STRATEGIC FACTORS AFFECTING TECHNOLOGY MANAGEMENT IN TECHNICAL TRAINING INSTITUTES IN NAIROBI COUNTY

BY

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DECLARATION

The Research Project is my original work and has not been submitted anywhere else in any University or institution.

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The research project has been submitted for examination with my approval as a university supervisor.

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DEDICATION

This research is dedicated to my late Dad for instilling the importance of hard work, patience, humility and higher education.

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This research is not the end of my academic journey!.

ABBREVIATIONS AND ACRONYMS

MOHEST	**:**	Ministry of Higher Education, Science & Technology
ANOVA	**:**	Analysis of Variance
TM	**:**	Technology Management
TTI	**:**	Technical Training Institutes
MBA	**:**	Master of Business Administration
STMF	**:**	Strategic Technology Management Factors
SM	**:**	Strategic Management
R&D	**:**	Research and development
TIVET	**:**	Technical, Industrial, Vocational and Entrepreneurship Training
UON	**:**	University of Nairobi
PCA	**:**	Principal Components Analysis
KPLC	**:**	Kenya Power & Lighting Company
NYS	**:**	National Youth Service
IPR	**:**	Intellectual Property Rights
KMO	**:**	Kaiser Meyer Olkin
GOK	**:**	Government of Kenya
SPSS	**:**	Scientific Package for Social Scientists

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ABSTRACT

The current Technical Education landscape in Kenya is rapidly becoming complex and Technical Training Institutes are facing accelerating technological development and competitiveness. These opportunities need to be harnessed and converted into value through effective and dynamic Technology Management. This calls for strategic technology management in these institutions. However, the Technology Management discipline is silent on the coherent set of factors that could be used to manage technology. TTIs have been operating in an environment full of broad challenges that affect technology management. Effective and dynamic management of technologies require a set of skills and knowledge in Strategic Management. SM has a long-term focus and involves the development of vision, mission, setting of objectives, and strategies that guide the design of functional strategies. This study dealt with two interrelated questions: 1) what are the factors that affect TM in Technical Training Institutes? 2) What are the factors that determine the application of TM factors? The study employed statistical techniques in the analysis of data obtained through the use of a structured questionnaire. Factor analysis was employed to determine factors affecting. In this research, strategy, in the context of Technology Management, was used to show the linkage between technology management and strategic management in Technical Training Institutes within Nairobi County. The findings of this research have important implications for the practice of Technology Management. It will help demystify the concept of Technology Management in Technical Training Institutes within Nairobi County and also contribute to the discussion on strategic technology management.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

The current Technical Education landscape in Kenya is rapidly becoming complex and Technical Training Institutes are facing accelerating technological development and competitiveness. These opportunities need to be harnessed and converted into value through effective and dynamic Technology Management. This calls for strategic technology management in these institutions. To achieve long-term success, institutions must develop and sustain their technological capabilities to create a meaningful internal and external impact. This will require the transformation of Managers of Technical Training Institutes from functional managers to strategic managers. The managers will be required to develop a sustainable Strategic Technology Management Framework (STMF). To enable them manage technology effectively in the rapidly changing academic environment. This environment is perceived as turbulent and complex hence must be tackled as contained in the quote "the dogmas of the quiet past cannot apply in the present and the future, every time you have to think and act anew" (Abraham Lincoln- 1862).

Over the last three decades, the development of the strategic management field has been dramatic. Previous developments include Strategy and Structure by Chandler (1962) and Ansoff's (1965) Corporate Strategy. More recent theoretical contributions led to the emergence of the resource-based theory of competitive advantage and institutional theory. Resource based theory considers the value-creation potential of a firm's resources while the institutional theory focuses on the impact of the firms' environment and the cognitive, normative and regulative structures that surround them. The Chaos theory provides a useful theoretical framework for understanding the dynamic evolution of industries and the complex

interactions among industry actors. Currently Technology Management discipline is silent on the coherent set of tools and techniques that could be used to manage technology. TTIs therefore operate in an environment where they are faced with broad challenges that affect technology management. These broader strategic issues are; Lack of unifying policies and legal frameworks, Ineffective application and use of IPR law, Weak collaboration and linkages and Lack of effective research and development. Technical Institutions leverage Technology to create innovations, promotes competencies of graduates and sustain a competitive advantage. The Performance of these institutions is determined by among other things, how they manage their technology.

Strategic Management is concerned with the initiatives taken by institutions, to create, enhance and sustain environmental capabilities and to reach their objectives (Ansoff 1979). It has a long-term focus and involves the development of vision, mission, setting of objectives, and strategies that guide the design of functional strategies. In this research, strategy, in the context of Technology Management, is used to show the linkage between technology management and strategic management.

Technology management is crucial for the execution of the TTI's technology strategies for competitive advantage. This calls for TTI to come up with modalities on how to strategically manage their technologies for sustainable development. In this respect, conducting this research provides an opportunity to demystify the concept of Technology Management in Technical Training Institutes within Nairobi County.

1.1.1 Strategic Management Concept

According to Hunger &Wheelen (2012), Strategic management (SM) is the set of managerial decision and action that determines the long-run performance of a corporation. It includes environmental scanning, strategy formulation, strategy implementation, and evaluation and

control. It consists of the analysis, decisions, and actions an organization undertakes in order to create and sustain competitive advantages. The strategy concept is designed to answer three basic questions; where, how to compete and how to contribute at different levels; Corporate Strategy, Business Strategy and Functional Strategy.

Therefore strategic management emphasizes the monitoring and evaluating of external opportunities and threats in the lights of a corporation's strength and weaknesses. In this regard, a framework that can assist organizations in their quest for strategic competitiveness is the strategic management process, the full set of commitments, decisions and actions required for an organization to systematically achieve strategic competitiveness and earn above-average returns.

Strategic management is important in any organizational success and failure than any specific functional areas such as marketing, finance & accounts, human resource, and production into a top level management discipline. It has a long-term focus and deals with organizational level and top level issues unlike functional or operational level management. SM involves the development of vision and mission, setting of objectives, and strategies that guide the design of functional strategies. The purpose of strategic management in an organization is to; provide organizational leadership, create a fit between the organization and its external environment, cope with change and organizational renewal, Foster anticipation, innovation, and excellence, Facilitate consistent decision-making and create organizational focus.

1.1.2 Linkage between Strategy and Technology

The word technology is derived from the Greek word technología, meaning an art, skill or craft, Burgelmanet al. *(*2009). Therefore technology is the knowledge and usage of tools, techniques, crafts, systems or methods of organization in order to solve people, the institution's or companies' needs Burgelmanet al. (2001). Technology is often a consequence

of science and engineering, hence it is simply seen as applied science and engineering. Burgelmanet al. (2001) also defines technology as theoretical and practical knowledge, skills and artifacts that can be used to develop products and services as well as their production and delivery systems. Consequently, technology is embodied in people, materials, cognitive and physical processes, equipment and tools. There are three perspectives on the interaction between strategy and technology. The first focuses on the effect of current technology on current strategy of the firm, the second on the effect of current strategy on future technology and the third on the effect of current technology on future strategy. In essence Strategy capitalizes on technology, Strategy cultivates technology and Technology drives strategy.

Therefore there are advantages and limitations of various techniques for evaluating and selecting the technologies and new products that make the best fit with organizational goals and objectives. In effect technology is a strategic asset and strategic planning can be directed at research and development (R&D) management, technology planning, and the management of innovative technologies. It is important to be accurate and appropriate in linking marketing analysis to organizational goals, objectives, and technical capabilities for this determines the linkage between long-range plans and R&D with technology needs in an organization. The methods and techniques for ensuring this linkage will be explored

1.1.3 Technical education in Kenya

Technical Education (TE) refers to any educational processes and curricular activities not classifiable under language or art, humanity or pure science and which are characterized by the use and manipulation of hand tools, machines and apparatuses to acquire employable skills and competencies (MoHEST 2009). This is training that leads a participant to acquire practical skills and understanding necessary for employment in a particular occupation, trade or group of occupations. Such practical skills can be provided in a wide range of settings by

multiple providers both in the public and private sector. In Kenya TE mainly caters for people of the age bracket of 17-24 years. Of this group 10% get University Education, 30% are taken up by informal sector and the remaining 60% are expected to pursue TIVET which still faces great challenges of access and equity as well as quality and relevance. This coupled with the country's diverse economic structure illustrate the need for a well-differentiated TE system.

