

# **NORTH IN THE SOUTH: COMPARATIVE ANALYSIS OF INFORMATION TECHNOLOGY INFRASTRUCTURE IN NATIONAL VERSUS INTERNATIONAL ORGANISATIONS IN SUB-SAHARAN AFRICA**

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This paper examines the imbalances in the availability and usage of information technology infrastructure between the international and national research organisations in sub-Saharan Africa. While the national research organisations depend on the provision of the national government, the resources of the international organisations enable them to provide adequate infrastructure to meet their needs and even sustain it without being much affected by the local operating environment's factors. In the organisations studied, the imbalances could be broadly attributed to differences in funding, management and technical expertise, exposure and awareness to available technologies, training, and other national infrastructures like electricity, transportation, or banking. To reduce these imbalances, the national governments should provide adequate funds for building sustainable IT infrastructure in their national organisations even when it may not be feasible to build it nationally. The national organisations should study how the international organisations have been able to provide and manage their own infrastructure despite the odds in their environment.

## **INTRODUCTION**

According to Korpela (1994) the division of the world into two large blocks is intuitively rather obvious. There is the predominantly industrialised rich North and the traditionally more or less poor South. This distinction is gradually fading as more developing countries are joining the leagues of developed rich countries and globalisation is helping in blurring the lines. According to Mazrui and Andrew (1991), the most obstinate line of demarcation between the North and South is not income (criteria of wealth) but technology (criteria of skill). Thus much has been written on the technology gap between the North and the South (Braga and Alberto 1998; Crede and Mansell 1998; The World Bank 1999). While the countries in the North are characterised by good infrastructure and state-of-the-art technology with adequate human resources to support its functioning, most developing countries are characterised by poor infrastructure and lack of trained experts (Odedra et al. 1993; Moyo 1996). From infrastructure's perspective, we consider North as where things are working efficiently with due recognition to some problems which they continuously trying to improve and the South where things are still in a development stage and where people have a lot to learn on how it is being done in the North and adapt it in a right way to make it sustainable for their own purpose.

Consequently, the disparity in the availability of information technology infrastructure between Western industrialised countries of The North and the developing countries of the South has always been recognised by various agencies like The World Bank; UNDP; CIDA SIDA etc and it has been well written about (Crede and Mansell 1998; Talero and Gaudette 1996, Lynch 2000; Braga and Alberto 1998, Persaud 2001; De Boer and Walbeek 1999; Rodrieguez and Wilson 2000; GICTD 2000). It is popularly tagged the "digital divide" and at the Kyushu-Okinawa Summit in July 2000, the leaders of the G8 major industrialized countries focused considerable attention on the impact of information technologies and the growing risks of this global digital divide (DOT Force 2000). The particular problems of IT infrastructure in Africa, especially in sub-Saharan Africa, have also received attention in the literature (Odedra et al. 1993; Moyo 1996; Sadare 1998). However, the disparity in IT infrastructure between the multinational and national organisations in developing countries has received less attention.

International organisations in this context are organisations that are primarily sponsored by other various organisations within and outside their country of location. The management staffs are drawn from international experts and the senior staffs come from various countries. National organisations are usually owned by a national government and they primarily depend on government sources for funding and support, although some bilateral and multilateral donors such as World Bank, IMF, ADB, EU, etc are sometimes involved in funding projects. Their management staffs are also drawn from the local experts and the entire staffs are usually made up of nationals. They are controlled and affected directly by the national government policies and programmes.

At the beginning of the 1990s, national information infrastructures were planned in the USA and in Europe. The United Nation's Economic Commission for Africa with support of other development agencies launched the African Information Society Initiative to build Africa Information and Communication Infrastructure (ECA, 1996). The ECA efforts led to the development of National Information and Communication Infrastructure (NICI) policies, plans and strategies that could be used to enhance the role of information and communication technologies (ICTs) in facilitating the socio-economic development process. National information infrastructures greatly influence the organisational information infrastructures. *IT infrastructure* embraces computers, operating software, communication equipment and links, which collectively form

the platform for assimilating and delivering information products and services to the organisation and its suppliers and customers (Beranek, 1997). According to Broadbent and Weill (1997), information technology infrastructure is particularly important in industries going through dynamic change, reengineering their business processes, or with widely dispersed operations. Ciborra and Hanseth (1998) emphasise its role in allowing the firm to run interlinked applications to process and communicate information seamlessly; that is, ITI supports streamlined processes and enhances coordination.

