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INFORMATION TECHNOLOGY IN AFRICA: AN EXPLORATORY ANALYSIS

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ABSTRACT

This article investigates the competitive landscape enhanced by the outburst of the information technology [IT] and addresses its impact on businesses in Africa. Also, the article identifies problems encountered in Africa and discusses their systematic characteristic and impact on businesses. In sum, the analysis offers some recommendations for solving each problem.

INTRODUCTION

Connectivity via Internet access, e-mail services, e-commerce or e-business and networking have generated interest as multi-national companies seek new markets to cope with the continuous changes in the information technology competitive landscape (Amor, 2000). The African market is still untapped and is now ready for information technology infusion. Africa is the second largest of the earth's continent, covering about 30,330,000 square Km or 11,710,000 square miles. With a population of 780 million (1998 estimate by UNICEF, which is about 13 percentage of the total world population), sheer size alone make Africa an important member of the twenty-first century information technology revolution (Concise Columbia Encyclopedia, 1999).

The growth of the Internet and World Wide-Web together with the technological advances and the increasing world economy rejuvenated the continued growth of transnational corporations (Barlett and Goshal, 1989). Many companies, from strategic and comparative advantage points of view, have already been involved in multinational businesses and are expanding into Africa (Flynn, 1994). The major international Internet suppliers are AT&T, BT, Global One/Sprint, UUNET/AlterNet, MCI, NSN, BBN, Teleglobe, Verio and France Telecom/FCR. These multinational companies are providing quick links to Africa. Opportunities are there for corporations, however, cultural challenges (such as differences in languages, religions, customs, and social attitudes), political philosophies and ethical barriers in the region tend to hinder the progress of information technology.

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The purpose of this analysis is to explore the impact of business globalization of multinational corporations (MNCs), and the diffusion of worldwide information systems (WIS) management in Africa. By definition, WIS management is a distributed data processing system that is spread in different nations. Previous studies indicate that WIS professionals are resorting to client/servers (C/S) systems technology for an effective African implementation (Flynn, 1994; Kizior, 1993), because of its success in enhancing worldwide information technology (Alper, 1994). A good number of African countries now do have Internet access connections -- points of presence also known as "POPs" in some jurisdictions. Countries such as Nigeria, Egypt, South Africa, Algeria, Angola, Zambia and Zimbabwe, Morocco, Mozambique, Namibia, Tanzania, Tunisia, Zambia and Botswana, Ghana, Cameroon, Kenya among others are benefiting already from IT infusion due to the emergence of internet service providers (ISPs) in the region.

ISSUES WITH CLIENT/SERVER BASED INFORMATION TECHNOLOGY IN THE AFRICAN THEATER

Can information technology professionals implement C/S-based information technology on a large scale in Africa? When a company goes worldwide, it faces multiple problems. Due to high international tariffs and lack of circuit capacity, obtaining sufficient international bandwidth for delivering web pages over the Internet will continue to be a major problem. Key problematic areas in the African theatre include the following: multilingual issues, cross-cultural communication, different legal systems, governmental regulations, political and geo-economic challenges and various bureaucratic processes. Also included with these problems are the rapidly changing technologies within the computer and telecommunication industries (Flynn, 1994). An example of a major political challenge is that many African countries have policies regulating or prohibiting transfer of data across their national boundaries (trans-border data flows), especially personnel records. Others severely restrict tax, or prohibit imports of hardware and software. Still, other African countries have reciprocal trade agreements that require businesses to spend part of the revenue they earned in the nation's economy where they operate.

Multinational corporations that will break through Africa in the twenty-first century will be those who are able to cope with the problems by adapting practical strategies to influence any unforeseen difficulties where possible. Also, would-be-successful managers of these corporations must know when new technologies and infrastructures are needed to continue the enhancement of the C/S management systems in Africa. This is because

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client/server networks have become the predominant architecture of enterprise wide computing. Client/servers share computing processing among end-user workstations and network servers. The African continent will benefit because network servers will be able to share application processing, manage workgroup collaboration, common hardware, software, and databases. Data can be processed locally. Errors and any problems can be corrected as needed. This model provides computer processing that are more tailored to the need of African end-users. The process will increase information processing efficiency and effectiveness since users will be accountable for their various applications. Client server systems will let large central-site computers handle jobs they do best within the region. These will include, high-volume transactions processing, communication network securities and control, maintenance, control of large corporate databases, data warehousing and mining.