TVET institutions are therefore responsible for producing trained students and trained techno-preneurs. The trainees come from secondary schools or the local community. In addition, TIVET institutions also promote local technologies resulting in value addition to previously wasted products, local food and product safety improvement, Technology based wealth creation at a local level and Increase of agricultural production. As a result, trained students and trained techno-preneurs will have a definite impact on; technologically driven innovation, Skill level for small and medium term Enterprises, Productivity, Value Addition, Creation of Small and medium Enterprises and Wealth creation. Skills development therefore provides a fertile arena for strategic technology management.

Technical institutions need to exploit these opportunities and convert them into value through effective and dynamic Technology Management. This requires a set of skills and knowledge where the use of Technology Management tools plays a key role. It is still not clear how they go about Technology management. This study therefore seeks to analyze the Strategic factors affecting Technology Management in Technical Training institutes in Nairobi County.

1.1.4 Technical Training Institutes in Nairobi County

There are twenty one (21) both Public and private Technical Training Institutes within Nairobi County. The details are contained in appendix 3. These institutions are responsible for the Formulation, promotion and implementation of Technical Education policies and strategies. In 2006, the institutions adapted the concept of strategic planning to improve their

competitiveness. Nairobi County is one of the 47 counties in Kenya. The county is known for its location in a highly social economic and industrialized environment that posts a high demand for skilled workforce. The county provides an infrastructure and a large student catchment for Technical Training Institutes.

1.2 Research Problem

Strategic technology management factors are very crtical for the successful planning of organizations. In order to address market dynamics; competitive positioning and planning in strategy formation organizations must develop and sustain their technological capabilities to create internal and external impacts. Consequently, knowledge on strategic technology management is needed to provide clarity for practitioners in this field. Therefore technology management activities have to be linked with the strategy of any institution. However technology management discipline is silent on the coherent set of tools and techniques to be used to manage technology. Strategic technology management factors are very crucial for the long-term success of organizations (Ansoff 1987). In order to address market dynamics; competitive positioning and planning in strategy formation (Minztberg 1978, Porter 1980), organizations must develop and sustain their technological capabilities to create internal and external impacts. Consequently, knowledge on strategic technology management is needed to provide clarity for practitioners in this field. Therefore technology management activities have to be linked to the strategies of any institution.

Research and perceptions of enterprise practitioners indicate that factors affecting Technology management in Technical Training Institutes within Nairobi County are still not known. Baseline surveys indicate that strategic technology management in these institutions is still confusing and diversely practiced despite being made a requirement of performance contracting that all these institutions embrace TM in their strategic plans. The failure is

attributed to low or lack of adoption of the intended technology management factors. Various studies have been carried out locally but no one has attempted to address the strategic factors affecting Technology Management in Technical Training Institutes within Nairobi County.

In the year 2004, Mutanu carried out a study on Technology Diffusion methods for strategic management purposes. She focused her study on integrated systems in Kenya. This was followed by Ndugo, (2007) researched on indigenous Tools of Capturing Knowledge: In 2010Mosoti and Masheka carried out a research on Knowledge Management in Kenya, but they did not focus it on Technology management in TTIs within Nairobi County. In 1999 Aduda and Kaane came close to addressing these issues however they concentrated on Technology policies and strategies but failed to look at it in the context Technical education in Nairobi County. Other studies were by Ikiara in 1988 on the role of government institutions in Kenya's industrialization,Ngahu, in 1995, researched strategy and the Choice of technology; in the year 2010, Weru in his research project studied the relationship between technology and innovation strategies and competitive advantage. Finally Wanjihia in 2011 carried out a study on innovation management in Kenya's manufacturing sector. This study seeks to fill this void and contribute in demystifying the concept of Technology Management in Technical Training Institutes.

The study intends to distinguish TM as a managerial discipline of its own within other disciplines of a multifunctional organization. The study intents to show the way in proactively managing impacts of technology for competitiveness and for sustainable development and seeks to answer the question; what are the strategic factors affecting Technology Management in Technical Training Institutes within Nairobi County?

1.3 Objectives of the Study

The general objective of the study was to investigate the strategic factors that affect technology management in Technical Training Institutes within Nairobi County.

The specific objectives of the study were to:

(i) Find out the strategic factors that affect technology management in Technical Training Institutes within Nairobi County.

(ii) Find out what influences the application of the factors affecting technology management in Technical Training Institutes within Nairobi County.

1.4 Value of the study

It is expected that the study will form a theoretical reference in the field of strategic management within its core concepts of Technology Management in Technical Training Institutes in Nairobi County. The study will also contribute to the expanding knowledge base on strategic technology management in the Technical Education sector. Thus demystify the concept of Technology Managements so often overlooked as a potential pillar in the socioeconomic environment. The study should provide a better benchmark for better management of technical education and help to ensure that all future managers have a better understanding of what it takes to manage the sector.

It is anticipated that the study will identify ways through which proper Technology Management can provide for practitioners, an improved performance and profitability. The research findings can be adapted and used in formulating a policy document for the Technical Education Sector in Kenya. Finally, this study will form a basis for further research in this area among scholars and practitioners.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter provides a general evaluation of the strategic, technology management and the link between strategic factors and technology management. Strategic management means integrating technology planning in transforming knowledge in artifacts. The theoretical foundation of this research builds on the relevant concepts of strategic, institutional and technology management that seeks to achieve long term goals and objectives of Technical Trainng Institutes in Nairobi County.

2.2 Theoretical foundation

Strategic technology management is related to several stragetic management theories and disciplines. In Resourse-Based theory of competitive advantage. Strategy is defined as “The match in organization makes between its internal resources, skills, opportunities and the risks created by its external environment”. A firm is seen as a bundle of resources and capabilities comprising of physical, financial, human and intangiable assets. Resource and capabilities are the source of strategic direction. Identifying resources gaps and developing the resource base is the basis for organizational profitability. Therefore, organizations must develop or upgrade their resource bases by translating these resources and capabilities into a strategic advantages: in order to sustain advantage on the firms’ environment and the cognitive, normative and regulative structures that surround them. It attempts to explain how these structures impact the actions and boundaries of the firm. These structures provide stability to actions and cultures.

One of the enduring problems facing the field of strategic management is the lack of theoretical tools to describe and predict the behaviour of firms and industries. The chaos theory provides a useful theorical framework for understanding the dynamic evolution of the industries and the complex interactions among industry actors. It reconciles the essential unpredictability of industries with the emergence of distinctive attorneys (Cartwright, 1991.). it is argued that industries can be conceptualized and modeled as complex, dynamic systems, which exhibit both unpredictability and underyling order. For example, even if we know that oligopolistic industries are likely to experience periods of stability and alternating with periods of intense completion, we do not know when they will occur or what will be the outcome. Similary, it is almost impossible to predict the impact of the advent of a new competitor or technology in an industry. By conceptualizing distress as systems, a number of managerial implications can be developed. Chaos theory also points to the importance of developing guidelines and decision rules to cope with complexity and of searching for non-obvious an indirect means to achieving goals.

2.3 The Concept of Strategy

An organization's strategy is the determination of its basic, long-term goals, objectives and the adoption of cources of action and the allocation or resources necessary for those goals Chandler (1962). The concept of core competency (Prahalad & Hamel 1990) suggest that stategy is an integrated and coordinated set of actions to exploit competencies, in order to gain a competitive advantage in the business that an organization purses. Strategy therefore is a plan of action designed to achieve a vision. It is crucial for value creation, long term success and survival of any organization.(Minztberget al. 2005) describes three prescriptive schools of strategy as design, planning and positioning. Technology is one of the pillars of

stategy formation since it is involved in all activities that constitute an organization's value system (Porter 1985). Therefore business and product strategy has to embed in technology.

