ASSESSING THE PREVALENCE OF INTERNATIONAL TECHNOLOGY TRANSFER
BY CHINESE FIRMS INTO THE KENYAN CONSTRUCTION SECTOR

BY

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DECLARATION

I, undersigned, declare that this is my original work and has not been submitted to any other college, or university other than the United States International University- Africa for academic credit.

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ABSTRACT

Technological advancement and growth in skilled expertise are some of the factors contributing to economic development. As a developing country, Kenya’s quest to achieve economic growth is underpinned by the need to have technology embedded within the various economic sectors. Furthermore, a skilled and technologically adept workforce will be afforded an opportunity to improve their lives economically. Multi-National Corporations (MNCs) engaged in commercial activities within various developing countries have often contributed significantly to technology and skills-set transfers into the local economies. As Kenya intensifies its relationship with China, Chinese MNCs continue to be embedded into the Kenyan economic space. Even as activities of MNCs increase the question of whether Kenya is benefitting in terms of technology transfer from these MNCs begs to be asked. The aim of this study is therefore to assess whether Kenya is gaining new technology from Chinese MNCs operating in Kenya. This study therefore attempted to answer the question, “What is the prevalence of international technology transfer by Chinese firms into the Kenya government construction sector?” Data for this study was based on both primary data, obtained via interviews, as well as secondary data, obtained from reports, government publications, journals, books, newspaper articles amongst other documentary sources. The research conducted would be beneficial to both academic enthusiasts as well as policy makers in assessing various effects technology transfer by MNCs operating within the local economic sphere.
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LIST OF ABBREVIATIONS

CRBC-China Roads and Bridges Corporation
CRCC-China Roads Construction Company
EPZ-Export Processing Zones
FDI-Foreign Direct Investment
GATT-General Agreement on Tariffs and Trade

GDP-Gross Domestic Product

IPRs-Intellectual Property Rights

KENHA-Kenya National Highways Authority

KIHBT-Kenya Institute of Highways and Building Technology

KIA-Kenya Investment Authority

KINA-Kenya National Innovation Agency

KIPO- Kenya Industrial Property Office

KIPI- Kenya Industrial Property Institute

LAPSSET-Lamu Port, South Sudan, Ethiopia Transport

NCA-National Construction Agency

NHC-National Housing Corporation

NIA-National Innovation Authority

NIP-National Industrialization Policy

MNCs-Multi National Corporations

OECD-Organization for Economic Corporation and Development

R&D- Research and Development

SDGs-Sustainable Development Goals

SGR-Standard Gauge Railway

UNEC- United Nations Economic Council

UN-United Nations
UNCTAD-United Nations Conference on Trade and Development

WTO-World Trade Organization
1. **CHAPTER ONE**

ASSESSING THE PREVALENCE OF INTERNATIONAL TECHNOLOGY TRANSFER BY CHINESE FIRMS INTO THE KENYA GOVERNMENT CONSTRUCTION SECTOR

1.0 **Background of the Study**

In its quest to achieve sustainable development, Kenya in its vision 2030 espouses the vision of “Transforming Kenya into a new industrializing middle income country providing a high quality of life to all its citizens by 2030 in a clean and secure environment”. Under its pillars, macroeconomic stability, science technology and innovation, are factored as one of the foundations of achieving vision 2030 (Kenya Vision 2030).

The country’s is in constant need of infrastructure to meet its basic needs as well as achieve sustainable economic growth. Being a middle income economy, Kenya’s construction sector is a vital component of the country’s economic growth. With a rising population infrastructure demand for schools, hospitals, commercial spaces, roads as well as urban residential housing has increased. In this regard the Kenyan government has set out goals in infrastructural development by engaging expansively in the construction sector. Some of the major projects that the government has engaged in include the Lamu Port, Lamu Port, South Sudan, Ethiopia Transport (LAPPSET) Project, and Standard Gauge Railway (SGR) amongst others (Ndaiga, 2014).

Kenya has had a long relationship with China since attaining independence in 1963. However the relationship became more cemented after 2002 with deepening of economic relations between the two countries championed by the former President Mwai Kibaki. The former President as well as the then Chinese Premier Wien Jiabao, reiterated in a 2005 meeting in Beijing that they would strengthen bilateral relations in agriculture, telecommunication and infrastructure
construction (Xinhua, 2005). In 2013, the then newly elected President Uhuru Kenyatta entered into a bi-lateral agreement with the Chinese Premier worth five (5) Billion US dollars. The agreement was to strengthen boost development in industrialization and energy sectors (BBC, 2013).

Kenya has experienced an influx of Chinese firms into the local economy and more so in the construction sector. Chinese firms have changed the local landscape of Kenya’s urban centers with landmark buildings and notable construction projects (Thuita, 2013). This is as a result of several contracts entered into by the Kenyan government and the China Development Bank to fund construction various construction projects. As a result several construction projects have been undertaken and provided ample low and medium priced housing in the Kenyan housing sector. Several other projects have been financed by China in the same fashion. (Aid Data, 2006).

Rapid industrialization and technological advancement have continued to be an agenda for Kenya In its quest to achieve economic growth. Indeed, technological advancement and presence of specialized skills within an economy are the backbone of economic growth for any developing state. Furthermore, technological advancement is beneficial to a third world economy due to increased production, increased exports, job creation, jumpstarting innovation amongst other advantages (Kvochko, 2013).

Technological advancement is usually preceded by innovation, research and development funded by the state, private sector or other non-state actors. However technology transfer from foreign firms and Multi-National Corporations are viewed as one of the most effective means of obtaining technology since homegrown technology can be a costly affair. Technology transfer is
described “as the process through which knowledge relating to transfer of inputs to outputs is transferred into entities within a country from sources outside that country.” (Wahab, 2014) In order to avoid risky ventures, governments therefore invests in beneficial relationships with MNCs and other foreign firms in order to achieve technological transfer which translates into technology being transferred into the local market (Harrie & Percy, 2007).

Transfer of the said technology is usually realized through contractual agreements, trade in products, trade in technology and inter-state movements of persons with expertise. It is hardly ever achieved as a byproduct of interaction by MNCs with the economies in developing countries. In some instances however governments of developing countries host MNCs with the hope that some of the technology employed by the companies will be “spilled” over into the local market and effect advancement in technology that will eventually manifest in economic growth (Harrie & Percy, 2007). Furthermore successful technology transfer often depends on the host government taking deliberate steps to ensure that transfer takes place by creating a conducive environment to ensure that it does indeed occur. In other instances, the technology at hand is too advanced for the underdeveloped economy and thus cannot be effectively absorbed and utilized locally (Wahab, 2014).

With the entry of many MNCs, the government grapples with the daunting task of nabbing the most favourable contractual agreements to the Kenyan economy. It is unfortunate that technology transfer may not occur where the elaborate terms have not been negotiated with the MNCs by the host country’s government officials. In these regard, Kenya in tandem with the rest of the international community has put in place regulations to tackle technology transfer. Legislation such as the Industrial Property Act 2001, allows for private corporations to transfer technology via contractual agreements with the state providing an oversight role (Kenya Law
Reports, 2001). Other bodies that are intricately involved in technology transfer into the country include Kenya Industrial Property Institute (KIPI) that scrutinizes what technology is brought into the country (Kenya Legal Resources, 2011).

China has made deliberate efforts to ensure technology transfer to its African partners. Through the initial agreements set out through the Forum for China-Africa Cooperation (FOCAC) annual meetings, technology transfer was outlined as a major theme that would characterize all the government partnerships. Kenya was also expected to benefit in terms of technology from the intensified Kenya-China relations (Nording, 2012). In line with this, National Treasury has also received funding from China in ‘continuance with economic and technical cooperation’ (Aid Data, 2010). Furthermore, Chinese MNCs have set up training centers in Kenya for conducting technology training sessions. For instance, in 2016 the China Road and Bridge Corporation responsible for constructing the historic Standard Gauge Railway opened a railway training institute in Nairobi. The institute has thus far trained several Kenyan youth on railway maintenance (Xinhua News Agency, 2016).

The entry of China into Kenya’s economy as a key financier and development partner has drastically changed the character of Kenya’s external debt. Though mega projects such as the SGR, Kenya continues to accumulate its external debt to China which is currently the country’s largest creditor. According to a World Bank report, Kenya’s debts to China have increased by 54% between 2010 and 2014 which has in effect elbowed out other creditors. The heavy debt accumulation from China has faced a lot of criticism from local politicians and civil society who question the viability of mega structures in the name of achieving rapid economic growth (Mungai, 2016).
More specifically Chinese firms have dominated the local construction industry and giving unparalleled competition to local firms. China currently controls over 60% of the current infrastructural projects. This has elicited an outcry from both local and other foreign firms who are agitating for a bigger stake in the local construction sector (Genasi, 2016).

1.1 Statement of the Problem

As the government grapples with the rising demand for infrastructure, China continues to fill in the gap by providing the much needed infrastructure through involvement in the construction sector. China has also proven to be a willing partner in ensuring that rapid infrastructural development is achieved by the Kenyan government and has willingly provided workmanship as well as the finance for the said projects. In assessing the extent to which China is involved in government construction sector, the danger of overreliance on China is a present reality even as debt rises to unsustainable levels. Chinese domination also bears the danger of stifling local firms and thus impeding growth of the local industry.

Amidst the growing concern over China’s increased dominance, there arises the need to assess the economic benefits that accrue from Kenya’s interaction with China. One of the intended benefits of the interaction is technology transfer from Chinese MNCs into the partnering local firms, consultancies and government departments. This supposed technology transfer would then translate into technological advancement that would lead to economic growth. Furthermore, it is useful to equally examine the nature of technology transfer agreements between Kenya and China and assess their success or failure.
1.2 **Research Objectives:**

The following were the objectives of the research:

i. To assess the existing policy frameworks regulating international technology transfer between China and Kenya,

ii. To assess the prevalence of technology transfer by Chinese MNCs into the Kenya government construction sector,

iii. To assess the perception of local professionals as to the prevalence of technology transfer by Chinese MNCs into the government construction sector.

1.3 **Research Questions:**

The research project sought to answer the following questions:

i. What are the existing policy frameworks regulating international technology transfer between China and Kenya?

ii. Is there substantive technology transfer from Chinese MNCs to stakeholders within the government construction sector?

iii. What is the perception of local professionals as to the prevalence of technology transfer into the government construction sector?

