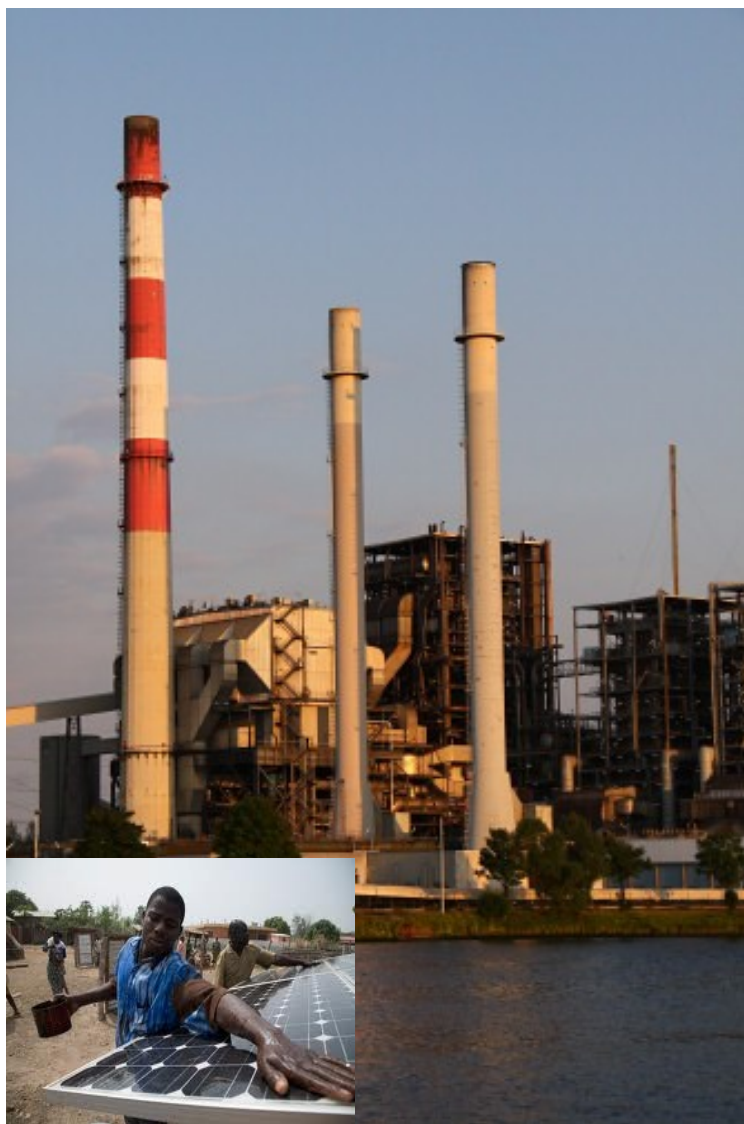


New Industrial Policy



'We view with disquiet the overdependence of the economy of our continent...

(Lagos Plan of Action: OAU, 1980)

HIGHLIGHTS:

Problems facing Local Manufacturers in the Nigerian Agro-Allied Machine Fabrication Industry

From Science and Technology to Innovation for Development

Exploring the Constraints of Rural Enterprise Development and Poverty Reduction in Ghana

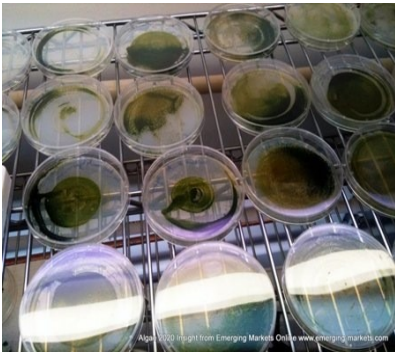
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PROBLEMS FACING LOCAL MANUFACTURERS IN THE NIGERIAN AGRO-ALLIED MACHINE FABRICATION INDUSTRY

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Abstract

This study investigates the challenges and opportunities of the local industries involved in the fabrication of agro-related machinery in Nigeria. With the aid of personal interviews, on-spot assessment/visual inspection, a number of problems confronting these local industries were recorded. These include erratic power supply, cost of raw materials, level of automation, noise pollution, occupational hazards, instability in government policies, marketability and a general bias for machines fabricated locally.

The government is currently making efforts at reviving the economy, yet the priorities set in addressing the problems of the local economy may not be aligned with the actual priority problems that local companies face in their daily business. The paper makes suggestions on how the government could better address the primary concerns of the industry in areas like power supply, raw material processing and sensitization of the Nigeria populace towards appreciating and procuring locally made machines.

Keywords: Agro-Allied Industries, Agro-Allied Machinery, Policy Instability, Development, Raw Materials

1. Introduction

Most agricultural produce that is sold in formal markets requires post-harvest processing operations. The market for processing machines therefore is of significant economic importance and offers great opportunities for local companies which specialize in fabricating agro-allied machinery (both "pre" and "post" harvest machines) and their existence and operations is pivotal to the overall success of the country as a would-be industrialized nation. Machines fabricated by such companies include the cassava press, cassava grater, cassava chipper, maize sheller, plate mill, honey press, cassava sifter, hammer mill, multi-purpose grain thresher, de-stoners, dryers, planters, feed mill mixers, graders etc. Food processing is an integral part of agriculture as most farm produce must undergo one form of conversion or the other either for storage or breaking down into smaller, workable units as a food source or raw material.

Just as Nigeria is known for its yet largely unrealized potential for agricultural development and the positive welfare effects it would create for poor rural producers and urban consumers, an important condition for its future success is the creation of a suitable institutional environment that allow local industries to operate professionally

and thus boost the returns of the food and agro-allied sector; ensuring more export earnings for the country. It is pertinent to note that as the world is increasingly becoming a global village, there is a lot of competition from industrialized countries to use developing countries like Nigeria as a dumping ground for obsolete products (1,2,3). This negatively impacts local producers because most times, they cannot compete with these cheap give-aways. Hence, this study seeks to find feasible solutions that policy makers can adopt in support of the local producers of agro-allied machinery in this current environment.

The objectives of this study are:

- (i) To highlight the problems facing indigenous industries fabricating agro-allied equipment in Nigeria with a view to national development and,
- (ii) To suggest possible solutions that can effectively tackle these problems.

2. literature review

Until Nigeria attained independence in 1960, agriculture was the most important sector of the economy as it accounted for more than one-half of Gross Domestic Product and for more than three-quarters of export earnings (4,5). This shows how important this sector of the Nigerian economy was until it was neglected after the oil boom.

Political and institutional instability was another factor that affected the management and performance of Nigerian agricultural research institutes who were meant to be develop new and innovative ways of solving agro-related problems and pass the knowledge on to industries for adoption (6). The decline of agriculture in Nigeria also led to a general neglect of local agro-industries by investors and policy makers. The problem in public policy was the lack of long-term consistency and predictability. Successive government abandoned previous policy strategies and instead came up with completely new ones. Examples of previous agricultural policy strategies include policy initiatives related to Operation Feed the Nation of 1976, the Green Revolution of 1980, Directorate of Food, Roads and Rural Infrastructures in 1986, withdrawal of fertilizer subsidies in Mid 1990's and restoration of

fertilizer subsidies at 25% between 1999 and 2000 (6). Others include the Cassava Initiative in 2002 and the Seven Point Agenda of 2007.

With Nigeria's return to democracy in 1999, the Federal Government identified import dependence, reliance on a single commodity (crude oil), a weak industrial base, low level of agricultural production and a weak private sector as the major weaknesses of the Nigerian economy (7). As a result, the government made the development of the agricultural sector the highest priority both for poverty reduction and improvement of the economy. Also, new technology, improved seedlings, better storage facilities and access to funds at reduced lending rates were to be made readily available. It was also reported that the government would move the country away from being an export dependent country as all necessary incentives and encouragement will be given for the development of the agro-allied industries as contained under the Small and Medium-scale Enterprises (SME) act (7,8).

Foreign investors were not left out of the developmental strategies as the Federal Government of Nigeria invited foreign companies to come and help tackle the problems facing different sectors of the economy. For instance, the Federal Government encouraged certain Ukrainian firms to boost their investment in Nigeria's steel sector (9). Nigeria is a country rich in iron ore, the principal element in the making of steel products which in turn is a major raw material in the agro-allied machinery fabrication industry. Similar invitations had also been given to Russia and China.

As part of the efforts to encourage local production in the primary sector of Nigeria, the government also imposed a ban on a number of foreign goods which can be sourced in Nigeria e.g. poultry products, leather products, textiles, etc. Moreover, the Nigeria's National Cocoa Development Committee recommended a total ban on the importation of cocoa products into the country as part of measures to protect the local cocoa growing and processing industry (10). All these measures had varying impacts on local SME industries. The question however is, has the current efforts by the Nigerian federal government alleviated or compounded problem being faced by the agro-allied machine fabrication sub-sector of the Nigerian economy? In order to ascertain their current situation, a study was conducted on agro-allied machinery fabrication industries in Ibadan, the largest city in Nigeria and a major agricultural hub and trade route in western Africa.

3 Methodology

In carrying out this study, the following methods were used to get information from the target industry:

3.1 On Spot Assessment and Inspection

Visits were paid to the factory premises of selected companies for an "on the spot" assessment. Various divisions of the workshops were examined to inspect ma-

chines being produced in their cutting/fabrication, joining and finishing sections. In doing this, the physical conditions of the factory site and workshop were inspected including the working environment of the artisans and technicians employed at the factories. The problems that workers were having in each sub-division were also noted.

3.2 Personal Interviews

Interviews were conducted with people from all cadres and sections of the companies. This included the chairmen/managing directors, administrative director/accountant, factory foremen, heads of joining and finishing subdivision, fabrication sub-divisional heads, industrial training apprentices, etc. These were able to shed light on areas of enquiry.

4. Results and discussion

The findings reveal that even though there has been some level of improvement in some areas of operation in the industry, there still exist myriads of problems confronting these small and medium scale enterprises. For example, the ban on importation of poultry products (e.g. turkey, chicken and eggs) has gone a long way to help improve the operating environment for the agro-allied processing machine fabrication industry. According to respondents, the local producers of poultry products had to increase their production to meet the local demands, since consumers can no longer buy imported frozen turkey and chicken like before. With this need for increased production came a corresponding increase in demand for the fabrication of "Feed-mill mixers", a processing machine used in the production of animal feed and which can be easily produced locally by technicians in the agro-allied machinery fabrication industry.

As encouraging as this may be, findings revealed that the agro-allied machinery fabrication industry is still facing tough times due to the high costs of construction materials, unreliable power supply, lack of marketing skills, inadequate labour safety, neglect of waste disposal, low level of technology and indigenous product bias.

These problems are discussed in more detail in the following section.

4.1 Cost of Construction Materials:

The materials of construction being used in this industry ranges from angle iron bars, iron rods, steel plates, stainless steel plates, pulleys, vee-belts, bolts and nuts, electrodes, bearings, square pipes, flat bars etc. Because these are the main raw materials, their costs greatly influence the overall price of the fabricated machine. Table 1 shows current prices of some of these mostly imported raw materials. The prices quoted change in accordance with the exchange rates at the international market but generally they are all increasing.

Table 1: Prices of Some Raw Materials in the Nigerian Agro-Allied Industry (July 2010)

S/N	Raw Material	2008 Price in Naira	2010 Price (in Naira)	Equivalent Price in U.S. Dollars @ N150/Dollar
1	Gauge 20 black steel plate	3,500	4,800	32
2	Gauge 18 black steel plate	4,200	5,000	33.3
3	Gauge 16 black steel plate	5,800	6,500	43.3
4	Gauge 14 black steel plate	9,000	7,500	50
5	Gauge 20 stainless steel plate	25,000	32,000	213.3
6	Gauge 18 stainless steel plate	31,500	37,500	250
7	Gauge 16 stainless steel plate	34,500	40,500	270
8	Gauge 14 stainless steel plate	38,500	45,500	303.3
9	Gauge 20 galvanized steel plate	12,500	15,000	100
10	Gauge 18 galvanized steel plate	13,000	18,500	123.3
11	Gauge 16 galvanized steel plate	19,500	22,500	150
12	Gauge 14 galvanized steel plate	27,500	30,500	203.3
13	Stainless steel Electrode (1 pack)	9,500 (150 pieces in a pack)	12,000 (150 pieces in a pack)	80
14	Ordinary Electrode (1 pack)	1,150 (150 pieces in a pack)	1,600 (150 pieces in a pack)	10.7

4.2 Power Supply

These industries cannot exist without electricity. As a matter of fact, their very existence is based on electricity supply since basically; all their operations in machine fabrication require one form of electrical energy or the other. These include lathe machine operations; welding, grinding, power saw cutting, nibbler cutting, drilling, milling machine operations, etc. As is the case in Nigeria generally, power supply has been very erratic. This slows down production and most times, set targets are not met. As at the time of this study, some of the factories visited complained of having been without power supply for over 3 days while some others had been on generators for weeks.

Operating a fabricating factory like these on power supply from generating sets is costlier compared to power supply derivable from the National Grid (NEPA). This also adds to the overall cost of production and

ultimately the selling price of these machines as cost of maintaining and fuelling the generator also comes into consideration. This corroborates findings reported by other researchers on the on SMEs' and industrialization in Nigeria (11,12,13,14,15,16,17).

4.3 Restricted Market Base

Respondents made it known that most of the requests for machines come as a result of development programmes sponsored by big organizations like the United Nations Industrial Development Organization (UNIDO), International Institute of Tropical Agriculture (IITA) Ibadan, Federal and State Government projects after which there comes a fall in demand. Other sources are large scale farms with considerable hectares of land which are very few in Nigeria. This shows how restricted the market for these industries are since about 70% of agriculture in Nigeria is still on small scale or subsistence

levels. Moreover, many large scale companies which are into agri-business (cocoa processing, milk and milk products, fruit juice etc.) import most of their equipment from developed countries where quite a number of them have their roots. Moreover, because of the cost of production, the final cost of these machines is sometimes beyond the reach of individuals who may wish to acquire one. This affects marketability in the local and to some extent, the international arena knowing fully well that there are competitors mostly from Asian countries.

4.4 Waste Disposal

It was observed that waste disposal is a major problem even though workers at the factory did not mention this. Dumps for scrap metal, metal chips, used chrome cuttings etc. litter the factory premises. Dumps are located just outside the workshop where it is exposed to the forces of nature (air, water, rain etc). Since these materials are non-biodegradable, they constitute a nuisance to the environment. Had it been that these can be recycled or given back in exchange for money, the problems disposal would have been reduced.

4.5 Noise

Findings from this study also revealed that the technicians and artisans complained about noise levels they were exposed to during some of their operations. Noise arise from the various jobs being done by factory workers or usage of heavy equipment at the same time e.g. generator, grinding, chiselling, hammering, beating to shape, shaft threading etc. Noise levels depend on how many of these operations are carried out at the same time.

It was observed that different people respond differently to noise levels and even though, there was no scientific equipment readily available during the study for measuring the various decibels of sound the workers were exposed to, it was quite clear that the working environment will be a much better had it been that something could be done to check the effect of noise pollution on the workers.

4.6 Safety

Loss of lives or maiming was reported to be a frequent occurrence. The most common safety problems are the dangers of electrocution, paint fumes at the spraying section, flying metal chips and fatal accidents while working at the lathe machine. A technician at one of the factories visited was actually maimed by the lathe machine as he was working on it shortly before this study was conducted and he was certified unfit to work on the lathe machine again. In another factory, finishing work was being done on a set of cassava pressing machines at the painting section and the artisan working on it had to use cotton wool to cover his nostrils to minimize the volume of paint fumes being inhaled by him because of the serious respiratory/health problems that could arise from it. Most places visited had no first-aid-kit in place. Throughout the period of the study, it was observed that there was no government agency that inspects or ensures occupational safety and health standards for workers.

4.7 Level of Technology/Automation

Automation can be said to be at a discouraging low level in fabricating industries in Nigeria. Thus, the progress of work is slow as human factors greatly come into play in these situations. This also affects the finishing aspect of production as errors based on human judgements are sometimes very conspicuous.

4.8 Indigenous Product Bias

Some respondents complained that while marketing their machines, they often meet with a general indigenous product bias among the Nigerian populace as people prefer to go for imported machines rather than patronize the locally fabricated ones. This is because it is generally assumed that any Nigerian made product is fake or sub-standard and this creates an atmosphere of discouragement for the local producers. Also, this bias also results in an uneven competition in the market between the locally fabricated ones and the imported machines even though the locally fabricated ones could also be efficient in operation.

4.9 Policy Instability

All respondents re-iterated the fact that sudden policy changes seriously hinder the growth of their industry. For instance, the management of some factories visited made it known that during the Cassava Initiative in 2002, most of the machines demanded for then were cassava related (e.g. graters, chippers, presses etc). This clearly reflected the government policy on cassava and cassava products exportation then. However, that was no longer the case as the intense publicity of the initiative then has since given way to other policy issues when another administration came into power (18,19,20).

5.0 Conclusion and recommendations

From the facts gathered from this study, it is clear that the local agro-allied machinery fabrication industry in Nigeria has quite a number of problems confronting them. There is need to see this sector of the Nigerian economy as an upcoming and viable sub-sector of the SMEs' in Nigeria. As such, any problem confronting the sector should be seen as a problem confronting the nation as a whole. Should Nigeria develop in her indigenous technology to an appreciable level in terms of what is available in the international world, the country which is so blessed with both human and national resources can rise up and stand in a formidable position not only as an industrial giant in Africa, but also as a force to reckon with in the global market.

As a result of indigenous technological development and breakthroughs attributed to good operational environment created through favourable policies, a nation like India with an economy worse than Nigeria before can now boast of having a say in the technological world. This can also be the case in Nigeria should

proper focus and attention be given to this sector of the Nigerian economy.

In 1987, radio-active wastes were brought from Italy and dumped in a town known as Koko in the old Bendel state of Nigeria. This resulted in loss of lives even though the situation was arrested on time. Likewise, dumping of foreign goods and technology on Nigeria should be seen as being dangerous just like that of the Koko wastes saga as long as there are competent hands within the country to help in the area of technological development.

5.2 Recommendations

While the Federal Government of Nigeria might be commended for efforts aimed at resuscitating the ailing industry, the following recommendations if implemented will enhance the performance of agro- allied machinery fabrication industries in Nigeria:

- (i) Local producers should be encouraged and assisted as regards the cost of raw materials for their industries. If this is done the cost of production will be less and marketability will increase. Since the primary raw material used in producing these secondary raw materials are available in Nigeria, the government should find a way of reviving the relevant sectors of the economy involved in turning these primary raw materials into their secondary forms (e.g. iron ore into steel products). These include the Osogbo Machine Tools and Ajaokuta Steel Rolling Mills.
- (ii) A more conducive environment should be created for the local industries by enacting policies that will ban the importation of products or machines that may stifle or choke the local fabricating industries as was done in the case of poultry products for example.
- (iii) Electricity supply should be improved till it becomes not just more regular but stable.
- (iv) Petroleum products should be made available in abundance at all times as there will always be need for it in terms of power generation as well as transportation of raw materials and finished products. Since Nigeria is rich in crude oil, efforts should be made at reviving and building more refineries in the country.
- (v) The Nigerian populace should be sensitized to be more positively disposed to Nigerian products as this will help in its development as this will eventually help the local industries to grow.
- (vi) Safety measures should be ensured and enforced at local industries to minimize the industrial hazards occurring in the industry. Monitoring agencies should be created to effect in a way similar to what is obtainable in some other countries e.g. the Occupational Safety and Health Administration (OSHA) in the United States of America.

- (vii) Ear-muffs and gas masks should be provided where and when necessary by employers of labour at the industries to reduce the effects of noise pollution and health problems respectively.
- (viii) Increased effort should be made at improving waste disposal methods in the industries. This is because of the non-biodegradable nature of the raw materials (mostly metals) being utilized by the sector. Relevant professionals should be contacted for the possibility of recycling. Laws should also be formulated to enforce compliance by industries to environmental rules.
- (ix) Instability of government policies is an important issue which should be properly addressed as it is vital to the survival of this sector of the economy. A very recent example is the issue of the Cassava Initiative of the immediate past administration but which is no longer the being projected as before because another agenda has come up to replace it.

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FROM SCIENCE AND TECHNOLOGY TO INNOVATION FOR DEVELOPMENT

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Abstract

Science and Technology (S&T) for development is often associated with radical technological change that offers new opportunities for human development. In affluent, highly developed countries, the use of material saving and energy efficient technologies promises to gradually eliminate unsustainable consumption patterns; while in developing countries, S&T are expected to eradicate world poverty, diseases and underdevelopment. Despite the many warnings raised by development and S&T economists that sustainable technological change depends on corresponding institutional change, there has been a tendency to take the economic sustainability of new technologies for granted. Humanity, waiting so to say, for such “technology manna” and technology transfer from North to South to become implemented.

In this paper, I will not enter the global sustainability policy challenges, which have been discussed at greater length elsewhere (see Kemp, Soete and Weehuizen, 2005 and 2011), but focus on the shift from S&T to *Innovation for Development*, which has occurred over the last ten to twenty years. This shift fully recognizes the “endogenous” nature of innovation as opposed to the old, neo-classical exogenous view of technological change and technology transfer, as it was popular in the 70’s and 80’s.