SURVEY OF THE LITERATURE

Studies indicate that businesses have on a small-scale implemented C/S systems within their respective strategic business units (Anyanwu, 1994; 1994; Kim et. al., 1995; Aggarwal and Bruce, 1994). However, many businesses are embarking on penetrating the untapped African region (Flynn, 1994; Aggarwal and Bruce, 1994; Kizior, 1993). The biggest problems associated with C/S systems implementation are the lack of proper tools, retraining facilities, updated technologies, systems management and the management of change (Alper, 1999). Others identified the literature include communications and networking, decision-making capabilities, data collections and storage devices, systems security and integrity, as well as geo-economic challenge. This challenge refers to the effects of geography on economic realities of international business activities (Aggarwal and Bruce, 1994).

The Internet has grown rapidly on the continent over the last few years. By the end of 1996, only eleven countries had Internet access (Abel, 1997). Today all fifty-four countries and territories had achieved permanent connectivity. Currently, Liberia has no local Internet service (Liberia was connected last year but lost its link when the ISP failed to achieve commercial viability).

Despite the rapid growth of Internet access in the region, Internet has been largely confined to the capital cities. Currently, the average total cost of using a local dialup Internet account for five hours a month in the region is about \$50/month (usage fees, telephone time included, but not telephone line rental). Nevertheless, ISP charges vary greatly with a range of \$10.00 to \$100.00 a

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month, largely reflecting the different levels of maturity of the markets, the varying tariff policies of the telecom operators, and the different national policies on private wireless data services and on access to international telecommunications bandwidth (Alper, 1999).

EFFICACIOUS FACTORS OF SUCCESS IN AFRICA

Dispersion of several end-users in a myriad of transnational organizations across the African borders is often uneven with respect to the end-users socio-cultural heritages, political affiliations, legal and economic entities and levels of technological know-how. This uneven demographic composition of end-users increase the complexity of the problems encountered in the management of end-user computing in the African environment, namely; information integrity, security information privacy and accessibility, information data flow and effectiveness. Other emerging factors include African cultural expectations, information management effectiveness, communication ineffectiveness, economic volatility, African regulatory standards, resources availability, connectivity, systems security and electronic commerce (Flynn, 1994; Kim, et. al. 1995). These factors could serve as barriers to a successful infusion into the continent. However, they could also serve as motivators to potential multinational corporations.

MODEL EXPLANATION

The model used in this analysis focuses on identifying the factors affecting information technology managers as they implement an African C/SWIS application system. These factors are examined in four domains with respect to their impacts on business and information systems (IS) management. The four domains are general management, information systems management, cultural and environmental. Each domain has its own sub domain as presented in Table 1.

The problems and factors associated with the domains outlined in Table 1 will help generate a set of recommendations, which will enable successful information technology infusion into the African continent. Also, these recommendations may enable WIS managers to become fully equipped with the proper tools in dealing with the critical issues that could hinder their progress.

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TABLE 1

Major Domain I	Major Domain II	Major Domain III	Major Domain IV
General management factors	Information systems management factors	Cultural factors	Environmental factors
SUB-DOMAIN Collaboration & communication competence factors African economic volatility factors Bureaucratic standards	SUB-DOMAIN Africans as end-users Connectivity factors Systems securities	SUB-DOMAIN African cultural diversity Regional expectations	SUB-DOMAIN Virtual environment & information management effectiveness Tangible & intangible resources Information technology & Electronic commerce

THE GENERAL MANAGEMENT DOMAIN

This domain includes critical areas that could be of concern to C/S-WIS multinational corporations such as collaborative and communication competence, African economic volatility, bureaucracy and regulatory standards. These criteria are discussed below.

Collaborative and Communication Competence: Effective communication is a critical managerial skill for WIS executive because it is the essence of effective organizational management. Its importance can be targeted to the functionality of the C/S-WIS team and the overall business productivity issues. Understanding the African culture is crucial because the region has more than 3,000 ethnic groups and 1,000 languages (Concise Columbia Encyclopedia, 1999). MNCs abilities or inabilities to communicate in the local language can determine the success or failure of IT infusion into the region. Information system programs should be written to be language independent. Other

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communication mediums may be used for more effective data communications. Enterprise collaboration systems will further enhance the infusion. These systems involve the use of groupware tools to support communication, collaboration and coordination among members, network teams and workgroups in the region.