1.4 **Purpose of the Study:**

Kenya aims to achieve economic growth from her agreements with China. As a developing country engaged in international trade, one of the key means to achieving this growth is to ensure
that technology transfer occurs from more technologically advanced economies. In this regard Chinese MNCs have become prevalent in the Kenyan economy and can act as a source of new and more advanced technology to the Kenyan economy. Therefore the purpose of the study is to assess whether there is transfer of technology within the construction sector between the two countries.

1.5 **Significance of the Study**

There are two major realms through which the significance of the study can be highlighted.

1.5.1 **Theoretical significance**

Even with proliferation of Chinese firms into the local economy and specifically government projects; the impact of China on the local economy is yet to be fully appreciated. There is a marked increase in literature that focuses on China-Kenya relations and its impact on economic growth. China will continue being a significant part of the Kenyan economy as manifested in construction of mega infrastructure and provision of development loans. Despite these developments, very little literature exists on technology transfer within from the MNCs into various Kenyan economic sectors. This study will be of assistance to those in the academic field who wish to continue in their study of the nature of bi-lateral interactions between the two states and the subsequent outcome as far as transfer of technology is concerned.

1.5.2 **Policy significance**

The findings of this study will be useful to policy and lawmakers in formulating and redefining legislation and regulations that touch on technology transfer from foreign entities particularly within the construction sector. Other stakeholders such as private firms, experts involved in
issues of technology transfer will have a reference point on various factors that necessitate successful international transfer of technology.

2. CHAPTER TWO

This Chapter focuses on the theoretical framework that provides a backdrop of nature of relationship between a more developed state which in our case is China and a developing state (Kenya). The theories attempt to set a discourse as to whether matters such as technology transfer are indeed a reality between developed and developing countries.

2.1 Theoretical Framework

China’s unprecedented economic growth and increasing role in the international system has caused a ripple in traditional theoretical underpinnings that have in the past described states’ behaviour in the international system. Furthermore, China’s relations with Africa have brought about a change in Africa’s role in the international system. In this research two theories can be aptly used to describe China-Africa relations.

2.1.1 Dependency Theory:

Dependency Theory was formulated in the 1950s by Raul Prebisch who was at the time the Director, UNEC in Latin America. Prebisch had observed that economic growth in the Global North did not necessarily translate into growth for the underdeveloped countries. In fact in his assessment, growth in the developed nations would lead to economic exploitation of the developing countries. This was because the underdeveloped nations would primarily export raw materials at low prices to the developed world. The developed world would in turn import finished and manufactured goods to the developing countries at high prices. This inequality thus meant that the developing countries had to borrow to sustain the demand for finished products in
their own economies, thus leading to dependency. Dependency theory is therefore conceptualized as an explanation for economic development of a state under political, economic and cultural influences of an external actor (Yergin & Stanislow, 2002).

In Dependency theory, the world is dichotomized into two, that is, the core represented by the developed states and the periphery represented by the underdeveloped states. Andre Gunder Frank describes dependency as largely a problem created by capitalism. In this context, an imbalanced division of labour has been put in place by the developed world. The division of labour creates an exploitative relationship that is favourable to the developed nations who receive cheap raw materials and agricultural produce from the developing countries (Yergin & Stanislow, 2002).

Dependency theory is relevant to the relationship between Chinese and African states as it aptly describes the complex relationship between the two. Even as China looks adopts a more diplomatic and accommodating approach towards Africa than that displayed by the West, its’ economic interactions with Africa are largely asymmetrical due to the latter’s weak bargaining power. China’s unquenchable thirst for Africa’s resources means that Africa primarily a source of raw materials and agricultural products. Furthermore, as opposed to being an upcoming producer in finished or manufactured goods. The inequality is further deepened by heavy borrowing from Chinese financial institutions occasioned by the rising need for rapid infrastructural development.

2.1.2 Structural Realism:-

Structural realism as a theory espouses that states in the international system are in competition for power and a fight for their own survival. Kenneth Waltz, the neo-classical theorist espouses
that states’ behavior is shaped by the happenings in the international system and not by its own domestic intrigues as proposed in classical realism. Taking a radical departure from classical realism, Kenneth Waltz proposed that the international system as opposed to human nature was the main determinant of human behavior. Hence, the international structure was the main unit of analysis and not the state. According to neo realists, anarchy is the ordering principle of the international system as there is no central authority and subsequently states are left to fend for themselves (Waltz, 2001).

In structural realism, actions of state are determined by their relations with one another as opposed to their foreign policy inclinations. Furthermore the nature of the relationship between a state and the most powerful states in the international system will determine its position in the international system (Craig, 2004)

China’s rise to economic stardom has indeed created a huge impact on international trade. As the current economic giant, its rise and dramatic entry into Africa has displaced the western countries as the traditional sources of trade and funding for Africa. China’s current disposition also brings about a lot of change in how the current international system is viewed. On a local scale, Kenya has also benefitted from China’s current role in the international system through increased economic and diplomatic interactions. Through trade and infrastructural development brought about by China, Kenya is slowly becoming more centralized in both continental and international trade relations.
2.2 Literature Review:-

The literature review presented in this chapter focuses on technology transfer between countries and the dynamics involved in such transactions. It also focuses on the nature of Chinese engagements in Africa and more specifically, Kenya.

2.2.1 Technology Transfer in the International System

There is no agreed definition of the process of transfer of technology though various concepts are common. UNCTAD defined technology as the systematic knowledge for application of a process that results in manufacture of a product or delivery of the service. Technology can also include the know-how of professionals used to develop the products or service. Technology transfer therefore refers to transfer of the systematic knowledge of the process of manufacturing a product or delivering a service going beyond mere sale of goods and services (UNCTAD, 2014).

Technology transfer can be embodied in sale and licensing of industrial property excluding the trademark. It also involves the provision of technological know-how inform of models, diagrams, designs. It also involves the provision of technical knowledge for use, installation, and operation of equipment, machinery or other intermediary goods. Lastly, technology transfer involves the provision of the contents of technical cooperation agreements.

UNCTAD makes a distinction between technology transfer and technology diffusion in that diffusion refers to a process where technology is adoption by a particular group/segment of the local population without any agreement between the user and the originator. Technology transfer is more deliberate and involves effort by the user of the technology to acquire it and usually involves a bilateral agreement between the user and the originator of the technology (UNCTAD, 2014).
Technology transfer also involves the process becoming aware of the existence of the technology, acquiring it, domesticating it to local use and marketing it locally. Intricate knowledge of the latest technologies in the market can help a developing state keep in-step with technological developments and put in place strategies to acquire and incorporate it locally. Philosophy or doctrine of a society may determine the success or failure of technology transfer. Presence of educational, social, financial institutions that favour technology transfer can contribute to its success (Tuma, 1987).

Technology transfer is also defined as application of technology to a new function or a new user for commercial profit. It is a three pronged process that is embodied in the product, the process and the people involved. However the three factors do not become a useful conduit for movement of technology without an overarching functional institutional framework. Technology transfer is also embodied in different types. The first is material transfer where the end result is transfer of materials, equipment and products. The second is design transfer which is transmission of designs, blueprints and know-how. The third is capacity transfer which entails transmission of the ability of not only adapting new technology but ability to replicate it and produce different products (Agmon Glinow, 1991).

### 2.2.2 Factors influencing technology transfer

There are various factors that necessitate technology transfer within the international arena. For instance, technology transfer occurs through international technology market through independent merchants, through joint ventures, government initiatives and exchanges involved both public and private business stakeholders, through publishing of the technological information through training and educational programs and also through imitation and reverse engineering (Agmon Glinow, 1991).
Hoekman & Javorcik (2006) found that technology innovation happens mostly in developed countries and therefore developing countries have to “borrow” technology from the developed nations. Technology transfer from a developed to a developing state can happen via multiple means, such as trade in goods and services, FDI or joint ventures as well as technology purchases or licensing. One of the most efficient modes of technology transfer is through purchase of equipment both new and used. The new equipment is then useful in reducing costs of production and increasing productivity output in local firms. Market transactions, achieved through hiring of consultants and engaging in technology license agreements can also be a source of technology transfer.

Trade is a major determinant in international technology transfer and diffusion where local firms take advantage of technologies imported into their countries through trade interactions with foreign firms. Studies by Coe and Helpman (1993) found that countries that rely on imports possess a high capacity for absorption of technology. Moreover, the openness of an economy to trade as well as the quality and extent of R&D conducted by a country has an influence on the recipient country’s capacity to absorb new technology. Openness of a country to trade is achieved through lowering of barriers to imports ensuring an easier flow of foreign goods and services into the local domestic markets.

Hoekman & Javorcik (2006) however opined that openness by itself is not sufficient to ensure technology transfer but a country’s ability to absorb this technology is of importance as well. This means that the recipient country needs to have the requisite human capital as well as the considerable investment in R&D for the transfer to occur. Presence of a skilled workforce as well as research labs in private firms and learning institutions will ensure that the technology is absorbed. This will ensure that the technology acquired will be adjusted to meet the local
requirements. The local firms will then apply the ‘domesticated’ technology to improve on their productivity output.

FDI can also encourage technology transfer where a foreign firm undertakes a joint venture through a local firm. This is largely achieved through demonstration or labour turnover where persons employed in the foreign firms move into local firms, consequently moving the technological know-how into the local scene. The motivating factor for foreign firms to diffuse technology is the intermediate firms that the foreign firm will use in production. This means that firms that are in close proximity to the foreign firm might benefit in a huge way from technology diffusion. In a study carried out by Simeon Djankov and Bernard Hoekman from the Czech Republic from 1992 to 1996, FDI was shown to be the main contributor to technology diffusion where the foreign firms invested in the local firms (Djankov & Javorcik, 2006).

Technology transfer is not an idealistic and seamless transaction and is sometimes stifled by need to protect intellectual property on the part of the ‘donor’ foreign firm. This complicates the nature of contractual agreements entered into between foreign firms and domestic firms. Domestic firms are unable to ascertain the true value of technology that they intend to purchase leading to an impasse brought about by information asymmetry. Owners of technology also hold considerable market power in that they are able to control prices of their technology which could lead to overpricing.

Howard Pack (2006) observed that a foreign firm might find it easier to transfer technology to a local market if the legal and policy regimes of intellectual property protection are friendly. Policies of a host country are deemed friendly when foreign firms are not under threat of incurring unnecessary risks in terms of intellectual property infringement or unnecessary
pressure from local governments compelling technology transfer, which might be deemed detrimental to their proprietary interests. Additionally, a foreign firm might be more compelled to transfer technology if legal recourse is in place to guard against infringement of intellectual property (Pack, 2006).