The main school of thought about competitive strategy is Porter's positioning approach, which is about attempting to achieve a sustainable competitive advantage for organization by preserving what is distinctive about organization within the industry (porter 1996). Fundamentally technology strategy is one of the key elements in strategic technology management. It comprises of the definition, development and use of technological competencies that constitute an organization's competitive advantange (Dodgson et al.2008). technology strategy is concerned with linking technology with the firm's competitive strategies (Burgelmanet sl. 2001). This forms the basis of the overall strategy. Factors shaping the technology strategy comprise of internal and external integrative and generative forces. These forces interact with organizational and industry context strategic actions and technology evolution (Burgelmanet al. 2001)

2.4 Technology Management

Technology management is a discipline of management where an organization leverages the technology fundamentals to create a competitive advantage. It is conceived as the development and exploitation of technological capabilities that are changing continuosly (Helfat and Peteraf, 2003). Previous findings indicate that typical concepts in technology management are technology strategy (a logic or role of technology in organizing), technology forecasting (identification of possible relevant technologies for the organization, possibly through technology scouting), technology road mapping (mapping technologies to business and markets needs), technology project portfolio (a set of projects under development) and technology portfolio (a set of technologies in use).

In this respect technology management disciplines pursued by organizations in managing fundamentals of technology in order to create competitive advantage. Therefore technology management focuses on the connection between technology and business, encircling not only technology construction but its application, dissemination and impact.

Technology identification and monitoring enlarges an organization's external environment awareness, whilst supplementing the understanding of how internal technological performance and maturity compare to State-of-the-Art (Geers, Pears, Wouters, 1997). External environment understanding and the ability to respond to technologies opportunities or threats, therefore act on the forefront of technology management. For an organization, these early technology planning activities support the ability to achieve and sustain a competitive advantage through technological innovation. To enable the realization of these functions and manage technological forecasts, a set of tools for identification and monitoring is specified as technology networking, technology watch, benchmarking and technology maturing assestment. This provides the practical means for the organization to commence the development of a robust technology strategy based on foresight and technological forecasts. (Langley 2007) defines technology selection and approval as the alignment of technology and organization's strategies to enable technology investment decision making. This is meant to create a situation where technologies that meet the organizational requirements are selected through a down selection process. This ensures that organizations have the tools and information to guide technology deployment towards the right outcome.

According to Burns, (1961) capability development process refers to development process refers to developmental research, acquisition and adoption indicating a sequential approach to developing technology maturity or capability. It involves understanding technology capabilities against the product timelines

and ensuring that mature technologies are deployed for use within a particular setting. In order to realize this, financial surport is provided for development of innovative ideas. In addition to achieving capability and demonstration, improvement is undertaken if necessary. To enable the realization of these functions, a set of tools for capability development or technology make-buy, capability acquisition and Technology readiness scale.

Finally the protection stage considers the direct product of research as knowledge which can be in the form of new technology, new product, new Process and Improvement on an existing product, technology or process. The effective dissemination of this knowledge can only be realized through knowledge trade or commercialization of research products. Knowledge can only be commercialized if it becomes a property meaning that it must have (i) a legal owner; (ii) value and (ii) a market for it. This stage therefore ensures that technology in the organization is protected for purposes of commercialization (McManis, 2003). To enable the realization of these functions, a set of tools for protection is specified as technology risk management, Knowledge base protection and intellectual property protection. (Spinello& Richard, 2007), (Lemley, 2005).

2.5 Strategic Factors and Technology Management

Strategic factors that affect technology management are related to several theoretical concepts and management disciplines. The body of knowledge in strategic technology management is intertwined with abundant aspects of strategic management, organizational management, knowledge management, innovation management and R&D management (Steele 1989, Khalil 2000, Burgelmanet al. 2001). This study seeks to link strategy and technology by means of strategic technology management of Technical Training Institutes in Nairobi County.

Knowledge of IPR law and its application influence Technology management. Intellectual property rights (IPRs) are property rights in something intangible and protect innovations and reward innovative activity. It comprises a bundle of rights focusing on the physical manifestations of intellectual activity in any field of human endeavor. IPRs are concerned with the expression of an idea for an invention, the details of which have been worked out and which takes the form of a product or process that can be applied industrially (WIPO Intellectual Property Handbook 2004).

Technology is managed effectively where there is a Technology foreseeing. This is the process of predicting the future characteristics and timing of technology (Wissema, 2007). It is a “customer validation" strategy- determining if customers will really buy an innovative new product or not. The purpose of forecasting is to assist the contemporary decision-makers in choosing of policies and making of plans that are most promising (Bright, 1972). It facilitates in developing technological competencies so as to meet global competition and international trading imperatives and planning for the creation of sustainable comparative advantages in select technology thrust areas.

Knowledge on research, development and innovations is very much crucial to the survival in this competitive world. Institutions must have the proper infrastructure to carry out research, development and innovation activities. The students must have access to scientific Journals and other modern library facilities. There must be availability of qualified and experienced research oriented and motivated staff. Adequate financial provision must be present to carry out research activities; (Proceedings of the World Congress on Engineering 2008 Vol IIWCE 2008, July 2 - 4, 2008, London, and U.K).Linkages and Collaborations between Academia and industry are absolutely essential in a knowledge-based economy. These strengthen research and technology commercialization capabilities, lead to lucrative sponsored research

contracts and licensing agreements and also enable institutions to successfully launch their innovations into the local, national and global marketplace. Through linkages, institutions equipped with modern experimental equipment, provide high-quality analytical services to local and global industry. This partnership's Win-win interdependence between academia and technology-driven enterprises, help institutions to play a role in a country's economic development.

Technology comprises of a physical thing and knowledge embedded in hardware and software. Hence the acquisition of technological capability is not as a one-off process but a cumulative one. In this respect, learning is derived from the development and use of technology. Consequently, national competitiveness is achieved through intensification of a science base and increasing Research and Development (R&D) capacity. Therefore, science and R&D activities are only one part of the overall process that includes learning by doing, through learning factories and interacting with suppliers and customers. Evangelista et al (1998) reports the different elements of innovation and innovation processes are in form plant, machinery and equipment purchased by an organization.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter presents how the study was carried out by the researcher. The research was done by quantitative study where the researcher employed constructivism and positivism approaches that included procedures and methods used in collecting the desired data, recording the data and eventually analyzing and validating it.

3.2 Research Design

This exercise was carried out in all the Technical Training institutes within Nairobi County using a census survey method. Since the entire population is sufficiently small with a similar socioeconomic and geographical setting, data were gathered on every member of the population. A census is the procedure of systematically acquiring and recording information about the members of a given population. Census data is commonly used for research and planning, as well as a baseline for sampling surveys, Robert W. Greene (2003).

A questionnaire was developed to collect information to answer the research questions. The exercise involved analyzing strategic factors affecting technology management in all the technical training institutes within Nairobi County. The primary dependent variables in this study were Technology Management in these institutions while the independent variables are factors affecting Technology Management. The choice of research design was dictated by the desire to unearth specific knowledge that is truthful and corresponds to reality. (Arbor &Bjerke 1997), and (Lancaster 2005) contents that availability of time, money, research personnel, materials, people's knowledge and interest in research determine the research approach.

3.3 Population of the Study

The study targeted responses from Principals and/ or managers responsible for technology management practices in all the Technical Training in Nairobi County. The study used a census survey where questionnaires were given to each principal who delegated to the heads of departments responsible for technology management activities in the institution. The researcher collected information from all the sources since they were few.

The responsive population of the study was 19 Principals out of the 22 earmarked institutions in the county (Appendix 2). This represented 90.5% response. This response was considered significant enough to provide valid and reliable analysis that conforms to statistical requirements, (Mugenda and Mugenda).Two questionnaires were not filled because the 3 institutions could not be located despite appearing in the ministry's registry.