## **THE EMPIRICAL STUDY**

The study was conducted at six organisations in two countries in West Africa – Nigeria and The Gambia. Nigeria has a wealth of all the problems found elsewhere in Africa, and also wealth of research capacity and indigenous industry (Korpela, 1994). There is high level of probability that findings in Nigerian organisations will be representative for the sub-region. The Gambia is unique as one of the most peaceful and stable countries in the sub-region. For this kind of a study, The Gambia becomes relevant as it gives a good comparison to Nigeria in terms of social, economic and political structures. The study uses several methods of data gathering: semi-structured interviews are complemented with short time on-site observations and surveys with quantified responses. Full discussion about the methods and data collection can be found in Okunoye and Karsten (2001). It is important to remark here that we did not consider the differences in the IT infrastructure capability between international and national organisations when we were designing the study. The outcome reported here evolved naturally and we consider it important to report. IT infrastructure was assessed using the approach developed by Broadbent and Weill (1997). They identify 23 maxims describing ten core ITI services and thirteen additional services. The IT infrastructure capability includes both the technical and managerial capabilities required to provide reliable services. The IT infrastructure list was completed with the heads of computer sections where applicable, supplemented by observations and interviews. A high number of the services in a firm indicates a high level of IT infrastructure capability.

### **The international organisations: IITA, MRC and ITC**

The infrastructure capability at *IITA* is very high, with 19 of the 23 services available. They have a well-developed computer section with highly qualified personnel. They also invest a considerable amount of money on IT infrastructure. The head of the computer section estimated an annual spending of about \$200,000 on information technology. They do not rely on the local infrastructure for external data communication, but they broadcast directly via their own satellite. They provide training services and use local vendors when necessary. They have a well-developed intranet, a groupware system, and full Internet connectivity. The IT infrastructure capability of *MRC* Laboratories in The Gambia showed a similar trend to that in *IITA*, they have 16 of the 23 services measured. They have a well-developed computer unit, managed by an expatriate. The head of the computer section estimated an annual spending of \$142,243 on computer hardware and software. They also have full connection to the Internet. They have a working groupware system (GroupWise), though only few of the features (like email client) are being utilised by the staff. The internal telecommunication system is functioning very well. All senior staff members can make even international phone calls for official purpose. *ITC* had a low IT infrastructure capability, with 8 of the 23 services available. The IT infrastructure is entirely managed by an outside vendor, which is in contrast to other organisations that have an internal information systems group. They have a dialup connection to the Internet through a local ISP. The internal telephone system (intercom) was not functioning.

### **The three national organisations: NISER, NARI and NIMR**

Of all the national organisations in this study, *NISER* had the best IT infrastructure capability, with 12 of the 23 services available. Like *IITA*, they have a computer section but the spending is not comparable. The head of computer section estimated an annual average spending of about \$ 8,900. They also have a dial-up connection to the Internet through a local ISP. Each staff member has access to email services at a cost, which has been discouraging many scientist from making use of it. The service is available only on few workstations, with sometimes queues for several hours. There is no local area networking (LAN) in the institute and hence no intranet or a groupware system. The internal telephone system (intercom) was not functioning. Also, researchers cannot make phone calls to make enquiries outside the organisation. *NARI* had a low IT infrastructure capability and it ranked fifth among all the organisations. With 7 of the 23 services available. The major problem had to do with funding and lack of expertise to provide the required services. The computer section was not well staffed, with only two persons with little expertise. It was difficult to estimate the spending on IT since no proper record of this was kept. There was no local area network even though its importance was recognised. Nevertheless, the majority of the researchers had access to computer and of recent, to the Internet. The telecommunication system at *NARI* is not efficient. The internal telecommunication (intercom) is not functioning and phone calls can only be made via the exchange, which doesn't function most of the time. *NIMR* had a low IT infrastructure with 7 of the 23 services available. They share the similar fate with *NISER* and *NARI* being a nationally funded organisation. They have a computer unit which is not well staffed and developed. *NIMR* also has a dial-up connection to the Internet, which is quite bad due to persistent connection problems to the ISP. During the interview, the connection to the Internet was broken and

an attempt to call the service provider proved abortive due to telephone problem. Only one phone line is available for researchers, but most of the time it is not functioning.