Though MNCs are the one of the most effective ways of ensuring technology transfer, MNCs adopt strategies that favour them as opposed to strategies that favour the host country. For instance most MNCs prefer their R&D aspect to remain at the parent company while the labour intensive firms are situated in the developing countries. MNCs can source for equipment locally instead of imports so as to encourage technology transfer at a local level (Reinhart, 2007).

Kenya has envisaged technology transfer in various economic sectors by the use of EPZs. The main objective of the EPZ was to promote exports, foreign exchange earnings, technology transfer, industrialization and creation of employment opportunities. More than 57% of the firms in EPZ are foreign owned; around 13% are Kenyan owned while the rest are joint ventures. Kenyan firms employed unskilled labourers and equip them with basic skills. Foreign firms have also equipped employees with low specialized skills. However the amount of technology transferred is not apparent (Masta, 2009).

Despite changes brought about by globalization, technology remains a preserve of OECD countries whilst majority of developing countries have to acquire technology from advanced countries. In this regard, the developing states have sought national and international policies to facilitate technology transfer, largely through the efforts of the UN. Technology being proprietary in nature is largely owned by private corporations and is aimed at boosting production and profit making. This makes MNCs reluctant to diffuse the same. Technology
transfer is therefore a preserve of state to state negotiations as opposed to international regime regulations. Article 7 of the Trade Related Aspects of Intellectual Property Rights (TRIPS) provides that IPRs should contribute to technological innovation and ensure that the process of technology transfer is not undermined (World Trade Organization, 1994).

Apart from ‘openness’, local firms need to be able to absorb and retain the technology. FDI is also a source of transfer of technology where MNCs have subsidiaries that diffuse the technology onto the local markets or through joint ventures with local firms. This is visible particularly where vertical linkages are present. Vertical linkages manifest in form of MNCs are in business with local firms who utilize their products or buy their equipment in order to sell them under their brand names (Hoekman, Maskus & Saggi, 2004).

Technology spillovers occur when the technology is widespread and available to larger economy where the MNCs or foreign firms cannot possibly extract economic gain as a result. The local firms then step in and imitate the technology without necessarily having any linkages to the MNCs or foreign firm that own the technology. Technology spillover also manifests in the movement of professionals having trained in developed countries moving back home to developing countries and use the gained technological know-how (Hoekman et al., 2004).

Countries with strong R&D content as well as human capacity are able to have a stronger absorbing capability than countries that don’t. This is because research allows innovation and optimizing of opportunities availed by new technology in the market. Countries without a strong R&D component are not able to identify opportunities for technological advancement. R&D is given emphasis by programs within Universities as well as research institutes. Human capital
accumulation is also paramount as it provides an economy with a ready workforce conversant with the latest technological developments in the market (Hoekman et al., 2004).

In some instances some countries that have weak intellectual property regimes are able to achieve technology diffusion from the foreign firms. In the 1980s Korea was able to achieve rapid economic growth through imitation of low level technology as well as utilizing in house R&D element to ensure training of the local professionals. Other export intensive countries such as China, Brazil, Mexico and Malaysia also took advantage of weak IPR regimes to encourage technology transfer through pure and creative imitation during production processes (Hoekman et al., 2004).

The discourse on technology transfer has become common place in multilateral negotiations in the GATT and the WTO agreements. This is because technology is proprietary in nature and thus means that MNCs have vested interest in protecting their intellectual property rights. Unfortunately, despite these negotiations the technological gap between developed and developing countries has grown due to the increased commercialization of innovation and research where developing countries are completely left out of the process (UNCTAD, 2014).

National policies should aim at increasing access of technology and knowledge base of local firms, encouraging innovation, reducing of costs of technology transfer. International technology transfer will considerably be more successful in countries that have a friendly entrepreneurial environment. This includes open trade regimes, political stability in government, accountability and transparency in judicial systems, presence of skilled labour force as well as developed infrastructure (Hoekman et al., 2004).
Technology transfer from one state to another can be successful due to the incentives present in a given situation. For example where financial and commercial interests are feasible for the particular MNC, or where government strategic and national goals of the state receiving the technology, can be achieved through the technology transfer. Policy considerations should go into improving the knowledge base within a particular industry to maximize the success of technology transfer. Policy therefore should be aimed at determining what nature or level of technology transfer is needed for particular developmental goals. Knowledge is solidified through interaction of the various stakeholders involved such as the local firms, government departments, research organizations as well as learning institutions. Policy will therefore aim at making that these stakeholders maximize the relevant technology (UNCTAD, 2014).

The intellectual property laws and regulations of a country that is recipient of technology can act as an incentive or deterrent of technology transfer. The local policies should ensure that local firms capitalize on opportunities provided by expiry of patents for foreign firms in a bid to imitate their technology. Policy should also take into consideration the already available or publicized technology that can be utilized or absorbed by local firms. Public policy should also aim at reducing the costs of intellectual property protection through patents for foreign firms looking to operate locally (UNCTAD, 2014).

In the Middle Eastern countries technology transfer has had relative success due to training of engineers and scientists, both in craft shops and educational institutions. However despite mobilization of technological experts technology transfer has not been useful to the local economy. This is because imported technology is only consumed but does not encourage innovation and creation at the local level. New equipment is bought and used but knowledge and
skill for making similar equipment is not gained. In the oil industry in these countries, new technology has been brought on board but has not resulted in technology transfer. Of the 573 projects initiated in the 1970s and 1960s very few of them have resulted in technology transfer thereby reducing dependence on foreign experts (Tuma, 1987).

Most of the projects have requirements of foreign input with local skilled labour being primarily secondary. The contracts call for transfer of plants to the Middle Eastern countries in fields such as oil, transportation, manufacturing, nuclear energy. However technology transfer was not obtained as a result. This is because of lack of production of any of the support tools or spare parts needed by local producers. Technology transfer failure can also be attributed to misidentification of the problem, inability to select appropriate technology, misunderstandings of the implications of technology transfer (Tuma, 1987).

Migration in Middle East has only resulted in brain drain where the experts migrate to developed countries whereas influx of technological experts into the countries has remained minimal. Due to cultural and religious constraints technological experts find it difficult to apply the knowledge and training received abroad. This is because both religion and culture in the Middle East were predisposed against use of technology thus hampering technology transfer. Technology transfer into the Middle East has been largely curtailed by the size of the economy in that the various economic sectors in underdeveloped countries are disjointed thus too small to absorb technology meaningfully (Tuma, 1987).

National policies of a particular country play a huge role in the extent to which transfer of technology is achieved. Polices aiming at protection of local and infant industries can be more effective in achieving transfer of technology by insisting on joint ventures between foreign
multinationals and the local firms. The joint venture will provide business opportunities to the local firms as well as create opportunities for an integrative relationship between the foreign and the local entities thus creating an opportunity for technology transfer. China is such an example, in that the government created friendlier policies to joint ventures and discouraged fully foreign-owned subsidiaries to conduct business within China (Saggi, 2004).

National policies where technology acquisition is a major policy objective have more success with technology transfer. For instance Japan’s Ministry of International Trade and Investment (MITI) played an aggressive role by insisting that foreign firms investing in Japan must share their technology. Fortunately Japan had also invested in local R&D aimed at facilitating absorption of foreign technology. This enabled the technology to trickle in from the incoming foreign firms onto the local market (Saggi, 2004).

Policies that aim at protection of intellectual property rights act as a good incentive for attracting FDI. This is because where MNCs feel that their proprietary rights will be protected, they will invest in R&D within the host country in a bid to boost effectiveness in production of their goods and services. However, such strong property rights protection limit the opportunities for local firms to gain technology since technology diffusion will be legally restricted (Saggi, 2004).

Trade in both capital and consumption goods can be a source of international technology transfer. New technology from interaction with consumption goods can be achieved through study and imitations of design of the particular product and, in turn, replicate the same. According to Saggi (2004) importation of capital goods such as machinery and specialized equipment translates into more tangible results in acquisition of new technology (Saggi, 2004).
2.2.3 Extent of Chinese Presence in Africa:

Throughout its dealings with Africa, China has always been guided by several foreign policy perspectives. In the 1950s, Chinese Aid to Africa was guided by principles such as mutual respect from sovereignty and territorial integrity, mutual non-aggression, mutual non-interference internal affairs, equality and mutual benefits and peaceful coexistence. In 1960s other foreign policy approaches by China included offering of technical assistance and promotion of self-reliance and not dependency on recipient governments (Haifang, 2010).

China opted for this approach in order to garner trust with its’ African counterparts who were still reeling from the effects of colonialism. The tactic of non-interference also meant that China could not question Africa’s internal policies and politics and would only focus on its trade. This of course welcomed by the newly independent African states that were weary of the impositions of Western influence (Haifang, 2010).

In the new millennium, China’s renewed interest in engaging Africa is seen in its quest to take on Africa as its major development partner after decades of predominance by the western states. Following its’ earlier approach, China views Africa not as a recipient of economic development but as a participant in attaining economic development. This is in stark contrast with other development partners in the global north who view themselves as donors of aid and development while Africa is seen as the meek recipient. This attitude is reflected in the China’s African Policy written in 2006 where ‘economic cooperation’ is given an emphasis in describing the relationship (King, 2013).

Additionally, China has engaged in an aggressive cultural diplomacy meant to woo its African counterparts. This is manifested through various avenues, such as human resource training of
African employees, opening of Confucius Institutes, establishment of the Municipal foreign policy and the Sister Cities Programme among other projects. This approach has been well received by African states who appreciate being regarded as active partners in the economic system, a departure from the traditional role of being the marginalized voice in a largely western dominated economy (Haifang, 2010).

According to Alden, Large & Oliveira (2009), China’s current engagement with Africa has accelerated to unprecedented levels and overtaken the United States and France who were regarded as Africa’s major trading partners. By the year 2010, Chinese Ministry of Commerce estimated that China-Africa trade stood at $100 Billion. China takes in a significant portion of Africa’s exports. For instance in oil and mineral producing countries, China absorbs about 85% of the countries’ exports (Alden, et al., 2009).

Behind the aggressive interest in Africa evidenced in intensified trade relations, China’s motivation is majorly driven by economic interest. Due to rapid development and economic expansion, China is competing fiercely with the highest traditional consumers of energy, namely the United States, Japan and the European Union. China is also fast rising as a major consumer of oil and currently caters for roughly 38% of the world’s oil demands. This has compelled China to compete with the Global North for resources within the continent. China is also a major consumer of timber and other mineral resources from Africa (Guliwe, 2009).

