

GHANA BECOMING 'BANGALORE OF AFRICA': THE ROLE OF SERVICING CAPACITY AND MARKET ACCESS

VIPIN GUPTA

Simmons College School of Management
300 The Fenway
Boston, MA 02115
USA
Tel: 1-617-277-3692
Fax: 1-617-521-3138
Gupta05@gmail.com

SUSAN D. SAMPSON

Simmons College School of Management
409 Commonwealth Ave.
Boston, MA 02215
USA.
Tel: 1-617-521-3895
Fax: 1-617-521-3138
Sampson@Simmons.edu

Abstract

Over the past few years, Ghana has been able to gain accolades from many as the rising Business Process Outsourcing (BPO) center of Sub-Saharan Africa, and even a potential Bangalore of Africa. In this paper, the case of Ghana and its pioneering technological firms is examined, to draw valuable lessons on how to develop initial technological capability for servicing global customers from a condition of competitive deficiency. This study has important implications for other nations in Sub-Saharan Africa looking to play an important role in the global economy.

Key words: Technological Capability, Ghana, Servicing Capacity, Telecommunications, BPO, Sub-Saharan Africa

INTRODUCTION

In a survey released in January 2006, rating the most promising Business Process Outsourcing (BPO) centers in the world, Ghana was ranked 22nd among 40 nations, and 1st in Africa. Ghana was ranked ahead of South Africa, which is ranked 32nd (World Bank, 2006). Ghana's rising as the Bangalore of Africa will be a sign of hope for the whole of Sub-Sahara Africa. The Western nations, particularly the US, appear to be ready to support Ghana by way of market access and immigrant diaspora.

The rise of Ghana as a BPO center was unexpected as recently as just a few years ago. In 2003, South Africa had more than 500 call centers, which was triple the number in 1997, employing about 70,000 employees (De Vynck, 2004). In contrast Ghana employed less than 5,000 employees in its BPO sector including call centers and claim processing in 2003, although the sector was growing very rapidly. At the time, it had only about 300,000 fixed phone lines, 550,000 mobile subscribers, 400,000 computers, 20,000 Internet subscribers and 325,000 Internet users, with a population of about 20 million (Osiakwan & Foster, 2004).

Using data from around 2000, Ifinedo (2005) assessed technological readiness of nine African nations. Ghana scored below average on seven of the eight factors: (1) culture, understanding and effectiveness, (2) knowledgeable citizens, (3) industry competitiveness, (4) access to skilled workforce, (5) willingness and ability to invest, (6) advanced infrastructure, and (7) macro economic stability. It was rated above average and the best in only one factor – cost of living and pricing. Overall, it was ranked second to the last, above only Cote d'Ivoire. South Africa was rated the best on the eight factors.

Along with economic factors, work culture played a part in the lack of development in Ghana. Traditionally, Ghanaian work-culture has been summed up in terms of a local saying, "If I can't get ahead, I won't let you get ahead either." (Oster, Goodman, Osiakwan, & Bernstein, 2004). The saying is generally represented by the image of an alligator with two heads, each trying to go in a different direction. Therefore, Ghanaians have historically avoided going into business and instead sought support from the government. Ghana's founding president, Kwame Nkrumah, once declared, "Seek ye first the political kingdom and all else shall follow." (Thompson, 2002).

Given the economic and cultural factors working against Ghana, how did they rise to become a promising BPO and quite possibly the next Bangalore? This paper traces the process by which the development of technological capability in Ghana was managed by various actors and the inter-play of market forces. First, a brief review of the literature on the concept of technological capability and the technological background of Ghana is presented. Second, the research methodology is identified and successive stages in the information and communications technology enabled services are classified. Third, the technological base available to the actors in each succeeding stage of servicing is investigated. Finally, there is a discussion of the factors that enabled success, despite the technical deficiencies in technological capability.

LITERATURE REVIEW

Technological Capability

Technological capability is a multi-faceted ensemble of human, physical, social, emotional, organizational, institutional, and financial capital. According to Bell and Pavitt (1993: 163), "Technological capabilities incorporate the resources needed to generate and manage technical change including skills, knowledge and experience, and institutional structures and linkages." National technological capability confers the absorptive capacity on a nation's people, and provides a base to exploit for added value. Absorptive capacity refers to the

capacity to appraise, acquire, apply, and adapt the acquirable technology (Cohen and Levinthal, 1990).

In the case of Ghana, the technological base has been extremely deficient, not only from international standards, but also from the minimalist African norms. As such, the absorptive capacity conferred on Ghanaian firms is of a very poor quality, and cannot be credited to be the factor in the rise of Ghana as the potential BPO center of Africa.

While the concept of absorptive capacity is an acquisitive one, it is suggested here that the need for incorporating an additional concept, that of servicing capacity, is necessary to capture the experiential and application aspect of technological capability. "Servicing capacity" refers to mobilizing, assembling, and offering a range of appropriate and relevant technological servicing to the involved players. This servicing capacity helps the players become demanding customers, sophisticated vendors, developers and purveyors of factor endowments, rival competitors, and enables government and institutional agencies. Even when a nation's technological base is very deficient, the devotion and dedication of its firms to service their targeted constituencies, in a way that enhances the value-adding knowledge and skills (including awareness of new possibilities), can contribute substantially to a nation's technological capability.

Background of Ghana

A review of the background of Ghana confirms the fundamental technical deficiencies in the national and organizational technological base. Ghana has an agricultural orientation with 70% of its 20 million plus population living in rural areas. Cocoa and gold are its primary sources of foreign revenue (World Fact Book, 2006). After independence in 1957, Ghana set up a number of state-owned enterprises producing a range of previously imported consumer goods for the domestic market. The Pioneer Industries and Companies Act of 1959 committed to develop an attractive environment for foreign direct investment and identified this environment as a critical factor for development. By 1970, Ghana had a diverse, dynamic manufacturing sector, although only on the surface (UNCTAD, 2003).

In reality, little servicing capacity had been created and Ghanaian aspirations remained low. Aspiration is essential to building community cultural wealth and can be defined as the ability to maintain hopes and dreams for the future despite real or perceived barriers (Yosso, 2005). The major national firms were concentrated in the refining and aluminum smelting sector where the nation had a natural resource advantage. Foreign firms operated primarily in food processing and industrial intermediaries manufacturing. African-owned firms in the formal sector were small scale, running on simple machinery and on low-level technical and managerial skills. The output tended to be of lower quality and focused on the domestic market. These firms lacked capital for refurbishing, upgrading, and modernizing facilities. Most African-owned firms were in the informal sector, operating essentially as home-based enterprises using very simple technologies and personal and part-time family labor (UNCTAD, 2003).

The weak foundations led to disastrous macro dynamics. In 1978, the nation's first president was overthrown through a military coup. The fragile manufacturing sector disintegrated, output fell to about 40 percent of the 1977 level by 1984, and inflation surged to 120 percent in 1983. Faced with huge national debt, a freer market system was adopted under World Bank guidelines. More than 250 of the 300 state owned enterprises were divested. Yet, even after this freer market system was adopted, the share of private sector in the national income rose from 4.5 percent to only 10 percent in 2003. This occurred, despite the fact that as many as 80 percent of the economically active population was engaged in the

private informal sector, 8 percent in the private formal sector, and 6 percent in the public sector (UNCTAD, 2003).