### COMPARATIVE ANALYSIS

In Table 1, the services provided have been separated from those not provided and summed separately. The organisations differ in the extent of their ITI. In sum, IITA and MRC, two international organisations, have the highest IT infrastructure ranking, whereas the national organisations NARI and NIMR have the lowest ranking. However, ITC, which is an international organisation, had fewer IT services than, for example, NISER, a national organisation, although this was compensated by the outsourcing strategies. We rank them in ascending order of availability of services.

	<i>International</i>			<i>National</i>		
	<i>IITA</i>	<i>MRC</i>	<i>ITC</i>	<i>NISER</i>	<i>NARI</i>	<i>NIMR</i>
<i>Services provided</i>	<i>19</i>	<i>16</i>	<i>8</i>	<i>12</i>	<i>7</i>	<i>7</i>
<i>Services not provided</i>	<i>4</i>	<i>7</i>	<i>15</i>	<i>11</i>	<i>16</i>	<i>16</i>
<b>Ranking</b>	<b>1</b>	<b>2</b>	<b>4</b>	<b>3</b>	<b>5</b>	<b>5</b>

Table 1. IT infrastructure summary and ranking

All the organisations, except one, have a computer department with personnel range from two to ten. An expatriate usually manages the IT units of the international organisations. The expatriate heads of the IT units are generally more experienced and exposed to relevant modern technologies due to their training and access to Western market. This usually has influence on the performance of the IT unit and adoption of technologies. The only international organisation without a computer unit has an effective outsourcing strategy which indirectly gives them better services over national organisations with higher IT infrastructure services. The IT units of the international organisations are better staffed than the national organisations. Most of the staff members have a university degree and some other special training.

Although there is Internet connectivity in all the organisations, the access mode is different in the international organisations. For example, IITA is well resourced enough to bypass the national infrastructure by broadcasting directly via their own satellite. MRC is one of the few non-commercial Internet Service Providers (ISPs) in Africa. All the national organisations only have a dial-up access via local ISPs. There is a wide margin in the estimated IT expenditure based on the available figures from one national and two international organisations. It was difficult to get the estimated annual IT expenditure in the national organisations due to their diverse ways of acquiring and procuring of IT infrastructure services, but based on my observation, they might have similar figures to that of NISER. All organisations use outsourcing partners for some services, with ITC is solely dependent on vendors (Table 2). Thus it is difficult to give a sum of the yearly IT expenditure.

	<b>International</b>			<b>National</b>		
	<b>IITA</b>	<b>MRC</b>	<b>ITC</b>	<b>NISER</b>	<b>NARI</b>	<b>NIMR</b>
IT Unit	Yes	Yes	No	Yes	Yes	Yes
Status of the Head	Expatriate	Expatriate	N/A	Local	Local	Local
Outsourced services	Some	Some	All	Some	Some	Some
Staff No.	10	7	N/A	8	2	4
LAN/intranet	Yes	Yes	No	No	No	No
Internet	Yes	Yes	Yes	Yes	Yes	Yes
Intercoms	Yes	Yes	No	No	No	No
Est. expenditure on IT per year	\$ 200 000	\$ 142 243 <sup>1</sup>	Not known	\$ 8 900	Not known	Not known

Table 2. Summary of selected IT capabilities in the six organisations.