1. Introduction

Many S&T scholars that contributed to endogenous growth literature found that the process of innovation is actually much more complex and challenging in a developing country context. Aghion and Howitt (2005) have questioned the sustainability of S&T even in the high income country context and argued that the future innovation policy challenge will need to address the double meaning of “non-sustainability” resulting from technological “progress”. Next to the ecological unsustainability of particular technological “progress” trajectories such as fossil fuel energy dependency, there is also the unsustainability of the “creative destruction” process within environments that give increasingly premiums to insiders, to security and risk aversiveness in favour of maintain rather than creating income and wealth. It is in this sense that as argued below, a high income environment is increasingly “inappropriate” for innovation that goes beyond incremental improvements.

In an emerging, developing country context, by contrast, it has been argued by a number of development economists

such as Martin Bell (1985), Carl Dahlman and Larry Westphal (1983) Sanyaya Lall (1992), Howard Pack (1981), that industrial science and technology policies appear first and foremost more directed towards “backing winners”. The central innovation policy question in these countries is how to further broaden an emerging national technological expertise in the direction of international competitiveness and specialisation. Such S&T policy broadening will have to involve a strong recognition on the part of policy makers of the importance of engineering and design skills, of accumulating “experience” rather than just Research and Development (R&D) investments and of enabling innovative entrepreneurship based on a multitude of talent and creativity across the board driven by the need to find solutions for the manifold problems of development. In short, the natural environment for innovation is likely to flourish in developing countries.. It is also in this environment that innovation takes on its full meaning: not just limited to technological innovation but including social and organisational innovation. As Lina Sonne (2011) has argued: “the need for increased ability to innovate should not be confused with the fixation on new state-of-the-art technology (Juma and Yee-Cheong, 2005). Instead a paradigm shift is needed away from these, often labour saving, innovative activities on the international innovation frontier, to mature or platform technologies. These less complex technologies are more useful for smaller scale and local solutions needed in terms of technology upgrading in developing countries (Juma and Yee-Cheong, 2005). Whilst frontier technologies are considered ‘exciting’ or ‘sexy’ it is the smaller and simpler innovation process which provides solutions that are more easily adapted to fit with the needs of countries where labour is generally abundant and cheap” .

2. Technology and the emergence of formalized industrial research activities

The strong focus on S&T, and industrial Research and Development (R&D) in particular, as the central factor behind economic development is actually of relatively recent origin. Up to the late 50’s, R&D was barely recognised by growth economists despite the recognition that “something” (a residual, a measure of our ignorance) was behind most of the economic growth in the 20th Century and the post-war period in particular. But, of course, long before the 20th Century, experimental development work on new or improved products and processes was carried out in many industries, mostly in ordinary workshops. As Chris Free-

man and myself noted in the Economics of Industrial Innovation: *"The early classical economists were well aware of the critical role of technology in economic progress even though they used a different terminology. Adam Smith (1776) observed that improvements in machinery came both from the manufacturers of machines and from "philosophers or men of specialisation, whose trade is not to do anything but to observe everything". But although he had already noted the importance of "natural philosophers" (the expression "scientist" only came into use in the nineteenth century), in his day the advance of technology was largely due to the inventiveness of people working directly in the production process or immediately associated with it: "... a great part of the machines made use of in those manufactures in which labour is most subdivided, were originally the inventions of common workmen" (Smith, 1776, p. 8). Technical progress was rapid but the techniques were such that experience and mechanical ingenuity enabled many improvements to be made as a result of direct observation and small-scale experiment. Most of the patents in this period were taken out by "mechanics" or "engineers", who did their own "development" work alongside production or privately. This type of inventive work still continues to-day and it is essential to remember that is hard to capture it in official R&D statistics."* (Freeman and Soete, 1997).

What became distinctive about modern, industrial R&D in the late 19th and early 20th Century was its scale, its scientific content and the extent of its professional specialisation. Suddenly a much greater part of technological progress appeared attributable to research and development work performed in specialised laboratories or pilot plants by full-time qualified staff. It was also this sort of work which got officially recorded in R&D statistics; if only because it was totally impracticable to measure the part-time and amateur inventive work typical of the nineteenth century. Thus, typical for most developed industrial societies of the 20th Century, there were now high-technology intensive industries, having as major sectoral characteristic the heavy, own, sector-internal R&D investments and low-technology intensive, more craft techniques based industries, with very little own R&D efforts. And while in many policy debate, industrial dynamism became as a result somewhat naively associated with just the dominance in a country's industrial structure of the presence of high-technology intensive sectors, the more sophisticated sectoral studies on the particular features of inter-sectoral technology flows, from Pavitt (1984) to Malerba (2004), brought back to the forefront many of the unmeasured, indirect sources of technical progress in the analysis. Unfortunately, many of those insights have not been translated in attempts at broadening the policy relevant concept of R&D.

3. From industrial R&D to innovation: a paradigm shift?

As increasingly acknowledged by innovation studies scholars ranging from economists such as Paul David and Dominique Foray to S&T studies scholars such as

Mike Gibbons and Helga Novotny, a major shift in one's understanding of the relationships between research, innovation and socio-economic development occurred over the last twenty years. It is interesting to note that both the more economically embedded innovation research community as well as the more STS embedded research community converge on this issue: in each case the perception of the nature of the innovation process appears to have changed significantly.

Thus for innovation economist such as David and Foray innovation capability is today seen less in terms of the ability to discover radically new technological principles, but much more in terms of the ability to exploit effects produced by new combinations – one is reminded of Schumpeter's already old notion of "neue Kombinationen" – and use of pieces from the existing stock of knowledge (David and Foray, 2002). This alternative view, also closely associated with the emergence of numerous knowledge "service" innovations, implies in other words a more routine use of an existing technological base allowing for innovation without the need for particular leaps in science and technology, sometimes also referred to as "innovation without research". This shift in the nature of the innovation process implies actually a more complex structure of knowledge production activities, involving a much greater diversity of organizations having as explicit goal the production of knowledge. The previous industrial system was based on a relatively simple dichotomy between knowledge generation and deliberate learning in R&D laboratories on the one hand, and production and consumption activities on the other hand where the motivation for acting was not to acquire new knowledge but rather to produce or use effective outputs. As David and Foray have argued: "the collapse (or partial collapse) of this dichotomy has led to a proliferation of new places having as an explicit goal the production and use of new knowledge". These places are no longer readily observable from national R&D statistics, yet they appear essential to sustain innovative activities, locally and even globally.

In short, most of our notions of traditional R&D-based technological progress are still dominant in many industrial sectors ranging from chemicals and pharmaceuticals to motor vehicles, semiconductors and electronic consumer goods. These sectors are characterized by the S&T system's ability to organise technological improvements along clearly agreed-upon criteria and ability to evaluate the progress continuously (Freeman and Soete, 2009). At the same time, a crucial part of the engineering research consisted, as Richard Nelson put it, "of the ability to hold in place" meaning to replicate and subsequently upscale experiments previously carried out in the research laboratory environment. As a result it involved first and foremost a cumulative process of technological progress: a continuous learning from natural and deliberate experiments. Many of the detailed historical descriptions by Vernan Ruttan, Nathan Rosenberg and Giovanni Dosi of the emergence of the agricultural, chemical, electri-

cal and electronic engineering research fields provide ample illustrations of such continuous learning processes.

The process of learning is very different in the alternative mode of technological progress described above. Since there is no procedure-related protocol in place yet, the development process is more based on flexibility and confronted with many intrinsic difficulties in replication. Learning from previous experiences or from other sectors is more difficult or can even be misleading. Evaluation is also difficult because of changing external circumstances over time, among sectors, across locations. It will often be impossible to separate out specific context variables from real causes and effects. In view of the frequent lack of availability of "hard" data that can be scientifically analysed and interpreted, technological "progress" will be much more based on trial and error. As a result, technological change is less predictable, more uncertain and ultimately more closely associated with entrepreneurial risk taking. Attempts at reducing such risks might involve, as Von Hippel (2004) has argued, a much greater importance given to users, already in the research process itself.

4. Implications for development

The new mode of technological progress brings to the forefront the importance of endogenous innovation processes in developing country situations. In the old industrial S&T model, the focus within a context of development was quite naturally on technology transfer and imitation: imitation to some extent as the opposite of innovation. In the new model, innovation is anything but imitation. Every innovation appears now to be unique with respect to its application. Re-use and re-combinations of sometimes routine, sometimes novel pieces of knowledge are likely to be of particular importance, but their successful application might ultimately well involve engineering expertise, design capabilities even research.

a) Innovation from the "tip" to the "bottom" of the income pyramid

A feature of the old industrial R&D and the underlying model of technological progress which has not received much attention in the development literature is the focus of industrial R&D on continuous quality improvements of existing and new consumer goods, enlarging at the same time continuously the demand for such quality improved or new consumer goods. The mass consumption growth model which emerged over the post-war period in the US, Europe and Japan appeared to generate its own infinite demand for more material consumer goods: a continuous growth path of rising income with increasing consumer goods' production and consumption (Pasinetti, 1981). As if consumer goods - contrary to food - would remain totally unaffected by Engel's law of decreasing marginal utility. I do not elaborate here on the challenges this growth model raises for achieving a pattern of sustainable development at the global level.

The continuously rising industrial R&D efforts in high income countries appeared in other words to match perfectly the continuously rising incomes of the citizens of those countries leading to a continuous enlargement of their consumption basket with new, better designed or better performing products. The actual initial demand for such quality improvements often arose from extreme professional use circumstances, but thanks to the advertising campaigns in the media portraying popular symbolic figures in sports and entertainment presenting the new products to emphasize the prestige image of such professional use - the average, non-professional consumer could easily become convinced of the personal need of such new goods even though those additional quality characteristics might ultimately add only marginally to individual utility. In a certain way the highest income groups in society, the "tip" of the income pyramid, acted often as first, try-out group in society, contributing happily to the innovation monopoly rents of the innovating firm. So a continuous circle of research was set in motion centring on the search for new qualitative features to be added to existing goods.

This "professional-use driven" innovation circle has been the main source for extracting innovation rents out of consumer goods - ranging from consumer electronics, sport goods, shoe wear, household equipment, computers, mobile telephony, medical diagnostics, sleeping comfort, and so on - often with an extended physical life time. However, the worldwide risks of this relatively straightforward professional-use driven innovation strategy for the existing global multinational corporations have increased significantly, not in the least because of globalization. While the size of the world market appears at first sight gigantic for new innovative goods and often without any doubt sufficient to recoup investments relatively quickly, the huge research, development, and global marketing costs, coupled with ever-increasing numbers of competing international players means that the length of time that a company can enjoy its innovation rents is diminishing very rapidly. Hence, despite the growing high income classes in large emerging BRIC economies, the new generation of goods being sold to these newly affluent people will not generate sufficient earnings to fund both the costs of mass production and the development of the next technology generation of the respective good. Having developed technologically incredibly sophisticated new goods, many firms are encountering major global sales problems in view of a much contracted product life cycle with increased competition and rapidly over-saturated markets.

b) Innovation at the bottom of the income pyramid: a new form of "appropriate innovation"?

The need for a shift in research on innovation in private businesses has been popularized by the late CK The

Prahalad in his famous book: *The Fortune at the Bottom of the Pyramid* (2004) with the provocative subtitle “*Eradicating Poverty Through Profits.*” One of the best-known Prahalad examples of a Bottom of the Pyramid (BoP) innovation is the multiple-fuel stove innovation developed for the rural poor, in which cow dung and biomass (sticks and grass) can be used as cooking fuels. Traditionally these fuels are used in an extremely inefficient way and are dangerous to use due to the smoke inhaled from indoor fires. With the so-called “combination stove” that costs less than \$20, the user can now switch relatively easily from biomass to natural gas, according to his/her needs. “If it succeeds in India...” Prahalad notes, “...it will be rolled out across multiple geographies, with potentially immense impacts on the people’s quality of life throughout the developing world.” Drawing on this example, Prahalad observes that “the process of designing these breakthrough innovations started with the identification of the following four conditions:... 1. The innovation must result in a product or service of world-class quality. 2. The innovation must achieve a significant price reduction — at least 90 percent lower than a comparable product or service in the West. 3. The innovation must be scalable: It must be able to be produced, marketed, and used in many locales and circumstances. 4. The innovation must be affordable at the bottom of the economic pyramid, reaching people with the lowest levels of income in any given society.” (CK Prahalad, *The Innovation Sandbox*). Since the book of Prahalad, there has been a flood of similar examples of BoP innovations being primarily introduced by foreign, large multinational corporations from developed countries in developing countries, sometimes in poor rural villages, sometimes in urban slums.

At first sight these BoP examples seem to contradict Lall’s earlier observations about the limited effectiveness of technology transfer through FDI. As Lall noted, back in 1992: “With few exceptions, the developing country affiliate receives the result of innovation, not the innovative process itself: it is not efficient for the enterprise concerned to invest in the skill and linkage creation in a new location.” (Lall, 1992, p.179). This is where BoP innovation takes on, in my view, a totally new meaning.

First of all the likely and most successful location of the innovative process activities, the BoP learning lab, will have to be close to *BoP users* contexts. Given the crucial role of users in the innovation process as argued above, this will imply that BoP laboratories will have to be embedded in users’ environments and not be part of the traditional high-tech R&D centres and enclaves whether in the developed or developing country. In this sense the notion of “**grassroots innovation**” developed by Anil Gupta (1997) can be considered as the endogenous, intrinsic version of Prahalad’s external, top down version of BoP innovation. To be successful though, such version will have to pay particular attention to all the elements and features emphasized by Lall back in the early 90’s: the local context, the vertical linkages, the avoidance of innovation “truncation” (Lall, 1980,

1992) by which refers to the isolation of the innovation process from the host country’s technological and production infrastructure. All this brings now to the forefront the need for a local business model that also fully embodies local behavioural responses to innovation. Hence, the increasingly recognized need in BoP innovation for strategic alliances between large MNCs and local NGOs (e.g Hybrid Value Chains).

Second, in line with the shift in research paradigm described in the first sections of this paper, the innovation process itself is now also likely to be reversed, starting with the design phase which will be confronted most directly with any attempt at finding functional solutions to some of the particular BoP users’ framework conditions. This will involve not just the need to bring the product on the market at a substantially lower price than existing goods, as Prahalad emphasized, but also, and must also be more in line with Sanjaya Lall’s observations. He refers to the need of a robust and dependable adaptation to potentially poor and shaky local infrastructure facilities with respect to energy delivery systems, water access, transport infrastructure, digital access, etc. **Autonomy** is the key word here. It is no surprise that the most rapidly spreading technology in developing countries has been mobile communication with currently more than 3 billion users worldwide. Autonomy from high quality energy, water, broadband network availability is undoubtedly one of the most pervasive drivers for innovation in a developing country context. Another one might well be “cradle to cradle” sustainable innovation (Braungart and McDonough 2002). The lack of high quality logistic infrastructure facilities in rural development settings might well imply that once goods are sold, the repair and/or central recollection of obsolete goods or their parts will be expensive. By contrast local re-use along the principles of cradle-to-cradle might well be a new form of sustainable grassroots innovation. It is in this sense that one might talk about “**appropriate innovation**” and that there seems to be some analytical similarity with the old notion of “appropriate technology”.

Third, the feedback from BoP users and from design developers upstream towards more applied research assistance, even fundamental research in some of the core research labs of Western firms might well become one of the most interesting examples of reverse transfer of technology (from the South to the North), reinvigorating and motivating the research community in the highly developed world increasingly “in search of relevance.” Not surprisingly, the main focus within the developed world at the moment is on BoP innovations in the health area, a sector where applied medical research is increasingly dominated by access to new technologically sophisticated equipment and much less by more down to earth research questions about, and the list is non-exhaustive: anti-biotic resistance, infectious diseases or resistant tuberculosis. Not surprisingly, health is the sector most in need for what could be called a bottom of the pyramid research re-prioritization (Crisp, 2010).

5. Conclusions

The dramatic acceleration of the globalization of science and technology (S&T) over the last ten to fifteen years largely helps explain the transformation of the process of innovation described in this paper. For most countries in the world, the contribution of domestic S&T to the global stock of knowledge is today relatively small; the contribution to domestic productivity growth is equally small. It is instead the increasing speed of diffusion of technological change and with it global access to codified knowledge that explains the largest part of world wide productivity growth over the last ten years.. The role of information and communication technologies has been instrumental here, as has been that of more capital and organisation- embedded forms of technology transfer.

While there remains a huge world-wide concentration of research investments in a relatively small number of rich countries/regions, it is important to realize that such activities, whether privately or publicly funded are increasingly becoming global in focus. The shifts in global demand underlying the process of globalisation taking place today, increasingly affect the allocation of private resources to the sort of research, knowledge creation and diffusion, and innovation being carried out in research laboratories, wherever located. From this perspective it is important to realize that the new, much more global, international business community is becoming concerned, also from its internal research strategy perspective, with the sustainability of its long term growth based on the demand of high income groups rising in absolute terms at a much slower rate than lower income groups.

Up to a point this trend is similar to what happened in the US at the beginning of the 20th Century period - also a period of rapid growth and rising income inequality - when Henry Ford introduced the **Ford Model T**. His "putting America on wheels" strategy centred on assembly line production and on paying workers wages so as to create a lasting market for the car. How to create a similar global mass market for consumer goods in the context of the 21st Century represents of course a much more complex, global challenge, but the similarity and the timing of such business concerns is striking. It is in a certain sense the ultimate paradox of inequality: the business community itself is becoming concerned over too much inequality limiting its own long future output growth potential.

It is in this sense that the vision of innovation for development outlined here, appears maybe novel, yet also very familiar: familiar to the many development economists dealing with technology accumulation and learning who will undoubtedly recognize many of his views and visions in some of the concepts and notions discussed here on how to develop successful innovation-for-development strategies.

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EXPLORING THE CONSTRAINTS OF RURAL ENTERPRISE DEVELOPMENT AND POVERTY REDUCTION IN GHANA

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Abstract

The objective of our study is to identify the most relevant factors limiting the poverty reduction and growth potentials of rural micro and small scale enterprises (MSE) in the Northern region of Ghana. For that purpose, we profile the main characteristics of MSEs by means of literature review, focus group discussions (FGD), and personal interviews of key informants. The insight gained from this qualitative research is supported by quantitative data collected by means of a structured questionnaire designed for the local actors in the MSE sector.

The study covered six districts in the northern region. Generally, the study indicates that several constraints related to vocational training, management and lack of access to larger distribution networks and technology hamper the path of rural enterprise development and poverty reduction in rural Northern Ghana.

Policy makers, development planners and business development organisations play a major role in helping the region to overcome these obstacles by designing the appropriate incentive packages, training and financial support for rural small-scale enterprises development.

Key words: Rural small businesses, Enterprise development, Poverty reduction Northern Ghana

1 Introduction

Promotion and development of rural Micro Small Enterprise's (MSE's) as drivers for improved welfare and livelihoods of people is not a new concept in Ghana (GPRS II, 2005). Small business enterprises (defined as independent enterprises, which control relatively small share of the market and usually managed and operated by an individual or family) have always contributed to economic development of many nations including advanced economies. Rural MSE's ensure that, local economic growth through support for local employment creation and income generation, poverty reduction and wealth creation are attainable. The import of this is crucial in a developing nation like Ghana where over 60% of the population reside, operate and eke out a living from such small businesses. It is

estimated that about 69% of the country's population are employed in the MSE sector and majority of these are located in rural areas (GSS, 2002). Thus the sector provides employment for a considerable number of people in rural areas. However, despite this recognition and its significance for local and national economic development, research has not investigated systematically, the real strengths and weaknesses of these rural enterprises, at least in Northern Ghana where poverty is very high (GSS, 2007).

Unlike urban enterprises, rural small businesses are usually diverse and socio-culturally embedded. They mostly employ locally available resources to produce their products, without having to spend so much on production. These characteristics give rural enterprises relative edge over their urban counterparts. These features of rural enterprises may help protect such businesses located in rural areas against any unforeseen social unrest, disintegration, and economic downturn. It will also help restrict over reliance of rural enterprises on expensive raw materials imported from both urban centres and other countries. Since the opportunities and constraints facing these businesses differ from larger and/or more urban enterprises, government's support to rural enterprises should, as a matter of necessity not overlook the contexts within which rural enterprises operate.

Provisions of an enabling policy environment that ensure that gains from such enterprises do not fritter away, is essential. The study was designed to profile the characteristics of rural business enterprises (both existing and potential) as a way of exposing their strengths and weaknesses and how these are and can be addressed effectively. The implications for practice and policy as well as some recommendation of how to give a fillip to the sector were also discussed.

1.2 Poverty and rural enterprises development

In Ghana, poverty is primarily rural, with the northern regions recording the highest incidence of poverty in the country (GSS, 2007). Low agriculture productivity, undeveloped markets and lack of gainful wage employment opportunities as well as restrictive access of the less endowed to productive resources have been iden-

tified as the major causes of poverty in the three Northern regions of Ghana (GPRS II, 2005). In the quest to find answers to the myriad of challenges facing the rural poor, government has taken steps to ensure that the rural person, particularly its entrepreneurs are adequately empowered. Empowering these entrepreneurs gives them the right to acquire the capabilities that ensure their right or freedom to choose the life they wish to have (Sen, 1999).

Studies have shown that rural small-scale enterprises (businesses) stand a better chance of benefiting from the readily available local raw material deposits (Ravinder, 2007) in the regions and communities. The World Bank, (WB, 2004), has indicated that harnessing the human agency, market support institutions and 'crude' entrepreneurial skills of rural entrepreneurs should be major intervention strategies to fast track the rural enterprise development agenda in developing countries. Rural development is therefore linked to entrepreneurship, which among others may take the form of diversifying from mainstream agriculture production to non-agriculture enterprises such as agro-processing, blacksmithing, local restaurant or catering, carpentry, pottery and/or the discovery of new products or service markets within and outside the local communities.