African Economic Volatility: Regional chaos, nationalization of foreign businesses, economic and political instabilities that precede economic insolvency in Africa is crucial business concern for C/S-WIS professionals. Key concerns and questions are how might a C/S-WIS manager deal with an African dictatorship whose country is in economic depression? Also, how can a firm doing business in Africa with little or no bargaining leverage handle the host country's investment and nationalization initiatives? These are some of the challenges that might be encountered as a result the infusion.

Bureaucracy and Regulatory Standards: Every country in Africa has regulatory standards that govern their business practices. However, it becomes a liability when the regulations and standards vary with countries within the continent and proliferate even at the spur of the moment. C/S-WIS management will have to resolve the problem of how to articulate C/S-WIS management policies. These policies and procedures will incorporate all the African regulatory standards pertaining to business activities, information access and distribution, without compromising on information security and integrity.

Previous studies indicate that various standards and rules governing types of information and technology or the use and dissemination of them differ in many African countries (Kizior, 1993; Singer, 1998). The applications of these systems should be modified or customized to meet national and local needs and regulatory requirements. Policies, procedures, standards and rules governing the various characteristics of data and technology acquired or developed by the firms should be set up.

INFORMATION SYSTEMS MANAGEMENT DOMAIN

This domain is critical to C/S-WIS multinational corporations as they penetrate the continent. Information systems management domain includes Africans as end-users, Connectivity factors and systems securities.

African as End-Users and their Expectations: A good understanding of the customer base within the African end-user context is essential. This understanding will include the interest of the end-users and how those interests

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and concerns can be met. The end-users' beliefs and value systems should also be considered. The cultural and value systems should include semantic differences, attribution and perception issues, attitude towards women and work in general, ethical issues, religious influences, collectivism and so on (Singer, 1998; Lewis, 1996). As a solution, a task force of African end-users, C/S-WIS professionals, political and legal experts should be formed to search for synergy and balance between the end-users and the prospective multinational corporations.

Connectivity and Systems Security: Due to the nature of geo-economic vulnerability of Africa, connectivity and systems security had been problematic (Hedlung and Rolander, 1990). Some of the responsibilities of the information system manager are to protect the information systems, make information available to authorized users and maintain high information systems integrity. Threats to information integrity, security and privacy, while assessing user accessibility to data have been problematic to multinational corporation C/S-WIS managers (Flynn, 1994).

Protection of firms from security problems will involve the use of firewalls, user identification, authentication methods and encryption. Firewalls will help establish barriers to system entry from hackers either outside the system or inside the intranet. User identification will help establish the process of obtaining information from the user to determine authorization. Authentication process will help establish the identity of users by asking for entry clearance into the system (i.e., password and user IDs). Encryption process will help by applying a mathematical formula to code or scramble data for transmission over the Internet. Also, previous studies have suggested that software piracy and intellectual copyrights, hardware compatibility, and congruency of data formats within Africa must be carefully monitored (Flynn, 1994, Hedlung and Rolander, 1990; Hopkin, 1994).

CULTURAL DIVERSITY DOMAIN

This is the third domain of concern to C/S-WIS multinational corporations. The domain comprises of African cultural diversity and regional expectation issues.

Cultural Diversity in Africa: African cultural homogeneity or heterogeneity in the C/S-WIS user team affects the dynamics of the team in its ability to achieve results. Cultural factors such as time, money, information, technology, among other things, affect the perceived relevance facing the team and its use of available resources. African people culturally interpret messages

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and instructions in the context of their respective cultural heritage such as semantic differences, attribution and perception issues, attitude towards women and work, ethical issues, religious influences, collectivism and so on (Singer, 1998; Lewis, 1996). The concern of cultural diversity can be a complex problem as well as strength in the survival of an organization within the continent. The secret to success is for the MNCs to recognize and implement the philosophy of diversity from the African context.

Regional Expectations in Africa: The goal here is for the organizations to develop strategies to meet and exceed the expectations of African customers. The customers are the local end-users whose information technology needs are to be satisfied. End-users such as the governmental agencies and natives want the firms to respond more adequately to their local needs. Firms must be sensitive to local needs and must give high priority to these needs. MNC achieving competitive competence must implement solutions to findings from research and development breakthroughs in the region.

