9	**The policy indicates no implementation strategy**	42 respondents disagreed with the statement.
10	**No clear guide line for collaboration work with sectors (other than science)**	23 respondents agreed with the statement.
11	**No clear influencing factors that affect formulation and implementation of STIP**	28 respondents agreed with the statement.
12	**Doesn't clearly identify sectors that affect its implementation**	25 respondents agreed with the statement.
13	**No monitoring and evaluation system created**	32 respondents disagreed with the statement.
14	**No clear performance indicators to monitor and evaluate implementation**	30 respondents agreed with the statement.

15	**No feed back mechanism for private sectors**	38 respondents agreed with the statement.
16	**No feedback from government actors**	44 respondents disagreed with the statement.
17	**No involvement of sectors in the implementation process**	36 respondents disagreed with the statement.
18	**There were no effective mechanisms in the policy making (formulation) process**	52 respondents disagreed with the statement.
19	**There were no effective mechanisms to implement STIP**	28 respondents agreed with the statement.

source: survey result

4.7 Responses from Interview and Secondary Data

Policy has been defined as a "statement of the goals and objectives of an organization or a state in relation to a particular subject matter as well as description of the strategies for achieving those goals and objectivities (Salako,1999). Policy making therefore covers everything relating to the preparation and taking of decisions of concern to the state, together with the monitoring of their execution, evaluation of the results of government activities and possible feedback from the decisions taken (UNESCO, 2009, p.72).

The study attempts to assess the effectiveness of STIP of Ethiopia and its implementation in MoST. To this end questions were posed to respondents in order to determine the effectiveness of STIP of Ethiopia. Also, considering the background of the respondents as major stakeholders in the formulation and implementation of the STIP of Ethiopia.

The respondents answer from the interview questions and interpretation are explained below.

For the item **"How and why is the STI policy formulated?"** The all the seven interviewee answered that STIP is formulated by the initiation of the government. Therefore it can be concluded that Science technology and innovation facilitate the achievement of development goals through sustained and enhanced economic growth, provide employment opportunities, enhance market efficiency, and climate change.

For the item **"Who participate in the formulation of STIP?"** all the seven interviewee have almost similar suggestions i.e. The actors that participate the policy making process are: - The Ethiopian Science Academy / Interest groups/ , Policy Advisors /expatriate / , Researchers from universities , Policy experts that have back ground of science , Legislators and Executives. From this ,the study established and concluded the importance of collaboration between the various stakeholders responsible for STI Policy formulation and implementation. The whole essence of assessing this aspect is to establish the relationship between governance and STIP formulation and implementation. The stakeholders identified in the collaborative efforts at formulating and implementing STI Policy include the, policy makers as well as legislators, administrators, academicians.

While it was established that the Federal Ministry of Science and Technology effectively collaborated with other stakeholders, some issues emerged which were emphasized by the respondents . Reasons For and Against the Effectiveness of Collaboration between MoST and Key Stakeholders are lack of skilled personnel, limited coordination due to ineffective collaboration.

For the item **"What is the uniqueness of STIP and its implementation?"** The majority i.e. five interviewee i.e. the policy advisor and the policy experts explain that STIP needs special expertise for its formulation and implementation and it is a cross sector issue that needs special attention of government The rest two interviewee answered about STIP cross sector issue. So from this it was concluded that government role is very important in the formulation and implementation of STIP because STIP is cross sector issue .

For the item **"What are the main contents of the current STI policy?"**For this question majority of the interviewee answer as technology transfer, human resource development, STI indicators and Research and development and National quality infrastructure. From this it can be concluded that the issues mentioned by the interviewee are in the contents of the policy document and they have awareness of the STIP and awareness was also created for policy makers and implementers .

For the item **"What are the factors that influence the implementation of the STIP?"**Most of the interviewee answer for this question were resource i.e. The human and financial resource . And some of the respondents answer collaborative work, stake holder participation in making guide lines and implementation strategies. So from this it can be concluded that the most important factors that influence the implementation of STIP are the human and financial resource .