Since the early 1980s, Ghana emphasized education, increasing allocations from 1.5 percent to 5 percent of GDP. In 2004, five hundred odd public senior secondary schools graduated a total of 90,000 students, up from 27,000 students graduating from three hundred schools in 1987. Yet, 70% of the 3.7 million school students in Ghana studied at the primary level, and only 30% of junior secondary school graduates had access to senior secondary school education. Further, the number of students graduating from universities was only 10,000, with total enrollments in tertiary education at 100,000. With these limited education options, the minimum wage in Ghana was \$1 per hour (World Fact Book, 2006).

Most workers in Ghana's manufacturing firms had middle or secondary education. However, because of the deficiencies in the education system, firms had to incur the costs of remedial training for two thirds of these workers (Verner, 1999). Consequently, Ghana's firms were smaller in terms of structure and staffing, employing a less educated and less trained workforce that had only a quarter of labor productivity relative to Sub-Saharan African nations such as Zimbabwe and Kenya (Bigsten, et. al. 1998). Ghana suffered from a high brain drain with 43 percent of its skilled workforce estimated to have migrated overseas (Docquier & Rapoport, 2004).

RESEARCH METHODOLOGY

Gupta and Wang (2004) suggest a Process Tracing Congruence technique to uncover the process of transformation. In the congruence method, an existing formal or informal theory is used to make predictions regarding the outcome of the dependent variable in a particular case, given the value of the independent variable relevant to that case. The inference is then triangulated using 'process tracing', i.e. by identifying a causal sequence that clarifies how the independent variables contribute to the outcome of the dependent variable (Bennett and George, 2001). In deciding on a case study, one should look not for a 'typical' case, but rather for a 'critical' case that has a low probability of holding out in relation to theory, so as to uncover one or more missing steps in a causative relationship through intense observation and theoretical arbitrage.

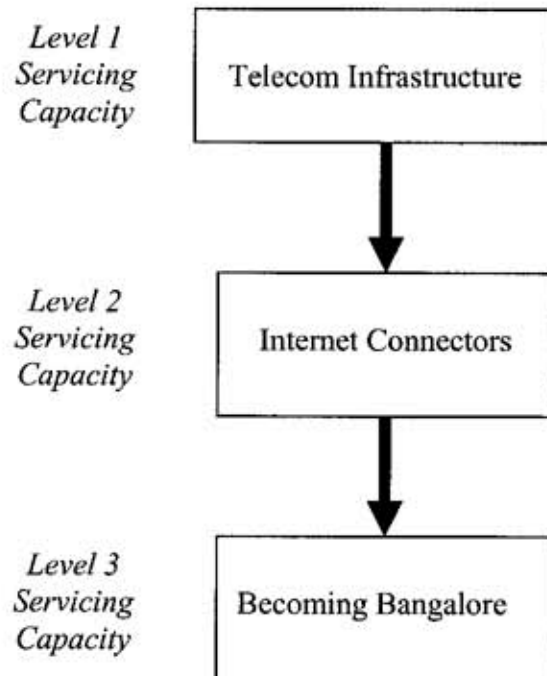
In this article, the general theory of technological capability that attributes further development to prior absorptive capacity, giving rise to an evolutionary multi-staged process, is used. In South Korea for example, studies suggest that in Stage 1, foundations were established by the assembly of finished products locally. In Stage 2, absorptive capacity was built through R&D to understand technology either to produce on license or to copy, and through development of public sector university and research centers. In Stage 3, the government vastly increased its R&D funding, and the private sector pursued small scale advanced R&D effort to create new products. Finally, in Stage 4, the firms were able to make large research investments, in both basic as well as applied domains (Mahoney, Lee & Yun, 2005).

The case of Ghana and its firms is used for conducting within-case analysis. Ghana represents a 'critical case' because it has a low probability for strengthening of foundations using R&D and academic centers, thereby limiting absorptive capacity between development stages. Ghana is among the most impoverished nations of the world and is substantially dependent on the aid from bilateral and multilateral sources for even basic development. The case of Ghana is of high relevance because it shares these characteristics with several nations in Sub-Saharan Africa that are seeking to develop their technological capability with few resources for building even basic absorptive capacity. Given limited resources, jobs in

technology would substantially raise the standard of living for citizens of Ghana and other Sub-Saharan African nations.

To trace the process of technological capability in Ghana, three levels of servicing capacity are identified in congruence with the staged evolutionary theory:

FIGURE 1
Staged Evolutionary Theory for Ghana's Technological Capacity



This paper will also examine if sufficient absorptive capacity was accessible to the nation for the development of each level and, if not, then what factors enabled the observed servicing capacity of the firms at each level.

BUILDING ICT-ENABLED SERVICING CAPACITY

First Level Servicing Capacity: Telecom Infrastructure

Telecom infrastructure is among the most basic requirements for servicing capacity in ICT-led value-added services. Until 1994, market penetration of telephones in Ghana stayed around 0.3 percent. In the 1970s and 1980s, the government launched two telecom rehabilitation projects sponsored by the World Bank. These projects helped replace obsolete equipment and supported improved institutional governance and management at the state-owned monopoly, Ghana Posts and Telecommunication, which was founded in 1974 (Godfred & Henten, 2004).

As part of 1983 Structural Adjustment Program of the World Bank, the government adopted the Accelerated Development Plan in 1994. Post and Telecoms were separated and converted into Ghana Post and Ghana Telecom in 1995. In 1996, a strategic equity stake of 30 percent of the Ghana Telecom was sold off to G-COM, a consortium led by Telecom Malaysia with full management control. A competitive duopoly was created, by licensing a second national network operator with similar rights and obligations as Ghana Telecom. Both operators were given five-year exclusive rights over the years 1997 to 2002. A third operator was licensed for the rural areas. The National Communications Authority was set up

as the regulatory body in 1996. Value-added services such as mobile telephone services, data transmission, paging, and pay phones were offered. The corporate users were allowed to develop their own private networks by investing in satellites (Frempong & Henten, 2004). Mobile operators were allowed to operate starting with Mobitel (now Buzz) in 1991, Celltel (now Kasapa) in 1993, ScanCom (now Areeba) and later the incumbent Ghana Telecom affiliate, One Touch.

Between 1995 and 2000, there was rapid growth in phone usage in Ghana. The nation had about 750,000 phone lines in 2000, up from 50,000 in 1994. By 2000, when the five-year Accelerated Development Plan ended, tele-density had risen from 0.34 lines per 1000 inhabitants in 1994 to 1.16 lines, and public phones had risen from 0.001 lines per 1000 inhabitants in 1994 to 0.16 lines (Ministry of Communications, 2004).