The challenge for government however, is how to encourage local capacity building, particularly in rural areas where most of these businesses are located (GSS, 2000).

1.3 The resurgence of small scale enterprises in Ghana

Until the 1970's, governments pursued policies which, in principal aimed at encouraging large scale business enterprise development (Asante et. al 2002). It was presumed at the time, that successes of large scale urban businesses could transform rural economies through a spill over effect of urban industrial revolution. Economic, industrial and employment policies therefore focused heavily on the corporate sector and state led imports (Frempong, 2003). In the 1970's there was a shift in focus in favour of small scale private sector development (Buame, 1996). Some policy initiatives embarked on by government to resuscitate the numerous but poorly functioning small scale enterprises for income generation, poverty reduction and sustainable development included, the provision of roads, electricity and telephony infrastructure for domestic and commercial uses, good drinking water and sanitation facilities, markets, human resource development facilities as well as strengthening financial institutions and empowerment training programmes in the communities.

The latest of these policy initiatives is the introduction of structural adjustment programme (SAP) and its market liberalization policies in the 1980's and 1990's. These have had major impetus on local industries development. In spite of these programmes, poverty still continues to loom in the countryside. The question that remains in the public is whether existing and emerging small scale enterprises in the private sector have the

needed capacities, regarding the creation of employment and generation of income to ensure Ghana's economic growth and poverty reduction (GoG, 2002).

1.4 The challenge of building local enterprise capacities

Building successful local entrepreneurial capacities for accelerated poverty reduction and economic growth is crucial. Though government is making some efforts, to resuscitate the SME sector in Ghana, these are not without challenges. Lack of localised efforts to build capacities has been adduced to two main factor; firstly, lack of adequate access to infrastructure such as markets, business service provision and financial institutions that have the capacity to sustain programmes of entrepreneurial development and, secondly, lack of adequate business competences and acumen including the management of funds, records, human and other material resources which are crucial for the sustainability and growth of businesses. Other issues that limit the potential of building successful enterprises is the remoteness of rural communities which often disadvantages them in terms of access to business capital, services and clientele markets.

Road networks are either non-existent or poorly developed if not invisible in rural areas. Though some efforts have been made to address this deficiency, more is expected of the government. Rural enterprises fall in different categories, crafters, farmers, fishermen, traders, artisans, youth, middle aged, full time and part time to mention a few. Each of these groupings has different skills, motivations, opportunities and constraints. These must be identified and streamlined in a holistic manner. Market opportunities are crucial but underdeveloped in Ghana.

Storey (1994; 1999) suggested three key areas for developing successful small businesses or enterprises. These include the qualities of the entrepreneur, characteristics of the firm and strategies adopted by the entrepreneur to raise output and grow the business. Although some efforts are been made by the existing small business development institutions such as National Board for Small Scale Institutions (NBSSI), Rural Enterprises Project (REP) and GRATIS foundation, some areas of business development that need serious government attention are the development of efficient and effective financial delivery systems, infrastructure support facilities, entrepreneurial education and training at all levels, adherence to effective marketing strategies and reliable business networking. An important first step to developing such capacities and the concern of this paper is to profile the characteristics of rural micro and small scale enterprises (SME) in the northern regions, with the view of identifying the factors that may limit rural enterprises potential for poverty reduction and economic development of rural areas.

2 Methodology

The study started with a period of two weeks questionnaire pre-testing in some rural communities in the

Greater Accra Region. The survey was carried out and completed in 2008, between the months of March and July. While the region was purposively chosen based on the higher rate of poverty, presence of various non-governmental (NGO's) and governmental (GO's) and the visible presence of but yet untapped abundant natural and human resources, the six districts were chosen randomly from the list of district from the regional administrations sources. The study employed three data collection instruments, participatory focus group discussion (FGD), key informant interviews and questionnaire administration. These three were chosen for the purposes of triangulation. These are sure to provide reliable data and therefore conclusion which might be drawn from the study (Creswell, 2003). The latter was included mainly to capture information about business characteristics, asset distribution and quantitative relationships between business resources and their poverty positions of entrepreneurs. Fundamentally, the use of the two methods was aimed at getting profound insights into challenges of rural MSE's in Ghana both in quantitative and qualitative terms.

The main source of secondary data was collected from the some officials in the Ministries, Departments and Agencies (MDA's) in the districts and regional officers through key informant interviews employing structured questionnaires. Data collected included information on population, vegetation, climate and other socio-economic conditions of the area.

The questionnaire survey contained both open and close-ended questions. It was used to elicit information on existing and potential businesses in the region, cost of production as well as pertinent problems encountered by entrepreneurs in their day to day business activities. The study surveyed six villages and within each, the simple random technique was used to sample entrepreneurs. Though the original language of the questionnaire was English, the questionnaire was administered in the dialects of the people for effective understanding and also to ensure that the right kind of information for the study was gathered. Information was collected from 950 small scale entrepreneurs, most of whom were women. This gives us an estimated response rate of about 82%.

One participatory FGD each was held in every district selected for the study. The people were grouped based on the type of enterprises which was considered as their primary occupation. The FGD also sought to collect qualitative data from real life experiences of entrepreneurs. Questions mainly focused on the nature and availability of raw materials, level of technology use, innovations, infrastructure development as well as business financing, training and marketing issues. Though the study was not designed on strict gender lines, the investigator separated man and women during the FGD due to the sensitive nature of gender in the area of study. Others included the major binding constraints that hinder the development of businesses in the districts. The key people that were interviewed

involved some opinion leaders (6); assemblymen (6), local and regional officers of business support agencies (4), NGO's (4) and politicians in the districts (2). These were selected based on their positions in their respective organization or case communities.

3.1 Results of Study and Discussions

3.2 Characteristics of Entrepreneurs

Though the services sector had more females than men, the study survey revealed that male entrepreneurs dominated most of the enterprises surveyed; about three-quarters of the sampled entrepreneurs were male. Majority (72.0%) of respondents were married. The average number of children per parent was 3. Levels of formal classroom education were quite low; about 16.2% of respondents had received education up to high school (secondary, technical, vocational) level. In corroborating Baah-Nuako's work in Accra, Ghana (Baah-Nuako 1991), the study confirmed that the majority of self-employed managers in Ghana have less of formal education. Despite the few years of formal education, a considerable number (79.4%) of them however, managed to go through apprenticeship training, a typical way of acquiring skills in trade in Ghana. A significant majority (73.7%) of entrepreneurs were within the youthful age of 20 and 35 years old. About a third (34.4%) of entrepreneurs had twenty or more years of working experience.

3 Business Enterprises and their Resources

To explore the characteristics of small scale businesses in the districts, several questions were related to motivations, business categories, ownership, enterprise management capacity and networks. The entrepreneurs were asked to state their motivation for starting a business. The quest of becoming independent or owning a business was cited by a large proportion (78%) of entrepreneurs. Other reasons include the desire to turn past experiences or hobbies into income generating activities for financial gains, self managing entrepreneurs, independence, and seizing the opportunity to supply what in their estimation would be needed by the society. Other reason was the fact that they needed to do something that will support their incomes from small scale farming. Majority (86.2%) of respondents identify themselves as sole proprietors; businesses were small, started and managed by owners. About 12.6% were in partnership while only 1.1% owned limited liability companies. The trend was not different from national statistics. Nationally, sole proprietorship tops the list of registered companies, followed by limited liability companies and partnership (personal interview).

Though the Registrar Generals Department (RGD) is the main body recognised by the country's law, to register companies, the study revealed that only few businesses (6.2%), registered with RGD. The absence of RGD offices in the regions may have contributed to the low registration of businesses with the main body in charge of business registration. Though most entrepreneurs saw the need for such business networks and the benefits they could derive from it, the study revealed that business networks were uncommon among entrepreneurs. Only

3.5% of entrepreneurs had contacts outside the region. While none of the entrepreneurs had a foreign contact, 14.5% of entrepreneurs belonged to networks within the area (town and/or village) where the businesses are set up. What comes close to business network was local association membership. Only about 5.8% were found to be active members of such associations. The few and simple network could explain why most rural entrepreneurs are poor (Granovetter, 1973).

Majority (62.5%) of enterprises were found in the services sector. The few (10.0%) who were into agro processing, mainly groundnut oil and shea butter extraction, *pito* (a local beer) brewing and *kulikuli* (a local groundnut cake) preparations were mainly above 60 years old. The youth were mainly engaged in the services sector as tailors, dressmakers and caterers. The middle aged entrepreneurs however, were found to have spread themselves among all sectors of the rural economy. Could the dominance of the youth in the services sector be attributed to a positive response of people to government's policy of encouraging self-employment or a mere move away from traditional rural enterprises, predominantly oil extraction? These questions are addressed in forthcoming chapters.

The number of entrepreneurs in the trading sector, 'buying and selling' as its commonly called in Ghana, was also found to be high. Though a risk taking venture, the business of 'buying and selling' was said to be much more rewarding and hence the involvement of many people (both men and women). Non traditional income generation activities such as Bee keeping, Rabbit and Grasscutter (a micro ruminant) farming were emerging in the districts. A total of 24.5% of entrepreneurs in the rural localities surveyed were involved in the rearing of the micro ruminants and bee keeping. Surprisingly, despite the availability of abundant raw materials for traditional arts and crafts, those into wood carving, basket weaving and clay pottery were marginally (5.7%) represented.

3.4 Assets of Business Enterprises

The study revealed that though both locally made and imported equipment were used by entrepreneurs, about half of respondents claimed they used locally made equipments and machines in their operations. More than 80.0% of these respondents owned the capital equipment such as lathe and sowing machines, used in their operations. The rest rented such machines from other people within the villages or district. Arrangement for capital equipment use was easy. Arrangements ranged from hiring, leasing, and free holding. The use of locally made machines and equipment was common; the two-thirds of entrepreneurs who usually use locally made capital equipment and/or tools, did so because of the ease of access to spare parts. Although most of these tools and equipment were mainly produced by the local people in the communities, some others are imported from the urban centres. The latter are mainly imported from other countries. Spare parts for imported machines and equipment are also available but, expensive according to the respondents. The respondents clearly indicated their preferences for the imported parts, tools and equipment except for the prices which compels

them to go in for the locally produced items which according to them are often of an inferior quality.

Market information and intelligence were shared through the various identified business networks. Access to market information heavily depended on social relations among people and the membership of business and social associations. This was mainly evident among the tailors and dressmakers associations. It was indicated that leaders or friends and relatives who returned from the 'big towns' always brought some information which was made available, first hand to members of association. However, non association members could only access such business information from their relatives or friends who belonged to the association.

The study revealed that although entrepreneurs employed all forms of labour, the distribution of labour type varied greatly. While some worked for wages others earned nothing for their labour. A significant number of respondents employed on the average a total number of family labour (11), graduate apprentices (7) and apprentices (15), who were mostly not on salary or any wage. On the average, both full time employees (those receiving wages) and part time workers (usually called work and pay staff, as it is known in the services sector) recorded 3 employees each per business entity. Majority of these people are either relatives or friends or their children.

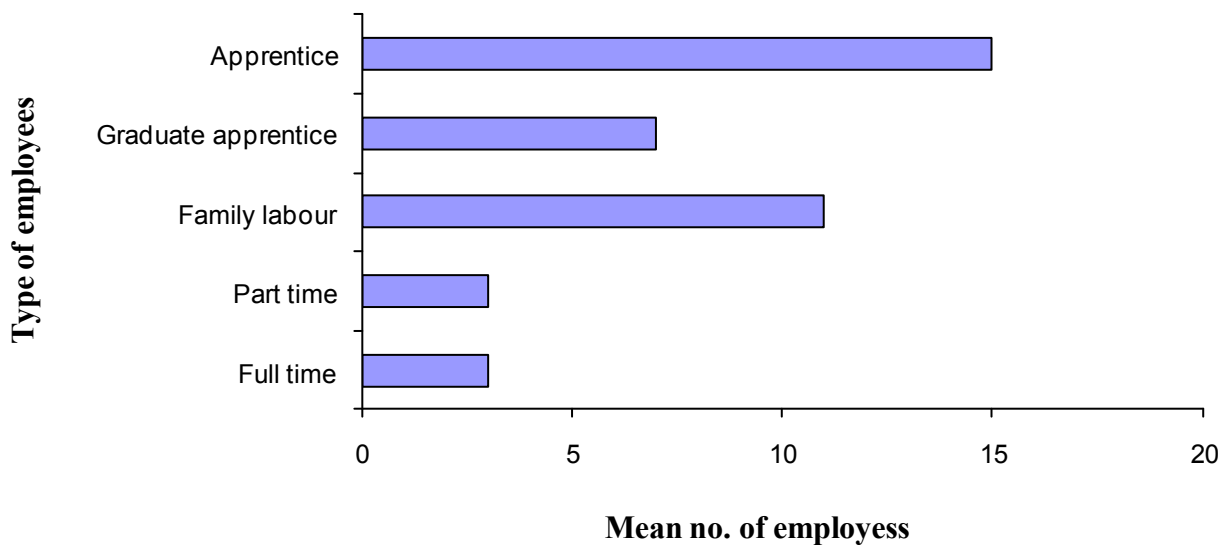
This corroborates Van Dijk (1997) assertion that though relations, particularly ethnicity could limit the success of businesses, it offers relatives access to jobs in the construction companies in Accra, Ghana. Unlike urban entrepreneurs, most rural entrepreneurs employ their relatives and friends or their children in their businesses.

3.5 Marketing, Management and Financing Arrangements

Two issues of importance to the success and survival of any business entity, particularly small scale businesses are access to markets and/or costs of credit. Though entrepreneurs had ready market for their products, the difficulty of getting prompt payments for goods supplied and/or services offered restricts the desire to increase production capacities. The study indicated that products were sold in and outside the districts though a large proportion of clients resided in the villages where the products were produced and a considerable number of entrepreneurs (89.7%) sold their products in the main market or by the roadside.

About 2.3% of the entrepreneurs used Commission agents and Wholesalers to distribute their products. Participation in trade shows or cooperate marketing arrangements among entrepreneurs was conspicuously uncommon; individual business entities employed different marketing strategies to distribute products but none ever used marketing research in their production decisions. As typical of such busi-

Fig 1 Type and level of employees



nesses, particularly in Africa, entrepreneurs produced and sold whatever they had to offer and not really what costumers wanted. Business activity is purely production and not market oriented. The main tool of product advertisement was by word of mouth. As one woman said 'if you serve a customer well he/she will not only come back but bring other customers'. The presence of local radio station (FM's) adverts did not appeal to entrepreneurs due to costs which they complain their profits could not support. Hawking or displaying products at strategic locations in the market were also significant in advertisement.

The study revealed that rural entrepreneurs access credit from different sources (formal and informal). Informal sources included money lenders, friends and relatives. The main source of financing was through personal savings (53%). This confirms the observation made by Tetteh and Frempong, (2009) in a similar study in some districts of Ghana. Personal savings as a source of financing entrepreneurial activities was followed by friends and relatives (23%), middlemen (6%) and private organizations such as non governmental organizations (17%) operating in the districts. The above sources were described by respondents as the most preferred and reliable sources of finance when compared to formal banks. If the aphorism 'poor no friend' is true then the poorest among entrepreneurs will always find it difficult if not impossible, to access credit in the community for their farming operations. This may be due to the poor penetration in rural areas, of the numerous micro credit schemes operating in the country.

Formal institutions farmers sourced included Banks (rural and commercial) and some registered credit unions which were also located in the area of study. The study indicates that less than 2% of entrepreneurs claimed they took loans from the banks. Traditionally, high interest rates, lack of collaterals and cumbersome

banking procedures have always remain major challenges that deter small scale entrepreneurs from borrowing from formal financial institutions. High interest rates and stringent conditions attached to informal credits such as the demand for large collaterals and payment schedules were observed to be different for the various categories of entrepreneurs. Women and men for example took money under different conditions, with considerable number of the men been the most successful. Also people of higher standards in the communities had a better chance of accessing loans since they were classified as credit worthy. The situation also posed some difficulties, frustrated and deterred business expansions. The poorest among the poor often suffered from such discrimination.

Terms and conditions of lending were flexible and affordable, allowing entrepreneurs to pay back loans contracted with less difficulty and/or harassments. *Susu*, a form of revolving fund (*an informal financial system where people contribute fixed amounts of money to the Susu collector daily. The amount payable is the sole decision of the contributor. The total amount of money contributed is collected at the end of a stated period*), which is ubiquitous in both rural and urban areas of Ghana, was another source of funding explored by entrepreneurs to mobilise money for their operations, though it was the least patronised source of business fund in the study area for obvious reasons-mistrust.

On the question of savings, 23% claimed they kept their moneys in their homes, while another 32% saved with the Rural Banks located in their vicinities. Rather than saving moneys with the banks or in their homes or with relatives, some respondents (15%) claimed they join some revolving fund groups operating in the communities. These moneys they collect with no interest at the end of a period as agreed upon at the beginning of

the contribution period. Others (18%) also have joined the Susu collectors (both formal and informal) in the communities. Lack of basic understanding of the operations of formal banks, less than enough profit and mistrust in Bank officials contributed to the poor attitude of formal institutional savings in the communities. As one woman puts it, 'I do not save with the Bank because I do not trust the banks. I am my own bank. They use our monies to enrich themselves by buying and driving big cars'.

4. Conclusion

It was realised that the majority of rural small businesses were indeed small in terms of size, owned by individuals as sole proprietors and used mainly manual labour, employed less than ten non waged employees and operated below capacity due to low level of technological improvements. Enterprises used less advanced technologies and innovations and lacked adequate capital for expansion. Effective management, regarding planning, sourcing and organizing human, financial and marketing resources for higher profits was inadequate. In such circumstances the rural entrepreneur had no other choice than to make do with what was available.

It has been recognised that when public and formal institutions fail to deliver efficiently, informal institutions thrive. The characteristic underdeveloped labour, output and financial markets in the study area was therefore not a surprise. Although informal sector institutions and arrangements are said to be inefficient and could disadvantage entrepreneurs and therefore businesses, most entrepreneurs in the area, still relied on them for access, production and exchanges. Enterprises employed mostly family labour and apprentices which were nearly free in terms of wages. Although the investigator did not look at the significance of social capital in this study, the use of such labour force, trust and loyalty, besides financial inadequacies, might have been factored into decisions to use family labour and apprentices. Governments should endeavour to take proactive steps to launch and integrate studies on social relations and employment since they place major roles in development in developing countries.

Informal market support institutions such as credit and output markets must be strengthened since most entrepreneurs preferred that to the formal Banks and other formal arrangements for access to resources. The credit policy and business support systems in the country still need to be scaled up, giving some better concessions to small scale operator. Market support institutions must also be improved. The districts should consider building more and better markets. A considerable proportion of entrepreneurs used mainly locally made tools and equipments, manufactured in the districts or country. An expanded local manufacturing environment will open the area for enhanced economic breakthrough.

5. Implications for policy and practice

Recognizing the importance of the micro and small enterprises (MSE) sector in Government's development policies, the timing of this research is considered appropriate and highly relevant. The relevance of this report is in relation to its coincidence with President J.A Kuffour's declaration of 'Golden age of business' for Ghana. The significant implications of the study to practise and policy lie in its capacity to provide a platform for local entrepreneurs and government to discuss and re-strategize their plans and programmes.

The study observed a marked difference between the characteristics of rural small businesses and small businesses in urban areas. To bridge the gap and ensure that rural enterprises gain from government policy support requires a re-look at the situation. It was evident that the majority of entrepreneurs have not participated in any government programme designed to support their activities. Any such programme aimed at ensuring equitable distribution of resources and outputs as well as provision of efficient service delivery at all levels should be a priority. To design such a programme, requires identifying and understanding the characteristics of rural enterprises and the context within which these enterprises operate. Understanding the constraints and opportunities of enterprises would help in designing pragmatic strategies aimed at transforming rural businesses.

The study shows that more and more entrepreneurs are yet to get receive training in the act of doing business in a more technological and scientific way. Some major constraints of the activities of rural enterprises observed were scarcity of financing, and low levels of entrepreneurship development and management training for a large section of the participants. Most rural entrepreneurs have no or little formal training in technical aspects of their operations. Formal training in small business organization, operation, marketing and management acumen was missing. These factors limit the development and growth of SMEs in rural communities. Traditionally, it is assumed that small business management requires more aptitude for practical activities than formal classroom education. However the study indicated that some amount of formal training or education on some aspects of the business environment is relevant.

Technological advancement and quality controls have become crucial part of modern day business practices. However, the absence and or lack of proper utilization of technological innovations were conspicuous among most rural entrepreneurs. Adoption of most current appropriate technology was also found to be absent. Except the use of some old equipment and gadgets in use technologies in use were mainly traditional. These often lead to drudgery but produces low output. The quest to develop and strengthen the synergies between science and technology on one hand and development of small scale businesses on the other hand should be carefully re-assessed and improved. It is therefore commendable that a suitable programme should be put in place provide on the job training for existing and emerging entrepreneurs.

Access to finance, markets and other business services such as extension entrepreneurial training was poor and clearly should be strongly supported by government through the creation of a more conducive business and policy environments. Establishment of business capital funds, concessionary loans and provision of adequate technical services training to small business in rural areas will go a long way to help reduce poverty and ensure rural development. Such policies must take into consideration the nature of existing and potential businesses, their contexts of operations and delivery systems in the area. Improving the financial markets, access to information, business advisory and other input delivery services could change the business environment. Government must therefore make it a priority to ensure quality control production.