For the item **"What do you say about the implementation process of STIP in MoST ?"** For this question the majority of the interviewee answer that there were challenges that affect the effectiveness of the implementation of the STIP . The challenges were no implementation strategies that show direction how to implement the policy. There were no collaborations between different sectors. There were no university industry linkages. To link universities and industries, industries do not show interest as well as to show their technologies, especially industries opened by foreign investors. From this it can be concluded that there must be effective mechanisms for monitoring and evaluation of the implementation process . Clear implementation strategies should be prepared , collaboration work should be strengthened , university industry linkages should be strengthened .

For the item **"What are the main goals and objectives of the STIP?"**The review of 2010 national STI policy document identified two intermediate objectives of the policy which were framing and accelerating technological change and facilitating structural change. The overall objective was to achieve economic growth. The intermediate objectives could be pursued by:

- To build a national capability to generate, select, import, develop, disseminate and apply appropriate technologies for the realization of the country's socio-economic objectives.
- To improve and develop the knowledge, culture and scientific and technological awareness of the people of Ethiopia.

- To make science and technology activities in Ethiopia more efficient and development oriented.

so implementing S&T policy not only requires clear objectives and credible commitment on part of the government but equally important, is a competent and meritocratic management that is closely related to the private sector.

For the item **"What do you say the key strength and weakness of the policy as a whole?"** almost all interviewees answer the following. The strengths are, there is good policy and the policy document was prepared by participating different actors. The weakness are ineffective Implementation and ineffective university Industry linkage, Guide lines are prepared with little consulting stake holders ,Initially there was no implementation strategy .Implementation strategy is prepared after two years the policy document is prepared. From this it can be concluded that clear implementation strategy should be formulated .

For the item **"What do you say about monitoring and evaluation system in the implementation of the policy?"** Some respondents answer the following. Monitoring and Evaluation system is created. From this it can be concluded that Each accountable organization to MoST reports its performance to MoST monthly and MoST is evaluated by HoF quarterly. More over concerning the eleven critical issues identified in the policy document, implementation strategy is prepared (MoST, Implementation Strategy, 2014).

For the item **" The main contents of STIP"** From the respondents answer the main contents of Ethiopian STIP document are: - technology transfer, human resource development, STI indicators and research and development. Of course these are some of the critical issues that are indicated in the STIP document of MoST .This indicates that these mentioned critical issues are implemented. From this it can be concluded that there were limited awareness of the existence of national STI policy even among scientist and researchers in the country. Even, those who were aware stated that the policy was not accessible to them and the public. This was considered a limiting factor to the social function of STI. The society was not aware and do not contribute to the policy formulation process.

4.7.1 Key Strength and Weakness of the STIP and its Implementation

Strength	Weakness
• There is good policy • The policy document was prepared by participating different actors	• Implementation • When thematic area is formulated to link universities and industries , universities are not consulted • Guide lines are prepared with less participation of stake holders • The study revealed that there was minimal relationship or linkage between universities and industries. This implies that most of the Industries of private-sector do not want support from universities. From the various reasons given to justify why they do not need is that the ownership and risk financing and entrepreneurial system contributed to the disconnect of universities from industry instead of their functioning as partners in facing development challenges. • Scientific breakthroughs are not identified and not commercialized.

The factors identified to have characterized the weaknesses are targets and goals not properly set for performance evaluation, lack of effective monitoring and evaluation and poor dissemination of information on STI.

4.7.2 STIP Innovation performance in Ethiopia

Ethiopia's innovation performance lags its overall competitiveness**.** According to the World Economic Forum's Global Competitiveness Index (GCI), Ethiopia ranks 118th out of 144 countries with a score of 3.6 out of 7.0 in the 2014-15 report. Furthermore, Ethiopia lags significantly behind in global benchmarking on key innovation indicators and has room for improvement.

Increase in the R&D budget was a result of the increased headcount of R&D personnel and not researchers**.** R&D Personnel are all persons employed directly on R&D (researchers, technicians and equivalent staff), as well as those providing direct services such as R&D managers, administrators, and clerical staff.