3.4 Data collection

In this research, both quantitative and qualitative data collection methods were used. Primary data were gathered by both open and closed-ended questionnaires from 19 Principals of the 19 respondents Technical Training Institutes in Nairobi County. The research questions (Appendix 1) were sent through email. Hard copies were sent by a 'drop- and- pick latter' method. Prior to sending the survey by email and drop-in, phone calls were made to the institutions in order to inform and refine the questionnaire. Secondary data were obtained from the internet, institutional records and Ministry Headquarters, from written sources like textbooks, journals, magazines, written reports from various libraries and policy papers. The methodology for collecting data was carefully considered to ensure that research outcomes are reliable and valid (Yin 2003, Saunders et al. 2007).

3.5 Data Analysis

To achieve the objectives of the study, statistical tests were done to determine the relationships and influences that exist among factors affecting Technology Management in Technical Training Institutes within Nairobi County. Exploratory factor analysis and Kruskal-Wallis ANOVA was used (Table 4.36). Since the study generated both qualitative and quantitative data that was obtained from open-ended and close-ended questions respectively, descriptive statistics involved the use of absolute and relative frequencies, measures of central tendency and dispersion. The quantitative data were presented in tables and graphs with data being analyzed based on the content matter of the responses.

The common themes or patterns were grouped together into coherent categories. These categories were used to explain the findings. In determining the factors, Principal Components Analysis (PCA) was used where the researcher sort a linear combination of variables so that the maximum variance was extracted to determine factors affecting Technology Management in TTIs. These factors were captured from the variables indicated in part C of the questionnaire. In this analysis, data is arranged in the R-mode where the rows represented Respondents, columns indicated the variables, and cell entries were the scores of the respondents on the variables. The factors were extracted from Principal Component Analysis with the rotational method being varimax with Kaiser Normalization. According to Bryman& Bell (2007), in qualitative research, reliability and objectivity is about the dependability and conform-ability of the results. To determine validity and reliability, Kaiser-Meyer-Olkin and Scree plot were used simultaneously. Factor analysis yielded distinct and reliable factors with a value of 0.892 which is higher than the value of 0.7 making it the most appropriate (Table 4.37).

CHAPTER FOUR

DATA ANALYSIS AND INTERPRETATION OF RESULTS

4.1 Introduction

This chapter contains data analysis and the research findings. The objective of this study was to identify the strategic factors that affect technology management and find out what influences the application of the factors affecting technology management in Technical Training Institutes within Nairobi County. The findings are presented in tables and figures.

4.2 Response Rate

Primary data collection was through the use of a semi structured questionnaire which was administered by “drop and pick” to respondents of the study. 21 questionnaires were distributed; a total of 19 questionnaires were received back. Some questionnaires were duly completed hence providing useful data. Two questionnaires were not filled because the 2 institutions could not be located despite appearing in the ministry’s registry. The rate of response was therefore 90.5 %. This response rate is considered significant enough to provide a basis for valid and reliable analysis of the factors that affect technology management in Technical Training Institutes within Nairobi County and what triggers their application. Table I below shows the responses from each institution.

Table 4.1: Number of principals and respondents selected

S/NO.	Name of institution	Expected Respondents	Actual Respondents
1	Kenya Armed Forces Technical College	1	1
2	St Josephs the worker Training Institute	1	1
3	Kabete Technical Training Institute	1	1
4	Nairobi Technical Training Institute	1	1
5	PC Kinyanjui Technical Training Institute	1	1
6	SOS Technical Training Institute	1	1
7	Institute of advanced Technology	1	1
8	K.P.L.C. Technical. Training Institute	1	1
9	EL- TAD Technical Training Institute	1	0
10	Nairobi Institute of Technology	1	1
11	Railways Training Institute	1	1
12	Millennium Technical Training Institute.	1	0
13	Karen Technical Institute for the Deaf	1	1
14	Kenya Teachers Technical Training College	1	1
15	Waithaka Technical Training College	1	1
16	Kenya Christian Industrial Training Institute	1	1
17	NYS Engineering Institute	1	1
18	Regional institute of science and Technology	1	1
19	Kenya Institute of Highways & Building Techn.	1	1
20	ST. Kizito Vocational Training Institute	1	1
21	Technical Training Institute-Nairobi	1	1

As observed from table 4.1, 19 institutions had responses above 95% .Two institutions which could not be traced had no response. Although these responses were below expectations, the results were used in the study. Any limitation could be reduced by the responses of principals from other institutions. This is because they were 19 Institutions out of 21, which translate to 90.5% of the institutions.

All the questionnaires received had all questions with responses. This was because the researcher took the respondents through all the questions. In determining the factors affecting technology management in Technical training institutes in Nairobi County, and what triggers their application, the 19 questionnaires were used. This gives an average indication of a respondent's perceived ranking for the test items.

4.3 Factors Affecting Technology Management

The study sought to establish the Factors Affecting Technology Management in Technical Training Institutes in Nairobi County. The respondents were required to rate the factors as somehow important, important or very important as shown in table 4.2.

Table 4.2: Knowledge on Research, Development and Innovation.

Rankings	Frequency	Percent
Somehow important	1	4.8
Important	6	28.6
Very important	12	57.1
Total	19	90.5

Table 4.2 Shows the responses received from the factor associated with Knowledge on Research, Development and innovation. 28.6% deemed it important while 57.1% felt that it was "very important" in their decision. This means that on average 85% of principals would consider Knowledge on Research, Development and innovation as affecting

4.2.2 Knowledge of IPR law and its application

Responses received for the factor associated with Knowledge of IPR law and its application indicates that 14% of the respondents were not decided how it would affect TM, 33 % felt that it was "important" and 33% felt that it was "very important" in TM. This means that on average 66% of principals would consider it while only 14 % were not decided. The institution should therefore adopt this factor as it affects TM.

4.2.3 Curriculum requirements

Responses received for the factor associated with Curriculum requirements indicates that 5% of the respondents were not decided how it would affect TM, 24% felt that it was “important” and 62 % felt that it was “very important” in affecting TM. This amounts to 86% approval and 5% disapproval.

4.2.4 Technology acquisition, transfer & dissemination

Table 4.5 shows the responses received for the factor associated with Technology acquisition, transfer, dissemination. 4.8% were not decided how it would affect them, 38.1% felt that it was “important” and 47.6% felt that it was “very important” in their decision. This means that on average 85.7% of principals would consider it while only 5% will not consider the factor. The institution should therefore consider this factor.

Table 4.5: Technology acquisition, transfer &dissemination

	Frequency	Percent
Somehow important	1	4.8
Important	8	38.1
Very important	10	47.6
Total	19	90.5

4.2.5 Technology planning and forecasting

Table 4.6 shows the responses received for the factor of Technology planning and forecasting. 9.5% felt that it is “not important” in their decision. 10% were not decided how it would affect them, 47.6% felt that it was “important” and 28.6 % felt that it was “very important” in their decision. This means that on average 76.2% of principals would consider it while only 9.5% were undecided.

Table 4.6: Technology planning and forecasting

Rankings	Frequency	Percent
Not important	1	4.8
Somehow important	2	9.5
Important	6	28.6
Very important	10	47.6
Total	19	90.5

4.2.6 Linkages and collaboration

Findings on linkages and collaboration shows 10% of the respondents felt that it is “not important” in their decision making,5% were not decided how it would affect them, 38% felt that it was “important” and a similar 38% felt that it was “very important” in their decision. This means that 76 % of principals would approve while 10 % would disapprove

Table 4.7: Linkages and collaboration

Rankings	Frequency	Percent
Not important	2	9.5
Somehow important	1	4.8
Important	8	38.1
Very important	8	38.1
Total	19	90.5

4.2.7 Institutional culture & management structure in place

Table 4.8 shows the responses received for the factor associated with Institutional culture & a management structure in place. 5% of the respondents felt that it is “not important” in their decision making, 19% were not decided how it would affect them, 43% felt that it was “important” and 23.8 % felt that it was “very important” in their decision. This means that on average 69% of principals would consider it while only 36% will not consider the factor.