While entrepreneurs accept the need for formal training on the technicalities of their operations, most of them are cash trapped. The government through the District Assemblies (DA) should be encouraged by law to sponsor and/or subsidize the training of local entrepreneurs. This will encourage self employment and small business growth, particularly in rural communities where resources for agro industrial production abound. Participation in local and international trade fairs and/or training at recognised STI training institutes must also be considered crucial. Such trainings must be tailored to meet the needs of these entrepreneurs, taking into consideration the needs of consumers of their good and services in the face of scientific and technological trends in the globalising world.

In the wake of a clarion call for the use of science and technology innovations (STIs) as tools for economic development, it is recommended that government's STI policies should be more focused on micro and small enterprises development especially in rural communities where people can easily take advantage of the abundance of local resources to develop themselves. Developing vibrant small businesses for accelerated economic

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A RESURGENCE IN ACQUISITION OF INDUSTRIAL TECHNOLOGY IN AFRICA?

ANALYSIS OF GLOBAL TRENDS IN TECHNOLOGY TRANSFER.

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Abstract

Economic Development in Africa has made significant strides over the past 20 years. Most African countries carried out economic reforms that eventually contributed to positive and impressive growth in real gross domestic product (GDP), attracted an increasing amount of investment and enabled them to benefit more from favourable trade terms. To what extent do the economic growth rates also reflect a better and more sustainable integration of the African continent into the global knowledge economy? We examine this question by looking at trends in the use, trade and transfer of technology between African countries and the rest of the world. In this context we use royalties and licensing fees, capital goods imports and trade in business, professional and technical (BPT) services as indicators reflect the quality and quantity of technology transfer and global economic integration.

We find that Africa is performing better than expected in the acquisition of industrial technology-related proxies. It is found that, between 1990 and 2008, Africa and Asia enjoyed high growth rates in royalties and licensing fees payments. However, the numbers also show that Africa still lags behind in exports of capital goods and imports of services. We recommend four easy steps that African countries can use to promote a type of technology transfer that would particularly benefit the local private sector.

Introduction

Technology transfer plays a critical role in innovation, industrial development and competitiveness in the global market place. It is for this reason that technology transfer has been a subject of significant interest and international debate.

It was agreed, during the negotiations of the International Code of Conduct for Transfer of Technology, to define technology transfer as the "transfer of systematic knowledge for the manufacture of a product, for the application of a process or for the rendering of a service and does not extend to the trans-

actions involving the mere sale or mere lease of goods" (UNCTAD, 1985; Patel, *et al* 2001). This definition views technology transfer as a transfer of a system that includes hardware, software, procedures and skills, among others, as a package, rather than as a "product transfer", such as the sale of a computer or tractor, and as a transaction between the supplier and user of the technology.

There are several channels through which technology may be transferred. The transfer of technological products may take place in the import or export of machinery/equipment embodying the technology of interest. The transfer of a production process for the manufacture of a product or delivery of a service is expected to take place through trade in knowledge assets and services (e.g. licensing, franchising and outsourcing), FDI (e.g. investments in new projects and joint-ventures) and turnkey projects. The extent to which these activities represent actual transfer of technology may depend on the level of learning, skills development and absorptive capacity of the recipient and the technology content of the project.

In terms of modes, technology may be transferred intra-firm (internalized) or inter-firm (externalized). Intra-firm technology transfers refer to transfers between affiliated firms or subsidiaries. Inter-firm transfers occur when technology is licensed to unaffiliated parties. Though firms may not be affiliated, they may have a common origin, collaborated in the past and have common advisers. Transfer of technology between such firms may not qualify as intra-firm legally. For example, transfer of technology to an independently owned contractor to enable the contract to supply services is inter-firm transfer legally speaking but does not seem to differ, in practice, from transfer of technology to an affiliate to supply goods and services.

Irrespective of the mode, the process of technology transfer starts in practice with identification of the need and possible sources of technologies (in case of the buyer) or potential users of the technology (in case of the seller). Depending on the various reasons mentioned earlier, an agreement is reached and the transfer conditions set, then the

technology is transferred. In terms of individual market transactions, a technology transfer may be considered completed once the sale is finalized and the technology is put into operation by the user. From a development perspective, however, effective transfer of technology entails the outcome that the user is able to operate, maintain, upgrade and build on the acquired technology to spur further innovation.

Technology transfer may range from a single purchase to complex negotiations that involve several commitments lasting for months or even years. For example, in August 1992, Tanzania appointed a committee of experts to come up with specifications for a radar system that would meet the country's requirements. The experts recommended a joint radar system for military and civilian use. In September 1997, Tanzania and BAe Systems (then SPS) agreed on the list of components to be included in the radar system. The Sales Agreement price included equipment maintenance contract, training, spare parts and wages for expatriates. In 2002, BAe Systems was issued with a license by the United Kingdom (UK) to supply the radar to Tanzania. This case demonstrates some of the key steps and components of technology transfer.

Indeed, technology transfer should not be seen as a one-time process but rather as a continuous process to acquire and absorb advanced technologies to remain competitive. For example, the development of the automotive industry in the Republic of Korea took several key stages. The country started with the assembly of foreign models with about 20% local content in the early 1960s. Within two decades, the country achieved mass production. A key component of this success is Korea's continuous acquisition of technology and learning to operate and further improve the acquired knowledge (Pacudan, 1998). Korea remains a net importer of technology despite its incredible achievements. Korea is not an exception. Japan, the second major technology-exporting country after the United States, only became a net-technology exporter in 2003, according to a study by the Bank of Japan (Yamaguchi, 2004; Nitta, 2005).

1. Tracking and defining proxies for measuring technology transfer

There are several proxies that

have been used to measure technology transfer (see Kelly 1998 for a detailed discussion). The most common ones include royalties, licensing fees and imports of capital goods. In general, the proxies track the payments that are associated with technology transfer and not the technology itself. For example the transfer of intellectual property rights and provision of technical services occasion payments in the form of royalties and licensing fees. Some of these assets, such as trademarks, do not directly represent technology transfer. However, they may signal the existence of growing confidence and trust in domestic industrial processing and other activities that often indicates an increasing use of better production and service delivery techniques. It is important to stress that the technological sophistication or knowledge content of capital goods or intellectual property asset may vary widely even within the same class of machines (e.g., in complexities, sophistication, performance and applications) and, as a result, their validity to serve as conduits for technology transfer (Navaretti *et al.*, 2003).

Services are another proxy for technology transfer. Services that play a key role in technology transfer include architecture, engineering, consulting, installation, research, management, operational leasing, financial and analytical testing services, among others. In particular, trade in R&D services is now seen as a key proxy of technology transfer. In many of these cases, the parent or contracting firm may provide requisite information, technologies and support to meet the specific requirements of their next generation of products or services. Depending on the needs, a firm may choose to use one or more of these approaches to achieve specific goals in managing the high cost of R&D effec-

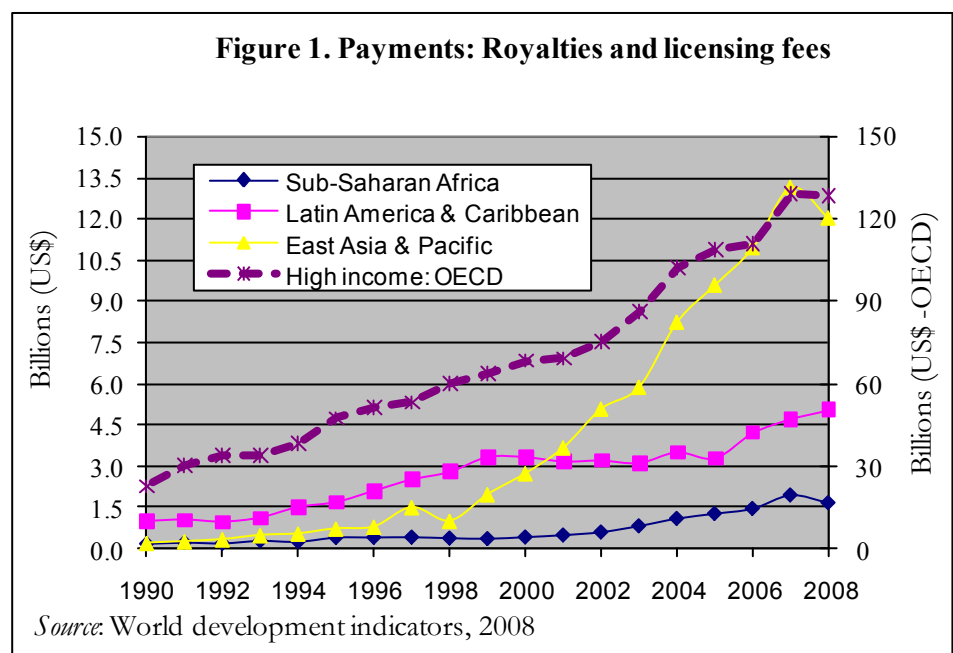
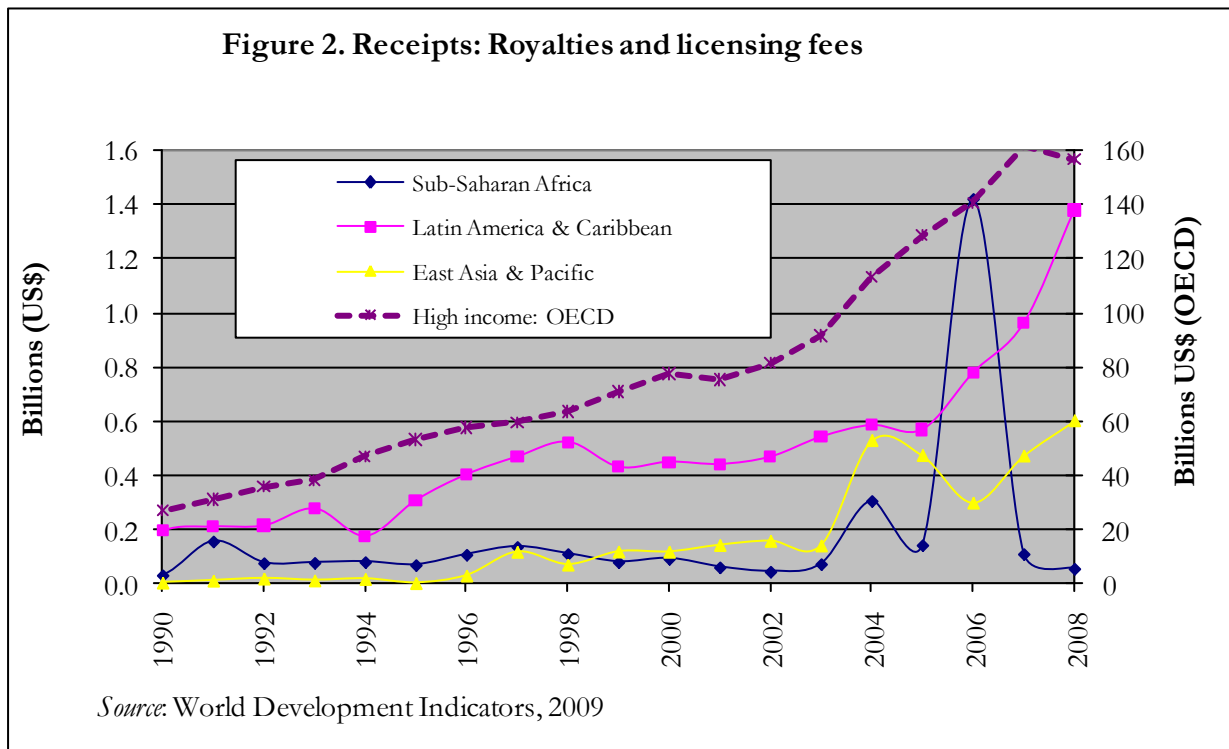


Figure 2. Receipts: Royalties and licensing fees



tively.

2. Trends in technology transfer in Africa

This chapter looks at the trends in global flows of technology at regional level, largely comparing Africa to other developing regions using the proxies explained earlier. It then provides a similar comparison, where data is available, among African countries and national examples where data is absent. The analysis largely covers the period 1990 to 2008. This time period is deliberately selected bearing in mind that most economies started to liberalize and privatize in the 1990s. It was also in the 1990s that WTO Agreement and with it the TRIPS Agreement were adopted. Therefore, it presents an interesting period to capture the effect of many of these changes in the structure of economies and governance of technology.

2.1. Trends in royalty and licensing fees payment and receipts.

There has been a significant and steady increase in the trade in knowledge assets over the last few decades. Globally, royalty and licensing fee receipts were estimated to have increased from \$24.2 billion in 1990 to \$158 billion in 2008 while royalty and licensing fees payments were estimated to have increased from \$27.3 billion to about \$161 billion over the same period. In general, royalties and licensing fees payments and receipts have increased nearly 6-fold between 1990 and 2008 globally. As show in Figures 1 and 2, the 30 member countries

of the Organization of Economic Cooperation and Development (OECD) accounted for about \$128 billion (or 81%) of the global royalty and licensing fee payments and \$158 billion (i.e. 98%) of the global receipts.

In terms of royalty and licensing fee payments, East Asia and the Pacific and SSA registered higher than the world average. It was observed that royalty and licensing fee payments increased 57 times for East Asia and the Pacific, 10 times for SSA, 6 times for the OECD and 5 times for LAC between 1990 and 2008. In terms of royalty receipts, East Asia and the Pacific registered the fastest growth followed by LAC, OECD and SSA as shown in figure 1. LAC has registered the fastest growth in the last four years (2005 to 2008) - with royalty and licensing fee receipts more than doubled.

At national level, trends in royalty and licensing fee payments and receipts differ widely among African countries. South Africa remains the main consumer of knowledge assets in Africa with its payments reaching \$1.68 billion in 2008. Indeed, South Africa's payments dwarf those of other main African countries such as Egypt's \$241 million and Nigeria's \$174 million in 2007 (see Table 1 for details of royalty and licensing fee payments of selected African countries). Of these, the fastest growth in payments of royalties and licensing fees between 1990 and 2007 has been witnessed in Cameroon, Senegal, South Africa, Swaziland and Tunisia.

For example, payments of royalties and licensing

Table 1. Average annual royalty and licensing fee payments and receipts for selected countries in Africa (in US\$ million)

	Payments		Receipts	
	1990-99	2000-07	1990-99	2000-2007
South Africa	195.0	809.8	52.0	37.2
Egypt	288.5	223.5	49.8	95.0
Swaziland	20.5	76.4	0.2	0.1
Kenya	48.4	44.0	12.9	16.8
Morocco	111.9	36.4	4.3	13.8
Madagascar	6.8	13.4	1.2	1.0
Cote d'Ivoire	13.1	12.9	0.3	3.3
Botswana	6.6	9.6	0.1	1.5
Tunisia	2.0	7.3	3.7	15.6
Senegal	1.3	5.0	0.9	0.1
Cameroon	1.1	3.6	1.7	0.5
Namibia	3.2	2.9	2.8	1.8
Niger	0.7	0.5	NA	NA
Cape Verde	0.1	0.2	0.1	0.2
Angola	NA	NA	10.7	274.7
Lesotho	NA	NA	32.2	15.3

Source: World Development Indicator, 2009

NA= Not Available

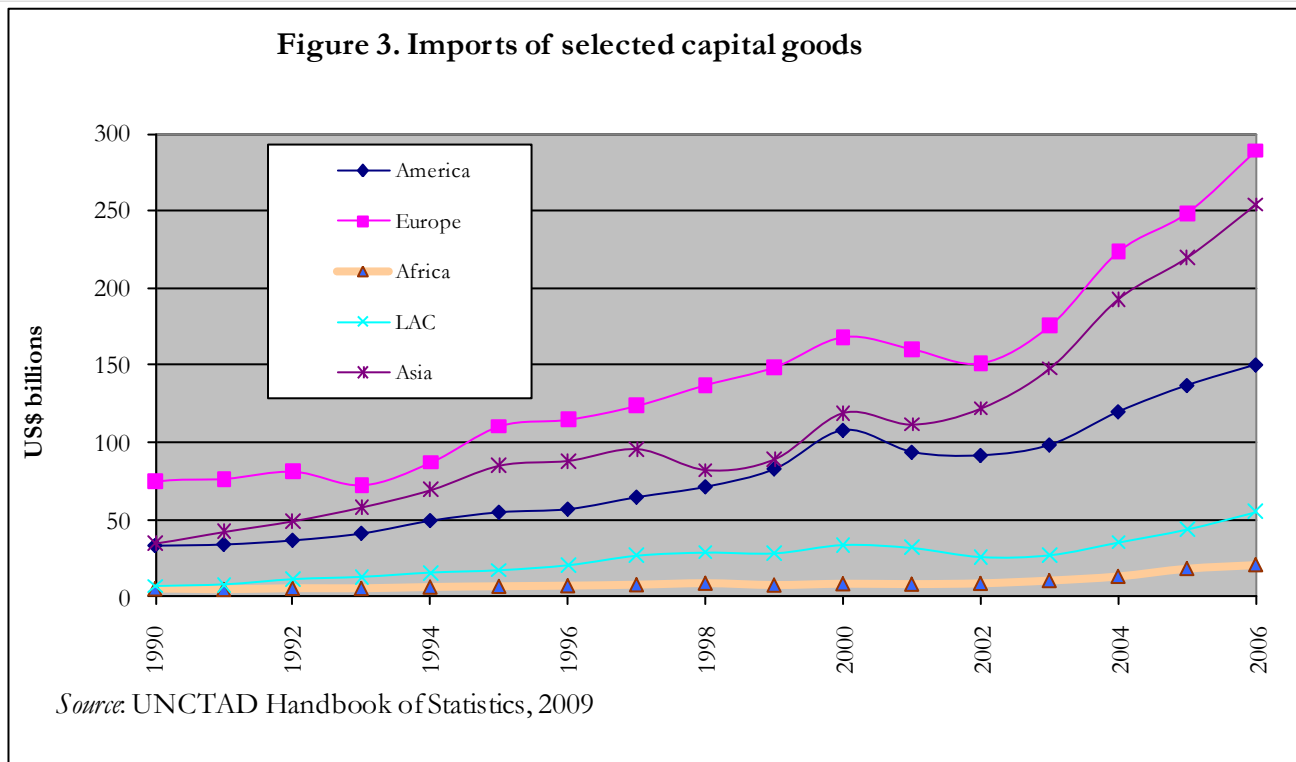
fees have increased 13 times for Swaziland, 12 times for South Africa, 9 times for Tunisia and 2.3 times for Senegal between 1990 and 2007. In terms of real value, Tunisia's royalties and licensing fees payments have increased from \$1.13 million to about \$10 million between 1990 and 2007 while those of Swaziland have increased from \$9.3 million to \$121 million over the same period. Similarly, payments by South Africa increased from about \$132 million in 1990 to about \$1.6 billion in 2007 while Senegal's payments increased from about \$330 thousand to about \$780 thousand over the same period. As a proportion of the world, South Africa's payments have grown from about 0.3% in 2000 to about 1.1% in 2007 and the global share of Swaziland had grown from about 0.04% to 0.07% over the same time.

However, there are other African countries whose royalty and licensing fee payments have fallen between 1990 and 2007. Countries that have seen their payments fall include Cote d'Ivoire, Egypt,

Kenya, Morocco and Namibia. For instance, Kenya's payments for knowledge assets have fallen sharply from about \$102 million in 1993 to about \$23 million in 2007. Similarly, Morocco's royalty and licensing fee payments grew up to \$201 million in 1999 but has since fallen to an annual average of about \$ 36 million since 2000. Similar fall is seen in the payments of Egypt - from over \$400 million in 2000 to an annual average of about \$170 million since 2003, and in the payment of Cote d'Ivoire - from about \$25 million in 1998 to about \$9 million in 2006.

In terms of magnitude or absolute value of receipts, Angola, on average, occupies the first place followed by Egypt, South Africa, Kenya and Tunisia as shown in Table 1. Angola recorded its highest level of receipts of \$1.3 billion in 2006, giving rise to an annual average of \$275 million between 2000 and 2007. It also accounts for the peak in Sub-Saharan Africa's receipts for 2006 in Figure 2. On this basis, Angola's receipts went up 25 times, followed by Bot-

Figure 3. Imports of selected capital goods



swana whose receipts went up 22 times between 1990 and 2007. South Africa, Lesotho, Madagascar and Cameroon are among countries that have seen their royalty and licensing fee receipts fall while Egypt, Cote d'Ivoire and Kenya are among countries that have witnessed a general growth in their receipts. The countries whose royalty and licensing fee receipts have increased are not exactly exporters of knowledge-intensive products or generators of technologies but rather charge royalties and licensing fees related to other activities such as explorations, mineral and mining rights and others related to travel and tourism, etc.

2.2 Trends in capital goods imports

In general, the import of capital goods has grown rapidly over the last two decades. Such imports have increased by 7.8-fold for LAC, 7.5-fold for Asia, 4.7-fold for North America, 3.9-fold for Europe and 3.7-fold for Africa between 1990 and 2006. However, Europe, North America and Asia are the largest importers of capital goods. Imports of capital goods by European countries increased from about \$74 billion in 1990 to about \$289 billion in 2006. As such Africa's imports of capital goods grew much slower than that of the other regions included in this paper (see Figure 3) but accelerated much faster in the last five years.