From 2010 to 2013, Government's spending on R&D, increased from 931.3 million ETB to 5,242.6 million ETB. As such, the share of R&D spending as a share of GDP has increased from 0.24 percent to 0.61 percent. However, a large share of this increase is on account of the increased headcount of R&D personnel. The number of R&D personnel in the country has increased to 18,435 in 2013 from 13,095 in 2010, which is approximately a 41 percent increase. Meanwhile, the percentage of the number of researchers that increased during the same period was about 13 percent (from 7,283 to 8,218). This implies that the majority of the increase of R&D personnel was on account of the increase of personnel other than researchers.

On the other hand, business sector spending on R&D has sharply declined. Contrary to higher education and government institutions, the R&D spending by business sector has decreased from 144.6 million ETB to 61.5 million ETB during the same period, which accounts for only 1.2 percent of the total R&D spending in 2013. This is also reflected in the low rankings in the GCI ranking/score related to the business sector (i.e., Firm-level technology absorption and Company spending on R&D). Given increased global competition, success of Ethiopia's industrial sector depends on the firms' ability to innovate Talegeta (2014)

Chapter Five

5.Summary of the findings, Conclusion and Recommendation

5.1 Summary of Findings

Now a day's Government in Ethiopia stress the overwhelming significance of science, technology and innovation in the development process.

These efforts were varied both in extent, scope and emphasis. Within this framework therefore, Ethiopia's STIP formulation and implementation emerged with some strength as well as weakness. All these offered vital lessons of experience and policy concern.

This study is therefore carrying out on the need to assess the effectiveness of STI policy and its implementation in MoST of Ethiopia. The summary of findings from the study is presented based on the following subject headings: The STI policy making process in Ethiopia; Science technology and innovation policy implementation; and the factors influencing the implementation of STI policy in MoST of Ethiopia.

5.1.1 The STI policy making process /formulation/ in Ethiopia

Evidence from literature studies and analysis of findings from this study revealed as follows:

AS STI policy making process requires very important expertise and knowledge, the Ethiopian STI policy making process indicates that it is formulated by science expertise i.e. knowledgeable actors. The actors that participate the policy making process are: - The Ethiopian Science Academy / Interest groups/ , Policy Advisors /expatriate / , researchers from universities , Policy experts that have back ground of science , legislators and Executives. The reason the STIP is formulated, science technology and innovation are the driving force for socio-economic development of human civilization. They have become the major force towards gaining competitive advantage in many societies. Technological developments have created great opportunities for socio-economic development. Scientific knowledge has led to remarkable innovations that have been of greater benefit to human kind.

Science technology and innovation facilitate the achievement of development goals through sustained and enhanced economic growth, provide employment opportunities, and enhance market efficiency.

.

The study revealed that the current explicit STI Policy was formulated almost exclusively by government officials and science academy and policy advisors, which calls to question its overall acceptability by private sector stakeholders . In general concerning the of STIP policy making /formulation/ it was revealed that the process was effective.

5.1.2 Science technology and innovation policy implementation

The successful implementation of Science, Technology and Innovation policy has a very important role in the prosperity of any nation in the global market.

Science Technology and Innovation policy formulation and implementation point obviously to three basic subsystems consisting of the policy framework, the institutional framework for policy implementation and the user subsystem (Bwisa 1997, Tiffin 1994). The subsystems are expected to interact in such a manner as to create the necessary impact on national development.

One of the ineffective mechanisms that hindered the implementation of STI policy objectives are scarce resources, i.e. human and capital.

The country lacked the science culture that is required to create awareness on the need to use scientific methods in economic activities.

The findings from the questionnaire, it was established that science technology and innovation policy implementation was ineffective .

5.1.3The factors that influence the implementation of the STIP

The finding indicates that, the main factors that influence the implementation of STIP are the human and financial resource, collaborative work, stake holder participation in making guide lines and implementation strategies.

The Government is the major stakeholder and financier of STI activities with limited support from the private sector.

The study revealed that the STI institution lacked the necessary linkage with the productive sector.