Table 4.8: Institutional culture & management structure in place

Rankings	Frequency	Percent
Not important	1	4.8
Somehow important	4	19.0
Important	9	42.9
Very important	5	23.8
Total	19	90.5

4.2.8 Technology Evaluation and assessment activities

Table 4.9 shows the responses received for the factor associated with Technology Evaluation and assessment activities. 4.8% felt that it is “not important” in their decision. 4.8% were not decided how it would affect them, 28.6% felt that it was “important” and 52.4 % felt that it was “very important” in making the decision. This means that 71% of principals would consider it while 4.8% were undecided

Table 4.9: Technology Evaluation and assessment activities

Rankings	Frequency	Percent
Not important	1	4.8
Somehow important	1	4.8
Important	6	28.6
Very important	11	52.4
Total	19	90.5

4.2.9 Strategic planning

Responses received for the factor associated with Strategic planning are contained in table 4.10 shows that 5% of the respondents felt that it is “not important” in their decision making. 33% were not decided how it would affect them and 52.4 % felt that it was “very important” in their decision. This means that on average 67% of principals would consider it while only 24% will not consider the factor.

Table 4.10: Strategic planning

Rankings	Frequency	Percent
Not important	1	4.8
Somehow important	7	33.3
Very important	11	52.4
Total	19	90.5

4.2.10 Desire to sustain a competitive advantage

Table 4.11 shows the responses received for the factor associated with Institutional culture & a management structure in place. 10% of the respondents were not decided how it would affect them, 28.6% felt that it was “important” and 52.4 % felt that it was “very important” in their decision. This means that on average 90% of principals would approve while only 5% would not approve.

Table 4.11: Desire to sustain a competitive advantage

Rankings	Frequency	Percent
Somehow important	2	9.5
Important	6	28.6
Very important	11	52.4
Total	19	90.5

4.2.11 Utilization and Integration of Technology

Responses received for the factor associated with Utilization and Integration of Technology indicate that 5% felt that it is “not important” in their decision while 33% felt that it was “important” and 52 % felt that it was “very important” in their decision. This means that on average 85% of principals would consider it while only 5% will not consider the factor.

4.2.12 Commercialization of New Technology

Responses received for the factor associated with Commercialization of New Technology. Commercialization of New Technology as indicated table 4.13 shows that 5% felt that it was “not very important” while none felt that it is “not important” in their decision. 14% were not decided how it would affect them, 67 % felt that it was “important” and 5 % felt that it was “very important” in their decision. This means that on average 72% of principals would consider it while only 5% will not consider the factor.

Table 4.13: Commercialization of New Technology.

Rankings		Percent
Not very important	1	4.8
Somehow important	3	14.3
important	14	66.7
Very important	1	4.8
	19	

4.2.13 Principals Academic and Professional Qualification

Table 4.14shows the responses received for the factor associated with Principals Academic and Professional Qualification. 5% of the respondents felt that it was “not important”, 14% undecided, 33% “important” and 38 % felt that it was “very important”.

Table 4.14: Principals Academic and Professional Qualification

Rankings	Frequency	Percent
Not important	1	4.8
Somehow important	3	14.3
Important	7	33.3
Very important	8	38.1
Total	19	90.5

4.2.14 Need for creativity

Table 4.15 shows the responses received for the factor associated with Need for creativity. Of the total respondents interviewed, 4.8% were not decided how it would affect them, 28.6% felt that it was “important” and 57.1 % felt that it was “very important” in their decision. This means that on average 85% of principals would consider it while no one would disapprove.

Table 4.15: Need for creativity.

Rankings	Frequency	Percent
Important	6	28.6
Very important	12	57.1
Somehow important	1	4.8
Total	19	90.5

4.2.16 Benchmarking

Responses received for the factor associated with Benchmarking show that 10% of respondents felt that it was “not important” in their decision, 10% were undecided, 33% felt that it was “important” and 38 % “very important” in their decision. This means that 71% of principals would consider it.

Table 4.16: Benchmarking.

Rankings	Frequency	Percent
Not important	2	9.5
Somehow important	2	9.5
Important	7	33.3
Very important	8	38.1
Total	19	90.5

4.2.17. Desire for continual Improvement

Table 4.17 shows the responses received for the factor associated with Desire for continual Improvement. 4.8% were undecided, 28.6% felt that it was “important” and 57.1 % “very important”. This means that 86% of principals would consider it while none opposed.

Table 4.17: Desire for continual improvement

Rankings	Frequency	Percent
Somehow important	1	4.8
Important	6	28.6
Very important	12	57.1
Total	19	90.5

4.2.18 Performance contracting

Responses received for the factor associated with Performance contracting are indicated in table 4.18. 24% of the respondents were not decided how it would affect them, 38.1% felt that it was “important” and 28.6 % felt that it was “very important” in their decision. This means that on average 67% of principals would consider it while no one would oppose the factor.

Table 4.18: Performance contracting

Rankings	Frequency	Percent
Somehow important	5	23.8
Important	8	38.1
Very important	6	28.6
Total	19	90.5

4.2.19 Teamwork

Table 4.19 shows the responses received for the factor associated with Teamwork. 10% were undecided how it would affect them, 28.6% felt that it was “important” and 52 % “very important”. This means that 81% of principals would consider it while none disapproved.

Table 4.19: Teamwork.

Rankings	Frequency	Percent
Somehow important	2	9.5
Important	6	28.6
Very important	11	52.4
Total	19	90.5

4.2.19 Marketing Research

Table 4.20 shows the responses received for the factor associated with market research. 23.8% were undecided how it would affect them, 38.1 % felt that it was “important” and 28.6% felt that it was “very important” in their decision. This means that on average 66.7 % percent of principals would consider it while no one would oppose the factor.

Table 4.20: Marketing Research.

Rankings	Frequency	Percent
Somehow important	5	23.8
Important	8	38.1
Very important	6	28.6
Total	19	90.5

4.2.20 Government Policy on Technical Education

Table 4.21 shows the responses received for the factor associated with Government Policy on Technical Education. 10% were not decided how it would affect them, 19% felt that it was "important" and 64 % "very important". This means that 83% of principals would approve it.

Table 4.21: Government Policy on Technical Education.

Rankings	Frequency	Percent
Somehow important	2	9.5
Important	4	19.0
Very important	13	61.9
Total	19	90.5

4.3 Factors influencing the application of Technology Management

These factors were subjected to analysis as illustrated below.

4.3.1 Technology evaluation and assessment activities

Table 4.22, 10% of respondents felt it was "not important"while10% were undecided. 24% and 47.6 % of the respondents felt that it was "important" and "very important" respectively. Therefore 71.4% find it important and essential in their decision.

Table 4.22: Technology evaluation and assessment activities

Rankings	Frequency	Percent
Not important	2	9.5
Somehow important	2	9.5
Important	5	23.8
Very important	10	47.6
Total	19	90.5

4.3.2 Strategic Planning Requirements

As indicated in Table 4.23, 9.5% felt that it was “not important” to consider this factor, 4.8 % were undecided. 28.6% felt it was “important” and 47.6 % “very important”. The indication was that 77% would consider it as influencing the application of TM factors.

Table 4.23: Strategic Planning Requirements.

Rankings	Frequency	Percent
Not important	2	9.5
Somehow important	1	4.8
Important	6	28.6
Very important	10	47.6
Total	19	90.5

4.3.3 Desire to sustain a competitive advantage

As shown in table 4.24, 23.8 %, found it “important” while 66.7% found this “very important” in influencing the application of TM factors. This means that 90.5 % approves this factor.

Table 4.24: Desire to sustain a competitive advantage

Rankings	Frequency	Percent
Important	5	23.8
Very important	14	66.7
Total	19	90.5

4.3.4 Utilization and integration of technology

Many institutions view Utilization and integration of technology as a critical tool to the success of companies. Table 4.25, clearly shows this trend as 38.1% of the respondents opted

for very “important” while, 47.6% felt it was “important”. However, 4.8% were undecided. Therefore 85.7% considered it a trigger of TM activities.