Multinational corporations must consider powerful databases and access languages that are flexible for local rapid application development. Structured query language (SQL), a popular computer language used by diverse groups such as home computer owners, small business owners, end-users, large organizations and programmers, will be strongly recommended as a tool to enhance the infusion. Also the addition of Java, which is a full-fledged, object oriented programming language will enhance the infusion. Java is similar to the more traditional compiler programming languages such as "C" or COBOL because it can be used to create stand-alone applications. Another feature that will be helpful is the implementation of JavaScript into the process. JavaScript enhances Web page creation by adding interactivity to HTML (Hypertext markup language) protocols. The result of these activities will be that African end-users will be able to provide and receive instant feedback without the complicated common gateway interface (CGI) problems.

EXTERNAL AND INTERNAL ENVIRONMENTAL DOMAIN

This is the fourth domain and comprises of the following: Virtual environment and information management effectiveness in the African theater; tangible and intangible resources; information technology and electronic commerce.

Host Country Expectations in the African Theater: The distributed learning revolution in the information technology environment will bring current and future participants up to speed. The management of information technology's

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parochial approach in many multi-national corporations has become a liability to the achievement of organizational strategic objectives. Interpersonal skills, communication and cognitive styles of management that often make user interfaces more or less acceptable and effective are important factors to recognize.

According to Regina Bento, leadership within cross-cultural African teams is associated with cultural dominance. An example in the African context is the disproportionate power vested in members of one culture over those of others (Bento, 1995). Continued environmental changes within the continent will be a major concern to C/S-WIS management.

Resource Availability: Worldwide data issue has been a subject of political controversy and technology barriers in worldwide business operations. Due to the problem of inadequate or obsolete storage devices and trans-border data flow, data may be unreliable or even unavailable. Most African states, view their national sovereignty as being violated because of trans-border data flow (Kizior, 1993). The question for C/S-WIS managers is: how can a manager cope with the disparaging technological (hardware/software) platforms and compatibility often found across borders? Another question could be to what extent will a nation deficiency in technological expertise be compensated without introducing foreign cultural dominance into their culture? Also, how can a C/S-WIS manager maximize efficient use of resources by minimizing waste, while availing user resources flexibility to meet various information needs?

The frustration of C/S-WIS managers in resolving country-specific applications of information technology has emerged as a barrier to a successful information technology infusion into the region (Dean, 1992, Hopkin, 1994, and Flynn, 1994). As a solution, reorganization of data processing to conform to each African nation's specific applications is advisable (Flynn, 1994). Implementing a business strategy, such as testing, accepting, and adapting new information technologies will be essential for achieving the competence and sustainability of competitive advantage in the implementation of client server systems.

Electronic Commerce Platform in Africa: Another area of concern is the use of client/server technology as a tool for achieving competitive advantage in the electronic commerce environment. Success of the infusion of information technology into Africa through electronic commerce can be achieved through a transnational business strategy and worldwide information system management.

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As global businesses enter a new millennium, Africa will be experiencing one of the most important changes in its history. This change is the move to an Internet-based society. Almost everything will be changed at home, in the African villages, in schools, at work, in the government, in cultural and leisure activities. Some of these changes are already here and spreading around the continent. One of the most significant changes is the manner Africans conduct business especially in the way in which Africans and the multinational managers manage the marketplace and commerce.

Electronic commerce (EC) describes the manner in which transactions take place over the networks, mostly the Internet. EC is the process of electronically buying and selling goods and services, and information. Certain EC applications, such as buying and selling stocks or books on the Internet, are growing at a rate of several hundred percent every year. Electronic commerce could have an impact on a significant portion of Africa, its businesses, professional, and, of course, on the African people. This could lead to the building of a new industrial order in the continent. According to Vice President Albert Gore, Jr:

We are on the verge of a revolution that is just as profound as the changes in the economy that came with the industrial revolution. Soon, electronic networks will allow people to transcend the barriers of time and distance and take advantage of global markets and business opportunities not even imaginable today, opening up a new world economic possibility and progress.

Such a revolution in Africa brings a myriad of opportunities as well as risks. Multinational and African information technology managers should be aware of the problems and should design and implement strategies to overcome barriers to process.