Land-line operator. Ghana Telecom, with a subscriber base of 280,000, was the largest fixed line telecom operator in 2003. Since its partial privatization, its management was under the control of Telekom Malaysia (the minority shareholder). The new 2001 government refused to renew the management contract of Telekom Malaysia in 2002, because of deteriorating service quality and failure to fulfill investment promises. Telekom Malaysia asked for a buy back of its 30 percent shares bought at US\$38 million in 1996 for US\$100 million, though the Ghana government disputed this valuation (Frempong & Henten, 2004). Meanwhile, the Norwegian operator Telenor received the new management contract. A loan of US\$150 million was obtained from China to fund new investments. Telenor committed to 400,000 new phone and Internet lines to all towns and villages that contain a secondary school (Frempong & Henten, 2004). Ghana Telecom reduced the loss of revenue leakage in the billing system from 25 percent in 2001 to 10 percent by 2005 (myjoyonline, 2005c). In 2001, receivables over 180 days constituted almost one-third of the total revenues resulting in a huge amount of bad debt. Under Telenor, Ghana Telecom achieved a turnaround from substantial losses to growing profits.

Along with introducing better systems for preventing fraud and bad debts, a Ghana Telecom Training Centre was also founded. This centre trained 822 people in 2003; 2,995 in 2004; and 3,936 in 2005 to improve individual and institutional efficiency, and planned to eventually obtain university status (myjoyonline, 2005c). Thus, there was substantial improvement in the efficiency of customer service, and the majority of Ghanaians could get access to telecom services by 2005 (Botwe, 2005).

The second largest telecom operator was Westel, which was set up in 1997 with majority equity from the US-based Western Wireless Company. Westel was expected to invest about US\$50 million for the first five years of operation. However, its actual investments were only US\$26 million and they generated a subscriber base of less than 3,000 in 2002, as compared to its target of 50,000 subscribers (Frempong & Henten, 2004). Most of Westel's revenues derived from its international gateway license that it used to connect some of the mobile operators who were not allowed to directly connect overseas. Westel planned to operate a pre-paid system whereby the users would have access to Ghana Telecom's network. However, Ghana Telecom contested this, forcing Westel to set up its own network, which delayed its operations and its viability.

The third telecom operator, Capital Telecom, was wholly Ghanaian owned and had license to operate in the underserved rural areas. However, its subscriber base was only about 500 in 2002. It secured a \$275,000 grant from the United States Trade Development Agency for a pilot project, to test the viability of new technologies in providing low cost wireless service in a rural environment (Frempong & Henten, 2004). Overall, the landline telecom capacity in Ghana was very limited, and the quality poor. As seen in Table 1, the call

completion rate deteriorated in the late 1990s and early 2000s, as the number of subscribers increased without expanding the network infrastructure.

TABLE 1
Quality of Service for Ghana Telecom, 1998-2002, in Percentages

	1998	1999	2000	2001	2002
Fault incidence rate/month for 100 lines	5.2	6.1	5.0	3.9	4.0
Fault clearance rate in 48 hours	62.0	56.9	58.5	59.9	65.7
Local call completion rate	81.1	78.8	77.6	78.5	77.6
Long distance call completion rate	63.4	54.7	47.0	59.8	55.2
International call completion rate	50.3	69.0	73.0	70.4	63.5

Source: Frempong & Henten (2004)

In summary, there is little evidence that the new telecom operators benefited much from the absorptive capacity created by the preceding player. Moreover, the absorptive capacity of the first telecom operator itself was very limited. It was not until servicing capacity in the form of pay phones, mobile phones, paging, and data transmission were added by competing contractors, financed through foreign investment, that there was any capacity built beyond the basic landline infrastructure.

In Africa, a significant amount of telecom services are distributed to users who did not have telephone or International Direct Dialing. To serve these users, small entrepreneurs resold Ghana Telecom services through some 2,000 tele-centers. Often, Ghanaians living abroad or returning from abroad invested in tele-centers as safe investments. A survey by Falch and Anyimadu (2003) indicated that 67.6 percent of the tele-center owners established the business through their own funds, 15.5 percent from friends/relatives, 4.2 percent from the banks, and 12.5 percent from the other sources.

Mobile operators. Given the limited capacity of the landline operators, mobile telephony grew more rapidly in Ghana, as shown in the Table 2.

TABLE 2
Number of Cellular Mobile Subscribers, 1993-2003, in thousands

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Mobitel/ Buzz	1.7	3.3	3.6	10.0	16.9	22.3	33.0	40.0	50.9	53.0	45.8
CellTel/ Kasapa	-		0.8	1.9	2.6	2.8	2.2	0.9	0.9	8.7	10.5
ScanCom/ Areeba	-		-	0.4	7.0	13.0	38.0	90.0	140.0	160.0	300.0
OneTouch	-		-		-	-	-	-	30.0	78.2	175.0
Total	1.7	3.3	4.4	12.3	26.5	38.1	73.2	130.9	221.8	299.9	531.3

Source: Frempong & Henten (2004)

Mobitel (now Buzz), Ghana's first mobile operator and 90 percent owned by Milicom International, launched the first prepaid service in Sub-Saharan Africa in 1998, which accounted for two thirds of its customers by 2002. The second mobile operator was CellTel, founded by a Ghanaian Company Kludjeson International, which later sold an 80 percent equity stake to Hong Kong-based Hutchison Wampoa, and was renamed as Kasapa. Inspired by these, ScanCom, a subsidiary of Luxemburg-based Investcom, entered the market. ScanCom estimated its potential customer base at 3,000 in 1996, but grew rapidly to become highly successful with 300,000 subscribers by 2003; the company was later sold off to Areeba (Frempong & Henten, 2004).

The mobile telephony resulted in a changing cost structure for Ghana Telecom. In 2005, 37 percent of its revenues and 90 percent of the cost of goods sold were comprised of the connectivity fees paid to the mobile operators, for the calls made from its networks to other mobile networks (myjoyonline, 2005c). Therefore, Ghana Telecom launched its own mobile phone service – OneTouch. It also sought to push the pre-paid system to mitigate its bad debts. Though OneTouch grew very rapidly with a capacity of 600,000 subscribers in 2005, Areeba maintained its lead, and under new ownership, Buzz became number 2.

For all mobile operators, landline operators controlled international connections via its congested submarine fiber cable; therefore, the international call quality of the mobile operators was very poor. Overall, the pace of growth of mobile telephony in Ghana until 2003 was below that of many other African nations like Kenya, Tanzania, and Uganda (Frempong & Henten, 2004). Thus, the basic telecom infrastructure capacity in Ghana was quite impoverished.

Second-level Servicing Capacity – Internet Connectors

Internet service providers. While the absorptive capacity of the telecom sector remained minimalist, the improvements in the telecom servicing capacity began to inspire new entrepreneurial leaders. National Computer Systems (NCS) was started by Dr. Nii Quaynor in 1988, using his own personal savings. Quaynor was a senior software engineering manager of Digital Equipment Corporation (DEC). In 1994, NCS allowed its subscribers to dial-in to its computers, and access the global Internet over a dial-up link to Pipex, the largest ISP in England. It thus became the first company in Sub-Saharan Africa to offer TCP/IP connectivity, including to the government and its agencies. Later in 1996, NCS used a PanAm satellite for establishing a connection to the global Internet backbone in the USA for more reliable service. NCS also hosted web pages for over 125 organizations in Ghana, mostly non-government organizations (Foster et al, 2004).