Another finding indicates that there were challenges that affect the effectiveness of the implementation of the STIP. The collaborations between different sectors is weak . University industry linkages are weak. Industries do not show interest to participate to practice students in their factories as well as to show their technologies, especially industries opened by foreign investors.

5.1.4 Monitoring and evaluation system in the implementation of the policy

Monitoring and Evaluation system is created. Each accountable organization report its performance to MoST monthly and MoST is evaluated by HoF quarterly.

Also, three phases of policy process were identified from the critique on national STI policy formulation which include; strategy formulation, program identification and design, program implementation and assessment. These phases must be supported by impact assessment which will form part of the feedback control mechanism.

5.2 Conclusions and Recommendations

5.2.1Conclusion

Science technology and innovation are today more important than ever for Ethiopia , if it is to raise the standards of living of its people, consolidate a modern economy and participates as a significant partner in the global arena. This implies that the economy must be modernized and be competitive.

The collaboration between the various stakeholders responsible for STI policy formulation and implementation requires commitment to achieve the desired success. Collaboration work is needed to implement the policy. Government should intervene because STIP is a cross cutting issue i.e. the implementation process is at the hands of different sectors. Without collaborative work the policy will not be effective.

In general from the research it was concluded that the science ,technology and innovation policy making process /formulation / in MoST of Ethiopia was effective where as its implementation was found ineffective.

5.2.2 Recommendation

Policymakers should design and formulate their STI Policies based on National Innovation System (NIS) framework. Having chosen national system of innovation as a policy framework may not be necessary factor for implementation of the STI Policies, but it can help the policy makers to make proper decisions towards turning those policies more operational and feasible.
It is also necessary for the policy makers of LDCs to adopt open policies toward the massive acquisition and diffusion of foreign suitable technologies that promote their capability to compete in the international market.

The study on the assessment of STI Policy and its implementation would have been an easy one if comprehensive national framework of S&T indicators and measures are in place and operational. This made the assessment of the STI Policy and its implementation very difficult and moreover, there are no indigenous capabilities to monitor trends in performance.

The issue of STI literacy deserves serious consideration in the new STI Policy paradigm.
In order to improve on STI literacy, the foundation has to be laid and this must begin from the schools. Pupils and students must be provided with early and regular contact with technology. Exposing these groups to technological concepts and hands-on design-related activities is the most likely way to help them acquire the desired knowledge, ways of thinking and acting and capabilities consistent with STI literacy.

- Science and technology policies are needed to make Ethiopia refocus its industrial development process so as to make it more competitive. It is therefore, recommended that government should consider adopting a pragmatic approach to redirect the country's STI policies in line with the new economic realities. To this end, the

policies should aim at reorganization and technological modernization of the industrial sector using appropriate sector policies.

The implementation of the STI policy for Ethiopia is crucial to facilitate linkages between different actors and institutions involved in the innovation ecosystem.

While the current implementation arrangement is in line with international practice, key lessons learned from global experience emphasize the importance of inter-ministries and inter-agency bodies creating a coordinated and coherent implementation of STI-policies. A few recommended policy actions that Government of Ethiopia could undertake include:

- The development of STI policy implementation strategy. While the policy identifies basic objectives and strategies, it is important for all the stakeholders to understand a clear path to promote innovation in Ethiopia.
- Good Coordination mechanism**.** Given that the STI policy covers a wide range of topics which involve a number of organizations/institutions, a clear communication strategy among these stakeholders needs to be developed.
- Monitoring & Evaluation mechanism implemented. To monitor the progress of STI policy (and implementation strategy), the Key Performance Indicators need to be developed and disclosed to the public, together with their progress. This could potentially help inform future policy making.
- Feedback Mechanism from the Private Sector**.** Given the crucial role that STI Policy plays in the move towards an export led industrial growth transformation, the implementation of the policy needs to have clear ownership from the private sector.
- Framework for Inclusive Innovation Policy. The STI Policy has been framed under the vision of "alleviating poverty and joining the mid-level income earning countries". Herein lay the clear role for Government to spearhead a strategy to develop an adequate policy framework for inclusive STIP.