China’s own local market has experienced saturation and thus China is in need of external markets for its products. Incidentally, Africa has provided the much needed market for China consumer goods. However due to insurmountable debt deficits on the part of Africa, China has
strategically adopted a more diplomatic approach towards it’s dealings, by offering infrastructure deals are quite attractive to the Africa that is largely lacking in infrastructure (Guliwe, 2009).

China appears to have abandoned the philanthropic approach to giving aid to Africa and now looks at aid in terms of high profile infrastructure. Loans offered to African government are zero-interest, concessional loans and grants which are slightly cheaper than offered by the International Monetary Fund. The funding of grandiose projects and infrastructure in Africa has been construed to be towards some political mileage and has been met with suspicion and cynicism of critics of Chinese interactions with Africa. Apart from infrastructure development, China has also ventured into other sectors such agriculture, human resource training, medical cooperation as well as conflict resolution and peace keeping (Alden et al., 2009).

China’s construction sector has exponentially grown in the past two decades. Chinese is slowly edging out Japanese and US companies in the global construction sector. One of the factors contributing to the growth is privatization of previously state owned Chinese corporations. This has allowed the companies to diversify their target markets. The Chinese government also permitted their companies to have alternative sources of funding apart from state owned funding. This includes funding from the Africa Development Bank, Islamic Development Bank among other institutions (Guliwe, 2009).

On the labour frontier, the desirability of Chinese presence in Africa remains questionable. Employment at Chinese MNCs has been characterised by absence of employment contracts which creates room for abuse employment practices. Chinese employers have displayed a disregard of local labour legislation that stipulates administrative practices such as annual leave days, maternity leave days, weekend breaks among other issues. In several countries across
Africa, Chinese companies have been seen to renumerate below the minimum wage. In the presence of strong trade unions, the MNCs have been able to offer fairer working conditions (Leong, 2009).

Chinese MNCs have also been seen adopt discriminatory approaches in dealing with female employees. In surveys carried out in Namibia and Kenya, it was found that women labourers were treated at casual workers leading to preferential treatment towards men. It was also found that women were dismissed in the event of pregnancies. In South Africa and Namibia, Chinese were ignorant on legislation that outlaws discrimination on the basis of gender, disabilities or race. The unfavourable situations have been excercbated of absence of trade unions to collectively agitate for better working conditions for their members. Despite existence of favourable legislation, African countries continue to allow unfair labour practices due to low bargaining power as well as mere non-chalance (Baah & Jauch, 2009).

2.2.4 China and Technology Transfer:-

China has migration into Africa has largely been multifaceted and ranges from the entry of huge multinationals such as Huawei, influx construction workers to carry out huge infrastructure projects, and independent Chinese startup companies among others. The different facets of Chinese presence therefore bring with it different skills sets and technology into the African market. Nevertheless, majority of the workers who migrate to Africa from China are semi-skilled and engage in low level or informal transfer of skill and technology onto their African counterparts (King, 2013).

China does not have a comprehensive technology or skill set transfer policy in its engagement with Africa. However, the establishment of Confucius Institutes in Africa could point towards
formalizing training of Africans who enroll within the centers resulting in technology transfer. Majority of African attendees in the said institutes are interested in learning the Chinese language for purpose of exploring further business opportunities within both China and Africa. Moreover, the rise in number of infrastructural projects undertaken by the Chinese in Africa has created a huge awareness in Africa leading to increased demand for Chinese scholarships (King, 2013).

The Chinese government has over the years engaged in training African intellectuals with professional training. For instance, West African professionals in various fields were trained in China. Unfortunately, there is often a mismatch between the training received and the current market needs. In the case of Cameroon, the numerous professionals trained in China did not play a vital role in the subsequent mega projects undertaken by China in their country (King, 2013).

China has engaged in technology transfer through its’ multinational ventures into Africa. For instance ZTE, a telecommunications company trained about 1000 engineers when it moved into Ethiopia. The engineers received training on how to use ZTE technology. In this instance, technology transfer was informed by ZTE’s need to maintain effectiveness, in the face of competing telecommunication multinationals (King, 2013).

African governments have attempted to engage China on training of local personnel. For instance the Ethiopian government entered into a scheme with Shanghai Construction Company where 50 Chinese workers were allowed immigration rights on the condition that each would train 10 local workers. In Nigeria, Chinese firms undertook training of locals where they had joint ventures with local firms. Chinese also preferred this approach where they were supplying and installing machinery for maintenance and sustainability. Technology transfer also occurred in the event of
Nigeria’s National Space Agency Programme, where technicians were sent to China by the government to study space technology (King, 2013).

Africa does not have a consolidated policy approach towards engaging in trade relations with China. A comprehensive policy would go a long way in ensuring that sourcing for additional FDI to ensuring that production capacity is increased from the bi-lateral relations. This will be achieved through agreements on employment conditionality as well as requirements that the Chinese MNCs effect technology transfer (Munyi, 2011).

According to Africa Labour Research Network (ALRN) Chinese employment record in Africa is tainted with hostile conditions such as violations of workers’ rights, poor working conditions, hostility towards trade unions amongst others. Technology and skills transfer is also undermined by imported Chinese labour by the Chinese firms. In Tanzania, the picture painted in a bleak one where the TAZARA railway project in the mid-1970s where the locomotives stopped functioning a mere five years after completion of the project. This was due to lack of technical training by the Chinese government as well as the Tanzanian’s lack of zeal towards the project (Monson, 2009).

The Chinese strategy can be characterized by maximized profits as well as minimized costs in their ventures within Africa. This is reflected in reliance on their own semi-skilled labour as well as masses of unskilled African labour impedes technology transfer. Chinese culture of keeping separate from their workers as well as having demeaning and demanding attitudes towards labourers has characterized Chinese immigrant workers (Monson, 2009).

A stark cultural difference between Chinese and African workforces could be a factor posing a challenge for technology transfer. For instance the Chinese preference to work long hours and
weekends as well as have night shifts can be a strain on the African workforce. In some cases however, cultural similarities of hard work can be to the locals’ advantage. In Nigeria, the Chinese chose to work with the Igbo around Nnewi due to their dynamic business orientation. Another case is illustrated in the rebuilding of the Benguela Railway where cultural ties limited labourers from working more than 100 kilometers from their home (Haifang, 2010).

In Kenya, Chinese multinationals getting into joint ventures with local affiliates has facilitated technology transfer. The Beijing Tianpu Xianxing Enterprises and Electrogen Technologies entered into a partnership to build a solar panel factory in Nairobi. This was to provide a source of energy to make up for growing energy demands within the country. Beijing Tianpu Xianxing Enterprises has a production capacity of 300,000 water heaters annually as well as other products such as heat pipes. The company also engages in research and development as well as training in a bid to improve its production capacity (Cheru & Draper, 2010).

2.2.5 Impact of Chinese Firms on local African Firms

China-Africa has had varied effects in different countries which makes it harder to generalize the impact it has on local firms. While on one hand the influx of Chinese finished goods had flooded local markets and in effect providing competition to local firms, on the other hand the opening up of China as an export destination has also created a market for African goods. China investment in the manufacturing sector and has led to the establishment of over 239 manufacturing firms in Africa. These firms have majored on light industry merchandise such as electrical appliances, paper production and household appliances just to name a few (Brautigam, 2009).
Chinese impact on the manufacturing sector is ostensible in countries such as Mauritius, where the setting up of Export Processing Zones has aided in fast-tracking Chinese investments and as a result, contributed to rapid economic growth of the country. The China factor also brought about transfer of technology through, training and technology diffusion (Brautigam, 2009).

However, the impact of Chinese presence in Africa cannot be viewed in only positive terms. The firms operating in the construction sector in Africa are known to edge out local firms through aggressive competition in low bidding. The Chinese firms also practice undercutting to the detriment of the local firms. Due to availability of cheap loans the Chinese firms are able to subsidize their costs which present unfair completion to local companies (Mulinge, 2012).

Chinese firms largely source their equipment from Chinese manufacturers due to cheaper costs. As a result does not create any opportunities for local manufacturers to produce equipment. Further Chinese companies have been known to bring in their owned skilled workers whilst only employing locals for low skilled level jobs which invariably limits opportunity for technology transfer (Mulinge, 2012)

2.2.6 Kenya-China Debt Relations

China has become one of the largest sources of aid for the African continent. China’s FDI is markedly different from the West who is Africa’s traditional source of aid. With the advantage of state ownership, Chinese MNCs have access to loans with significantly lower interest. This allows them to engage African governments with low interest loans that can be repaid for a protracted period of time. This gives them a competitive edge over MNCs from the west that offer short term, high interest loans (Guliwe, 2009).
Kenya has also greatly benefitted from Chinese funding of infrastructure development projects. According to Mulinge (2010) Kenya received an estimate of $381 Million between 2006 and 2010. China offers its development assistance through China Export-Import (EXIM) Bank which requires that 50% of the funded projects are carried out through Chinese firms. Due to direct affiliation with the Chinese government, EXIM is able to offer low rate loans. The current loan burden has been seen to draw a lot of criticism with regard to its sustainability. Some of the notable projects in Kenya that have been undertaken by Chinese firms are listed in the table below:-