Ghana's second ISP, Internet Ghana was founded in 1996 by Electromod, a local computer company run by Leslie Tamakloe. It leased a line from Ghana Telecom for a dedicated connection with the MCI's Internet backbone in the USA. It focused primarily on the corporations, growing its corporate customer account from 20 in 1996, to 40 in 1998, 60 in 2000, and 84 in 2003. It pioneered the use of DSL in Ghana, and supported 150 subscribers on DSL by 2003, over existing phone lines by using a splitter. It used fiber optic backbone operated by Volta Communications, which supplied electricity to Ghana, to offer high speed Internet in many regional capitals of Ghana (Foster et. al, 2004).

Soon, one more ISP entered the market. Africa Online had been set up in Kenya by three MIT/Harvard-educated Kenyans. An operation in Ghana was started in 1996 by MIT-educated Ghanaian Mawuli Tse, using a leased line from Ghana Telecom to connect to the company's hub in Boston. Africa Online used VSAT to connect many of the regional capitals of Ghana. The emphasis of Africa Online was to rapidly build its absorptive

capacity through funding support from Prodigy. However, after the dot com crash, it was forced to focus on premium-priced high quality service to fund its strategy, as the funding from Prodigy dried up. Its position was therefore relegated to 5th position in the Internet market (Foster et. al, 2004).

Ghana Telecom also made substantial investments in creating Internet infrastructure; however, it was unable to introduce an Internet service by 2003. Overall, by 2004, over 52 ISPs had been licensed with only about 23,000 dial up accounts because of a shortage of functioning dialup phone lines. Five companies accounted for about 22,000 dial up accounts, and 70 percent of about 1000 corporate leased line DSL accounts. These were: NCS, ITS, Internet Ghana, IDN, and Africa Online. Most corporate accounts were comprised of Internet cafes. Most users relied on these Internet cafes, and the total number of internet users in Ghana was estimated to be 500,000 in 2003. The cost for unlimited dialup Internet service declined from over US\$100 a month to US\$25 by 2003, after the government made access to ISP licenses automatic in 1999 (Foster et. al., 2004). These initiatives also attracted two companies offering satellite connections – Veristar and Intelset. These planned to integrate into the ISP market, as the competition between them was reducing the prices of global IP connectivity over satellite (Foster et. al, 2004).

In addition to weaknesses in organizational design and human capital training, a major challenge facing ISP entrepreneurs was the cost of capital, with interest rates at over 30 percent. Therefore, many ISPs accepted Voice over IP international calls over their international satellite connections, and some even terminated these international calls illegally on the local exchange network of Ghana Telecom. The government allowed such termination on the private networks of the ISPs, but a number of illegal ISPs had neither their own private networks nor leased lines from Ghana Telecom. Consequently, Ghana Telecom suffered a huge reduction in its revenues from incoming international calls by 2000 with the losses from the actions of 32 unlicensed and illegal VoIP operators in 2002 estimated at US\$15 million (Coomson, 2003). These illegal ISPs, however, found it difficult to grow because Ghana Telecom took an aggressive stand and got many of them shut down and their owners imprisoned.

Those adopting a legal route took advantage of the fact that their international connections offered better and more reliable solutions for voice, data, as well as video, compared to the international network of Ghana Telecom. Therefore, most multinationals and diplomatic missions preferred to use the dedicated leased lines offered by these ISPs for their voice needs over the direct service offered by Ghana Telecom (Osiakwan & Foster, 2004).

Within Ghana, many of the regional capitals were linked through a combination of VSAT, wireless, and fiber optic connections. However, in most towns, the only way to access the Internet was through a long distance call to an ISP in one of the regional capitals served by the Internet. Moreover, the ISPs in Ghana were not connected through any Internet exchange. Only about 4 percent of total Internet traffic in Ghana was between ISPs in Ghana. Most Ghanaians accessed hosts outside Ghana, and sent emails to other users in Ghana using international servers primarily like Yahoo and Hotmail. The Ghana Indian Kofi Annan Center of Excellence planned to establish the Ghana Internet Exchange by 2005 (Foster et al, 2004).

Internet cafes. While the capacity of the ISPs was low, it was further hindered by an even lower capacity of the general users to benefit from the services of these ISPs. Therefore, many ISPs focused on offering Internet service to the Internet Cafes, the first of which was founded in 2001. By 2004, there were about 2,000 Internet Cafes, charging between 0.60

cents to US\$1.20 per hour, although most of these were small (Foster et. al, 2004). The greatest entrepreneurial leadership in this domain was enacted by now the largest privately owned ICT company in Africa - BusyInternet, founded in Ghana by Mark Davies and his French partner Alex Rousselet in 2001. BusyInternet started with \$1.7 million of funds, partly personal savings from an earlier venture of Davies in the UK, and partly from a local non-banking financial institution called Fidelity Group and Databank. BusyInternet was based on the model of the EasyEverything chain of Europe (Hale, 2003b).

BusyInternet's mega cybercafé centers, the first of which was in a 14,000 square foot building, included entertainment such as fashion shows, live music and movies, thus becoming a popular hang out place in the locale (Hale, 2003b). In addition to a one hundred computer public Internet access area, they included an incubator to provide start up Internet businesses with phone and high speed internet service. There was also a 60-seat learning center for workshops and seminars, equipped with video conferencing and web design classes. A \$30,000 generator, a back up battery, and an \$18,000 transformer protected BusyInternet against the frequent power outages and power surges in Ghana (Hale, 2003b). The BusyInternet, led by Eselle Akofio-Sowah, generated positive cash flows within four months of its opening. However, because of the high costs of the satellite link, the original plan to open two technology centers every year, including centers in other Sub-Saharan African nations, had to be put aside. Instead, the company partnered with local software house SOFT Tribe to develop a software product Limpopo to run accounting functions for African cybercafés. By 2003, the BusyInternet employed 90 people from across West Africa, with 1,800 customers paying US\$1.20 an hour. Six out of the ten person management team were women (Phillips, 2002).

In a 2002 survey, about a fourth of the company's users reported e-mail as the preferred reason for Internet use and about 12 percent each identified search, research, education, and business as their preferred use. About 8 percent of users used it for music and for news. About half the users spent half of their Internet time on email. About half the users spent their time emailing primarily to family members (BusyInternet, 2002). BusyInternet included a vision for socio-economic servicing.

BusyInternet's incubator program, BusyIncubator, was headed by Lesley Dodoo, formerly of the Ghanaian Ministry of Finance. BusyIncubator was the first of its kind of small business incubation program in Sub-Saharan Africa. The program was started with a \$300,000 grant from the World Bank and the Government of Japan's InfoDev (Information for Development) program (Phillips, 2002). BusyIncubator paired incubates with local businesses that provide a range of financial, technical, management and marketing support services. In its first three years, BusyIncubator graduated five companies:

1. eShopAfrica.com: founded by Cordelia Slater-Nour in Ghana in 1999, to help promote African arts and crafts into global markets and to secure artisans adequate compensation that was reflective of their talents and the quality of their products. Products included hand-carved Ga coffins shaped like airplanes, shoes and howitzers, which were all designed to reflect the earthly interests of the recently deceased. Cordelia gave hope to numerous African artisans, by recognizing that, "... if you're an artisan in Africa your 'hand-made' thing won't command a high price... you'll be made to feel inferior... Perceptions and economics will force you to accept a low price for your work and you may not be able to feed your family. When they get sick you won't be able to afford medicine, and schools cost too much.... This is the scenario for traditional African artisans all over the continent and in this way centuries old skills are being lost." (Global Knowledge Partnership, 2003: 49).