It was noted that Africa is the only region that spends more than 10 times on imports of capital goods than it earns in exports of similar goods. This perhaps indicates that Africa is not a major producer of capital goods as its exports of capital goods remained largely unchanged. On the other hand, Asia

has joined Europe as a net exporter of capital goods and LAC's exports of capital goods have grown at the same speed as that of Asia (a 3-fold increase).

A closer look at Africa reveals that imports of capital goods have grown rapidly since 2001. Imports of such goods did not change much between 1995 and 2001 but has almost tripled in value between 2001 and 2006. Therefore, while Africa remains a small importer of capital goods in absolute value, it has registered the fastest growth in the import of capital goods between 2001 and 2006 than any other regions.

In terms of rate of growth in imports of capital goods, Madagascar registered the fastest growth in imports of capital goods between 2000 and 2008 in Africa. Madagascar's imports of capital goods increased eight times within that period. Another four African countries - Zambia, Niger, Nigeria and Rwanda - saw their imports of capital goods increased more than seven times between 2000 and 2008. In general, about 60% of the African countries (19 out of the 32) considered here saw their imports of capital goods more than triple over this period (See Table 2).

There are also a number of general observations. The best performing countries in terms of imports of capital goods are smaller economies - except Nigeria. Secondly, while the mining and petroleum producers and exporters performed well, the top importers include countries outside this category

Table 2. Imports of capital good (BEC 41) of selected African countries

	2000	2001	2002	2003	2004	2005	2006	2007	2008
South Africa	5089	4749	5010	6350	8500	10000	14088	14088	15322
Nigeria	851	1096	1815	2676	-	-	5235	5463	6280
Egypt	1771	1385	1166	896	1090	-	-	-	6201
Algeria	1432	1678	2144	2643	3489	3583	3540	4381	-
Morocco	1739	1401	1462	1841	2365	2668	2908	3793	-
Tunisia	1177	1293	1176	1315	1499	1494	1621	1976	2534
Kenya	414	439	336	364	580	580	777	1067	1473
Ethiopia	194	235	236	395	447	690	777	1097	1097
Sudan	225	257	334	384	640	1388	1687	1184	891
Uganda	122	139	128	174	237	347	357	533	737
Zambia	94	152	162	248	304	347	598	788	713
Madagascar	85	91	45	114	189	206	174	327	699
Senegal	168	168	88	201	260	391	391	424	629
Côte d'Ivoire	219	224	317	377	425	716	391	496	575
Botswana	347	249	432	575	370	341	318	489	571
Namibia	203	203	161	164	298	317	345	543	546
Zimbabwe	-	164	326	-	282	134	228	522	-
Mauritius	242	196	243	277	331	574	593	468	465
Mozambique		80	135	198	247	282	317	281	391
Malawi	75	61	62	89	99	124	115	124	357
Mali	78	129	79	110	100	119	163	216	337
Gabon	181	162	150	123	136	217	289		
Rwanda		31	31	29	23	57	71	97	230
Guinea	29	35	35		90	56	94	173	183
Niger	17	17	40	56	63	57	100	97	124
Swaziland	109	81	92	199	130	126	123	95	
Mauritania	34	43	23	26	819	670	66	134	87
Cape Verde	26	26	32	27	32	41	60	79	83
Seychelles		33	43			39	52		64
Benin	34	49	40	57	66	46	48		
Gambia	10	6	7	10	21	21	23	26	18

Source: Comtrade database, 2009

such as Ethiopia, Malawi, Rwanda, and Uganda. Some of the countries that have not witnessed a fast growth in the imports include Botswana, Mauritius and Swaziland.

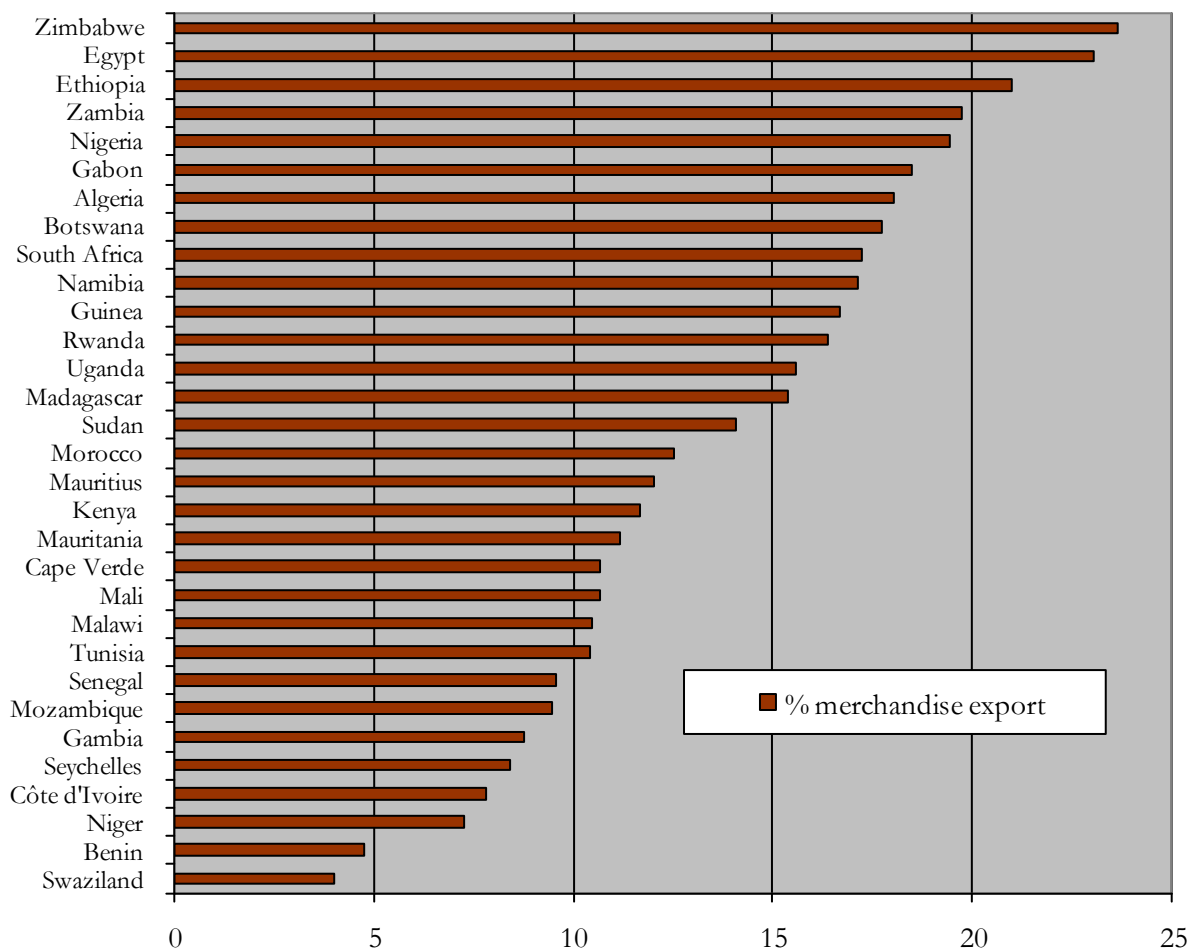
To determine the extent to which countries are investing in capital goods, we assess such imports as a proportion of total merchandise imports. As shown in figure 4, about 10 out of the 32 countries spent more than 17% of their total merchandise import bill on capital goods. Zimbabwe, Egypt, Ethiopia, Zambia and Nigeria are the top five countries and they

each spent almost a fifth or more of their total merchandise imports bill on capital goods in 2008. Only Benin and Swaziland out of the 31 countries whose data was available spent less than 5% of their total merchandise imports on capital goods in 2008.

2.3 Intra- and Interfirm Trends in trade of BPT services

Most of the data on trade in services is not suffi-

Figure 4. Capital goods imports (BEC 41) as percentage of merchandise imports



Source: Comtrade database, 2009

ciently disaggregated to identify technology transfer-related service payments and receipts. Here we use the United States - the top exporter and importer of such business, professional and Technical (BPT) services - as a proxy of trends in global trade in BPT services. Geographical proximity, trade relations, language barriers, diplomatic relations and historical ties are likely to influence access to and trade in BPS among countries in different regions. Despite this limitation, United States has the data disaggregated sufficiently to at least portray some general trends in trade of BPT services.

According to the United States Bureau of Economic

Analysis (USBEA), the trade in BPT services between the United States and the rest of the world has grown, at varying speeds, as shown in Table 3a. In general, payments by the United States for business and professional services grew faster than receipts. Intra-firm payments increased much faster than inter-firm receipts. While this raises some doubt that firms may be overstating payments to cover external profits, it is perhaps important to note that inter-firm payments also grew faster than inter-firm receipts.

Africa posted a 5-fold increase in receipts and 51-fold rise in payments to the United States between

Table 3a Trends in the US international trade in business, professional and technical services (in US\$ millions)

	Receipts		Payments	
	2001	2008	2001	2008
Intra-firm	30,744	55,484	20,966	50,603
Inter-firm	28,169	58,041	9,452	25,681
Total	58,913	113,525	30,418	76,284

Table 3b The US international inter-firm trade in business and professional services by region (in US\$ millions)

	Receipts			Payments		
	1990	2000	2005	1990	2000	2005
Europe	2,182	10,153	16,805	687	3,481	5,979
Africa	230	1,008	1,289	11	155	562
Asia	979	3,382	6,365	147	963	2,087
LAC	1,314	3,690	5,640	126	574	1,208

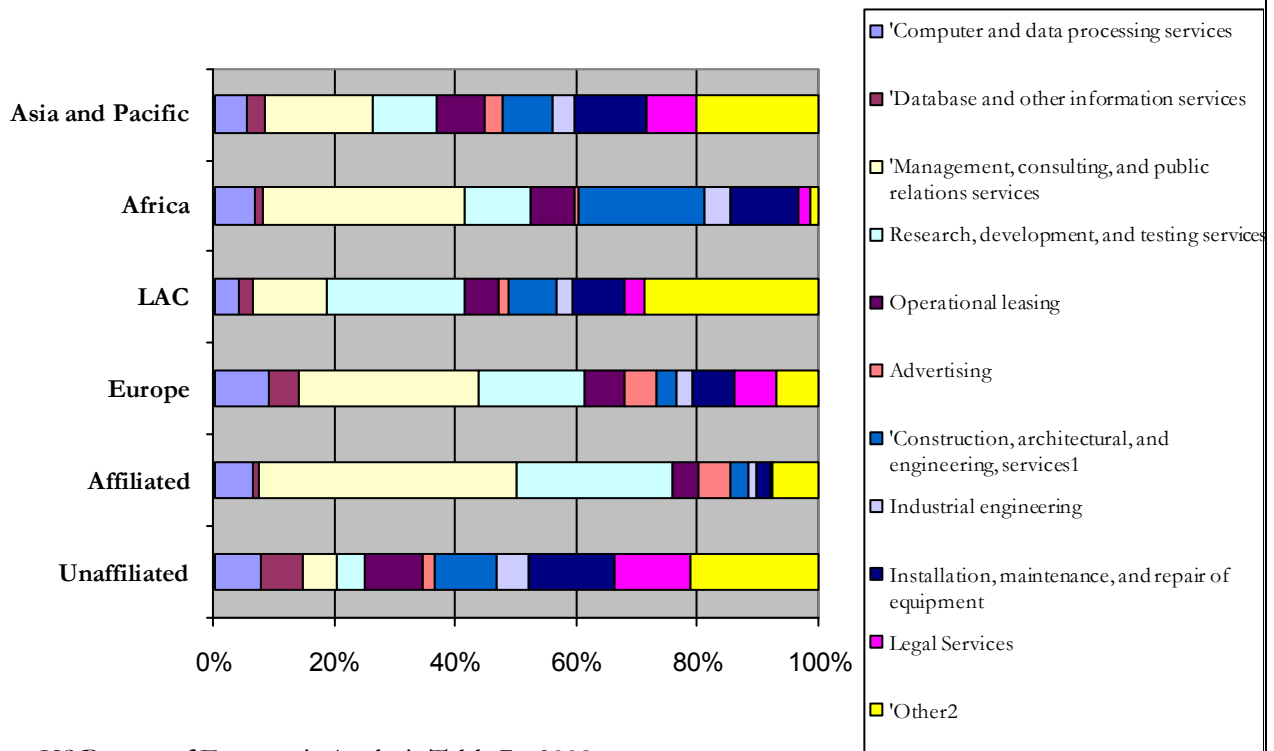
Table 3c As a percentage of the US receipts and payments

	Receipts			Payments		
	1990	2000	2005	1990	2000	2005
Europe	28	40	42	33	38	13
Africa	3.0	4.0	3.2	0.5	1.7	1.2
Asia	13	13	16	7	11	4
LAC	17	15	14	6	6	3

Source: US Bureau of Economic Analysis

NB: Data for trade in services between affiliated firms is available only from 2001 and receipts refer to exports of such services by the US and payments refer to imports (i.e. US firms paid for the services).

Figure 5. Difference in composition of import of BPS from the United States in 2008



Source: US Bureau of Economic Analysis Table 7a, 2009

1990 and 2005. As shown in table 3b, it was observed that receipts by the United States from unaffiliated firms for business and professional services between 1990 and 2005 increased by about 7.7-fold in Europe, 6.5-fold in Asia, 5.6-fold in Africa and 4.3-fold in LAC. However, growth in payments by

United States firms to unaffiliated firms for BPT services grew fastest in Africa (51-fold) followed by Asia (14.2-fold), LAC (9.5-fold), and Europe (8.7-fold) over the same period. As a result, Africa's share of United States' imports of BPT services has more than doubled – from 0.5% in 1990 to

about 1.2% 2005 (see Table 3c).

There is also a major difference in the nature of BPT services that are traded between affiliates and their parent firms, between unaffiliated firms, and between the United States and developing regions. As shown in figure 5, more than 40% of intra-firms payment to the United States was for management, consulting and public relations type of services and about 25% was for research, development and testing services in 2008. However, these two groups of BPT services made up less than 9% of inter-firm payments in 2008. Similarly, installation, maintenance and repair of equipment and legal services made up about 26% of the payments by unaffiliated firms to the United States while the same group of services constituted only about 4 % of payments by affiliated firms.

Similar differences are also observed at the regional level. Inter-firm trade in BPTs accounts for over 60% of Asia's payments but less than 40% of that of Africa. Similarly, about 33% of Asia's and 22% of Africa's payments for BPT services to the United States are for management, consulting and public relations services and construction, architectural and engineering services, respectively. These two categories of services collectively account for only about 22% of LAC's and about 30% of Asia and the Pacific's payments for BPT services to the United States. It seems intra-firm trade dominates Africa's payments for BPT services. The much higher share of intra-firm trade in Africa might be an indicator for little incentives for foreign investors to collaborate with the local private sector

While the rest of Africa is collectively a net importer of BPT services from the United States, South Africa has been a net exporter of such services in 2006, 2007 and 2008. Other developing countries that are net exporters of BPT services in the period reviewed include Brazil, India, Israel, Malaysia, Philippines and Thailand. Of these, India was the largest net exporter of BPT services to the United States – rising from \$3.5 billion in 2006 to \$6.8 billion in 2008.

Table 3b The United States' international inter-firm trade in business and professional services by region (in US\$ millions) *Source: US Bureau of Economic Analysis*

NB: Data for trade in services between affiliated firms is available only from 2001 and receipts refer to exports of such services by the US and payments refer to imports (i.e. US firms paid for the services).

Overall, Africa is performing better in proxies that are closely related to trade and investment such as

trade in capital goods and royalties and licensing fees than those that represent emerging knowledge such as the research, development and testing services.

Four easy and effective steps to promote technology transfer

There are several ways in which Africa can promote and facilitate technology transfer. These include providing information on new and emerging technologies, supporting training and attachments, offering targeted tax incentives for technology acquisition, establishing R&D and technology sourcing units in advanced economies, developing international cooperation and partnerships, encouraging trade and foreign direct investment (FDI), among many others. In this section, we place emphasis on a few viable ways that could be implemented relatively easily and quickly by African countries and likely to stimulate innovation and technology transfer.

Enhancing university-industry-government partnerships

One way of promoting the acquisition, adaptation, upgrading and diffusion of new and emerging technologies as well as birth and growth of firms is to improve the relationships between knowledge and skill producers (academia), knowledge users and product/service providers (industry) and regulators/policy makers (government), commonly referred to as the "Triple Helix" of University-Industry-Government (Leydesdorff and Etzkowitz, 2001). The three parties represent the key players of any national or regional innovation system. In brief, the triple helix model does not impose boundary restrictions in relations, interactions and location of innovations and entrepreneurship or the roles of the players. The triple helix is a "spiral model that captures multiple reciprocal relationships at different points of knowledge capitalisation" (Leydesdorff and Etzkowitz, 2001).

In order for academia to play this role, the universities have to expand their roles from being trainers and producers of skilled elites to owners of the knowledge and founders of firms. This gives rise to what has been termed the "entrepreneurial university" (Clark, 1998) whose key characteristics include:

- Independent, strong and efficient managerial system,
- Interdepartmental cooperation and increased collaboration with the outside,
- Broadened resource base,
- Transformation of faculty to accept entrepre-

neurial attitudes and, Shared entrepreneurial culture throughout the university.

These characteristics are seen as key in enabling universities to function as centres for knowledge creation, technology transfer, centres for development of firms and agents for economic and social development (creating jobs and wealth). The university, in this case, enables research teams to operate as 'quasi-firms'(Etzkowitz, 2003).

Although these relations are not well characterised in developing countries, there is a growing volume of evidence that they play an important role. Several countries have already considered ways of encouraging such partnerships. For instance, South Africa's Innovation Hub (<http://www.theinnovationhub.com/>) is strategically located between two of the country's premier scientific and industrial research institutions: the University of Pretoria and the Council for Scientific and Industrial Research (CSIR).

Similarly, Egypt's Mubarak City for Scientific Research and Technology Applications (<http://www.mucsat.sci.eg/citypages/home.aspx>) is located in an industrial area housing about 40% of the Egyptian industry. The locations are deliberately designed to encourage collaboration with industry.

3.2 Technology transfer through government contracts

Governments are among the major consumers of products and services. They often source products and services in the domestic economy and internationally. Many African governments depend on foreign firms to acquire technologically sophisticated equipment. Governments can use such contracts to encourage local firms to source foreign technologies by floating technologically challenging contracts to local firms. Similarly, governments could ensure that international contractors work with local firms in implementing contracts to encourage technology transfer.

Another example is the Airbus-Aeroflot deal involving the purchase of twenty-two A350 Airbus planes by the state-owned Russian airline in March 2007. This deal includes the participation of Russian firms in the production of the planes. A number of components for the production of Airbus planes are to be manufactured by Russian plants and the Engineering Centre Airbus in Russia (ECAR), one of Airbus' design and engineering centres. This deal follows the three partnership

agreements proposed in 2006 by Airbus (engineering and manufacturing of parts, conversion of passenger planes to cargo planes and participation in design and manufacture of new-generation Airbus planes), with Russian firms and government, estimated to be worth about \$25 billion.

In a nutshell, all these arrangements could be tailored to serve as conduits for the transfer of technology from one country to another. In Africa, Tunisia used the contract for global sourcing of motor vehicles to develop its automobile components industry. Firms that agreed to supply automobiles were encouraged to source some components from local firms. Despite its limited market size – a small population – the country managed to attract interest from car assemblers. Backed with incentives and technical support to local manufacturers of automobile parts, the country has developed an industry that supplies parts to car assemblers in Europe.

3.3 Industrial technology alliances

Industrial technology alliances, as defined by the US National Science Foundation (NSF), are "industrial technology linkages with the aim of co-developing new products or capabilities through R&D collaboration" (NSF, 2006). There are at least four factors that promote the development of technology alliances:

- the multidisciplinary nature of R&D activities;
- the complexity of R&D;
- the uncertainty of commercial success of R&D products; and the high cost of R&D activities (Suarez-Villa, 2004).

Firms may seek alliances to spread the cost, risks and uncertainty, especially in knowledge intensive fields such as biotechnology where there are restrictive and lengthy regulatory regimes (Ernst & Young, 2005). Some of these partnerships may strategically position a firm to gain access to public and private resources of its partner(s), avoid regulatory and registration hurdles in foreign countries and access lucrative contracts and markets. In the life science industries, such as biotechnology and biopharmaceuticals, and the information and communication technology sector, firms may engage in partnership to invest in a new firm.

These arrangements are crucial in enabling countries lagging behind to quickly gain access to knowledge, learn and run a business without needing to reinvent the "wheel". The risks of developing, producing, distributing and marketing new products is drastically reduced in industrial

alliances such as joint ventures because even the least developed country may easily obtain exclusive access to its market especially where the government has a stake in the firm. Key to these arrangements is the government playing a facilitating role in technology transfer through industrial alliances and partnerships by completing science and technology agreements.

3.4 International science and technology cooperation agreements

International science and technology cooperation agreements (ISTCAs) as well as multilateral environmental agreements (MEAs) often contain clauses that promote technology transfer. Whereas South-South ISTCAs have contributed significantly to genuine technology transfer, North-South MEAs have so far failed to do so. Promotion within ISTCAs may take the form of cooperation in R&D through joint research projects in the field of common interest, strengthening the R&D capacity of the least developed party, exchange of scientists and researchers and fostering relations between research centres, among others.

Countries enter into collaborative R&D activities to pool financial resources for large or expensive projects, tap expertise and natural resources located in other countries, participate in global projects and promote political, cultural, scientific and industrial relations. In addition, international collaboration could keep national policy makers informed about key international S&T policy decisions of other governments, promote international reputation, facilitate FDI and identify markets for technology products and services.