<table>
<thead>
<tr>
<th>Project</th>
<th>Contractor</th>
<th>Project Cost (Kshs)</th>
<th>Funding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nairobi-Thika (A2) (Lot 1)</td>
<td>China Wuyi Co Ltd</td>
<td>8.1 Billion</td>
<td>Afdb/GOK</td>
</tr>
<tr>
<td>Nairobi Thika (A2) (Lot 2)</td>
<td>Synohydro Corporation Ltd</td>
<td>8.6 Billion</td>
<td>Afdb/GOK</td>
</tr>
<tr>
<td>Nairobi Thika (A2) (Lot 3)</td>
<td>Shengeli Engineering Group Co. Ltd</td>
<td>9.4 Billion</td>
<td>China/Gok</td>
</tr>
<tr>
<td>Isiolo-Merrille (A2)</td>
<td>China Wuyi Co Ltd</td>
<td>4.9 Billion</td>
<td>Afdb/GOK</td>
</tr>
<tr>
<td>Athi River Namanga (A104)</td>
<td>China Overseas Engineering Group Co. Ltd</td>
<td>6.2 Billion</td>
<td>Afdb/GOK</td>
</tr>
<tr>
<td>Doundori- Olkalau Njanini (c66)</td>
<td>China Wuyi Co Ltd</td>
<td>3.5 Billion</td>
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<tr>
<td>Email-Oloitoktok</td>
<td>Synodryho Corporation Ltd</td>
<td>4.2 Billion</td>
<td>BADEA/OPEC Fund/GOK</td>
</tr>
<tr>
<td>Londiani-Fort Tanan (C35)</td>
<td>Jiangxi Zhongmei Engineering Co. Ltd</td>
<td>4.4 Billion</td>
<td>Gok</td>
</tr>
<tr>
<td>Marsabit- Turbi (A2)</td>
<td>Jiangxi Zhongmei Engineering Co. Ltd</td>
<td>13 Billion</td>
<td>Afdb/GOK</td>
</tr>
<tr>
<td>Northern and Eastern</td>
<td>China Roads and</td>
<td>8.6 Billion</td>
<td>China/Gok</td>
</tr>
<tr>
<td>Project Description</td>
<td>Contractor</td>
<td>Cost</td>
<td>Contractor Type</td>
</tr>
<tr>
<td>-----------------------------------------------------------------------------------</td>
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</tr>
<tr>
<td>Bypass Roads Project</td>
<td>Bridges Corporation(K)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Southern Bypass Roads Project</td>
<td>China Roads and Bridges Corporation(K)</td>
<td>16.9 Billion</td>
<td>China/Gok</td>
</tr>
<tr>
<td>Oginga Odinga Road Section 58, Nakuru</td>
<td>China Roads and Bridges Corporation(K)</td>
<td>369 Million</td>
<td></td>
</tr>
<tr>
<td>Olkaria IV Geothermal Field Production Wells Drilling Project</td>
<td>Great Wall Drilling Company of China</td>
<td>7.5 Billion</td>
<td>China/Gok</td>
</tr>
<tr>
<td>Kenyatta University Teaching, Research and Referral Hospital</td>
<td>China Jiangxi Company</td>
<td>9.85 Billion</td>
<td>China/Gok</td>
</tr>
<tr>
<td>Kenya Power Distribution System Modernization and Strengthening</td>
<td>China CAMC Engineering Co Ltd</td>
<td>1.4 Billion</td>
<td>China/Gok</td>
</tr>
</tbody>
</table>

*Source: Kenya Institute for Public Policy Research and Analysis (KIPPPRA Discussion Paper No 134 2012)*
3. CHAPTER THREE

3.1 Research Methodology

This chapter presents the methodology that was used to realize the study’s objectives as well as answer the highlighted research questions. It presents a description of the research design, the sources of data and the techniques for data collection and analysis. Ethical considerations and limitations to the study are also highlighted in the chapter.

3.1.1 Research Design

The design used for this study was qualitative which permitted the researcher to examine the prevalence of technology transfer by Chinese firms in the Kenya government’s construction sector. Through this design, the researcher was able to employ exploratory research by use of insight stimulating examples. By using insight-stimulating examples, the researcher was able to conduct a selective study of particular instances where little information previously exists (Kothari, 2004). Similarly, this design enabled the researcher to evaluate the existing policy frameworks on technology transfer within Kenya as well as examine the perceptions by professionals in the construction sector on Chinese technology transfer.
3.1.2 Data Sources

This study utilized both primary and secondary sources of data. In examining the policy framework regulating technology transfer in Kenya, secondary sources used consisted of government publications. These were sourced mainly from the National Council for Law Reporting to access existing legislation as well as the Chinese Embassy in Kenya website.

In assessing the prevalence of technology transfer from Chinese MNCs into the Kenya government’s construction sector, primary data was sourced from a sample of Chinese MNCs, local affiliate firms as well as the relevant government institutions. These companies were China Roads and Bridges Corporation (CRBC), China Roads and Development Company (CRDC), China Wuyi Limited, China Roads Construction Company (CRCC) and Jiangxi Company. Primary data was also sourced from Kenya Institute of Highways and Building Technology (KIHB), Kenya Railways Corporation (KRC), Kenya National Highways Authority (KENHA) and National Construction Authority (NCA) as well as government officials from Ministry of Transport, Infrastructure, Housing and Urban Development and the Ministry of Trade and Industry. Data obtained from the abovementioned MNCs and government offices aided in evaluating the presence of any licensing agreements between the government of Kenya and the MNCs, presence of training agreements between the government, China and the local firms and presence of purchase agreements of new equipment to enhance technology transfer from the MNCs onto local firms.

Lastly, in examining the perception local professionals in the construction sector on the prevalence of technology transfer, primary data in the form of interviews was obtained from
local experts in real estate, roads and railways construction sectors, who have experience with Chinese MNCs undertaking construction projects.

### 3.1.3 Data Collection Techniques

In this study, collection of primary data was done through semi-structured interviews of government officials, management from the Chinese MNCs as well as private sector members. This allowed the subjects to give their own unbiased view of the issue of technology transfer from Chinese MNCs into the government construction sector. Through interviews the researcher was able to have an in-depth analysis of the issues as well as address any existing information gaps (Kothari, 2004). Collection of secondary data was through direct participation and analysis of existing documentary material on the nature of China and Kenya relations as well as the existing policies touching on technology transfer.

### 3.1.4 Data Analysis Methods

In this study, the researcher made use of analytical induction analysis of both primary and secondary data collected in order to make inferences from the same. Analytical induction analysis involves the process of developing causal explanation for research phenomena. It involves the process of searching for similarities that point to possible common factors. The researcher also engaged in systematic reading of texts and other articles with an aim of getting explicit and implicit information on their content in the documents mentioned above (Hammsley, 2004).
3.1.5 Ethical Issues

The main objective behind research is to provide additional information in a particular issue for purposes of enriching academic and policy making processes in a given society. Research therefore needs to be conducted ethically in tandem with acceptable academic standards.

3.1.5.1 Ethical Issues regarding the researcher

The study was carried out after obtaining the requisite permission from the University’s School of Humanities and Social Sciences as well as School of Graduate Studies, Research and Extension. The researcher ensured that no physical or psychological harm as well as violation of privacy was suffered by respondents in the process of carrying out the research.

3.1.5.2 Ethical Issues Regarding the Research Process

The researcher also made sure that the research process was guided by integrity and that plagiarism and fraud was avoided. Being aware of the fact that discussions revolving around China and Kenya relations are emotive the researcher employed objectivity in carrying out the research process.

3.1.6 Limitations of the Study

Several issues influenced the nature and scope of the study. Being primarily qualitative research, the study involved obtaining and measuring of people’s perceptions on the subject. This meant that perceptions and bias were shaped by the respondent’s subjective experiences. Further, some of the targeted interviews within the Chinese MNCs and government institutions were not attainable. There were also issues of limited sources of secondary data, particularly on Chinese
4. CHAPTER FOUR

This chapter consists of the findings on research conducted on the research objectives as outlined in Chapter one.

4.1 Objective 1: To assess the existing policy framework for Technology Transfer between Kenya and China

To answer this objective both primary and secondary data was used. Primary data consisted of material gathered from interviews of government officials at the Ministry of Trade, Industry and Cooperatives as well as government officials at KIA, NHC and NCA all state corporations within the construction sector. The aim was to understand different policies that directly or indirectly touch on technology transfer. Secondary data consisted of policy documents as well as local legislation that outline the framework within which technology transfer would occur.
Secondary data was also obtained from documents outlining the agreements between the Chinese and the government of Kenya.

**4.1.1 Kenya’s Technology Transfer Framework**

Kenya does not have a comprehensive policy dealing specifically with technology transfer particularly between Kenya and other states. However, technology transfer has been in the minds of policy makers since the 1980s as the government came up with policies to catapult Kenya’s economy into robust economic growth. Kenyan policy makers recognized that indeed technology transfer is beneficial to Kenyan’s economic growth. They also recognized that technology transfer does not occur in a vacuum but it is instead backed by effective national policies that deliberately address technology transfer between different entities both at the local and international level.

Over the years several policies have been formulated that directly and indirectly address the issue of technology transfer. Sessional paper No. 5 of 1982 on Science and Technology for Development directly addressed the issue of technology transfer and termed it as critical to economic growth. It recognized the need for intentional and experimental research as being instrumental in Kenya’s growth in technological capabilities. The sessional paper also proposed an allocation 1% of the total GDP to research purposes. Sessional Paper No. 1 of 2005 on Policy Framework for Education Training and Research did not directly deal with technology transfer. Instead, the paper placed emphasis on the role of research in human capital development and highlighted on training of the labour force as well as reiterated the need to establish a fund dedicated to research (Moyi, 2013).
Under legislative framework, Industrial Property Act No 3 of 2001, the issue of technology transfer is also indirectly addressed. The Act established the Kenya Industrial Property Office to promote the innovation as well as acquisition of technology through various arrangements. Under the core functions of KIPO, screening of technology transfer agreements and licenses is recognized as the main function. The Act directly addresses the issue of technology transfer through granting of licenses between different entities both local and international (Laws of Kenya, 2001).

Fortunately, the Act offers local firms protection from unfair licensing agreements. For instance, Section 92 of the Act prohibits the importation of technology from abroad when substantially similar or equivalent technology can be sourced locally. It also ensures that local companies are not charged disproportionately to the value of the technology they acquire. Section 92 also prevents licenses that obligate the licensee to source for raw materials from the licensor (originator of the technology) unless it is not possible to obtain them from other sources. The Act also prohibits the licensor to impose restrictions that would impede innovation, research, absorption and application of the acquired technology by the licensee in relation with new products, processes or equipment (Laws of Kenya, 2001).

In 2012 the Policy Framework for Science, Technology and Innovation was drafted. This policy aimed to redefine the institutional frameworks that deal with technological innovation. The policy proposed the formation of Kenya Innovation Agency & National Research Fund. The policy encouraged strengthening of the R&D aspect within private companies and participation in Public Private Partnerships (PPPs). The policy aimed at addressing the lacunas that exist within the Kenyan framework that would make technology transfer impossible. Some of the challenges noted included weak institutional linkages, poor research and development

In 2013, the Science, Technology and Innovation Act No. 28 of 2013, was passed into law. The main objective of the Act is to “promotion, co-ordination and regulation of the progress of science, technology and innovation of the country; to assign priority to the development of science, technology and Innovation; to entrench science, technology and innovation into the national production system”. Interestingly, the Act recognizes the role of technology by defining it as the application of knowledge to meet the goals, goods and services for sustainable development. The Act provided for establishment of the institutions identified in the policy including; Kenya National Innovation Agency (KINA) and the National Commission for Science, Technology. The main aim of KINA is to regulate all matters science and technology as well as advise the Kenyan government on issues related to technology (Kenya Law Reports, 2013).