Table 4.25: Utilization and integration of technology

Rankings	Frequency	Percent
Somehow important	1	4.8
Important	10	47.6
Very important	8	38.1
Total	19	90.5

4.3.5 Commercialization of New Technology products

In Commercialization of New Technology products**,** 24% of the respondents felt it was “not important”. 24% were undecided while 24% felt it was “important” and 21% “very important”. This translates into 45 % approval.

4.3.6. Technology planning and forecasting

Table 4.26 shows 9.5% of the respondents felt that it was “not important” while 52.4% and 19 % felt it was ‘’important” and ‘’ very important respectively in triggering the application of TM. 9.5% of the respondents felt it would not while 10% of the respondents were undecided.

Table 4.26: Technology planning and forecasting

Rankings	Frequency	Percent
Not important	2	9.5
Somehow important	2	9.5
Important	11	52.4
Very important	4	19.0
Total	19	90.5

4.3.7 Principals' Professional and Academic Qualification

In Table 4.27, 9.5% felt that it is "not important" in their decision. 14.3% were undecided, 28.6% felt that it was "important" and 38.1% "very important". This means that 66% of principals would consider. While only 9.5 % will not consider the factor.

Table 4.27: Principals' Professional and Academic Qualification.

Rankings	Frequency	Percent
Not important	2	9.5
Somehow important	3	14.3
Important	6	28.6
Very important	8	38.1
Total	19	90.5

4.3.8 Institutional culture & leadership

In Table 4.28, 10% felt that it is "not important". 10% were undecided, 33% felt that it was "important" and 38% "very important". This means 71% approved while 9.5% disapproved

Table 4.28: Institutional culture & leadership

Rankings	Frequency	Percent
Not important	2	9.5
Somehow important	2	9.5
Important	7	33.3
Very important	8	38.1
Total	19	90.5

4.3.9 Need for creativity

In Table 4.29, 5% felt that it is “not important” in their decision. 4.8% were undecided how it would affect them, 38.1% felt that it was “important” and 42.9% “very important”. This means 81% of principals would consider it, while only 4.8 % will not consider the factor.

Table 4.29: Need for creativity.

Rankings	Frequency	Percent
Not important	1	4.8
Somehow important	1	4.8
Important	8	38.1
Very important	9	42.9
Total	19	90.5

4.3.10 Benchmarking tours

In Table 4.30: 4.8% felt that it is “not important” in their decision. 9.5% were undecided, 47.6% felt that it was “important” and 28.6 % “very important” in making the decision. This means 76.2 % of principals would consider, while only 5% will not consider the factor.

4.3.11 Desire for continuous improvement

In Table 4.31, 23.8% felt that it was “important” and 66.7% felt that it was “very important” in making the decision. This means that on average 91.5% gave approval

Table 4.31: Desire for continuous improvement

Rankings	Frequency	Percent
Important	5	23.8
Very important	14	66.7
Total	19	90.5

4.3.12. Performance contracting requirements

In Table: 4.32, 4.8% felt that it was “not important” in their decision. 24 % were undecided, 42.9 % felt that it was “important” and 19% “very important” in their decision. This means that on average 61.9 % would approve while only 36% would disapprove.

Table 4.32: Performance contracting requirements

Rankings	Frequency	Percent
Not important	1	4.8
Somehow important	5	23.8
Important	9	42.9
Very important	4	19.0
Total	19	90.5

4.3.13 Team work

In Table 4.33, 9.5% were not decided how it would affect them, 23.8% felt that it was “important” and 38% “very important”. This means that 76.1% would approve. This means 80.8% would approve it.

Table 4.33: Teamwork.

Rankings	Frequency	Percent
Somehow important	2	9.5
Important	5	23.8
Very important	12	57.1
Total	19	90.5

4.3.14 Marketing research

Table 4.34 shows that 14.3% were not decided how it would affect them, 38.1% felt that it was “important” and 38% “very important”. This means that 76.2% would approve.

Table 4.34: Marketing research

Rankings	Frequency	Percent
Somehow important	3	14.3
Important	8	38.1
Very important	8	38.1
Total	19	90.5

4.3.15 Government policy on Technical Education

Table 4.35shows that 4.8% felt that it is “not important”, 10% were undecided and 19% felt that it was “important” and 57% “very important”. This means 76 % of principals approved.

Table 4.35: Government policy on Technical Education

Rankings	Frequency	Percent
Not important	1	4.8
Somehow important	2	9.5
Important	4	19.0
Very important	12	57.1
Total	19	90.5

4.3.16 Results of Analysis

Results of Analysis were derived from statistical tests that were done to determine the relationships and influences that exist among factors affecting Technology Management in Technical Training Institutes within Nairobi County. Exploratory factor analysis and Kruskal-Wallis ANOVA was used. Both the Kaiser criterion and the Scree plot were simultaneously used to determine the factors.

4.4 Strategic factors affecting Technology Management

In order to analyze the strategic factors affecting Technology Management, factors had to be extracted from the data set. Principal component factor analysis was used to determine the factors. To achieve this, data were arranged in rows and columns and each score for the variable tabulated.

The correlation matrix was analyzed to determine if there were any variables that would be measuring the same thing or were highly correlated. The correlation matrix indicated that most of the variables were correlated. This is because most of the correlation coefficients were above 0.7, from the rule of the thumb.

There was need in determining whether the factor analysis would yield distinct results. The Kaiser Meyer Olkin measures of sampling adequacy tests were done so as to determine whether factor analysis will bring out appropriate factors. Kaiser-Meyer-Olkin measure of sampling Adequacy indicates that the patterns of correlations are relatively compact hence factor analysis should yield distinct and reliable factors. This is because it has a value of 0.892 which is higher than the value of 0.7 making it the most appropriate. The analysis also considered the table of commonalities.

Table 4.36: Kruskal Wallis Test

	tecnolc evalua and assess	strateg planni require	desire sustai compl advan	utilizatic intergra techno	comm tion of techno produ	techno plannin forecas	princip proffes and aca qualific	instituti culture leader	need creati	bench king t	desire contir impro ent2	perform contrac require	teamw	marke resea	goven policy tecnic educa
Chi-Square	13.3	12.9	12.5	9.2	11.6	8.8	11.9	11.0	11.0	8.7	11.4	12.4	17.5	10.1	17.4
df	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Asymp. Sig.	.00	.00	.00	.01	.00	.01	.00	.00	.00	.01	.00	.00	.00	.00	.00

Grouping Variable: knowledge on research development

Table 4.37 shows that PCA assumes that all variables have a common variance resulting in an initial commonality of one for all variables. The "extracted" commonalities are the % of variance in a given variable explained by the extracted factors, which will be less than all the possible variables, resulting in coefficients less than one. The average commonality being 0.892, meaning the extracted factors are able to explain on average 89.2% of each item.

Table 4.37: Reliability Indicator/Table of commonalities

	Initial	Extraction
Knowledge on research Development	1.000	.895
knowledge of ipr law	1.000	.944
curriculum requirements	1.000	.873
technicalacquistion	1.000	.841
tecnology planning and forcasting	1.000	.923
linkages collaboration	1.000	.864
institutional cultural management	1.000	.860
teaching evaluation and assesement	1.000	.957
strategicplaaning	1.000	.838
desirs to sustain acompetive advantage	1.000	.901
utilization and integration of technology	1.000	.953
communication of new technology	1.000	.826
principles academic and proffessional qualification	1.000	.905
need for creativity	1.000	.855
benchmarking	1.000	.910
desire for continual improvement	1.000	.895
performance contracting	1.000	.928
teamwork	1.000	.901
marketing research	1.000	.928
Government policy on Technical education	1.000	.848

The Table 4.38 below explains total Variance. The Principal Components are sorted in decreasing order of Variance, so the most important principal component is always listed first. The research therefore established that the factors influencing the application of TM in the institutions were ranked as follows.1) Desire for continuous improvement.2) Desire to sustain a competitive advantage.3) Utilization and integration of technology in curricular.4) Need for creativity.5) Team work.6) Strategic planning requirement influence.7) Marketing research.8) Government policy on Technical education.9) Technology planning and forecasting.10) Institutional culture & leadership.11) Benchmarking tours.12) Technology evaluation and assessment activities13) Performance contracting requirements14) Principals' Professional and Academic Qualification,15) Commercialization of New Technology products.