For instance, Brazil and China agreed (in 1989) to develop two remote sensing satellites through the China-Brazil Earth Resources Satellite (CBERS) Programme (Sausen, 2001). The Programme pools the human and financial resources of both countries to establish a remote sensing system that is competitive and compatible with international needs. To boost industrial development, a clause was included that obligated the Chinese to reinvest the equivalent of the money received from Brazil to purchase Brazilian products. The inclusion of such clauses stimulates industrial involvement and investment in R&D.

In the CBERS Programme, China bore 70 percent of the cost while Brazil covered 30 percent. Brazil is responsible for the development of the high-resolution cameras while China is responsible for the application platform. Recently, Brazil and China have agreed to swap fuel technologies and develop a joint venture for the construction of aircraft turbofan jets for low-cost and low-maintenance aircrafts. Such agreements benefit industries that develop, source and supply the technology such as aircraft manufacturers and suppliers of aircraft components.

Some ISTCAs explicitly mention the involvement of private firms. For example, the ISTCA between the Republic of Korea and Russia of 1990 led to the establishment of joint research centres in Russia for collaboration in various areas such as aerospace, materials, energy, and op-

tics, among others. Such joint centres may have facilitated Korean firms, such as Samsung, to enter into technology partnerships and establish R&D centres in Russia. Such collaboration also helps familiarize individuals in private and public institutions with the culture of partner countries and promote understanding.

Conclusion

The term technology transfer as used in this paper includes various processes associated with acquisition, learning or mastering of technology. Technology transfer is not only vital for developing countries but also developed countries. Indeed, most of the technology transfer related transactions and deals occur between developed countries. As such technology transfer is not and should not be seen as a one-off activity but rather a continuous process. The development of new and improved products, processes and organizational arrangements (i.e. the process of innovation) is likely to depend on access to knowledge generated by others.

Perhaps one of the most surprising conclusions is that Africa is performing relatively well in a number of areas in terms of technology transfer, unlike in a previous study (UNCTAD, 2003) where its performance was still considered to be poor. This may signal a technological resurgence at least at the industrial level. In general, Africa performed relatively well in the import of foreign technologies embodied in machines and some services. Africa's 10-fold increase (about 900%) in royalty and licensing fee payments between 1990 and 2008 is above the world average and the second highest among the regions compared in this paper. More importantly, a number of African countries recorded higher growth in this area than the African average: Cameroon (2,100%), Niger (4,300%) Senegal (2,300%), South Africa (1,100%) over the same period. We also note that Africa recorded the fastest growth in imports of capital goods between 2001 and 2006. A number of African countries including Guinea, Madagascar, Niger, Nigeria, Rwanda, Uganda and Zambia recorded an increase of more than twice the African average. Similarly, Africa's imports of business, professional and technical services from the United States rose at a slower rate than that of Europe and Asia while Africa's exports of the same services to the United States increased faster (51-fold) than any other region.

At a global level, we can make three general observations. First, cross-border payments for technology are growing fast but are still concentrated among developed countries and involve only a handful of developing countries. This is not entirely surprising as technology transfer is needed to generate and improve productivity and efficiency (Nelson and Phelps, 1966). Second, regions that have benefited from increased global flows of technology have also registered remarkable development, such as Asia. This is expected as effective technology transfer is fundamental to the processes of learning and catching-up (Perez and Soete, 1988). Third, all developing regions import more what may be termed mature technologies (e.g. ma-

chines) than knowledge related technology proxies (e.g. BPT services).

Significant attention has focused on the ability of a country to acquire, absorb, master and exploit foreign technologies to become innovators (Trivigno, 2006; Vinova 2005). While these trends may signal an increase in industrial upgrading, African countries may wish to invest in generating the scientific and technological base necessary to identify, acquire, operate, maintain and modify appropriate foreign technologies to meet their unique development ambitions (Nelson and Phelps, 1966).

Based on this understanding, we recommend a few simple measures that countries could implement to promote technology transfer and innovation and increase absorptive capacity:

Governments may wish to promote industry-academia-government (triple helix) partnerships to identify, acquire, adapt, upgrade and diffuse new and emerging technologies as well as incubate and nurture start-ups. Each of these players bring unique advantages that could reduce costs and risks associated with technology transfer.

Government contracts should be used to facilitate technology transfer through requirements that encourage joint ventures and projects between domestic and foreign firms, and between domestic industries and R&D centres.

Industrial alliances between domestic and foreign firms, especially those in which the government participates, invests or acts as guarantor could serve as a driver for technology transfer, learning and innovation.

International science and technology cooperation agreements (ISTCAs) between African countries and leading or emerging technology exporters could be developed with a focus on joint research projects, exchange of expertise and knowledge, pooling of resources and exchange of good practices.

All these measures are not mutually exclusive and thus can be mixed, recombined and refined to come up with innovative organizational arrangements to fit national realities. Furthermore, incentives for technology development, transfer and diffusion could also be built into these models. Other measures such as incubators, science parks, and industrial districts could be tailored to promote these models and vice-versa. The main objectives behind each of these recommendations are to encourage private sector involvement in innovation, leverage limited human, mobilize financial and institutional resources through partnerships and cooperation, and encourage learning through exchange of best practices.

To achieve these goals, countries need to engage their STI and non-STI development agents and agencies (e.g. those responsible for promoting investment, small and medium-sized firms, trade and industry and diplomacy) to take on board the need to facilitate technology trans-

fer. This is important as many of the areas addressed do not fall within the mandate of the ministries or agencies of science and technology only. Cooperation of other key ministries will be crucial to the success of any program as highlighted by the case of Rwanda.

While recognizing the efforts underway to assess and collect information on science, technology and innovation indicators, it may be important to include or develop reliable mechanisms to continuously collect and maintain data related to knowledge acquisition and generation. As demonstrated in this paper, data is missing even in relatively more advanced African countries. Organizations such as UNECA and AU and its NEPAD Agency should commit resources to collect such information to support informed policy making.

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However, it is important to keep in mind that it is a legal definition with a bias towards commercial contracts. This definition does not recognize general education and mobility of workers as technology transfer.

A type of project that is constructed by a developer and sold or turned over to a buyer in a ready to use condition.

Royalty and license fees are payments and receipts between residents and nonresidents for the authorized use of intangible, nonproduced, nonfinancial assets and proprietary rights (such as patents, copyrights, trademarks, industrial processes, and franchises) and for the use, through licensing agreements, of produced originals of prototypes (such as films and manuscripts)

Capital goods refer to the sum of handling, electrical and non-electrical machinery, telecommunication equipment and metal work machinery or tools (SITC groups 723, 736, 744, 764, 771, 778 and 874).

Until 2006, only data between unaffiliated firms was disaggregated by country and thus by region. Since 2006, both inter-firm and intra-firm trade in business and professional services is disaggregated by country or

region. Thus the data for 2008 is total trade in business and professional services while that for 1986 and 1996 are only for unaffiliated firms (inter-firm). For this reason, the 2008 is only used to determine the main importers and exporters of these services from and to the United States but cannot be compared to that of 1986 or 1996 to highlight a trend.



OVERALL CUSTOMER SATISFACTION IN GHANA'S MOBILE TELECOMMUNICATION NETWORKS: IMPLICATIONS FOR MANAGEMENT AND POLICY

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Abstract

This paper, which was a part of a larger study, seeks to empirically assess and analyse overall customer satisfaction (CS) with service quality delivered by mobile telecommunication networks (MTNs) in Ghana. It involves a cross-sectional survey that used a structured questionnaire personally administered to one thousand (1000) individual subscribers selected from four mobile telecom networks in 2008. The findings indicate that irrespective of mobile telecom network in Ghana, CS is low; neither equal to nor better than desire and expectation of the customers. The National Communication Authority (NCA), the regulator and policy makers are empirically informed of the general customer dissatisfaction with mobile telecom service in Ghana and should ensure that MTNs in Ghana improve upon their service quality. Overall CS ratings among customers of MTNs in Ghana significantly differ and that relatively, customers of Companies B, C, and D rated their satisfaction with service quality higher than those of Company A. The management of Company A would need to develop strategies toward to deal with their customer dissatisfaction. Further research should evaluate customer satisfaction with specific services across MTNs in Ghana. The paper contributes to the body of knowledge in the area CS in the Ghana's mobile telecom networks and provides important managerial implications.

Key words: Customer satisfaction, service quality, SERVQUAL models, mobile telecommunication networks, customer expectation and desire, disconfirmation models.

1.0 INTRODUCTION

1.1 Problem Discussion

Organisations are increasingly being customer-centric and are embracing customer-driven initiatives that seek to understand, attract, retain and build intimate long term relationship with profitable customers (Kotler, 2006; Gronroos, C 1994; Narver and Slater, 1990). Modern organisations are much interested not just in acquiring new customers, but more importantly, retaining existing customers. This is perhaps because it costs more to attract new customers than to retain existing ones. It is believed that the average business spends six (6) times more to attract new customers than to retain old customers. Again it is more profitable retaining an old customer who is more likely to re-purchase or re-use a company's products/services and recommend them to others.

Customer satisfaction (CS) is central to the customer-centric paradigm shift, and has gained much attention from scholars and practitioners as it has become one of the cardinal means for achieving quality improvement programmes, and one of the crucial foci of strategic marketing management in business organisations that have long-term perspective for growth.

The state of customer satisfaction with service quality delivered in Ghana's Mobile Telecommunication Networks (MTNs) is not clear as there is scanty documentation on the issue. According to

a discussion paper on telecom developments and investments in Ghana (Frempong & Henten, February 2004, p.3), the authors noted that “the goals set by government have only partly been met – especially with respect to the development in rural areas – and the quality of service is still low and has even deteriorated on some indicators. There is, therefore, a widespread dissatisfaction with the general telecom development in Ghana among users as well as policy decision makers and administrators.” In recent times, there has been more customer complaint about poor service quality which has been reported by the National Communications Authority (NCA) (*BIZ Community.com*, October 19, 2007).

Since the past decade, the industry has witnessed a tremendous increase in subscriber growth rate for all the mobile telecom operators (ITU, 2008). Though mobile subscribers have increased in Ghana MTNs, it does not provide justification that customers are satisfied with the service quality delivered by mobile telecom networks in Ghana. No study so far, to the best of the researchers' knowledge has been conducted to examine the CS in Ghana's MTNs. So there is the need to empirically assess and analyse the phenomenon for managerial implications.

1.2 Statement of the problem and Purpose of the study

In view of the above, the main problem that is addressed in this paper which was part of a larger study is: Are customers satisfied with the service quality delivered by Mobile Telecom Networks (MTNs) in Ghana? The focus of this paper, therefore, is to assess and analyse overall customer satisfaction with service delivery in MTNs within Ghana.

1.3 Research questions

This sub-study was guided by the following specific research questions:

- How can overall customer satisfaction (CS) with service quality be described in Ghana's MTNs with and without respect to customers' mobile telecom network?
- Do the ratings of customer satisfaction among MTNs in Ghana differ?
- Do the ratings of male and female customers regarding their satisfaction with service delivery of MTNs in Ghana's differ?

1.4 Significance of the study

The study is immensely significant in diverse ways to business/marketing practitioners, policy makers and stakeholders. To the management of Ghana's mobile telecom networks, the findings and results that will be reported in this study will provide a more reliable scien-

tific measure and perspective for describing and evaluating the overall customer satisfaction with the services they deliver. To policy makers like government agencies such as the Ministry of Communications and the National Communications Authority, the finding and results of this study will provide invaluable insights and a more reliable guide to monitoring the impact of the operations of Ghana's MTNs and measuring their respective policy goals and objectives.

To stakeholders like investors, shareholders, employees, pressure groups, consumer associations, among others, the study will provide invaluable information that will allow them to provide useful suggestions to the improvement in service delivery of their respective mobile network operators in Ghana.

2.0 LITERATURE REVIEW

2.1 Brief Historical Overview of Ghana's Telecom Industry

Until 1994, Ghana's telecommunication industry was monopolised by the incumbent-government corporation, Ghana Post, Telephone and Telegraph (PTT). Between 1994 and 2000, Ghana moved from a government controlled PTT to a competitive telecom environment that allowed strong internet and mobile telecom network providers to operate. This was as a result of the deregulation of Ghana's telecommunications sector in 1994 under the Accelerated Development Program (ADP) 1994-2000 (Addy-Nayo, 2001) when the Government announced a five-year comprehensive restructuring of the industry. The main policy objectives of the program were formulated with the assistance of the World Bank, consultants and other stakeholders, and aimed at:

- Achieve a density between 1.5 and 2.5 lines per 100 people;
- Improve public access in rural and urban areas, through the provision of payphone facilities (public and private);
- Expand the coverage of mobile services;
- Promote Ghanaian ownership and control of telecommunications companies; and
- Retain an overall public regulatory control of the sector through the creation of a single agency: the National Communications Authority (NCA) (Addy-Nayo, 2001, p.7).

The ADP adopted the following strategies to achieve the above-stated policy objectives:

- The authorisation of two national network operators: Ghana Telecom and a new independent operator;
- Support of new financing; arrangements which promote investment in new telecommunications infrastructure throughout the country; and

- Privatisation of Ghana Telecom through the sale of a strategic stake to an international operating company combined with measures to broaden share ownership in Ghana (Addy-Nayo, 2001, p.7).

As of the time of the study (2008) there were four cellular (mobile) phone networks in Ghana, namely: Millicom Ghana Ltd, Onetouch GSM Services – Ghana, MTN Ghana – Scancom Ghana Ltd and Kasapa Telecom Limited.

2.1 Millicom Ghana Ltd

Millicom Ghana Limited, operators of Tigo cellular phone network, is a subsidiary of Millicom International Cellular S.A. ("MIC") UK/Luxembourg, a leading global operator of cellular telephony services with several investments across the world. The company started its operations in Ghana in 1991 and was the first cellular network operator in the country. Millicom Ghana uses the ETAC System, and it had over 22 000 subscribers in 1998 with a market share of above 70 per cent of the mobile market. The company expanded and in 2002 Millicom Ghana introduced its GSM service under the brand name MOBITEL/Buzz GSM. Buzz GSM with its trendy lifestyle image offered very exciting services to its numerous clientele. Mobitel has, over the years, been able to maintain a fast rate of subscriber and revenue growth and a very high quality of service, acclaimed by most users as being second to none. In 2006, Tigo was launched in Ghana to replace the old national brand MOBITEL with a new international brand. Currently Tigo network coverage reaches all the ten regions in Ghana and it is fast expanding to rural areas (www.tigo.com.gh).

2.1.2 One touch GSM Services - Ghana

Onetouch is the cellular arm of Ghana Telecom. It started its operations in 2000 providing nation-wide cellular services. Ghana Telecom (GT) is the incumbent provider of telecommunication services in Ghana. As part of the ADP (1994-2000) reform program, Ghana Telecom was incorporated on June 16, 1995 as a successor to the telecommunications division of Ghana Posts and Telecommunications Corporation (GPTC). On 20th February 1997, Ghana Telecom was officially privatized to Telecom Malaysia Berhad with full management control. Subsequently the government handed operations of the company to Telenor Management Partner (TMP) till 2007. On July 3, 2008, the Government of Ghana announced the sale of 70% share to Vodafone for the purpose of making the company more profitable (www.ghanatelecom.com.gh).

2.1.3 MTN Ghana – Scancom Ghana Ltd

Scancom Ghana Ltd started operating in October 1996 using GSM 900 technology as Spacefone, with 15 sites and equipment from Ericsson. Initially, the network provided new services and coverage in Greater Accra, Ku-

masi and Obuasi, with ongoing developments in other regional capitals. The company operated as areeba and in 2006 it was taken over by Mobile Telecommunication Network Group (MTN) and now its name is MTN Ghana; it has expanded greatly its network coverage countrywide (www.mtn.com.gh).

2.1.4 Kasapa Telecom Limited

Kasapa Telecom Limited - a subsidiary of Hutchison Whampoa Group – was established in 1998. Hutchison acquired 80% of Celltel Limited in 1998. and in 2003, changed the brand to Kasapa and the company name to Kasapa Telecom Limited. In January 2005, Kasapa became a wholly-owned subsidiary of Hutchison Telecom. Kasapa means 'good talk' in Twi, the most widely-spoken local language in Ghana (Ghana business index, 2008).

2.2 Concept of Customer Satisfaction

Customer satisfaction (CS) is a term that has received considerable attention and interest among scholars and practitioners perhaps because of its importance as a key element of business strategy, and goal for all business activities especially in today's competitive market (Anderson, Fornell, and Lehmann, 1994; Gronroos, 1984; Lovelock & Wirtz, 2007). The concept has been variously defined by many authors. "Satisfaction is a person's feeling of pleasure or disappointment resulting from comparing a product's performance (outcome) in relation to his or her expectation" (Kotler & Keller, 2006 p. 144). Satisfaction is a "psychological concept that involves the feeling of well-being and pleasure that results from obtaining what one hopes for and expects from an appealing product and/or service" (WTO, 1985). CS is "as an attitude-like judgement following a purchase act or a series of consumer product interactions" Youjae Yi (1990 cited in Lovelock & Wirtz 2007). CS is "a consumer's post-purchase evaluation and affective response to the overall product or service experience" (Oliver, 1992). "Satisfaction is merely the result of things not going wrong; satisfying the needs and desires of consumers." (Besterfield 1994); CS is "an experience-based assessment made by the customer of how far his own expectations about the individual characteristics or the overall functionality of the services obtained from the provider have been fulfilled" (Bruhn, 2003).

Admittedly, satisfaction is more complex to define to accurately fit every context and measure. In the words of Oliver (1997), "everyone knows what [satisfaction] is until asked to give a definition. Then it seems, nobody knows". From marketing perspectives, customer satisfaction has multi-dimensionality. The object of customer satisfaction may be varied and can be related to different dimensions of multiple experiences with product/service provider (Surenshchandar et al. 2002 cited in Satari, 2007). While most definitions

relate customer satisfaction to quality of a product or service offering (Kotler & Keller, 2006; www.theacsu.org), satisfaction can as well be related to other non-quality dimensions (Singh 1991; Garland and Westbrook. 1989). It may be related to an on-going business relationship or with price-performance, satisfaction with the time or service delivery or the service experience, service context and satisfaction with entire reputation and outlook of an organisation. Even with the product or service quality there can be several dimensions (Groenroos, 2000, 2001; Bo Edvardsson 2005), such as *what* product offers, product or service reliability, timeliness, friendliness of the service providers, and the like. Therefore depending on the purpose one wants to achieve, one can relate satisfaction to any object of interest. In this study customer satisfaction is defined in relation to only dimensions connected to the service quality delivered by MTNs.

Satisfaction can be related to attribute-specific and overall performance. It is attribute-specific where it relates to a specific product or service (Cronin & Taylor, 1992). For example, with mobile telecommunication, satisfaction can be related to a specific attribute such as: Multimedia Messaging Service, Mobile TV or Mobile Internet Service or satisfaction with the voice quality, picture quality, speed, and the like. On the other hand, customer satisfaction can be related to the overall performance of a product/service or the overall performance of an organisation's products/services (Cronin & Taylor, 1992). The present study relates customer satisfaction to the overall performance of services delivered by mobile telecom networks in Ghana in order to generalise the findings for managerial implications.

As to whether customer satisfaction is an outcome or a process, many early definitions conceptualised satisfaction as a process which is currently the dominant view held by most scholars (Oliver, 1980; Parasuraman et al., 1988). The process perspective presupposes that customer satisfaction is a feeling of satisfaction that results from the process of comparing perceived performance and one or more predictive standards, such as expectations or desires (Khalifa & Liu, 2002).

This perspective is grounded in the expectancy disconfirmation theory proposed by Richard Oliver (Oliver, 1980). The customer is satisfied if the performance of product/service is equal to his/her expectations (positive disconfirmation) and he/she is dissatisfied if the product/service performance is perceived to be below his/her expectation (negative disconfirmation). If expectation exceeds perceived performance, the customer is highly satisfied. By taking satisfaction as a process these definitions do not focus on satisfaction itself but things that cause satisfaction, the antecedents to satisfaction, which occur primarily during the service delivery process (Vavra, 1997).

More recent studies view satisfaction as an outcome or end result during the process of the consumption of a service; it is viewed as a post-purchase experience (Vavra, 1997). This view has its roots in motivation theo-

ries that postulate that people are driven by the desire to satisfy their needs (Maslow, 1954) or that their behaviour is directed at the achievement of relevant goals (Vroom, 1964). In this way satisfaction is perceived as a goal to be achieved and can be described as consumer fulfilment response (Rust & Oliver, 1994).

In the context of mobile telecom services in Ghana, we believe that customers, through the promotional activities of the MTNs in Ghana, have developed certain expectations and set of desired services of the various service providers. These are important in determining their satisfaction of the services received/used. Therefore our conceptual framework treats satisfaction as a process not just an outcome that customers strive to achieve.

Another controversial issue in customer satisfaction literature is whether satisfaction is cognitive or affective. Although most scholars, notably proponents of disconfirmation theories, view satisfaction as a process, but the nature of satisfaction process remains unclear. While some authors maintain that satisfaction is a cognitive assessment involving a comparison of product/service offerings from a provider against expectations, other scholars opine that the feeling of satisfaction represent an emotional or affective state of mind that is formed through the process of service delivery where customers encounter service experiences that affect their emotions. More recent researches have found that satisfaction is both cognitive and affective (Edvardsson et al., 2005; Groenroos, 2001; Martin, et al., 2008; Oliver, 1993a; Wong, 2004). This view holds that customers do not only consume an offering for which they cognitively evaluate, but their involvement in the service production and delivery process allows them to emotionally evaluate the service quality. They argue that ". . . satisfaction is naturally tied to cognitive judgments and to affective reactions elicited in consumption" (Mano & Oliver, 1993, p. 451). In this study, customer satisfaction is conceptualised as cognitive and affective.