2. Data Management International Inc. (www.dmi-inc.com), of Delaware, USA. In 2002, it employed 40 Ghanaians at \$72 monthly, which was twice the per capita income and thrice the minimum wage, to process environmental fines for the City of New York for about US\$500,000 revenues annually. The workers typed in data from computer images of scanned citations handed out, for example, to food vendors who smoked while serving. The transcribed information was returned within 48 hours with an error rate less than 1 percent (Worth, 2002).
3. Interface Technologies (www.interfaceghana.com): A US-based web and software development company that worked with the local offices and dealers of multinationals like Volkswagen to develop their local websites.
4. SOFT Internet Solutions (www.sis.gh): A subsidiary of SOFT, focused on web design and development for companies and organizations in Ghana. Its clients included Ghana Breweries Ltd., Integrated Tamale Fruit Company, Goldlink Tours, Nescafe, Nestle, and First Pharma Ghana.
5. Graphicolor (www.graphicolorghana.com). A Michigan-based company set up a print fulfillment operation in Ghana, which printed the electronic materials on demand from the US-based clients and shipped it to their customers.

In 2004, BusyIncubator launched an 18-month intensive program for incubation, and selected four companies from a pool of seventeen applicants (InfoDev, 2005). The participating companies received a minimum of US\$45,000 in technical assistance, including assistance with ICT-based product design, marketing, branding, managerial skills, and technology requirements, low cost infrastructure and a conducive entrepreneurial environment, support for financing and networking opportunities, and access to legal and corporate advice. It encouraged the government to set up the Incubator Governing Council, and offered advice to the Ministry of Communications on setting up of the government's technology incubator at the Ghana Multimedia Centre. Its portfolio of incubates in 2005 included (InfoDev, 2005):

1. Childnet Electronic publishing Co.: interactive educational software development on CD-Roms in Ghana;
2. Event PmG: sells unique invitation cards for all occasions;
3. Top Up Business Services: sells integrated business services through a chain of outlets;
4. Runway 14: An international media firm comprised of animators, copywriters, designers, musicians, new media artists, programmers, television producers, video jockeys, and conceptual urban philosophers;
5. BusyLab: web-based software solutions developer for the Ghanaian market;
6. Cyterra Solutions: offering advanced web development, elearning, and database applications;
7. Ecoband Networks: the local agent/distributor of connectivity services for the ISPs;
8. African Learners Online: offers electronic books for individuals and organizations in collaboration with European and African content providers; and
9. Teledata: a distributor of mobile phones and phone cards.

Overall, BusyInternet became the model of Sub-Saharan African servicing, making a range of technology-focused services accessible to the general users as well as foreign and local firms seeking to establish ICT-enabled services in Ghana. It allowed the nation to dream big dreams, and generated aspirational capital for mobilizing the third level servicing capacity.

Third Level Servicing Capacity – Becoming the Bangalore of Africa

The success of Bangalore, first in software and later in BPO, is often credited to the absorptive capacity fostered by a diverse range of academic, research, and basic industry capabilities in the region, and the supporting institutional environment. Below we trace the process of the development of capacity in software and BPO in Ghana. It will become clear that absorptive capacity was not as important as servicing capacity in the development of software and BPO in Ghana.

Software sector. A few universities in Ghana started offering degrees in computer science, but these lacked computer labs and expert faculty. The private sector entrepreneurs took up the challenge. i2000 Ltd., founded in 1999, collaborated with NIIT of India to offer NIIT benchmarked software development and IT training in Ghana. Within a few years, NIIT became the largest training institute in Ghana, with three centers and a capacity to train 2,000 students annually, though its training was reported to be of mixed quality (Soderberg, Jensen, & Sintim-Misa, 2003). With the help of the government of India, the Ghana India Kofi Annan Centre of Excellence was also set up to develop academic and industry skills in ICT, which started producing graduates that could be absorbed into industry immediately as employees or employers (Osiakwan, 2004).

In the interim, entrepreneurial leadership created a few large local software business houses in Ghana. The largest was SOFT Tribe, founded by the UK-based Ghanaian, Hermann Hesse. Starting with only one computer that various software developers shared, SOFT adopted an industry by industry approach, designing software tailor-made for African situations. SOFT Tribe evolved a "shotgun business strategy," offering between 15 and 30 programs at any given time, including the best seller which was a payroll program called Akatua. This shotgun business strategy allowed the company to grow very rapidly (Zachary, 2005). SOFT Tribe also offered special software for micro-finance management (e-SuSu software), payroll, cybercafé billing and the Ndua system for the timber industry.

In Ghana, SOFT Tribe became the software system of choice, as compared to Microsoft. Its programs were small enough to work with the Intel 486- and even 386-based PCs available for as little as \$100. The programs wrote frequently to disk, reducing the chances of losing data if power is lost, as it often was. To combat the rampant piracy, finished products had to be installed by a SOFT technician. The code was not open source like Linux, to prevent people from learning it and then using it for fraud (Zachary, 2005). The company formed partnerships in Nigeria, Gambia, Senegal, and Kenya, for expansion into the region. After growing to a staff of 70, the founder sold a 40 percent stake to private international investors. SOFT Tribe also formed an agreement with Infosys – India's largest software firm – for helping with the marketing and support for Infosys products in Ghana (Hale, 2003). Hesse himself became a revered role model and a savior not only in Ghana, but whole of Sub-Saharan Africa. Guido Sohne, for instance, left SOFT Tribe to launch his own business as an independent programmer in Ghana, and observed, "Many young code writers get their start at SOFT Tribe, learn the ropes, and then hone their skills" (Zachary, 2005).

Growth of servicing options in the software domain also had a positive impact on the domains where the need for absorbing know-how from overseas was more critical. In 2003, there were only about 400,000 computers in use in Ghana, a significant number of which were refurbished. Ghana had no personal computer manufacturing plants, yet a few companies assembled computers using imported parts, though they needed to tap software options to be viable. For example, Racom of the Czech Republic formed Arrow Network Systems to manufacture and market a low cost/low speed networking equipment, but also offered remote branch, point of sale, and telemetry applications (Arrow Networks, 2006).

BPO sector. Given the high costs and interconnectivity problems facing the ISPs in Ghana, the use of Internet by businesses was very limited. However, some entrepreneurial leaders leased private voice over IP networks and offered BPO services, thereby starting a revolution.