Table 4.38: Total Variance Explained

Component	Initial Eigen values			Extraction Sums of Squared Loadings47.6			Rotation Sums of Sqd Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	16.580	82.898	82.898	16.580	82.898	82.898	10.915	54.574	54.574
2	1.265	6.325	89.224	1.265	6.325	89.224	6.930	34.649	89.224
3	.757	3.786	93.009						
4	.445	2.224	95.233						
5	.375	1.876	97.109						
6	.176	.880	97.990						
7	.120	.599	98.589						
8	.101	.503	99.092						
9	.070	.349	99.441						
10	.046	.229	99.670						
11	.036	.180	99.850						
12	.022	.108	99.958						
13	.008	.042	100.000						
14	2.109E-1	1.054E-1	100.000						
15	1.024E-1	5.120E-1	100.000						
16	3.004E-1	1.502E-1	100.000						
17	-1.48E-1	-7.375E-	100.000						
18	-2.30E-1	-1.148E-	100.000						
19	-5.84E-1	-2.922E-	100.000						
20	-1.44E-1	-7.183E-	100.000						

Extraction Method: Principal Component Analysis.

From the Scree plot, the third and twentieth factors formed a plateau meaning that their influence on Technology management is the same hence insignificance. The same factors can be arrived at by examining the Scree plot shown above. In the Scree plot, only 2 of the factors whch attained Eigenvalue of 1 and above are picked. As seen from the Scree plot reaches the plateau after two components. This confirms the results produced by Kaiser Criterion that two components account for the factors affecting Technology Management in Technical Training Institutes in Nairobi County. These are; 1) Knowledge on Research, Development and innovation and 2) Knowledge of IPR law and its application.

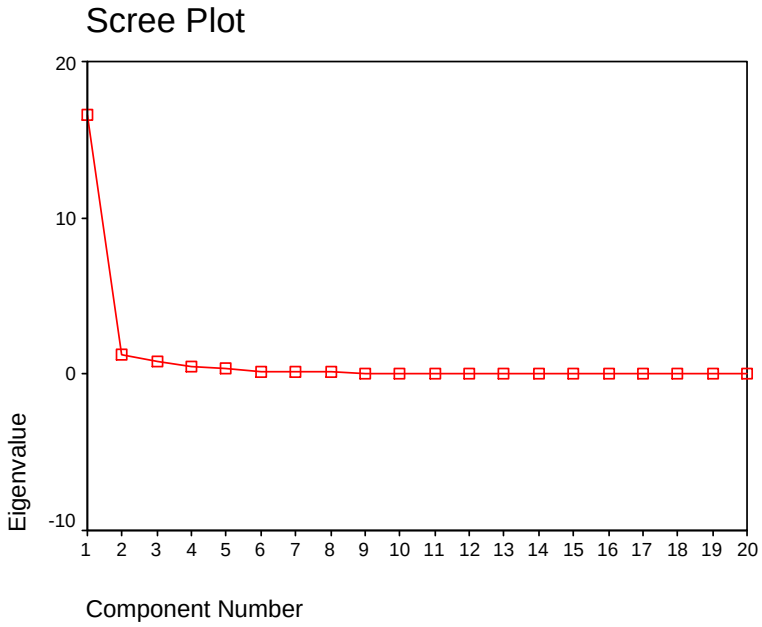

Fig 4.1: Scree Plot

To determine the actual factors the rotated factor loadings were also examined. Tables 7.9 &8.0 below shows the rotated component matrix with Eigenvalues below 0.608 suppressed.

The research therefore concludes that, Knowledge on Research, Development and innovation, and Knowledge of IPR law and its application are the factors that affect Technology Management in Technical Training Institutes within Nairobi County.

Table 4.39: Component Matrix

	Component	
	1	2
knowledge on research development	.939	-.118
knowledge of ipr law	.941	.240
curriculum requirements	.926	-.124
technicalacquistion	.916	-.038
tecnology planning and forcasting	.959	-.056
linkages collaboration	.923	.106
institutional cultural management	.912	.167
teaching evaluation and assesement	.964	-.167
strategicplaaning	.915	.040
desirs to sustain acompetive advantage	.949	.025
utilization and integration of technology	.936	-.277
communication of new technology	.850	-.321
principles academic and proffessional qualification	.947	.092
need for creativity	-.589	.713
benchmarking	.941	.158
desire for continual improvement	.939	-.118
performance contracting	.862	.430
teamwork	.949	.025
marketing research	.862	.430
government policy on technical education	.921	.000

Extraction Method: Principal Component Analysis.

2 components extracted.

Table 4.40: Rotated Component Matrix

	Component	
	1	2
knowledge on research development	.674	.664
knowledge of ipr law	.893	.382
curriculum requirements	.660	.662
technicalacquistion	.704	.587
tecnology planning and forcasting	.727	.628
linkages collaboration	.797	.477
institutional cultural management	.826	.423
teaching evaluation and assesement	.664	.719
strategicplaaning	.751	.524
desirs to sustain acompetive advantage	.768	.557
utilization and integration of technology	.575	.789
communication of new technology	.480	.772
principles academic and proffessional qualification	.808	.503
need for creativity	-.034	-.924
benchmarking	.843	.447
desire for continual improvement	.674	.664
performance contracting	.946	.183
Teamwork	.768	.557
marketing research	.946	.183
Government policy on Technical education	.731	.560

Rotation Method: Varimax with Kaiser Normalization.

4.5 The factors that trigger the application of Technology Management

In order to determine that Technology Management in Technical Training Institutes is triggered by certain factors, Kruskal Wallis ANOVA was used where the factor scores were ranked against each other.

The research therefore established that the factors influencing the application of TM in the institutions were ranked as follows.1) Desire for continuous improvement.2) Desire to sustain a competitive advantage.3) Utilization and integration of technology in curricular.4) Need for creativity.5) Team work.6) Strategic planning requirement influence.7) Marketing research.8) Government policy on Technical education.9) Technology planning and forecasting.10) Institutional culture & leadership.11) Benchmarking tours.12) Technology evaluation and assessment activities13) Performance contracting requirements14) Principals' Professional and Academic Qualification,15) Commercialization of New Technology products.

CHAPTER FIVE

SUMMARY, DISCUSION AND CONCLUSION

5.1 Summary

This research is a response to the need to establish strategic Technology Management factors in Technical Training Institutes and what triggers their application in the institutes within Nairobi County. In this research, situational errors affecting the reliability of the results were reduced by dealing with respondents who knew the subject based on their experience and had an interest in the topics. Opinion biases were diminished in the data collection by not requiring any preparation. Exposure of the respondents in advance to researcher's opinions was avoided by sending the questionnaire beforehand. Also, the topic was expected to be emotionally neutral. In the study, a data set of nineteen (19) completed questionnaires was used to determine the strategic factors affecting Technology Management in Technical Training Institutes.

Factors affecting Technology Management were extracted from a set of 21 test items borrowed from the field of Technology management. The factors analyzed were related to technology management decisions in the field of Technology. The factors were then amended to suit determination of Technology Management in Technical Training Institutes. Marked differences in the way respondents view the factors were noted. This meant that each of the factors influence Technology Management in varied ways. Since the items were many, there was the need to reduce them to meaningful factors that affect Technology Management. This was achieved through the use of principal component analysis. Two (2) distinct factors with a correlation of 89.22 were extracted from the initial items namely Knowledge on Research, Development and innovation, and Knowledge of IPR law and its application.