An equally debatable element in clarifying customer satisfaction concept is whether it is subjective or objective in nature. Pizam A. & Ellis T. (1999) noted that "a minority of researchers perceive the satisfaction process to be subjective in expectations but objective in the perceptions of the product attributes, or outcome." In this light, Klaus (1985, p. 21) defines satisfaction as "the customer's subjective evaluation of a consumption experience, based on some relationship between the customer's perceptions and objective attributes of the product". Expectation and perceived performance are constructs that are in themselves subject to external influences to some extent (Maister, 1985). Others point out that both what is perceived (outcome) and what is expected are subjective and psychological phenomena - not reality.

The importance of the subjective nature of the process cannot be overlooked. The reason is that both expecta-

tions and perceptions are psychological phenomena and are susceptible to external influences and manipulation. To say that customers' evaluation of a product or service is objective implies that the evaluation is not biased in any way. This is not realistic because it is a common knowledge that customers are different and the way they perceive a service like MMS, SMS, and Voice mail of a mobile network may vary considerably. However, we believe that each customer can be objective in their own subjective, cognitive and affective states. Therefore in this study, customer satisfaction in itself is defined as a subjective evaluation, but its measurement is approached objectively; thus, customers are supposed to be objective - expressing whatever subjective response they have about a product objectively without bias (subjective objectivity).

Satisfaction may be viewed as Transactional or Cumulative: On the one hand from a transactional-specific perspective, CS is based on a one time, specific post-purchase evaluative judgement of a service encounter (Hunt, 1977; Oliver, 1977, 1980, 1993 cited in Yonggui Wang & Hing-Po Lo 2002). On the other hand, in the cumulative CS perspective, CS is conceptualised as an overall customer evaluation of a product or service based on purchase and consumption experiences over a time period (Fornell, 1992; Johnson and Fornell 1991; Anderson et al., 1994a, b; cited in Yonggui Wang & Hing-Po Lo 2002).

In terms of the diagnostic and predictive value of customer satisfaction measurement, cumulative satisfaction is more useful and reliable than transaction-specific in that it is based on series of purchase and consumption occasions rather than just one occasion of transaction. Customer satisfaction, in this study, is measured from the last twelve months. Therefore, the conceptual framework of this study treats CS as cumulative. Consequently, the operational definition of CS in this study is, *"The process of customer overall subjective evaluation of the product/service quality against his/her expectation or desires over a time period."*

2.3 Research Hypothesis

This sub-study was guided by this hypothesis:

H1: *Overall Customer Satisfaction differs among MTNs in Ghana.*

H2: Overall satisfaction ratings differ between male

and female customers.

3.0 OPERATIONALISATION

3.1 Measurement of Customer Satisfaction

Oh and Parks (1997) identified nine methods for measuring CS, which are: expectancy disconfirmation, assimilation or cognitive dissonance, contrast, assimilation-contrast, equity, attribution, comparison-level, generalized negativity and value-precept. Pizam & Ellis (1999, p.327) in their work comment that "while most of these are based on cognitive psychology, recently numerous researches have attempted to apply CS theories developed by behaviourist in several areas. Out of the many theories the most widely used is the disconfirmation theories and customer satisfaction index."

To ensure the consistency of the results, three models of measuring CS were selected: One satisfaction index, specifically the Minnesota Customer Satisfaction Index (MnCSI), satisfaction measure, and disconfirmation measures. Each model is justified and operationalised.

3.1.1 MnCSI

Of the many satisfaction indices such as The Swedish Customer Satisfaction Barometer, The American Customer Satisfaction Index, The European Customer Satisfaction Index, The Minnesota Customer Satisfaction Index (MnCSI) was chosen because it is very stable using three questions that ask about the same idea--total satisfaction; it is also easy to apply, and it is relatively flexible and suitable for any reasonable number of responses deemed appropriate by a researcher. Interestingly the model of MnCSI succinctly captures the tenet variables of disconfirmation models: desire and expectation disconfirmations. This index was modified since customers were given five (5) responses to the three questions to reflect the value or weights of the five-likert scale that were used as shown below:

The following procedure for calculating the MnCSI with respect to and irrespective of mobile telecom network is outlined in Appendix C.

3.1.2 Disconfirmation Models (DMs)

MnCSI (modified)

$$= \left(\frac{\text{Question 1} - 1}{4} * 33.3 \right) + \left(\frac{\text{Question 2} - 1}{4} * 33.3 \right) + \left(\frac{\text{Question 3} - 1}{4} * 33.3 \right)$$

Source: DEED (Minnesota)

<http://www.deed.state.mn.us/customersurvey/csi.htm>

Oliver (1980) was the first to propose and developed the expectancy disconfirmation theory. DMs are models that suggest that customer satisfaction/dissatisfaction is the disparity that exist between the performance of a product/service and some cognitive or emotional standards of the consumer, such as desire and expectation of customers. If perceived performance exceeds or falls short of expectation or desire, there is positive disconfirmation or negative disconfirmation and the customer is satisfied or dissatisfied respectively. Desire disconfirmations (DD) and Expectation Disconfirmation (ED) are both empirically validated to significantly explain customer satisfaction (Khalifa and Liu, 2002). DMs have been tested and confirmed in several studies (Oliver & DeSarbo, 1988; Satari, 2007). Devlin, Dong and Brown (1993) and Rust & Oliver (1994) have recommended the use of disconfirmation scales instead of the others for three reasons: it highly correlates with customer retention, it simply captures in one disconfirmation-based single question, Parasuraman *et al.*'s (1988) two-stage SERVQUAL measurement, finally it is better because a customer rating service quality highly, for example as good or excellent, may not perceive it as 'better than expected.'" The results of Danaher and Haddrell (1996), who empirically compared several scales simultaneously on the same respondents, confirm the conclusion of Devlin *et al.* (1993) and Rust & Oliver (1994) that the disconfirmation scale is a preferred method in measuring customer satisfaction. They further agree, in particular, with Devlin *et al.* (1993) that a five-point disconfirmation scale would be an improvement over the three-point scale if high predictive validity is essential, but its use could pose challenges in telephone surveys where respondents might have to be continually reminded of five rather than three scale points. Since personal contact was to be used and high predictive validity was a major concern, we appropriately adopted five-point disconfirmation scales: from much better expected or desired to much worse than expected or desired. Thus, respondents responded to these question items:

- *How well did the services you received from your network compare with the ideal/desired set of services?*

- *To what extent have your mobile network services met your expectations?*

3.1.3 Satisfaction Model

The third measure used was the satisfaction model, which measures CS using scales such as from very satisfied to very dissatisfied (Danaher and Haddrell, 1996). Thus, participants responded to this question item:

Overall, tell how satisfied you are with the service delivery of your network.

3.2 Conceptualisation

A conceptual model (Figure 3.2) that provides the overall framework for this paper is displayed below, showing the four measures used in measuring CS.

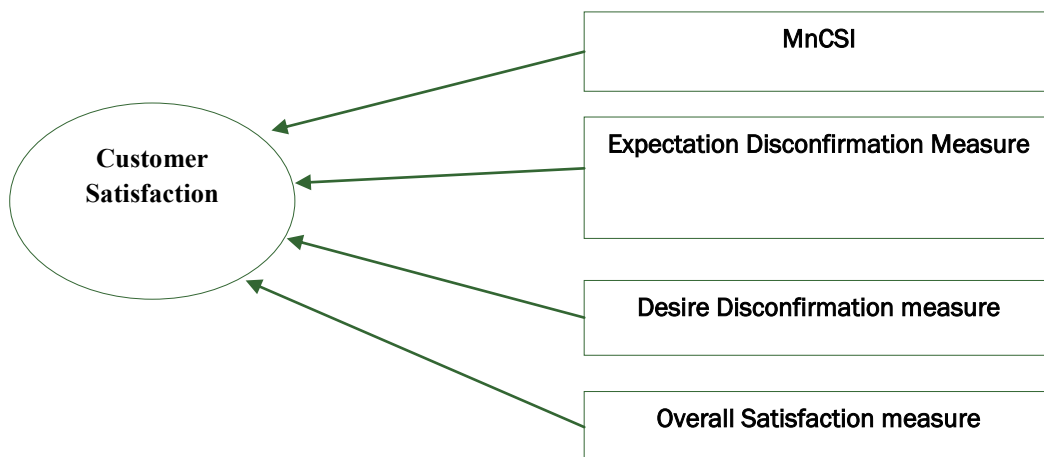
4.0 METHODOLOGY

4.1 Research Design, Population and Sampling

The study employed a cross-sectional survey which was appropriate for seeking the opinion of the target population about a phenomenon, with a researcher-designed questionnaire for data collection to answer the research questions (Cooper and Schindler, 2006).

The target population comprised 7.6 million mobile telecom individual subscribers as of December 2007 (ITU, 2007) from four mobile telecom networks in Ghana; namely: Scancom Ghana Limited operators of MTN, Millicom Ghana Limited operators of Tigo, Ghana Telecom operators of Onetouch, and Kasapa telecom. The study sample consisted of 1000 customers drawn from three selected cities in three zonal divisions in Ghana, namely: Tamale for the Northern Zone, Kumasi for the Middle Zone and Accra for Southern Zone. For confidentiality, each of the four companies used in this study is represented by a letter (A, B, C and D).

Fig. 3.2 A conceptual model for measuring CS



Stratum of Mobile Network	Estimated Percentage of Total subscribers	Expected Sample Size for Strata
Company A	60.5	605
Company B	19.5	195
Company C	4.0	40
Company D	16.0	160
TOTAL	100	1000

Table 4.1 Stratified Random Sampling by Mobile Network
Source: Fieldwork

A sample size of one thousand (1000) respondents was selected based on researchers' judgment because of cost and time constraints. In selecting the sample of one thousand (1000) respondents, a proportionate stratified random sampling was used. This technique was chosen because the population consisted of sub-groups of four mobile networks in Ghana. First, each of the four (4) mobile telecom networks within the target population was identified as a stratum. Secondly, the total sample was divided for each stratum according to the percentage of each stratum of mobile network in the entire industry guided by the available statistics of 2007 subscribers from each network (ITU, 2007) as shown in Table 1. Finally, a simple random method was used to select respondents for each of the mobile networks. Conscious effort was made to select only literate subscribers as respondents because of the use of self-administered questionnaire as the data collection instrument.

4.2 Data Collection Procedures

A self-administered, structured questionnaire (Appendix A) was used to collect data from respondents as recommended for a large survey (Saunders et al 2000; Cooper and Schindler 2006; Malhotra N. K. & Birks D. F. 2007). The questions sought respondents' feelings about overall customer satisfactions. The questionnaire had five (5) items related to respondents' identification data, and three (3) related to CS.

The questionnaire was pre-tested to a sample of twenty (20) subscribers selected by simple random method. This small size was guided by the suggestion by Fink (2003b in Saunders et al 2007) that the minimum of ten (10) members for pre-testing is adequate. Each of them was told the purpose of the questionnaire and assured of anonymity and confidentiality of responses before they were given the questionnaire to respond to. Finally, after adjustments were made to get more effective instruments, the questionnaire was administered to the target population through personal contact by researchers. Again, respondents were first informed of the purpose, assured of anonymity and confidentiality of responses. They were then given the questionnaire to fill; we left it to them, after which they submitted the questionnaire to us. This was between the periods of 10th June 2008 and 12th July 2008. In order to get a more representative sample of the entire target population, the questionnaire was

administered to respondents in three major cities in three zones in the country, namely: the northern Ghana zone – Tamale, Middle zone - Kumasi, and Southern Ghana - Accra.

4.3 Response Rate

Out of the one thousand questionnaires that were administered, nine hundred and thirty-seven (937) constituting 93.7% response rate were collected. Out of this, there were 601 customers of Company A, 140 customers of Company B, 40 of Company C and 156 customers of Company D. These numbers were adequate since a minimum sample of 30 is considered a large sample size for statistical analysis (Cooper and Schindler 2006, Saunders et al 2007).

4.4 Hypothesis Testing Tools

First, a One-Way ANOVA technique was used to test *Hypothesis 1* was adopted to find out whether CS differs among the customers of the four mobile telecom networks in Ghana. Second, Scheffe's statistic (and post hoc test) which assumes unequal sample size, equal variances for complex comparisons of means was used. Third the Means Plots were used to ascertain the structure of difference of means.

A One Sample t-test was used to test *hypothesis 2* to ascertain whether there is any statistically significance difference in the mean satisfaction ratings of male and female respondents.

4.5 Item Reliability

All the question items for satisfaction and disconfirmation scales yielded a Cronbach alpha reliability of 0.793 as in Table 4.5.

From the Table 4.5, the mean of OS measure was 3.24

Table 4.5 Reliability Statistics and Item Statistics (n=937)

	Item Statistics		Reliability Statistics	
	Mean	Std. Deviation	Cronbach's Alpha	N of Items
DD	2.7150	.89688	0.793	3
ED	2.8431	.91750		
OS	3.2433	1.05638		

while DD and ED were 2.71 and 2.84 respectively. The Standard deviations were DD (.89), ED (.91) and OS (1.05). 0.793 was a high composite Cronbach' alpha reliability score for the three items: ED, DD, and OS.

5.0 ANALYSIS OF RESULTS

5.1 Respondents' Characteristics

The characteristics of the respondents are presented in Table 1. In terms of gender, 55% of the respondents were males and 45% were females. 50% of the respondents were within the ages of 20-39 years and 13% were between 40 and 49 years, implying that majority of them were in the economically active population. Occupation-wise, most of them (63%) were students, 24% were public servants, 4% were business persons, while 9% belong to other professions. In terms of income, 98% of respondents earned monthly income below GH¢300 of which 31% earned between GH¢100 to ¢200 while 30% earned

Table 5.1 Descriptives of Respondents' Characteristics (n=937) Source: Fieldwork

		Frequency	%	\bar{x}	Std Dev
Gender	Male	520	55.5		
	female	417	45.5		
Occupation	Civil/Public	222	23.7		
	Student	592	63.2		
	Business Person	35	3.7		
	Other	88	9.4		
Age	<20	16	1.7	26	0.78583
	20-29	470	50.2		
	30-39	316	33.7		
	40-49	121	12.9		
	≥50	14	1.5		
Income	<100	93	9.9	201	1.40833
	101-200	277	29.6		
	201-300	195	20.8		
	>300	79	8.4		
	Non-income Earner	293	31.3		
Education Level	SHS	74	7.9		
	Post SHS	162	17.3		
	Tertiary	701	74.8		

virtually no monthly income indicating that most of them earned considerably lower incomes. All respondents were educated with 75% of them having tertiary level of education, while 25% had Senior High School (SHS) and post-SHS education levels of education.

5.2 Results of Minnesota Customer Satisfaction Index (MnCSI)

5.2.1 With respect to and Irrespective of Mobile Network

The formulae and description for the MnCSI (Appendix B) were used to arrive at a satisfaction index for each and all mobile networks together. The results are presented in Table 5.2.1.

Table 5.2.1 indicates that the calculated MnCSI for Companies A, B, C, and D were 44.3, 56.6, 58.1 and 53.7 respectively. The MnCSI indicated a fair index for Companies B, C, and D and a low index for Company A. The index for the entire sampled population irrespective of mobile network is 48.3 which is low.

5.3 Results of disconfirmation measures and overall customer satisfaction measure

Customers were asked to rate their satisfaction with service quality of service providers (MTNs) using desire disconfirmation (DD), expectation Disconfirmation (ED) measures and overall customer satisfaction (OCS) measures. The ED measure had a five-point likert scale: "much worse than expected", "worse than expected", "equal to expectation", better than expected and "much better than expected". The scale for DD measure was also five-point likert scale from "much worse than desired" to "much better than desired". OCS measure used a five-point likert scale: "very dissatisfied", "dissatisfied", "neutral", "satisfied", and "very satisfied".

5.3.1 Descriptive statistics: Irrespective of mobile telecom network

The Table 5.3.1a shows a descriptive statistics of the

Table 5.2.1 Summary of MnCSI for total sample and within groups

Mobile Network	MnCSI	Interpretation
Company A	44.3	Low
Company B	56.6	Fair
Company C	58.1	Fair
Company D	53.7	Fair
Irrespective of Mobile Network	48.3	Low

Table 5.3.1a Descriptive Statistics of Satisfaction Measures

	Mean		Std. Dev.	Variance
	Statistic	Std. Error	Statistic	Statistic
DD	2.7150	.02930	.89688	.804
ED	2.8431	.02997	.91750	.842
OCS	3.2433	.03451	1.05638	1.116

three measures: ED, DD and OCS.

Table 5.3.1a indicates that the mean rating of customer satisfaction using DD measure is 2.7150 with standard deviation of .89688 while using ED measure, the mean is 2.8431 with standard deviation of 0.91750. These mean were below the three (3) – equal to expectation or desire. Using OS measure, the mean rating was 3.2433 with standard deviation of 1.05638, being the highest. Statistically, the mean of 3.2433 is a low value, thus a little above neutral (3). Therefore, satisfaction can be described as very low.

A summary of the results of customer satisfaction rating irrespective of mobile network is presented in Figure 5.3.1b below.

It indicates that using DD measure, while 47% of the respondents rated their satisfaction as equal to expectation, 7.6% and 31.5% representing 39.1% rated their satisfaction as much worse than expected and worse than expected respectively, and 13.9 (9.6% and 4.3%) of respondents rated their satisfaction as better and much better than expected. Then using ED while 45.5% of the respondents rated their satisfaction as equal to desired, 5% and 30.4% representing 35.4% rated their satisfaction as much worse than desired and worse than desired respectively, and 19.1 (13.4% and 5.7%) of respondents rated their satisfaction as better and much better than desired. Finally, using OS measure, 50.6% indicated that overall they were satisfied or very satisfied while 49.4% maintained that they were either neutral, dissatisfied or

Figure 5.3.1b Satisfaction Ratings Irrespective of Network

Measure	Percentage of Ratings				
	Much Worse than expected /Very Dissatisfied	Worse than expected / Dissatisfied	Equal to expectation/ neutral	Better than expected or Satisfied	much better/Very satisfied
ED	5%	30.4%	45.5%	13.4%	5.7%
DD	7.6%	31.5%	47%	9.6%	4.3%
OS	7.2%	18.6%	23.6%	44.1%	6.5%

very dissatisfied.

5.3.2. Descriptive Statistics: With respect to mobile telecom network

Details of frequencies with respect to mobile network are shown in Appendix D. The mean satisfaction ratings using different satisfaction measures for each company are presented in Tables 5.3.2a

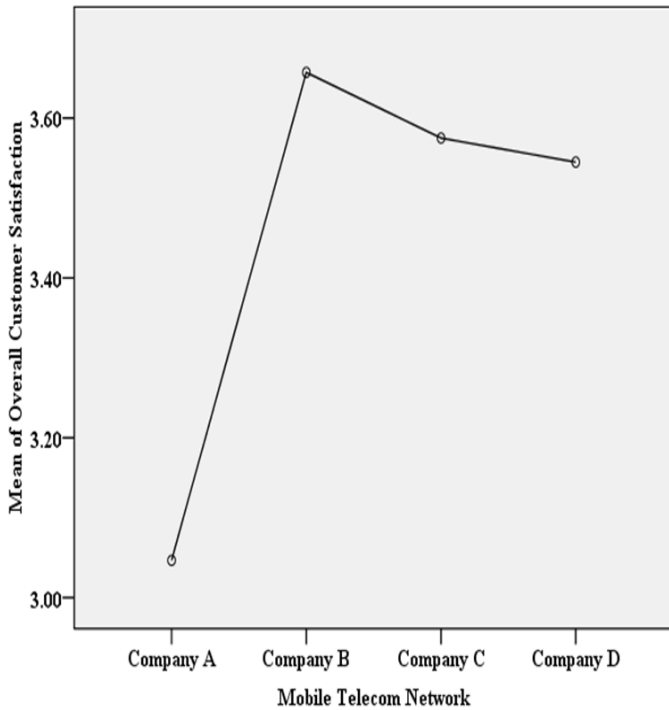
Figure 5.3.2a indicates the mean satisfaction rating of customers for Company A using the three measures. Mean overall satisfaction was 3.04 while the mean expectation and desire disconfirmations were 2.69 and 2.58 respectively. For Company B, the mean satisfaction rating by customers using OS measure indicates that overall mean satisfaction is 3.66 which is a little lower than 4 for satisfied. The mean rating using expectation and desire disconfirmation measures yielded scores of 3.2 and 2.94 respectively, indicating that satisfaction is equal to expectation but less than desire of customers. For Company C, the mean satisfaction ratings by customers using OS measure indicate that overall mean satisfaction was 3.58, indicating that satisfaction is considerably low close to 4, while expectation and desire disconfirmation measures yielded mean scores of 3.3 and 3.1 respectively, indicating that satisfaction of service quality is equal to expectation and desire of the respondents.