A model start-up operation was that of AQ Solutions, a US and Ghana-based firm that started its operations in 2000. The founder, Awo Qaison-Sackey, is the daughter of Ghana's former ambassador to the United Nations (1960's) and a US citizen. She wanted to help bring jobs to her native Ghana. She combined on-site project management in the US with a Ghana-based offshore software development model to deliver cost-effective, high quality solutions to client companies. The firm employed 6 people in the US and assigned them as on-site strategic account managers to each of its Connecticut-based clients including General Electric and Northeast Utilities. This account manager then liaised with the developers in Ghana. The firm consciously incorporated international project management and software development standards into a framework to ensure quality in every step of a client engagement. The Ghanaian managers were flown to the US to meet clients, and clients were allowed to phone the programmers in Ghana directly (Garigga, 2003). Its 30 employees in Ghana were paid an average of \$2,400 annually, compared to the local market average of \$1,200 annually. The firm planned to hire 500 employees in 2005, and to seek subcontracting jobs from larger Indian companies handling software development for American companies. Joseph Aivano, director of application development at Northeast Utilities, noted, "We picked it up to increase our investment in minority (owned) firms and to get a better understanding of offshore software development... AQ Solutions was more of a pilot test. The test was successful" (Garriga, 2003: www.ghanaweb.com).

The first and the most successful call centre was Affiliated Computer Services (ACS). ACS, a Texas-based Fortune 500 firm with Ghana operations, set up the centre in 2000 with 20 workers. It quickly grew to 1,000 workers within 18 months. The call centre had about 2,000 workers in 2005, earning an average of \$2,400 annually plus health insurance, meals, and subsidized transport; and had built a new facility. The employees entered the data on hand-written doctor notes and health insurance claims for Aetna and United Healthcare, working in three 8-hour shifts. This information was then transmitted them back via a satellite link to the US (Thompson, 2002). The founder of the Ghana operation, Tom Blodgett, noted "People didn't believe we could carry this off... We made a bold move, and it worked." (Zachary, 2003: www.ghanaweb.com) Site manager Damon Larson noted. "We have a turnover rate below 3% and an absentee rate also below 3%." (Zachary, 2003: www.ghanaweb.com) The accuracy rate was 99.7 percent (Zachary, 2003). The success of ACS encouraged other companies to follow, of which two were notable:

1. **Rising Data Solutions:** a Maryland, USA-based firm which opened the first English-speaking call center in Sub-Saharan Africa in 2001. Initially, it focused on telemarketing of mobile phone plans for T-Mobile to US households, using voice over Internet protocol using 15 employees. Later, it landed another contract from Haier America, the appliance manufacturer. Rising Data Solutions implemented Skills-Based Routing to make certain contacts are directed to agents specifically trained to provide that service ensuring quality and efficiency. In addition, it expanded into business process outsourcing and business process reengineering, including medical billing. Sambou Makalou, CEO, noted that "Ghanaian temperament is more suited for customer care (because of patience) than for telemarketing, which requires a bit more aggressive approach." (Mainsah & Ikezi, 2004: 13) Karim Morsli, co-founder, added "We're about leveraging technology to help people on both sides of the ocean" (Slyater, 2004: E05).

2. Global Response Corp: a Florida, USA-based customer contact center and fulfillment services business which had a joint venture partnership with a Ghanaian entrepreneur. Global Response recruited several Ghanaian French and Spanish speaking workers, to service Canada, the US, and France. It planned to hire 2,500 employees by 2005 (Yarney, 2003).

Beyond BPO. As a result of these servicing initiatives, new players with stronger absorptive capacity are being attracted to Ghana. In 2005, Artspace International, an online portal for the sale of music that is linked to approximately 200 distributors, identified Ghana as the hub for its West African subsidiary Afrofile (Myjoyonline, 2005d). It negotiated a deal, whereby Nokia Africa offered US\$500,000 dollars to promote Ghanaian music through concerts and training programs. The individual musicians and their publishers would enter their copyrighted works on the portal, which could then be downloaded by consumers for ring tones in their mobile phones. Thus, musicians would be connected with worldwide Internet Service Providers, phone service providers, media houses and entertainment centers, and would receive deserved royalties for the use of their works (Myjoyonline, 2005d).

Institutional support. The principled leadership and aspiration-building servicing by the companies like Busy Internet, AQ Solutions, and Affiliated Computer Services is also beginning to generate a notable change in the mindset of the institutions. In 1998, government of Ghana had laid a Vision 2020 with a science and technology policy aimed at, “lifting Ghana to a middle-income status by the year 2020 through the perpetuation of a science and technology culture at all levels of society, which is driven by the promotion of innovation and mastery of known and proven technologies, and their application in industry and other sectors of the economy.” (Yawson, 2003: 3) However, little progress could be made on that front.

The new government, led by President John Kufuor in 2001, recognized that ICT-led value-added services could be the key to future development strategy. The government also planned to modernize and improve eGovernment applications for internal revenue service, immigration, payroll, and procurement. A pilot project called GCNet helped the Customs Department increase custom revenues by 40 percent annually, and cut processing time from 3 days to four hours at the Kotoka International Airport, and from up to two weeks to 2 days at the Tema port (Government of Ghana, 2005). The government of Ghana portal (Ghana.gov.gh) was launched to “provide across the board information to the public and elicit their feedback and suggestions toward the attainment of good governance”. (Soderberg et al, 2003: 18)

In 2000, the US signed the African Growth and Opportunity Act to allow more than one thousand products, including such things as textiles, to be sold in the US without paying any tariffs. Given the perceptions of Africa as a ‘dark continent’ little results would have accrued. However, the entrepreneurial leaders in Ghana provided credibility for dreaming big dreams.

The first company to act was Network Knitwear Fabrics (NKF), which combined the power of free trade with the Internet to set up a sock-seaming factory in Ghana in March 2003. NKF was founded by the US-educated Prosper Adabla, in collaboration with a Ghanaian cotton businessman who formed a joint venture by approaching the third largest sock manufacturer in the US, the Southern Textile Exchange. The relocation of the factory to Ghana was estimated to save \$12 million a year (Myjoyonline, 2003). The quality of the products was on par with the US manufacturing operation. The socks originated semi-processed and duty-free from the US factories and were closely coordinated over the Internet.

Within 2 years, NKF grew rapidly to employ 700 people, who knit, sew, seam, bleach, iron, shape, sort, package according to vendor, and then ship duty-free approximately 60,000 dozen socks per week to the United States. The workers were paid \$700 annually and supervisors \$2400. They produced 23 different brands, including Lee and Wrangler, producing \$75m worth of socks per year. The firm made an initial investment of \$700,000 from a Bank loan and was profitable (Saki-Addo, 2003).

Several other smaller Ghanaian companies also benefited. Linda Yaa Ampah, a clothes designer and entrepreneur, used email at the Internet café to connect with American customers. She employed 50 tailors to meet the orders worth \$40,000 from Africans living in the US. 70 percent of her business was generated through email from the US. She held that "the internet is beautiful, easy and clear... I wouldn't have got nearly so far without it" (Hale, 2003b: newswww.bbc.net.uk).