Items that are associated with Technology Management indicate that Technical Training Institutions align TM with the factors that ensure a competitive advantage. Also items that ensure instant results play a significant role in TM. It was further noted the need for creativity had a negative correlation, this is because institutional culture caries a greater influence. Items that trigger the application of Technology management factors included Desire for continuous improvement. This was contrary to expectations that items like Performance contracting requirements and Principals' Professional and Academic Qualification would dominate. This could be due to the fact that the education sector has become technologically competitive. Therefore many consider the determination of technology management factors as a foundation for improved performance. Commercialization of New Technology products had the lowest positive correlation coefficient indicating that its influence on Technology Management is not very great.

5.2 Discussion

These broader strategic issues that have affected technology management include; Lack of unifying policies and legal frameworks, Ineffective application and use of IPR law, Weak collaboration and linkages and Lack of effective research and development. The study has shown the way to proactively manage the impacts of technology for competitiveness and for sustainable development. The research established and ranked factors influencing the application of TM in institutions as follows.1) Desire for continuous improvement.2) Desire to sustain a competitive advantage.3) Utilization and integration of technology in curricular.4) Need for creativity.5) Team work.6) Strategic planning requirement influence.7) Marketing research.8) Government policy on Technical education.9) Technology planning and forecasting.10) Institutional culture & leadership.11) Benchmarking tours.12) Technology evaluation and assessment activities13) Performance contracting

requirements14) Principals' Professional and Academic Qualification,15) Commercialization of New Technology products.The Kaiser Criterion test carried identified Knowledge on Research, Development and innovation and Knowledge of IPR law and its application as the two components that account for the factors affecting Technology Management in Technical Training Institutes.

The research findings will contribute to the expanding knowledge base on strategic technology management in the Technical Education sector. The study should provide a better benchmark for better management of technical education and also identify ways through which proper Technology Management can provide for practitioners, an improved performance and profitability. The research findings can be adapted and used in formulating a policy document for the Technical Education Sector in Kenya. Finally, this study will form a basis for further research in this area among scholars and practitioners.

5.3 Conclusion

The contributions of this study to Technology Management are two-fold. First, it has successfully applied the traditional conceptualization of Technology management in Technical training institutions within Nairobi County that is different from the previous studies. Second, factors affecting Technology Management were also found to be important determinants of the application of Technology Management. This is despite the fact that they have varied contributions towards the level of Technology Management in Technical Training institutes within Nairobi County.

5.3 Implication of the study of Theory, Policy and Practice

The findings of this study have implications for theory, policy and practice for Principals of Technical Training Institutes to develop their Strategic Technology Management Framework (STMF). The findings provide a logical structure of strategic factors in technology management for conceptualization, discussion and elaboration of the topics among scholars and practitioners in the field.

Considering the uniqueness of Technical Training Institutes towards the realization of vision 2030, Technical education sector should have a formal Technology Management policy framework. The policy framework will enable TTIs to effectively plan their future operations so as to effectively play their role in the society by ensuring sustainable development of Technical education sector. In order to achieve this goal, attention must be placed on developing a satisfying, trustworthy, and highly valued Strategic Technology Management policy framework.

5.4 Recommendation

This research study findings imply that Principals of T.T. I's should develop their Strategic Technology Management Framework (STMF). In addition, Technical Training Institutes should study their competitive environment with a view of aligning it to global standards. Further to this, the technical education sector should improve its performance as well as its corporate image since it's a key platform sector in the realization of vision 2030.

The research findings also imply that the Technical training institutions should give priority to the following strategic technology management factors .1) Desire for continuous improvement. 2) Desire to sustain a competitive advantage. 3) Utilization and integration of technology in curricular. 4) Need for creativity. 5) Team work. 6) Strategic planning requirement influence. 7) Marketing research. 8) Government policy on Technical education.

5.5 Suggestions for further Study

This research study has two limitations that can be addressed in future research. First, the data used in this study limit generalization to other Technical Training Institutes. A re-validation study using a large sample gathered from other institutions in different environments is required for greater generalization of the factors affecting strategic Technology Management in Technical Training Institutes. Secondly, Due to practical limitations of a single study, profound and detailed study of each factor had to be left out of the scope of this research. Thus, there are many possibilities for in depth study of each factor.

In general, further research can be conducted on how the strategic factors are configured in Technical Training Institutes, what the practical challenges are, and how the factors can be horizontally and vertically integrated to gain an optimum outcome. Also, the findings can be utilized in identifying and positioning practical problems and research topics in the field of strategic technology management in Technical Training Institutes.

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APPENDICES

Appendix 1: strategic factors affecting technology management in technical training institutes in Nairobi County.

Section A: Factors Affecting Strategic Technology Management

The following statements relate to your feelings, knowledge and experience with Factors Affecting Strategic Technology Management. The table uses a scale of 1 to 5 where 1 corresponds to Not very important, 2 -Not Important, 3 - somewhat important, 4- Important and 5 -Very important. Please tick in the appropriate box to show the extent to which they affect technology management in your institution.

KEY

Not very Important to undertake Very Important to undertake

1 2 3 4 5

No	Factors	1	2	3	4	5
1	Knowledge on Research, Development and innovation					
2	Knowledge of IPR law and its application					
3	Curriculum requirements					
4	Acquisition, Technology transfer, dissemination					
5	Technology planning and forecasting					
6	Linkages and collaboration**.**					
7	Institutional culture & management structure place.					
8	Technology evaluation and assessment activities					
9	Strategic planning requirement					
10	Desire to sustain a competitive advantage					
11	Utilization and integration of technology in curricula					
12	Commercialization of New Technology products					
13	Technology planning and forecasting					
14	Principals' Professional and Academic Qualification					
15	Institutional culture & leadership					
16	Need for creativity					
17	Benchmarking tours					
18	Desire for continuous improvement					
19	Performance contracting requirements					
20	Team work					
21	Marketing research					
22	Government policy on Technical education					

Section B: What influences the application of Strategic Technology Management factors in your institution?

Please tick appropriately on the table below to indicate which factors influence the application of technology management factors in your institution. The table uses a scale of 1 to 5 where 1 corresponds to Not very important, 2 -Not Important, 3 - somewhat important, 4- Important and 5 -Very important.

KEY

Not very Important to undertake Very Important to undertake

1 2 3 4 5

No	**What influences the Application of TM factors**	**1**	**2**	**3**	**4**	**5**
1	Technology evaluation and assessment activities					
2	Strategic planning requirement influence					
3	Desire to sustain a competitive advantage					
4	Utilization and integration of technology in curricular					
5	Commercialization of New Technology products					
6	Technology planning and forecasting					
7	Principals' Professional and Academic Qualification					
8	Institutional culture & leadership					
9	Need for creativity					
10	Benchmarking tours					
11	Desire for continuous improvement					
12	Performance contracting requirements					
13	Team work					
14	Marketing research					
15	Government policy on Technical education					

THANK YOU

Appendix 2: Technical Training Institutes in Nairobi County

S/no	Name	No. Of Principals	No. Of respondents
1	Kenyan Armed forces Technical College	1	1
2	St Josephs the worker Training Institute	1	1
3	Kabete Technical Training Institute	1	1
4	Nairobi Technical Training Institute	1	1
5	PC Kinyanjui Technical Training Institute	1	1
6	SOS Technical Training Institute	1	1
7	Institute of advanced Technology	1	1
8	K.P.L.C. Technical. Training Institute	1	1
9	EL- TAD Technical Training Institute	1	1
10	Nairobi Institute of Technology	1	1
11	Railways Training Institute	1	1
12	Millennium Technical Training Institute.	1	1
13	Karen Technical Institute for the Deaf	1	1
14	Kenya Teachers Technical Training College	1	1
15	Waithaka Technical Training College	1	1
16	Kenya Armed Forces Technical Training college	1	1
17	Kenya Christian Industrial Training Institute	1	1
18	NYS Engineering Institute	1	1
19	Regional institute of science and Technology	1	1
20	Kenya Institute of Highways & Building Technology	1	1
21	Kenya Christian Industrial Training Institute	1	1
22	ST. Kizito Vocational Training Institute	1	1
TOTAL		22	22

***Source**: Ministry of Higher Education, Science & Technology, 2012*