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Annex I- Respondents profile

Gender					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	54	69.2	69.2	69.2
	Female	24	30.8	30.8	100.0
	Total	78	100.0	100.0	

Age Group					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	age group18-29	14	17.9	17.9	17.9
	age group 30-39	47	60.3	60.3	78.2
	age group 40-49	17	21.8	21.8	100.0
	Total	78	100.0	100.0	

Educational level					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	BA	25	32.1	32.1	32.1
	BSC	31	39.7	39.7	71.8
	MSC	13	16.7	16.7	88.5
	MA	9	11.5	11.5	100.0
	Total	78	100.0	100.0	

Duration in the work					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	between 1-5	26	33.3	33.3	33.3
	between 5-10	19	24.4	24.4	57.7
	above 10 years	33	42.3	42.3	100.0
	Total	78	100.0	100.0	

Position					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Management level	31	39.7	39.7	39.7
	Expert level	47	60.3	60.3	100.0
	Total	78	100.0	100.0	

Type of activity					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	core process	33	42.3	42.3	42.3
	support process/staff	45	57.7	57.7	100.0
	Total	78	100.0	100.0	

Table 4.2 Gender, Age Group, Educational Level , Duration in the work, and Position,

		Frequency	Percent	Valid Percent	Cumulative Percent
Gender	**Male**	54	69.2	69.2	69.2
	Female	24	30.8	30.8	100.0
	Total	78	100.0	100.0	
Age Group	**18-29**	14	17.9	17.9	17.9
	30-39	47	60.3	60.3	78.2
	40-49	17	21.8	21.8	100.0
	Total	78	100.0	100.0	
Duration in the work	**between 1-5**	26	33.3	33.3	33.3
	between 5-10	19	24.4	24.4	57.7
	above 10 years	33	42.3	42.3	100.0
	Total	78	100.0	100.0	
Position	**Management level**	31	39.7	39.7	39.7

	Expert level	47	60.3	60.3	100.0
	Total	78	100.0	100.0	
Type of activity	**core process**	33	42.3	42.3	42.3
	support process/staff	45	57.7	57.7	100.0
	Total	78	100.0	100.0	

Appendix II: A List of institutions and universities those are accountable to Science and Technology Ministry of Ethiopia

S/N	Name of Institutions /Organizations	Location	Function	Objective
1	National Metrology Institute of Ethiopia	Addis Ababa City	Industrial and Scientific Metrology activities	• Develop national metrology system compatible with international metrology system and insure technology transfer in the sector. • Establish and Implement a system that enable to compare Ethiopian national measurement etalons and certified reference materials with international etalons and o maintain and disseminate them , • Support education and research activities in metrology, • Build national capabilities for maintenance of scientific instruments and provide maintenance services • Provide technical, training, consultancy and information services on scientific equipment with a view to supporting users to carry out their duties effectively.
2	Ethiopian Standard	Addis Ababa City	Prepare and Provide	

	Agency		standards	
3	Ethiopian Conformity Assessment	Addis Ababa City	Providing Certification , Quality Inspection and Laboratory Testing Services	
4	Ethiopian Accreditation Office	Addis Ababa City	Accreditation activities	
5	Ethiopian Radiation Protection Authority	Addis Ababa City	Regulatory activities	
6	Science and Technology Information Center	Addis Ababa City	STI Information	
7	Ethiopian Intellectual Property Office	Addis Ababa City	Intellectual Property activities	• To facilitate the provision of adequate legal protection for and exploitation of intellectual property in the country. • To collect , organize and disseminate technological information contained in patent documents and encourage its utilization. • To study , analyze and recommend policies and legislations on intellectual property to the government .

				• To promote knowledge and understanding of intellectual property among the general public.
8	Addis Ababa Science and Technology University	Addis Ababa City		
9	Adama University	Oromia Region / Adama City		

ADDIS ABABA UNIVERSITY COLLEGE OF BUSINESS AND ECONOMICS

Department of Public Administration and Development Management

Masters Program: Public Management and Policy

Dear respondents this questionnaire is designed to gather information for a study of Masters Degree at Addis Ababa University. The objective of the study is to assess the effectiveness of current science technology and innovation policy (STIP) and implementation in the ministry of science and technology of Ethiopia .