KINA is also mandated with, in consultation with stakeholders, identification of priority areas in scientific, technological activities in Kenya in relation to the economic and social policies of the Government and the country’s international commitments. The Agency is also meant to address the inter-agency efforts to ensure technological activities are enhanced; this includes the organizations within and without the country (Kenya Law Reports, 2013).

The 2013 Act has also authorized KINA to spearhead the involvement of the private sector in scientific research, innovation and development. Lastly, the Agency has been charged with the mandate of ensuring that technological knowhow obtained is applied towards national economic growth. The Act also prescribes the principles which govern the agency that could be instrumental to technology transfer. These include promotion of socio-economic development in
line with the country’s development agenda; achievement of manpower development and skills acquisition; promotion of knowledge creation, storage and dissemination; development of research, and innovation and the application of innovation to development (Kenya Law Reports, 2013).

The 2013 Act also establishes a National Innovation Agency (NIA) that is mandated with creating and maintaining institutional linkages with various stakeholders that will ensure that technological growth is maximized and effectively utilized. These stakeholders include government institutions research institutes, universities and private corporations amongst others. The NIA is also mandated with ensuring that technology transfer and diffusion is instigated among various economic stakeholders (Kenya Law Reports, 2013).

The National Industrialization Policy (NIP) can be deemed to have envisaged aspects of technology transfer from foreign countries as a means of economic growth. The policy framework recognizes that industrialization is the backbone of economic development and aims at providing linkages between various sectors of the economy in order to ensure that economic growth is attained. The policy also targets medium to high technology sectors as sectors that need extensive improvement. The NIP acknowledges that Kenya’s industrial sector is not vibrant enough to be a significant driver of economic growth in the country (National Industrialization Policy, 2013).

The NIP focuses on broad intervention areas such as increasing opportunities for FDI, development of priority industrial sectors and strengthening industrial research development and innovation. The Policy primarily aims being the policy tool that will enable Kenya to achieve the
ideals that are envisaged in Vision 2030 and Sustainable Development Goals (SDGs) to fruition (National Industrialization Policy, 2013).

The NIP has a holistic approach and takes cognizance of the need to maximize the opportunities brought about by globalization as well as regional integration in order for Kenya to withstand the happenings in the international arena. To maximize rapid industrial development strategies embraced by the policy include use of Public Private Partnerships (PPPs) and the use of approaches such as Build Operate Transfer (BOT) and technology development and transfer among other approaches. The policy targets the growth of Micro, Small and Medium Enterprises (MSMEs) into huge macro-economic industries that will acts as a source of employment as well as provide essential products (National Industrialization Policy, 2013).

Technology transfer is enabled by the ability to ‘absorb’ technology by the host country. The absorption capacity is depended on the recipient country’s ability to convert newly acquired technology into local use. Absorption of new technology requires a cohesive institutional framework that makes it favourable for the local market to retain new technology. In Kenya, the institutions cater for these “absorption” capacities are those mandated by policy to do so. These include KIPI (is a government parastatal under the Ministry of Trade and Industry established under the Industrial Property Act of 2001). KIPI offers proprietary rights and intellectual rights protection to companies both international and local as they commence their operations. After the end of the patented period, KIPI acts as a custodian of the patented technology which thereafter becomes available locally (Musee, 2018).

Another key institution that assists in the absorption of new technology is Kenya Industrial Research and Development Institute (KIRDI) is also a government parastatal that deals with
R&D. KIRDI facilitates innovation in technology in various economic sectors such as textile, civil engineering, food technology among others. KIRDI provides incubation and research services to local firms commencing or improving on new or borrowed technology. KIRDI’s mandate involves conducting research on the viability and technology as well as market research. In this sense KIRDI’s mandate is to ensure a smooth implementation of technology by local firms therefore facilitating technology transfer (Musee, 2018).

Within the construction sector, government has also established other institutions that are instrumental in the process of transfer of technology. These are mandated with ensuring that training and capacity building of professionals as well as semi-skilled labourers is taking place within the sector. Under the Ministry of Transport, Infrastructure Urban Housing and Development, the Kenya Institute of Highways and Building Technology (KIHBT) is a training institution that offers training under various disciplines in construction. This includes civil engineering, building, mechanical training and short architectural courses among others. Within the construction sector Nairobi Institute of Technology (NIT) offers short professional courses on architecture, engineering, construction technology (Musee, 2018).

The National Construction Authority (NCA) is mandated with streamlining, regulating and building capacity within the Construction sector for sustainable development. NCA was established under the National Construction Authority Act No 41 of 2011. Section 5 (2) of the Act states that NCA should promote the development and expansion of the construction industry. The Act also stipulates that research, training and consultancy in issues pertaining to construction are a core function of NCA. It registers contractors and projects and is involved in quality assurance and accreditation and trains local contractors and their teams to ensure quality output (Kenya Law Reports, 2011).
The NCA was formed to address challenges such as poor workmanship and increasing numbers of collapsed buildings. Before that, the construction industry was fragmented as contractors were hired in individual local ministries. Having the NCA has brought sanity to the construction industry and made it possible for all parties involved to view things from a similar prism (Akech, 2018).

The real estate sector in Kenya has experienced tremendous economic growth due to the ever increasing demand for affordable housing to cater for the rising population. Being one of the areas targeted for growth by government policies, the real sector has been the subject of major infrastructural projects some of which have been carried out by Chinese corporations. The government of Kenya has mandated the NHC with policy formulation regulating of all issues that touch on the government housing sector. (Mungai, 2018)

NHC is a profit making body that also carries out construction projects on behalf of the government in line with government’s vision of providing affordable housing in line with Vision 2030. NHC has in the past put up several housing projects countrywide, particularly in the major cities and its environs. It aims to remedy the housing shortage within urban areas by provision of low budget housing. NHC engages local and foreign contractors who win the construction tenders through competitive bidding. Chinese corporations have won several of the tenders and have undertaken construction work on behalf of NHC (Mungai, 2018).

Sessional Paper NO.3 of 2004 formulates the National Housing Policy which provides guidelines for growth in the housing sector. The Policy makes provision for research and development of cheaper building materials to enable the middle income earners to afford to build and buy houses (Ministry of Lands, 2004).
4.1.2 Technology Transfer within Kenya-China Relations

Kenya and has had a dynamic and longstanding relationship with China revolving around economic relations. China has long been Kenya’s trade partner and more recently has been a source of finance’s for Kenya’s mega infrastructure projects. The current Kenyan regime has increasingly deepened relations between the two states. In 2013, President Xi Jinping of China and His Excellency President Uhuru Kenyatta signed the China-Kenya Comprehensive Cooperative Partnership Agreement which laid out the framework for future relations between the two countries. Further in 2017, the bi-lateral relations were further elaborated through the formulation of the China-Kenya Comprehensive Strategic Partnership (KCETA, 2017).

As a result of the agreements the Kenya-China Economic and Trade Association were formed. The Association consists of both foreign and local Chinese owned enterprises operating in Kenya. The partnership between the two countries is defined by the need to pursue a win-win corporation that recognizes that industrialization and urbanization is instrumental to achieving Vision 2030. The pillars for the partnership is improving infrastructure, building advanced communication networks, innovation mobile health solutions among others (KCETA, 2017).

China-Kenya partnership has placed great emphasis on the infrastructural development. In this regard, China recognizes that the Kenyan construction sector was characterized by use of old technology, high labour intensity and traditional models. However the China intends to revolutionize the sector by bringing in new methodologies and technology. To this effect the Kenya Building Industrialization Research and Development Production Base was established by China Wuyi, a Chinese state corporation. The Base acts as a market for modernized construction material (KCETA, 2017).
In tandem with the ‘win-win’ cooperative partnership, Chinese government recognizes the lack of skilled workforce within Kenya needed to carry out the much needed infrastructural and industrial progress. Chinese corporations such as Huawei have begun conducting training in the Information and Communication Technology sectors (KCETA, 2017).

### 4.2 Objective 2: To assess the prevalence of technology transfer by Chinese MNCs into the Kenya government construction sector

To answer this objective primary data was used. Data was obtained from Chinese corporations, namely CRBC, CRDC, China Wuyi, CRCC and Gansu International Corporation for Techno-Economic Corporation. An assessment of various projects undertaken by the above-mentioned Chinese MNCs was done. To assess technology transfer, nature of contract, presence of training arrangements, presence of licensing agreements with local firms, presence of sale of equipment agreements within the projects were examined.

#### 4.2.1 Gansu International Corporation for Techno-Economic Corporation

This is a Chinese company that was contracted by NHC to construct mixed use houses. In the various projects the company was retained as a contractor since NHC does its own designs and specifications. There was no requirement made to the company that Chinese technology be transferred to the locals. However the company undertakes training of its local labourers in construction methodology as well as use of construction equipment from China (Obar, 2018).

#### 4.2.2 China Wuyi Company Ltd

China Wuyi set up the Kenya Building and Industrialization and Research, Development and Production Base. The base is a wholesale market set up through the facilitation of the Chinese government. The idea behind it was to facilitate quicker building processes by preparing, in
advance, the material required. By preparing building material in advance, the building process at works sites is made more efficient as the task is only underground work and assembly of structures above the ground. In this way, the building process is made faster and more efficient. Projects that would normally take three years could be completed in 6 months. New methodology of construction has been brought into the local market through this base (Zhou Handsomt, 2018).

China Wu Yi has also been involved in numerous road projects, including construction of Turbi-Moyale Road (Phase 3) completed in 2017, Thika Road which was completed in 2012 and James Gichuru road. China WUYI has had to import equipment for its road projects. However due to the fact that Kenya’s geographical landscape is generally a plateau, the road construction projects have not demanded the use of highly specialized equipment such as those needed to build tunnels in challenging terrains. In some of the projects however, there were some new technology employed through the use of unique equipment. For instance the company brought in a Slip form paver which is a type of special equipment used notably in the construction of James Gichuru Road. Using conventional methodology, the labour size is relatively bigger and the pace of operation slower. However, this equipment increases the speed of operation (15 metres per minute) and reduces labour size (requires only four to five people for one working group). The company also used a Mist Cannon, specialized equipment used to minimize dust. It works like a water sprinkler but more efficient as it can minimize dust both at ground level and in the air. It was very effective in the roads expansion and real estate projects (Zhou Handsomt, 2018).

As far as China WUYI is concerned no contractual agreement has been entered into with the Kenyan government for training and capacity building of local employees. However, in order to facilitate its work in the country, China Wu Yi has made it a policy to train local staff for mutual
benefit. For any given project undertaken, there are at least five hundred (500) local workers hired all of whom receive training from the MNC on road construction. As a matter of policy, China WUYI does not sell its equipment to other stakeholders and therefore no local firms have been able to benefit from their new technology. (Zhou Handsomt, 2018).