As a member of the Economic Organization of West African States, Ghana has a dream to be the Gateway of Sub-Saharan Africa. In 2005, the United Nations made Ghana its biggest investment destination in Africa with direct support for the small and medium enterprises. More private and public sector initiatives, with multinational, bilateral, and multilateral support, are sustaining the entrepreneurial leadership in Ghana. Ghana Cyber Group, Inc., founded by Yaw Owusu, secured \$10 million of funds from the United Nations and companies such as Oracle Corporation for an upscale technology park at the University of Science and Technology in Ghana. In collaboration with Columbia University and MIT, the park would be identifying, developing, and helping commercialize the early stage client companies through incubation, and for brokering contracts with buyers of outsourcing services in the US. It will include a digital lab for research and development and a two-hundred PC cybercafé.

Many other US companies have also committed developmental funds for IT infrastructure in Ghana. Google committed to \$1 billion for developmental projects at Technoserve in Ghana in October 2005. In the same month, General Electric donated \$4 million of medical equipment, as part of its \$20 million GE Africa Product Donation Program, to Ghana's Komfo Anokye Teaching Hospital (KATH). The donation allowed KATH to become the first hospital in Africa to start tele and e-medicine serving many nations in Sub-Saharan Africa (Myjoyonline, 2005b).

The government of Ghana also sought technical assistance from India, offering Ghana as a cost-effective and quality subcontractor for the Indian companies doing business with the US. It asked for the funds to pilot technology to create an efficient telecom infrastructure for rural areas in Ghana, in addition to the support for building a comprehensive Information Technology Park and related infrastructure for software development, training of software professionals, assistance with technology analysis and marketing, and design of necessary legislative guidelines.

As Ghana sought to develop into the BPO center of Africa, it has also attracted several non-Ghanaian Africans seeking to use its growing reputation and technological capabilities for fraudulent activities. In fact, some have described Ghana as "the rising star of Internet fraud", and in early 2005, the nation was banned from using credit cards to shop via the Internet after over \$5 million of online fraud was detected to have been generated from the country. In response, Internet cafes in Ghana, including even the small ones, have instituted several measures to check the level of fraud and to restore the image of the nation (Myjoyonline, 2005a).

DISCUSSION & CONCLUSIONS

The case of Ghana, and its pioneering technological firms, provides invaluable lessons on how to develop technological capability for servicing global customers from a condition of competitive deficiency. This paper traces the process by which the development of technological capability in Ghana got managed by various actors and the inter-play of market forces. This case shows that in the stages of development, absorptive capacity was not as important as the development of servicing capacity. This is especially important to many nations in Sub-Saharan Africa, who have little to offer in the way of infrastructure and hope to build themselves into BPOs. The evidence of technological development in Ghana points to the critical role played by a number of pioneers, many of them native Ghanaians who had emigrated overseas, particularly to the US, and who brought their technological, organizational, entrepreneurial, networking, and global cultural experience to Ghana. These entrepreneurs built aspirational capital in Ghana.

In addition, institutional support was offered by several national governments. Many companies in the US, Europe, and Asia brought to Ghana big dreams and converted these dreams into reality by offering various infrastructure, technological, and subcontracting options. The multilateral institutions, such as the United Nations, worked closely with the government of Ghana to promote a mindset change, oriented towards private sector development and enabling institutional policies.

Despite the challenges associated with the fraudulent activities of some, the result has been a unique hybrid of profit-oriented business orientation and social-oriented community orientation, or what has been termed as “principled leadership”. In addition to the unique influence of international and national principled leadership in many parts of Ghana, we also see the emergence of a nascent form of regional clustering. This regional clustering goes beyond the network of competing firms, innovative supporting and related firms, sophisticated customers, and advanced factor endowments, as in the Porter’s (1990) diamond model of national competitive advantage.

For most firms, a number of these factors, and several elements in these factors, are lacking in Ghana. The evolving regional clustering is also different from the neo-diamond models, where the firms in a nation could outsource some of the diamond factors, such as by taking advantage of the rivalry among firms in other nations, of the collaboration with international channel partners, and of the demanding customers and large demand scale overseas. In most cases, the foreign customers of Ghanaian firms begin with very low expectations of servicing capability – generally out of a benevolent act of generosity or a heroic symbol of passion for Africa. Similarly, the international channel partners have little strategic interest in Ghana, which remains a very small market because of its limited purchasing power – which, on per capita basis at US\$300, was the same in 2003 as in 1960. In addition, it would be a mistake to attribute the increasing foreign direct investments in Ghana to primarily an outgrowth of intense rivalry among firms in other nations. The global rivalry pressurizes the firms to search for sites where very large-scale operations could be established for servicing customers on a worldwide basis. Ghana, with its limited servicing scale, did not qualify by any measure.

Our analysis suggests a need to re-evaluate the traditional interpretations of technological capability. Servicing capacity model, as articulated here, shifts the research lens away from a deficit view of emerging communities as places full of absorptive capacity disadvantages, and instead focuses and learns from the array of cultural knowledge, skills, abilities, and contacts possessed by internationally marginalized groups that often go

unrecognized and unacknowledged (Yosso, 2005). Using a Critical Race Theory lens, Yosso (2005) emphasizes how in marginalized groups, such as communities of color, various forms of capital are nurtured through community cultural wealth via inter-related processes.

The model of aspirational servicing articulated here provides a systematic approach for mobilizing the community cultural capital and for converting the aspirations into reality. In addition, one must acknowledge that aspirations can degenerate into fraud and unlawful activities, when they are deprived, rather than enabled and realized. Therefore, aspirational servicing itself is a necessary, but not sufficient condition for development. One also needs principled leadership, which is committed to offering the connections in the form of access to market – both for services, as well as for training and resources, and then mobilizing the aspirational servicing to tap, and even enhance, this market.

In summary, we conclude that the nascent technological clustering in Ghana has germinated from a distinctive model of aspirational servicing, which combines a confidence in the basic human potential even in most deficient contexts with a prudently crafted servicing capacity, which would help germinate the foundations known to be the key to the national competitive advantage.

A major limitation of our work is the use of a single nation case study. It would be desirable to conduct comparative cross-national work and to conduct statistical analysis. Despite these limitations, the case of Ghana as analyzed here does offer a ray of hope to the people of Sub-Saharan Africa, and to other nations that have limited capacities to absorb the increasingly sophisticated, specialized, and costly global know-how.