In all questions, the researcher kindly asks your personal opinion(perception)about the effectiveness of STIP . As your responses to the given statements have great importance to my study, I therefore, kindly request you to answer the questions carefully and genuinely. All information you provide will be treated confidential and used for academic purpose only. Kindly put a (✓) mark on your answer from the given choices.

Part I. Respondents Information

1. Your gender?

☐ Male ☐ Female

2. Your age group?

☐ 18-29 ☐ 30-39 ☐ 40-49

☐ 50-60 ☐ above 60

3. Your educational level

☐ BA Bachelor degree ☐ BSC Bachelor degree

☐ MSC Post graduate degree ☐ MA Post graduate degree ☐ PhD

4. Duration in the work

☐ Below 1 year ☐ 1-5 year ☐ 5-10 year ☐ above 10 years

5. Position

☐ management level ☐ expert level

6. Type of Activity of work

☐ Core process /staff ☐ support staff

Part II. Your perceptions (opinion)towards effectiveness of science technology and innovation policy and its implementation

Please, show the extent to which you believe (perceive) towards effectiveness of science technology and innovation policy and its implementation in ministry of science and technology of Ethiopia. Put a (✓) mark on the number 1,2,3,4, and 5 for strongly disagree, disagree, neutral, agree and strongly agree respectively. There is no right or wrong answers all I am interested in is a number that best shows your perception (opinion) on effectiveness of science technology and innovation policy and its implementation in ministry of science and technology.

	Kindly rank each statement as follows:	**Strongly disagree-1**	**Disagree-2**	**Neutral-3**	**Agree-4**	**strongly agree-5**
	Dimensions	**Perception(opinion)**				
		1	**2**	**3**	**4**	**5**
	Science technology and innovation policy making/formulation/ process -actors participation					
1	No involvement of stake holders in the STI policy making process					
2	Poor understanding of the essential characteristics of STIP among policy makers					
3	Poor knowledge of STI among policy makers					
4	No awareness creation prearranged to STI policy makers					
	Science Technology and Innovation policy content					
5	The policy indicates no Clear communication strategy for stakeholders					
6	The policy indicates no clear direction to promote innovation					
7	The policy indicates no clear direction about monitoring and evaluation process					
8	The policy indicates no coordination mechanism with other sectors					
9	The policy indicates no implementation strategy					
10	No clear guide line for collaboration work with sectors (other than science)					
11	No clear influencing factors that affect formulation and implementation of STIP					

	Kindly rank each statement as follows:	Strongly disagree-1	Disagree-2	Neutral-3	Agree-4	strongly agree-5
	Dimensions	**Perception(opinion)**				
		1	**2**	**3**	**4**	**5**
12	Doesn't clearly identify sectors that affect its implementation					
	Science Technology and Innovation Policy monitoring and evaluation					
13	No monitoring and evaluation system created					
14	No clear performance indicators to monitor and evaluate implementation					
15	No feedback mechanism from private sector					
16	No feedback from government actors					
17	No involvement of sectors in the implementation process					
	Overall effectiveness of Science Technology and Innovation Policy making (formulation)and Implementation					
18	There were no effective mechanisms in the policy making (formulation) process					
19	There were no effective mechanisms to implement science technology and innovation policy					

Thank you for your cooperation

Annex III: Interview Questions

1. How and why is the STI policy formulated?

2. Who participate in the formulations of the STI policy?

2. What is the uniqueness/the difference / of STIP and implementation form other policies?

4. What are the main contents of the current STIP?

5. What are the factors that influence the implementation of the STIP?

6. What do you say about the implementation process of STIP in MoST?

7. What are the main goals and objectives of the STIP?

8. What do you say about the key strength and weakness of the policy as a whole?

8. What do you say about the monitoring and evaluation system in the implementation of the policy?

10. What are the policy out comes in relation to goals and objectives?

11. What do you recommend for improvement in any area of the policy?