For Company D, the mean satisfaction rating by customers using the OS measure indicates that overall mean satisfaction is 3.54, which is little below 4 indicating that satisfaction is low or somewhat satisfied. The mean rat-

Figure 5.3.2a: Mean Satisfaction Rating for Companies A, B, C, D

measure	Mean ratings		
	OS measure	ED measure	DD measure
A	2.04	2.69	2.58
B	3.66	3.2	2.94
C	3.58	3.3	3.1
D	3.54	2.98	2.92

Figure 5.4b Mean Plot of Mean Difference for OCS



ing using ED and DD measures yielded scores of 2.98 and 2.92 respectively, indicating that satisfaction is somewhat equal to expectation and desire of customers.

5.4 Hypothesis 1: Comparing satisfaction among mobile networks

Hypothesis 1 tests whether the customer satisfaction/dissatisfaction differs among network companies:

H1: Overall customer satisfaction (OCS) differs among MTNs in Ghana.

A One-Way ANOVA was used to test the equality of the group's mean using Scheffe's statistic which assumes unequal sample size and equal variances for complex comparisons. Before performing a One-Way ANOVA test it was important, first, to ensure that the assumption of equality of groups' variances was established. The

Levene statistic, which is very robust, indicated a p-value (0.172>0.05) confirming the equality of means. The ANOVA test at 0.05 showed the following summary in Table 5.4a

Table 5.4a indicates that the p-value (0.00<0.05) providing strong support for rejecting the null hypothesis that the means are equal. Therefore, we can safely conclude with 95% confidence level that overall satisfaction or dissatisfaction differ among MTNs in Ghana. We explored to learn more about the structure and pair-wise multiple comparisons of the differences. That was done by first using the mean plot (Figure 5.4b) to help identify the structure of the difference.

The result in Figure 5.4b indicates that relatively customers of Companies B, C, and D rated their satisfaction with service quality higher than those of Company A. This is confirmed by a further post hoc test using Scheffe's T2 (Table 5.4b).

Table 5.4b indicates a pair-wise comparison of satisfaction/dissatisfaction among customers of the four mobile networks in Ghana. It reveals that the p-values (0.000, 0.019, and 0.000) are all less than the significant level (0.05). This implies that the satisfaction or dissatisfaction of customers of Company A is significantly different from all the other companies.

5.5 Satisfaction among Male and Female Gender

Though the results showed a fairly balanced gender distribution, 55% males and 45% females, a One-Sample T-Test (Table 5.5) was used to test whether the means of satisfaction ratings among female and male gender are equal. The results reveal that customer satisfaction significantly differs among male and female customers in Ghana's MTNs. The mean plots (Figure 5.5) further reveal that the male customers rated their satisfaction higher than their female counterparts implying that significantly more male customers are more satisfied than female customers regarding the service delivery of MTNs in Ghana.

Figure 5.5 indicates that the males rated their satisfaction higher than the female customers in Ghana's MTNs.

Table 5.4a ANOVA test for Overall Satisfaction among Mobile Networks

CS Measures	Expectation Disconfirmation (ED)			Desire Disconfirmation (DD)			Overall Satisfaction Measure		
	No.	\bar{x}	p-value	No.	\bar{x}	p-value	No.	\bar{x}	p-value
A	601	2.6938	0.00*	601	2.5824	0.000*	601	3.0466	0.000*
B	140	3.2000		140	2.9429		140	3.6571	
C	40	3.3000		40	3.1000		40	3.5750	
D	156	2.9808		156	2.9231		156	3.5449	

* significant at 0.05, N=937

Table 5.4b Comparison of Mean Difference in Satisfaction among Networks

Scheffe's Multiple Comparison						
(I) Network	(J) Network	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
A	B	-.61055*	.09612	.000	-.8797	-.3414
	C	-.52841*	.16724	.019	-.9968	-.0600
	D	-.49828*	.09203	.000	-.7560	-.2405
B	A	.61055*	.09612	.000	.3414	.8797
	C	.08214	.18362	.978	-.4321	.5964
	D	.11227	.11923	.829	-.2217	.4462
C	A	.52841*	.16724	.019	.0600	.9968
	B	-.08214	.18362	.978	-.5964	.4321
	D	.03013	.18152	.999	-.4782	.5385
D	A	.49828*	.09203	.000	.2405	.7560
	B	-.11227	.11923	.829	-.4462	.2217
	C	-.03013	.18152	.999	-.5385	.4782

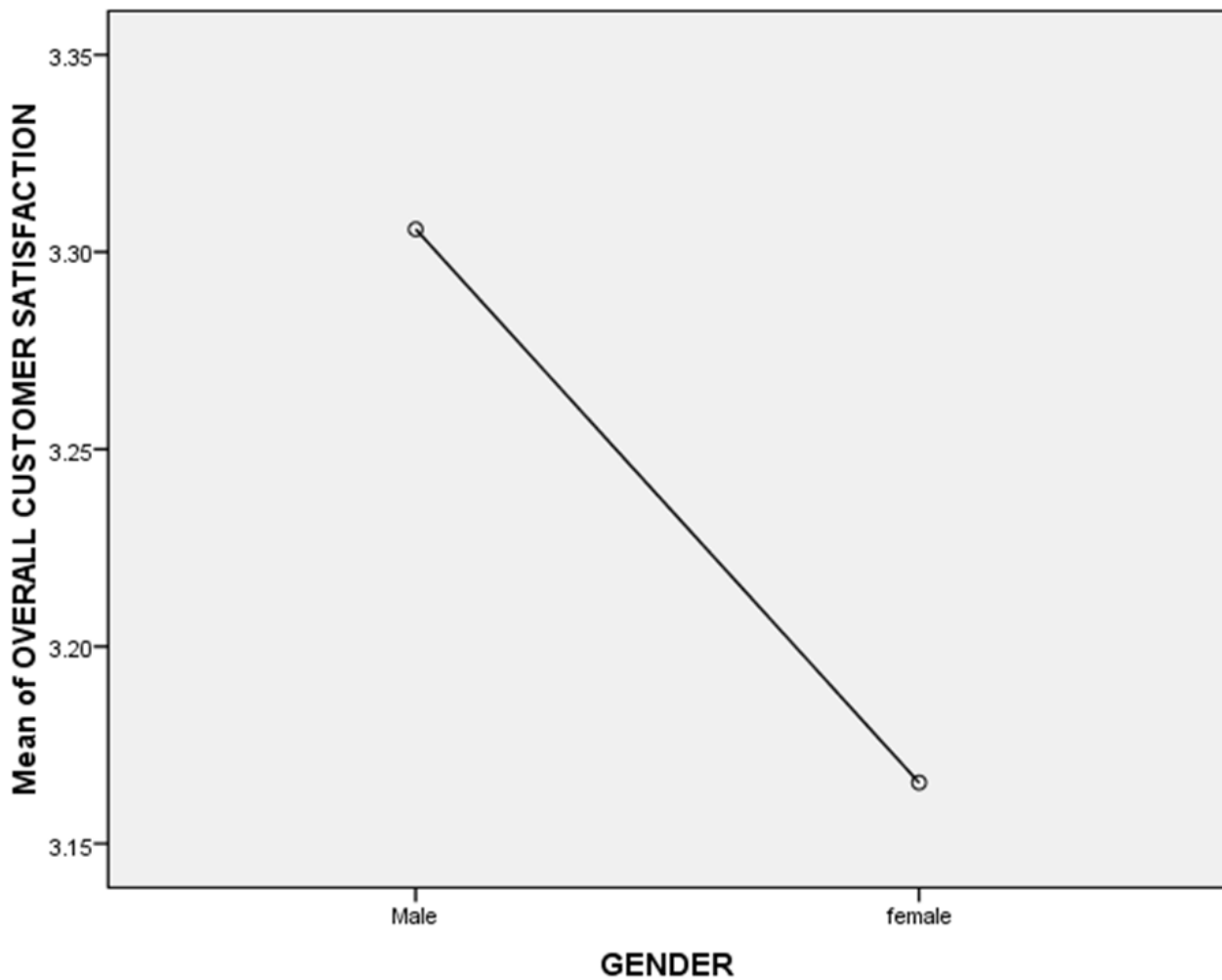
* The mean difference is significant at 0.05

Table 5.5 Chi-square test and ANOVA test – Gender*Overall customer satisfaction

	GENDER	N	Mean	Std. Deviation	Std. Error Mean	T-test for Equality of Means		Sig. (2-tailed) (p-value)
						t	df	
OVERALL CUSTOMER SATISFACTION	Male	520	3.3058	.98972	.04340	2.024	935	0.043*
	Female	417	3.1655	1.13042	.05536	2.024	935	

* The mean difference is significant at 0.05

Figure 5.5 Means Plots for Satisfaction among Gender



6.0 Discussion and implications

The findings are discussed to address the research questions for this study.

6.1 Research Question One:

How can customer satisfaction (CS) with the service quality be described in mobile telecom networks within Ghana with and without respect to mobile network?

6.1.1 Irrespective of mobile network company

First, the MnCSI (Table 5.2.1) indicated an index of 48.3 which could be described as low because it is below the satisfactory index of 50. This result indicates that generally CS in Ghana's mobile telecom market is considerably low.

Second, using desire and expectation disconfirmation measures (Table 5.3.1b) show that 13.9% and 19.1% of respondents rated their satisfaction better than their desire and expectation respectively, with mean rating of 2.72 and 2.84 respectively, which were a little below the

required mean of 3. Third, overall satisfaction measure (Table 5.3.1b) showed that 51.2% of customers indicated that they were satisfied or very satisfied, while 25.8% of respondents indicated that they were not satisfied or very dissatisfied, with a mean rating of 3.24 which is considerably low.

6.1.2 With respect to mobile network

First of all, the MnCSI (Table 5.2.1) indicates an index of 44.3, 56.6, 58.1 and 53.7 for Companies A, B, C, and D respectively. This implies that CS with service quality is considerably low for Company A, but is fair for Companies B, C, and D. Again, using disconfirmation and overall satisfaction measures for each network, Figure 5.2.3a, b, c and d showed means just around the required mean of 3.

6.2. Research Question two:

Does customer satisfaction differ among the MTNs in Ghana?

The comparison of mean satisfaction ratings among

MTNs from the ANOVA F-test (Table 5.4.4a) showed p -value $0.000 < 0.05$. This provides support for rejecting the null hypothesis that the means are equal across mobile telecom networks in Ghana. It can, therefore, be concluded with 95% confidence that CS is not equal among the mobile networks in Ghana. The mean plot (Table 5.4.4b) further revealed that significantly most customers of Company B, C and D rated their satisfaction with service quality higher than Company A.

6.3. Research Question three:

Do the ratings of male and female customers regarding their satisfaction with service delivered by MTNs in Ghana differ?

The study confirms that satisfaction differs among male and female customers. A further post hoc analysis using the mean plots (Table 5.5 and figure 5.5) indicate that significantly male customers are more satisfied than female customers. More information is needed to comprehend this empirical finding. However it has strongly been revealed that there is a statistically significance difference in satisfaction of male and female customers of MTNs in Ghana.

6.4 Implications of the Findings

6.4.1 To Industry Regulators and Policy Makers

It has been found in this study that generally customer satisfaction with service quality is low or less than expected and desired in the Ghana MTNs. This imply that policy makers and industry regulators such as the Ministry of Communication and National Communication Authority in Ghana, need to be awakened to this empirical fact and take pragmatic steps to ensure that mobile telecom network operators in Ghana improve their efficiency and effectiveness in the provision of telecommunication services that meet and exceed customer need, desire and expectation.

It is recommended that industry regulators such as National Communication Authority (NCA) should make it part and parcel of their monitoring activities to establish and implement an independent periodic survey to assess customer satisfaction of the service quality delivered by MTNs in Ghana. Such surveys should not only seek the overall satisfaction of customers but also satisfaction in the various service quality dimensions. The results of such satisfaction surveys should be published with the companies named for the public to take knowledge of the respective performance of MTNs, which has the potency of triggering change in the quality of service delivered by the lowly rated companies. Such surveys also give the NCA and other industry regulators that scientific basis for any sanctions, queries and addressing poor service quality issues in the industry.

6.4.2 To Management of the MTNs.

Specifically, the findings of this study imply that the management of Company A must seriously take knowledge of customer dissatisfaction with their service qual-

ity and make serious efforts to develop effective strategies to improve the situation. Their customers are typically dissatisfied with their service quality; therefore it is recommended that the management should keep improving upon the network quality as well as other dimensions of service quality until customers' are satisfied.

The management of Companies B, C and D must understand that generally their customer satisfaction is only equal to and not better than expected, and that they ought to work towards exceeding customer expectation and desired service quality.

Since satisfaction differs among male and female customers, it implies that that gender is an empirically valid variable that can be used as basis for market segmentation. It is therefore, recommended that service providers could segment and target male and female customers with different service offerings and marketing strategies. For this to be effective the type of service offering should be well considered; it should be an offering type that has the likelihood to appeal to female and male customers differently. In this regard, mobile network operators could use diverse approaches such as marketing intelligence to find out services that most likely appeal to the each gender group, and tailor marketing strategies to deliver them to each gender segment and target group.

7. Conclusion

7.1 Summary of Findings and Conclusions

This paper sought to assess and analyse customer satisfaction with service quality delivered by Ghana's Mobile Telecom Networks with respect to and irrespective of mobile telecom network using four measures: MnCSI, desire and expectation disconfirmation measures, and overall satisfaction measures. Out of the one thousand sample population, nine hundred and thirty-seven (937) responded to the questionnaire administered.

The study found that irrespective of mobile telecom network in Ghana, all the four tools or measures pointed that CS is low and not equal to or better than desired or expectation, so the customers are not satisfied with service quality delivered by MTNs in Ghana.

With respect to mobile networks, the customers are not satisfied with the service delivery of Mobile Network A. Customer satisfaction for service quality of Company B is better than *expected* and at least equal to *desire* of customers. For Mobile Network C, customer satisfaction is at least equal to *expectation* and *desire* of the customers. Finally for Mobile Network D, customer satisfaction is at least equal to the desire and expectation of the customers.

Overall customer satisfaction significantly differs among Mobile Telecom Networks in Ghana. Significantly, customers of Company B, C and D rated their satisfaction higher than those of Company A. Finally,

the male respondents or customers are significantly more satisfied with their service providers than the female customers.

It is recommended that future research should examine customer satisfaction with specific service areas delivered across mobile telecom networks.

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AN E-MENTORING PLATFORM FOR ENTREPRENEUR-DRIVEN DEVELOPMENT IN AFRICA

African Technology Development Forum

Project Description

E-mentoring is widely recognized as a tool to promote economic development and social empowerment. As a result, numerous public and private initiatives have emerged over the past decade to mobilize e-mentoring for a particular social and economic purpose mainly focused in particular areas of competence within developed countries (see <http://www.atdforum.org/spip.php?rubrique37>). Yet, few of them are related to poverty reduction through the assistance and support of local entrepreneurship.

There is increasing evidence that the main obstacles to sustainable, home-grown and inclusive economic growth in Least Developed Countries (LDCs), is the lack of tacit knowledge of and investment in innovative and entrepreneurial local people. E-mentoring is very promising because there are highly competent people of all ages and increasingly elderly people who would like to impart their knowledge, network and experience gained over a life time and become active as investors and mentors of promising and innovative Small and Medium Enterprises (SMEs) in developing countries.

On the other side, there is a growing young and educated population in developing countries who is seeking an opportunity to use its creativity to start businesses that provide solutions to the many unmet needs in poor countries. What stands between them and their aspirations is the lack of experience (tacit knowledge, or 'deep craft'), a supportive network and access to funding.

We believe that our Match-making Platform has the potential to bring together the critical players from all developing countries given the support by the UNCTAD EMPRETEC Centres (Entrepreneurship Training Centers) and numerous Mentoring organizations in Europe and the United States. ATDF was co-founded by the applicant. Since 2003, ATDF runs a free peer-reviewed online journal on science, technology and entrepreneurship for development, provides online entrepreneurship assistance and has set up an entrepreneurship hub in Zambia with annual investment awards.

ATDF has launched its plans matchmaking platform on January 21, 2011 at the UNCTAD multi-expert meeting on enterprise development in Geneva

(<http://match.atdforum.org>) and the response from the participating stakeholders has been very positive. The event was sponsored by the Swiss Secretariat for Economic Affairs (SECO)

In the course of 2011, ATDFs partners will undertake specific activities. For example, mentoring organizations will be offering the e-platform to their volunteer expert corps and provide financial support for mentors who have

reached a stage where they would like to meet the African entrepreneur in person and look at his business on the ground.

The Rotary club and other professional associations will be invited to use their network to recruit new mentors; Google and SAP are contributing to the platform by providing the online tools that assist local entrepreneurs with financial planning and other office tools. Credit Suisse is considering the launching of an investment fund dedicated to growth-oriented entrepreneurs in developing countries designed to support business partnerships between experienced mentors and innovative local entrepreneurs.

The platform will be available as a mobile application and support online communication via skype, sms and e-mail.

Its matchmaking function helps to reduce search costs by finding optimal matching based on the different profiles entered by those who have registered.

From June to December 2010, we have developed and tested the website design, the format of the mentoring, entrepreneurship and business profiles as well as a new matchmaking algorithm in collaboration with the ETH department of computer science, the UNCTAD Enterprise Development Branch, Swisscontact (Swiss expert corps), interested mentors and local partners in Ethiopia, Zambia and Kenya.

So far we have offered interested participants a test-platform to provide valuable input and suggest further improvements (<http://test-match.atdforum.org>). You can login with username and password 'EntrepA' to have access to an Entrepreneurship/Business Profile and username and password 'MentorA' to have access to a Mentoring Profile. The Matchmaking function then presents the mentors that best match a particular entrepreneur and his/her business idea/product/service.

Rationale of the project

Most aid initiatives that support entrepreneurs in the informal sectors in African countries are designed to support low-budget existing business activities (e.g. microfinance, vocational training in traditional jobs, etc). But such investments are too small to allow an innovative entrepreneur to develop and commercialize a new product or service that would enable him or her to make increasing returns and eventually enter the formal sector where one has to cope with complex and expensive standards and regulations. Yet, experience in Asia and parts of Latin America prove that government policies that focus on supporting the transition from low-growth informal to high-growth formal business help create endogenous and inclusive development through a growing entrepreneurial middle-class.

Many African governments tend to rely too much on foreign aid in the generation of revenues even though it is well understood that investment in growth-oriented entrepreneurship and institutions that support it would have a more sustained impact on development. Unfortunately, foreign aid agencies influence priority setting in national policies through implicit or explicit conditionality that are often unrelated to the promotion of entrepreneurship. In fact, many of the ongoing programs seem to discourage growth-oriented entrepreneurs. Development organizations are primarily accountable to donors and taxpayers back home and therefore reluctant to invest in educated but poor people that aim at making profits. Even though there are many venture capital firms in Africa and there is also support from the International Finance Corporation (IFC) for private sector development, these investments are mainly focused on helping established companies (with revenues between US\$ 100'000 and US\$ 1 million) rather than risky start-up firms. This also explains why efforts by African universities to foster links to the local private sector have been disappointing so far.

In view of the fact that growth-oriented start-up entrepreneurs in Africa tend to be ignored by large investors, micro-finance institutions, development organizations as well as their own governments, was the main reason to set up the 'African Technology Development Forum' (ATDF) in 2003 together with two African colleagues, Victor Konde from Zambia and Constantine Bartel from Sudan. Our free-peer reviewed online journal called ATDF Journal was set up to address topics and ideas that are hardly addressed in social science research that increasingly needs to comply with official priorities set by the large public and private foundations in order to get funding (embedded science).

Each ATDF Journal issue is dedicated to a particular topic (e.g. health, energy, biotechnology, ICT, IPRs, etc) and contributions consist of empirical research produced in Africa as well as well-known experts in the respective field. As such, ATDF encourages research, problem identification and unconventional solutions put forward by African researchers and leading academic scholars from different fields.

Even though ATDF has run the quarterly journal for the past seven years on a voluntary basis, it has managed to attract contributions from leading scholars and professionals. The ATDF website is recognized as a resource-tool for growth-oriented African entrepreneurs with its business centre (<http://www.atdforum.org/spip.php?rubrique2>) and knowledge essentials that are updated on a regular basis (<http://www.atdforum.org/spip.php?rubrique3>).

ATDF has been learning by doing. For example, ATDF has sponsored start-up entrepreneurs in Zambia thanks to the support of Dr. Ernst Thomke in 2007. In course of entrepreneurship coaching we realized that there are several obstacles that make it hard for the local entrepreneurs to grow and generate profits that would allow to further invest in the improvement of the business: the complex and expensive formal regulations, the high transaction costs in creating a local business and client network, the absence of a dependable entrepreneurial infrastructure (business support services), and, finally, lack of access to knowledge and credit. The situation is not made easier for local entrepreneurs by the fact that African leaders tend to distrust

their own people and prefer to support foreigners instead or people from their own kin. This subliminal discrimination may further aggravate the economic situation of the local people and undermine their self-confidence.

In order to overcome the institutional and mental obstacles we encountered in Zambia and at the same time expand our ideas to other African countries, we decided to create the above-mentioned e-mentoring platform. The platform can to some extent help create an e-entrepreneurial infrastructure that partially compensates for the absence of a local infrastructure. E-mentors may not just help local entrepreneurs to solve a particular problem, comply with regulation, help them get investment for their business idea or even become a business-partner, but they may also help increase local self-confidence and curiosity about new business opportunities. After all, electronic communication helps to focus on the real problem and forget about cultural, economic and other personal differences. As such, it tends to make prejudice and hierarchic thinking irrelevant.

The goal of our initiative is to first encourage African entrepreneurs register with the platform via UN EM-PRETEC Centres. These centres could also help them register properly and clearly define what kind of problem they would like to solve and what they expect from a mentor.

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