4.2.3 China Roads and Bridges Corporation (CRBC)

The railway transport sector is managed and regulated by KRC, a state corporation under the State Department for Transport under the Ministry of Transport, Infrastructure, Housing and Urban Development. Railway transport in the country began in 1896 and was completed in 1901, with branches of the rail being added in subsequent years. Rail construction within the country did not extend beyond the initial railway network which made the sector stagnate at its infancy. In 2012, Kenya and Chinese government undertook to construct the SGR on the Northern Corridor and the LAPSSET Corridor (Chege, 2018).

On the Northern Corridor, the contract for construction of the Mombasa Nairobi SGR was operationalized in December 2014. Within the terms of the contract KRC was as the client on one hand whilst CRBC was the main contractor on the other hand. Other parties to the contract were the consultants who played an oversight role. In this regard, both local and Chinese consultants were hired to provide an oversight role into the project. The SGR contract is an Engineering Procurement Construction (EPC) contract. Unlike other simpler construction contracts an EPC contract provides that the contractor is also the designer of the project and also carries out the procurement processes. An EPC contract is therefore unique and provides ample opportunity for technology transfer due to intensified foreign and local interactions (Chege, 2018).
During the subsistence of the entire Phase One SGR project a total of 37,959 persons were employed by CRBC. All the employees received some form of training with some getting more specialized training than others. The training and capacity building programs ranged from intensive training of engineers to basic safety training of both semi-skilled and unskilled workers. Trainings were conducted at the Kenya Railways Institute (KRI) whilst other trainings include onsite trainings and practical operations (APEC Consultants Ltd, 2017).

The 2014 SGR contract was quite specific in its stipulation that capacity building and technology transfer was a requirement of completion of the project. The various parties to the SGR contract had a role in ensuring that technology transfer and capacity building is effected. CRBC (EPC Contractor) was expected to carry out training of the client’s (KRC) both junior and senior staff in railway construction and management. KRC was charged with curriculum development as well as facilitating training programs and other incidental issues pertinent to the training. (APEC Consultants Ltd, 2017).

Capacity building and training was to be carried out in the following areas; Railway Project Management, Railway Survey and design and design review, Contract Management, Construction Supervision, benchmarking exercises of China Railways in order to establishment of its standards and management system, technology management of railway survey and design in China, Project financing by China Exim Bank, Basic Locomotive and rolling stock Engineering and Basic Railway Transport and logistics. The programs were carried out in Kenya and in China involving different levels of training and capacity building (Chege, 2018).
The main objectives of the capacity building program was articulated as, to improve the capacity of local consulting firms in design and consulting level to the extent with that future undertaking railway design and supervision is conducted under independent capacity; to transfer Chinese railway construction technology to local personnel and firms; and to enable the client (KRC) to obtain information on Chinese railway scientific and technological knowledge and thus come up with its own railway technology system and management system (Waititu, 2018).

Between the year 2016 and 2017, extensive training and capacity building conducted by CRBC (Contractor) was carried out as follows:

<table>
<thead>
<tr>
<th>No</th>
<th>Programme</th>
<th>No, of Trainees</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Basic Transport and Logistics</td>
<td>34</td>
<td>2016</td>
</tr>
<tr>
<td>2</td>
<td>Basic Signalling and Telecommunication Engineering</td>
<td>35</td>
<td>2016</td>
</tr>
<tr>
<td>3</td>
<td>Basic Locomotive and Rolling Stack Engineering</td>
<td>35</td>
<td>2016</td>
</tr>
<tr>
<td></td>
<td><strong>Total No. of Students for 2016</strong></td>
<td><strong>104</strong></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>Assistant Locomotive Drivers</td>
<td>32</td>
<td>2017</td>
</tr>
<tr>
<td>2.</td>
<td>Track Maintenance Technician</td>
<td>32</td>
<td>2017</td>
</tr>
<tr>
<td>3.</td>
<td>Signalling Technician Course</td>
<td>28</td>
<td>2017</td>
</tr>
<tr>
<td>4.</td>
<td>Communication Technician Course</td>
<td>26</td>
<td>2017</td>
</tr>
<tr>
<td>5.</td>
<td>Shunting Technician</td>
<td>30</td>
<td>2017</td>
</tr>
<tr>
<td>6.</td>
<td>Station Masters</td>
<td>37</td>
<td>2017</td>
</tr>
<tr>
<td>7.</td>
<td>Track Technician</td>
<td>41</td>
<td>2017</td>
</tr>
<tr>
<td>8.</td>
<td>Passenger Operations Officer</td>
<td>110</td>
<td>2017</td>
</tr>
<tr>
<td>9.</td>
<td>Passenger Train Crew</td>
<td>127</td>
<td>2017</td>
</tr>
<tr>
<td>10.</td>
<td>Passenger Train Technician</td>
<td>25</td>
<td>2017</td>
</tr>
<tr>
<td>11.</td>
<td>Freight Train Technician</td>
<td>73</td>
<td>2017</td>
</tr>
<tr>
<td>12.</td>
<td>Station Master</td>
<td>45</td>
<td>2017</td>
</tr>
<tr>
<td>13.</td>
<td>Locomotive Maintenance</td>
<td>43</td>
<td>2017</td>
</tr>
</tbody>
</table>
Table 2 : Training programs carried out by CRBC and KRC under SGR Contract sourced from APEC Consultants

Besides carrying being the SGR contractor, CRBC has also been awarded road projects by KENHA. CRBC has been engaged in four road construction projects. These include parts of Thika Road and the Northern Corridor project among others. CRBC employed a considerable amount of local labour in the projects and carried out training of its employees during the road construction projects. However, there was no contractual requirement to carry out training or capacity building on part of CRBC with most of the training being conducted out of necessity (Murenga, 2018).

4.2.4 China Railways Development Corporation (CRDC)

CRDC as lead consultant with a supervisory and oversight role over the SGR project ensured that local consulting firms (EDON architects and APEC consultants) received the technical and managerial training to provide a meticulous oversight role of mega construction projects such as the SGR. Training programs were customized to different oversight and auditing stages of construction and different areas of expertise, including intercommunication, training, and knowledge transfer, arrangement of trainee engineers and methods of mutual improvement during the works. During the training technology transfer from the senior and more experienced consulting staff to those with less experience was emphasized. This specialized arrangement was to ensure that a good foundation to complete the future management of railway operation was
laid. Chinese engineers worked ensure that knowledge was passed on to the Kenyan /local engineers (APEC Consultants, 2017).

The training and capacity building was carried out in the areas of civil works, which included railway truck design and construction supervision. Training also revolved around communication, signaling and electricity that involved extensive knowledge and technology transfer since it introduced a wholesomely a new system of information management system for railway operations. The signal, electrical and communication equipment was also manufactured and exported from China. Training at the consultancy level by CRDC was conducted as follows:-

<table>
<thead>
<tr>
<th>Program</th>
<th>Number of Personnel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Field operations training (Junior Management) 2 years of work experience.</td>
<td>10</td>
</tr>
<tr>
<td>Capacity building training (senior management) with more than 5 years of experience.</td>
<td>10</td>
</tr>
<tr>
<td>Capacity building training for senior adviser/experts with more than 10 years of experience.</td>
<td>10</td>
</tr>
</tbody>
</table>

*Table 3: No of training carried out by the Chinese Consultants CRDC in 2017*

Further training was conducted where the Railway Training Institute in conjunction with Chinese Universities on future maintenance, operations and management in order to build local capacity
on operations and management skills. In this program, KRC staff travelled to China to Southwest Jiaotong University for training. Further to this, staff from the same university travelled to RTI to conduct a four months training programme. Additional training will be carried out by CRBC to enable Kenyan universities to carry out specialized railway construction and management training in the future. In this regard discussions are underway between KRC and the University of Nairobi to formulate a training program with possible funding from the Chinese Embassy (Chege, 2018).

4.2.5 China Roads Construction Company

CRCC is a Chinese MNC that has twenty eight subsidiaries worldwide. One of the major projects carried out by CRCC is construction of Machakos-Athi River Road scheduled to be completed over a three-year period (2016-2018). CRCC has undertaken other projects in Ethiopia, Angola and Uganda. Although CRCC had signed a contractual agreement on capacity building the MNC does not have any training and capacity building programs running for junior officers currently. However, onsite training by senior Chinese staff members involves technical activities such designing, evaluation thus offering good practical experience. The equipment they use is imported from China and thus the local labourers are trained on how to use the equipment (Sirucha, 2018).

The contracts signed require CRCC to engage Chinese members of staff that are fluent in the English language. The contracts also have a requirement of local percentage in employing local labour. Technology transfer is evident through on-site training (there are more foremen being
trained, on the use of steel-fixers and other specialized). However CRCC occasionally conducts formalized training. For instance in December 2017, three local senior staff members were facilitated to travel to China for specialized training. CRCC is able to import construction equipment tax free to facilitate the smooth operations of the projects. After the completion of the roads project, CRCC intends to sell the equipment to government (and taxes duly paid) or ship it back to China (Sirucha, 2018).

4.3 Objective 3:

To assess the perception of local professionals on policy framework as well as the prevalence of technology transfer from Chinese MNCs into the construction sector

To answer this objective, primary data was gathered through interviews of Kenyan professionals within government institutions, local firms and Chinese MNCs. Professionals from KIA, KRC, APEC Consultants, KENHA, CRCC, NHC and NCA were interviewed.

4.3.1 Kenya’s national policy framework

Policy and legislation that regulates the function of technology transfer from the Chinese MNCs has not been consistent due to the lack of clear policy framework on the side of the government requiring MNCs to carry out technology transfer in their projects. Construction contracts are awarded differently and therefore have differing stipulations as far as technology transfer is concerned. A lot of institutions have been established to regulate varied issues touching on the same. Nonetheless, it remains difficult to monitor and evaluate technology transfer since the
institutions lack the requisite linkages and operate individually. Their activities remain largely uncoordinated (Musee, 2018).

The NCA Act 41 of 2011 has consolidated all issues regarding construction under one umbrella. Technology transfer has also been envisaged within the Act. However enforcement by NCA has been a challenge due to limitations in capacity in terms the number of employees that the authority has as well as limitations in other resources. NCA is thus unable to conduct inspections of all the individual projects being carried out by foreign firms within the country and establish whether capacity building and technology transfer is actually taking place. Therefore, the authority resorts to periodic sampling of major projects. Evaluating whether technology transfer actually takes place in projects done by Chinese MNCs is yet to be fully carried out. (Akech, 2018).