REFERENCES:

- Arrow Networks 2006. www.arrownetworks.net/company_profile.html, accessed April 2, 2006.
- Bell, R.M. & Pavitt, K.L.R. 1993. Technological accumulation and industrial growth: contrasts between developed and developing countries. *Industrial and Corporate Change*, 2(2): 163-210.
- Bennett, A. & George, A. 2001. Case Study methods and political science: similar strokes for different foci. In C. Elman and M.F. Alman (Eds.), *Bridges and Boundaries: Historians, Political Scientists, and the Study of International Relations*, MIT Press, Boston, MA.
- Bigsten, A., Collier, P., Dercon, S., Fafchamps, M., Gauthier, B., Gunning, J.W., Isaksson, A., Oduro, A., Oostendorp, R., Pattillo, C., Soderbom, M., Teal, F. & Zeufack, A. 1998. *Rates of return on physical and human capital in Africa's manufacturing sector*. Working Paper, Centre for the Study of African Economies, University of Oxford.
- Botwe, D. 2005. Telenor option justified – Botwe. <http://www.myjoyonline.com>, accessed 2 April 2006.
- BusyInternet 2002. Survey on Why People Use the Internet. *Busy Internet Publications*. www.busyinternet.com, accessed 2 April 2006.
- Cohen, W. M. & Levinthal, D. A. 1990. Absorptive Capacity: A New Perspective on Learning and Innovation. *Administrative Science Quarterly*, 35:128-152.
- Coomson, J. 2003. 32 ISPs caught in NCA dragnet. *The Ghanaian Chronicle*. <http://www.ghanaian-chronicle.com>, accessed 2 April 2006.
- De Vynck 2004. Telecoms liberalization will boost call centers. Business Report. <http://www.busrep.co.za>, accessed 2 April 2006.
- Docquier, F., & Rapoport, H. 2004. *Skilled Migration: The Perspective of Developing Countries*. Policy Research Working Paper 08/001, Washington, D.C., The World Bank.

- Falch, M. & Anyimadu, A. 2003. Tele-centres as a way of achieving universal service – the case of Ghana. *Telecommunications Policy*, 27: 21-39.
- Frempong, G. & Henten, A. 2004. *Telecom developments and investments in Ghana*. Discussion Paper, World Dialogue on Regulation for Networked Economies. <http://www.regulateonline.org>, accessed 2 April 2006.
- Garriga, M. 2003. New Haven software company's workers live in Ghana. *New Haven Register*. www.nhregister.com, accessed 2 April 2006.
- Global Knowledge Partnership 2004. *ICT Success Stories in Development*. Kuala Lumpur, Malaysia: Global Knowledge Partnership.
- Government of Ghana 2005. *E-Ghana Project*. Project Information Document, Ministry of Communications.
- Gupta, V. & Wang J. 2004. From Corporate Crisis to turnaround in East Asia: A Study of China Huajing Electronics Group Corporation. *Asia Pacific Journal of Management*, 21: 213-233.
- Hale, B. 2003a. Ghana Trumps Mighty Microsoft. *BBC News*. <http://news.bbc.co.uk>, accessed 2 April 2006.
- Hale, B. 2003b. Dot.com tycoon turns to Africa. *BBC News*. <http://news.bbc.co.uk>, accessed 2 April 2006.
- Ifinedo, P. 2005. Measuring Africa's e-readiness in the global networked economy: A nine country data analysis. *International Journal of Education and Development using ICT*, 11. ijedict.dec.uwi.edu, accessed 2 April 2006.
- InfoDev 2005. Busy Internet – Ghana. *The info Dev Global Network of Business Incubators*. <http://www.infodev.org>, accessed 2 April 2006.
- Mahoney, R., Lee, K., & Yun, M. 2005. Intellectual Property, Drug Regulation, and Building Product Innovation Capability in Biotechnology: The Case of Hepatitis B Vaccine in Korea. *Innovation Strategy Today*, 1(2): 33-44.
- Mainseh, M & Ikezi, E. 2004. Is Ghana an Attractive Proposition for IT Services and Business Process Outsourcing? *Chazen Web Journal of International Business*. <http://www.gsb.columbia.edu/chazenjournal>, accessed 2 April 2006.
- Ministry of Communications 2004. Draft, Committee on World Summit on Information Society. Ghana, Ministry of Communications.
- Myjoyonline 2003. Multi-million Cedi Socks Factory Inaugurated. <http://www.myjoyonline.com>, accessed 2 April 2006.
- Myjoyonline 2005a. Internet Service Providers Call on Govt to Reverse Ban. www.myjoyonline.com, Accessed April 2, 2006.
- Myjoyonline 2005b. KATH goes hi-tech with tele and e-medicine. <http://www.myjoyonline.com>, accessed 2 April 2006.
- Myjoyonline 2005c. GT threatens legal action to recover 400 billion cedis debt. <http://www.myjoyonline.com>, accessed 2 April 2006.
- Myjoyonline 2005d. Nokia to use Ghanaian music as ring tones. <http://www.myjoyonline.com>, accessed 2 April 2006.
- Osiakwan, E.M.K. 2004. *Access to Computers and Communication networks in Ghana*. Paper presented at 2nd International Wide Open Access Workshop in Sweden, May 11. Accra, Internet Research.
- Osiakwan, E.M.K. & Foster, W. 2004. *Negotiating the 'Net: The Case of Ghana*. Working Paper, Centre for International Development & Conflict Management.
- Phillips, M.M. 2002. On Ghana's Tech Frontier, Internet Start up Flourishes. *The Wall Street Journal*. <http://www.wsj.com>, accessed 2 April 2006.

- Saki-Addo, K. 2003. US Socks Made in Africa. BBC News. <http://news.bbc.co.uk>, Accessed April 2, 2006.
- Slayter, M.E. 2004. Company takes outsourcing to new level in Ghana. *Washington Post*, E05.
- Soderberg, B., Jensen, M. & Sintim-Misa, M.A. 2003. *Investment Opportunities in Western Africa ICT and Internet Sectors – Ghana*. Stockholm, Spintrack IT Advice AB.
- Thompson, N. 2002. Rising with Keyboards. *Newsweek International*. <http://www.newamerica.net>, accessed 2 April 2006.
- UNCTAD 2003. *Africa's Technology Gap: Case Studies on Kenya, Ghana, Uganda, and Tanzania*. New York, UNCTAD.
- Verner, D. 1999. *Wage and Productivity Gaps: Evidence from Ghana*. Policy Research Working Paper Series 2168, Washington DC, The World Bank.
- William F., Goodman S., Osiakwan E., & Bernstein, A. 2004. Global Diffusion of the Internet IV: The Internet in Ghana. *Communications of the AIS*, 13, article 38.
- World Bank 2006. BPO Center of Africa - Ghana among preferred countries for offshore services. Quoted by Martin Walker, UPI Editor. <http://www.upi.com>, accessed 2 April 2006.
- World Fact Book 2006. Ghana. <http://www.cia.gov/cia/publications/factbook/geos/gh.html>, accessed 2 April 2006.
- Worth R.F. 2002. In New York Tickets, Ghana Sees Orderly City. *The New York Times*. <http://www.nytimes.com>, accessed April 2, 2006.
- Yarney, J. 2003. Ghana Jumps into BPO. IDG News Service. <http://www.idgnews.net>, accessed 2 April 2006.
- Yawson, R. 2003. *Management of Technology in Ghana: Problems and Prospects*. Working Paper, CSIR-Food Research Institute, Accra.
- Yosso, T.J. 2005. Whose Culture Has Capital? A Critical Race Theory Discussion of Community Cultural Wealth. *Race Ethnicity and Education*, 8(1): 69-91.
- Zachary, G. P. 2003. Dialing for Dollars: How Ghana is learning to cash in on data services. *Fortune*. <http://www.cnn.com/fortune>, accessed 2 April 2006.
- Zachary, G. P. 2005. The African Hacker. <http://www.ghanaweb.com/GhanaHomePage/NewsArchive/artikel.php?ID=87421>, accessed 2 April 2006.