We next discuss the key factors responsible for the gaps in the availability and usage of IT infrastructure between the international and national research organisations. *Funding* is one major factor from which other factors take their root. The national organisations usually have little support from the government. In all the three national organisations, the situation was similar and they all acknowledged these problems. They are short of capital and have problems with foreign currency

<sup>1</sup> Exchange rate of \$1 = £0.7 from [www.oanda.com](http://www.oanda.com) 30/05/01

exchange. On the other hand, the international organisations appeared to have enough funds to acquire the needed IT infrastructure. They usually have a high budgetary allocation from their sponsor organisations in addition to direct support on various projects. They have most of their funds denominated in dollars, thus not affected by fluctuating exchange rates. The next factor is *managerial and technical expertise* that is closely related to *education, training, and experience*. An expatriate or a Western trained local expert usually heads IT sections of the international organisations. This could account for their better IT services. The expatriate staff members usually receive high standard training and they are aware of current developments in their field. The national organisations do not usually have the adequate resources to provide the kind of IT training necessary for professional development in IT. Staff that has received training abroad, once they return back to the home country, often lack the *continuous awareness* that is required due to the dynamic nature of IT. This is not limited to technical knowledge but affects the users. Most of the researchers in the national organisations have limited exposure to the possibilities of IT and cannot even properly utilise the little they have. Several might not be aware of the upgrades to the software they are using and lose the benefit of improved features and ease of use. The last factor is the *other national infrastructures*. This has been earlier observed:

*“Certain prerequisites, such as reliable power supply to operate the computers, a well-functioning telephone network to transmit data, foreign currency to import the technology, and the computer literate personnel, are necessary for successful use of IT. Such infrastructural elements remain inadequate in many sub-Saharan Africa countries.”(Odedra et al. 1993)*

Although there has been some improvement in the provision of these services, we still found them inadequate in the national organisations that have to depend primarily on the national infrastructures. The international organisations are able to provide these infrastructures where not adequately provided for by the national government. We have limited our discussion to the organization-level problems. There are other numerous nationally common problems such as complex purchasing procedures, vendor control of technical direction, dependency on outsiders, poor maintenance procedures, under-utilisation of machines and human potential. The problems concern not only availability (Odedra et al. 1993) but also application (Morales -Gomez and Melesse 1998; Avgerou 1998).

## RECOMMENDATIONS AND CONCLUSIONS

The followings measures are recommended for improving the IT infrastructure in national organisations in sub-Saharan Africa and to sustain the IT infrastructure in all organisations whether national or international. While drawing up our recommendations, we carefully incorporate local considerations without which any policy can be successful (Moyo 1996). We recommend that the national organisations formulate a *sustainable IT policy* and develop an appropriate strategy to implement this policy. The international organisations usually have a long-term strategic plan which they update as the dynamism of work environment and technology demand. We suggest *cooperation and alliance* among research organisations to cushion the costs and problems associated with acquisition of IT equipment. Another possibility is forging alliance with the international organisations. With the already good relationships this should not be too difficult, especially on an *ad hoc* basis. Even though there is very little the national organisations can do on their own without sufficient funds, we would still like to suggest that they try the best to manage the little they have. They could purchase directly from the Internet and save the additional cost of middlemen. The training and development of managerial and technical expertise seem to be completely in the domain of the government. We cannot encourage the national organisations to hire expatriates as international organisations do, knowing fully well they cannot sustain it. We can only suggest that the governments follow the earlier recommendations (Moyo 1996; Jarvis 1999; Nasseh 2000) of widespread standardised IT training and the importance of higher educational institutions responsiveness to the IT needs of the knowledge society. IT management courses need to be included in the Computer Science programmes that are common in most universities in the region (Marshall and Ruohonen 1997).

All the disparities noted here have been noticed and reported earlier by Odedra et al. (1993) and Moyo (1996). Although there have been some improvements, similarities in our findings reveal that their recommendations have not been followed. If the cases of the international organisations were carefully studied and adopted, with due consideration to factors specific to national organisations, there could be some improvement. Having adequate policy and right strategy could also assist in guiding the national organisations. Since the real gap between the North and the South has been attributed to the criteria of skill, it is imperative to start improving technologies (which include more than machines and tools) within organisations. By this, the skills and the knowledge level of people would be improved and thus also the wealth of the nation. We would like to conclude that the governments of developing countries should carefully examine how the international organisations are getting their IT infrastructure and maintaining it in order to apply the same in their national organisations, since the local situations are the same.

A more detailed version of this paper, including all the references, can be found at <http://www.jyu.fi/~adeokun/gitm/kmitpaper2.htm>