4.3.2 Technology transfer within the housing sector

Construction in the housing within Kenya is governed by local codes and standards which are markedly different from the Chinese ones. Despite interaction with Chinese contractors in multiple construction projects, Kenyan architects and engineers are still reluctant to adopt Chinese codes and standards because it’s a different ‘construction culture’ altogether. Consequently, Chinese codes in construction are yet to gain any competitive advantage within the real estate sector as local firms prefer to use local codes (Mungai, 2018).
However Chinese construction equipment is superior in that it saves time and costs. Furthermore Chinese have cheaper construction material as compared to what is found in the local Kenyan market. Due to availability of the cheaper construction material within the local market, local contractors are increasingly using Chinese material (Mungai, 2018).

4.3.3 Transfer of technology in the transport sector

In the road transport sector, technology transfer has been evident though in a relatively smaller magnitude. On the part of local firms, road design has been carried out by firms from various countries with comparatively low contribution from Chinese firms. For the major Kenyan highways consultants have mainly been sourced from Indian, Japanese, South Korean and Italian firms. The Chinese have a higher participation as contractors who come in to construct complete design which again limits opportunities for technology transfer. Furthermore, competitive bidding between local and Chinese contractors has created acrimony amongst the contractors where Kenyan contractors feel that China is increasingly taking over the construction sector and as a result, limiting technology transfer (Momanyi, 2018).

In most road projects, technology transfer is expected to take place through training programs. However in the many instances observed, Chinese use their own equipment whose manuals are in Chinese and therefore local workers are not able to fully acquire the skill of operating the equipment. Furthermore, Chinese equipment is an imitation of western machinery and in that sense is not new. Chinese MNCs are not interested in transfer of technology but are only focused on completion of the projects at hand. Technology transfer was witnessed during SGR
construction but it came with agitation from various stakeholders before it was integrated into the project (Omer, 2018).

In the railway sector, local consultants affirm that there has been significant technology transfer through the SGR projects. In future, firms such as APEC Consortium Ltd, will have capacity to manage massive projects such as SGR. Engineers not only have the ability to provide the design such a railway project but also have the ability to logistically plan for financial, human resources, procurement, legal and other input required for such a project. Furthermore, local consultancies now boast of experience of having oversight and supervisory experience and know-how of auditing the processes and outcomes of mega railway projects (Waititu, 2018).

The SGR was the first project of its kind as it fundamentally redefined railway transport in Kenya. Due to the fact that the railway sector remained stagnant for decades, most engineers within the sector had achieved very little practical experience in railway construction, operations and management. Similarly railway design was also still in its infancy within the country and hence SGR brought about new skills in this regard (Chege, 2018).

The negotiation of the SGR contract was intricate and took about two years bringing about numerous considerations that were hitherto not experienced within the sector. The legal exigencies brought about by the contract provided a unique learning opportunity on how to articulate needs and obligations under bilateral agreements. KRC as the client got unique legal experience and attained new skills in contract management (Chege, 2018).
5. CHAPTER FIVE

This Chapter entails an analytical breakdown of the findings under the objectives in Chapter four as well as recommendations on the same.

5.1 Analysis

Technology transfer remains a relevant part of international relations between countries as it remains a crucial factor in industrialization and rapid economic growth of a country. The dialogue of technology transfer between China and Kenya therefore continues to be relevant in that it provides an opportunity for Kenya to acquire technology for boosting its own industrial and technological capacities.
5.1.1 Objective 1 Analysis:

Under this objective the technology transfer framework within Kenya was examined. Additionally the Kenya- China partnership was examined to see whether it prominently featured technology transfer.

Though the technology transfer was envisaged in various policy papers, the said policies have not given a priority to on international technology transfer. Policies have focused on technological advancement and innovation and have prioritized the need for research and development at the local level. However no policy has directly addressed to need to maximize on technology transfer emanating from foreign firms into the local sector. This is reflected by the fact that oversight bodies such as NCA are limited in oversight and enforcement capacities. Implementation bodies such as NHC and KENHA have not been keen on enforcing terms of contract that require technology transfer from Chinese MNCs.

Ideally NCA being the body mandated with development, quality control and capacity building within the sector, there appears to be minimal input in guiding and enabling the implementing bodies to carry out the capacity building as stipulated by the NCA Act of 2011. From the primary data collected little coordination and links exist between the various agencies that would be the enablers for technology transfer. For instance, there is no express arrangement between the Authorities and the training school that training by the Chinese MNCs is conducted. Under the NHC policy there is only a requirement that the contractors that are awarded a construction tender should pay a levy to be used as a fee at the KIBHT. However, without programs ran by
persons directly associated with the Chinese MNCs the new techniques of construction as well as knowhow in use of new modernized construction equipment will not be passed to local trainees.

Different policy proposals have focused on R&D as a vital factor of technological advancement. However, the R&D envisaged in local policies has not been geared towards enhancing the absorptive capacity of various economic sectors to absorb technology from more developed countries has been given minimal attention. Further linkages between various research institutions (KIRDI) and the implementing bodies (KENHA, KRC and NHC) are inconsistent and uncoordinated which makes development and capacity building within the sector uncoordinated. The 2013 NIP policy is thus far the most comprehensive policy document in that it recognizes the role of government institutions in creating linkages between foreign and local firms. However, NIP specifically fails to address the construction sector and appears to be more geared towards the manufacturing sector. NIP is also silent on addressing the shortcomings of previous policy efforts on technology transfer.

Despite the numerous efforts made by the various policy documents to ensure technology transfer emanating from FDI, no policy has made it a requirement for contractual agreements between local and foreign entities. For example, Chinese MNCs operating within the construction sector are fully foreign owned subsidiaries of their parent companies abroad. No joint ventures with local firms are visible within the construction industry. With no policy deliberately pushing for such arrangements to create links between foreign and local firms, technology transfer is minimal or completely absent.
5.1.2 Objective 2 Analysis:

Under objective 2, findings focused on prevalence of technology transfer from Chinese MNCs into the Kenya government construction sector. Findings focused on the real estate, roads and the railways sector.

i. **Gansu International Corporation for Techno-Economic Corporation**

Technology transfer is not prevalent within the activities of the Chinese MNC. This is due to the fact that no technology transfer agreement has been in place for the projects that it has undertaken on behalf of the government. There are also no agreements on training and capacity building that have been put in place for the MNC during its engagement with its client, NHC. Technology transfer can only be witnessed at the level of its onsite training that the MNC conducts for its local labourers during the construction process.

ii. **China Wuyi Company Ltd.**

China Wuyi, through its Kenya Building Industrialization Research and Development Production Base established at Athi River, Machakos County has been able to introduce new and cheaper construction products. The base acts a source for new methodology and technology in construction within the country. This gives opportunity to local firms acquire new technology through imitation. However, neither local construction firms nor government consultants have adopted new technology brought in by China WUYI in the housing sector.
China Wuyi has brought in the use of new equipment in roads construction. This has not resulted in transfer of technology because the equipment remains within the MNC and is not shared with local contractors. The equipment is also difficult to use and adopt locally since the functionalities and manuals are in Chinese language, thus not user friendly. Furthermore, there is no policy requirement that the equipment is transferred to the Kenyan government or sold to local firms who would then incorporate it into their methodology. The opportunity to retain technology from the capital goods (in this case construction equipment) is severely limited.

iii. China Roads and Bridges Corporation

In the railway sector, the EPC contract awarded to CRBC by KRC (client) obligates the contractor to design, build and operate as well as facilitate handover the client. This process largely involved step by step capacity building and had several key features that allowed opportunity for technology transfer. This include; requirement that local firms (consultants) and suppliers must be included in the contract, incorporating both foreign and local firms as consultants (allowing them an opportunity to be involved in the design process), express requirement on the contract that technology transfer must be effected and incorporating of local training and academic institutions in training and capacity building programs.

Despite the fair success in technology transfer within the SGR project and enhancing the capacity of KRC (client), technology transfer was also limited in some areas. CRBC (as the main contractor) carried out the construction works throughout phase one of the project. However majority of the firms sub-contracted by CRBC were supplying raw materials such as sand,
ballast and timber or were only involved in peripheral construction works. Technology transfer was therefore not optimized during the process.

iv. **China Railways Development Corporation**

The MNCs was the lead consultant during phase one of the SGR project. Due to the clearly stipulated contractual requirement, technology transfer was achievable in this instance. Technology transfer was witnessed through training of local consultants and well as KRC members of staff.

v. **China Roads Construction Company**

Though the MNC’s senior management was aware of agreement with KENHA to ensure technology transfer, the company had no internal programs such as training to ensure that this happened. The company has its own incidental training opportunities for local staff members. No licensing or training agreements exists with local firms. Technology transfer is therefore minimal in this regard.

5.1.3 **Objective 3 Analysis:**

To assess the perception of local professionals on policy framework as well as the prevalence of technology transfer from Chinese MNCs into the construction sector

The interviewees were from various areas within the construction sector and had varied opinions as the prevalence of technology transfer. Majority of the professionals are of the opinion that Chinese use different methodologies and more advance equipment in carrying out construction. The professionals were also of the opinion that there are opportunities for technology transfer
from Chinese MNCs who have better capacity and superior technology which could be an added advantage to the Kenyan construction sector.

However their opinion on technology transfer policies seem to vary as no clear cut policy on the same was given by the respondents. From this it can be concluded that technology transfer is not a priority in the construction projects that are carried out. Apart from the SGR project, the respondents were not sure of technology transfer witnessed in other instances of construction projects done by the Chinese.

5.2 Conclusion and Recommendations

The policy framework regulating international technology transfer is not clear thus is not sufficient to enable the Kenyan government construction sector to sufficiently absorb new technology from Chinese MNCs. Technology transfer is also not a priority in the bodies regulating and implementing policy within the construction sector. This has severely limited the opportunities for technology transfer. Technology transfer was also more apparent where specific provision was made within the construction contracts in addition to policy. This is apparent when comparing the SGR project to other construction projects carried out by Chinese MNCs.

For technology transfer to be optimized in construction projects involving MNCs it is recommendable that policy specifically dealing the same is formulated. Further oversight bodies such as NCA and NHC need to ensure that technology transfer is prioritized within every construction project to ensure that technology transfer is successful.
Bibliography


6. APPENDICES

Research Tools

Sample One Interview tool
Sample Two Interview tool