Electronic commerce is an interdisciplinary topic and, therefore, should be of interest to managers and information technology personnel, who are venturing to penetrate the African continent. Success in penetration will include designing structures around the notion that EC applications, such as home banking or electronic fund transfers would require certain technological infrastructures and other support mechanisms. The applications should be divided into these segments: business-to-consumer, business-to-business, business-to government and intra-business transactions. The infrastructure will be in the areas of hardware, networks and software. The support services should range from secured payment systems to communication standards and legal issues.

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RECOMMENDATIONS

Regional collaboration within Africa should be encouraged as an important means of addressing the need for diffusion of IT infrastructure into the region. Conferences of African ministers for social and economic planning should generate high-level working groups to formulate a framework for the diffusion. Also, the formulation and development of a national information and communication infrastructure in every African country should be encouraged. There should be co-operation among African countries to share the success of expediciencies. The countries that have so far begun the process for developing in-depth national information infrastructure and communication development plans are Benin, Burkina Faso, Cameroon, Comoros, Ethiopia, Lesotho, Namibia, Nigeria, Ghana, Mozambique, South Africa and Uganda. The experiences developed by these countries in trying to formulate new policies will be of considerable interest to others considering the same undertaking.

IT infusion will be successful if the region opens an African Connection Telecenter in all 52 African states. This is in concert with recent efforts to improve accessibility to Internet connectivity in rural areas through the use of shared public access facilities, which exploit the convergence of technologies to provide cost effective services in underserved and remote locations.

One solution to bandwidth problem is that incoming bandwidth can now outpace outgoing bandwidth due to the increase of data broadcasting services that have been installed by ISPs in the region. Identified by the ISPs in the regions, is the use of direct personal computer type systems that can provide incoming bandwidth of 64Kps for the cost of approximately \$39.00 to \$1000.00 [depending on usage]. If properly connected, the asymmetric service should deliver up to 8Mbps oncoming, while the normal terrestrial phone circuit or leased line will be used for all outgoing traffic. The asymmetric technology uses a standard digital KU-Band or C-Band satellite television antenna that cost approximately \$175.00 to \$500.00 (depending on the size required) and a decoder card for the personal computer that cost approximately \$450.00. The effect of this technology is to enhance connectivity.

The infusion of IT into Africa will also depend on the MNC global strategies. These strategies will include the MNC-management expertise and experience in IT and their knowledge of the cultural implications. Success depends on a variety of global business drivers such as requirements caused by the nature of the industry and its competitive or environmental forces. This includes adequate planning on cross-cultural issues, creating task force to balance local users interest while balancing MNC business vision and

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objectives. Also included will be the application of collaborative management strategies concentrating on theme from the African prospective. Such as:

- Designing strategies to infiltrate the African culture and develop language independent computer programs that are user friendly.
- Designing and developing currency-tracking systems so as to control the black market fluctuations.
- Setting standards for control measures by customizing applications to fit regional needs and regulation standards.
- Identifying adequate hardware, software and network peripheries and incorporate the client server architecture into the region.

Additionally, regional strategies on the African customer should focus on issues such as diversity, use of workable local stations, simplification of machine languages, currency exchange, data transfer, political issues, regional products design, regional operations and resources should be incorporated into the strategy. Global and regional collaboration should further enhance the process. This means the knowledge and expertise of MNC executives should be easily accessible, shared and organized to support individuals or group effort thereby creating synergy.

As reported in this study, diffusion of technology in an organization is not simply a technical issue but also involves other societal spectrums such as politics, culture, economics status, and literacy level of the society. However, many challenges are still facing the continent. Some of the challenges will include how to deal with the introduction of new ways of doing business using information technology, the economic and ethical impacts, especially on competition and continental data transfer of information, the use of the extranet as a business-to-business infrastructure, the role of multinationals. It will also include the transfer of data across international borders, the differences and effect of electronic commerce and the World Wide Web, etc. Although the analysis has responded to some of these issues, more research is needed before a smoother transition can be assured.

CONCLUSION

The diffusion of information technology into the African continent is at an early stage. The analysis and discussions of major factors, as well as symptomatic descriptions of each area enhances the readiness of the C/S-WIS managers for the formidable responsibilities that await them in the twenty-first century.

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Many aspects of the society will be affected by the diffusion of information technology into the region. As indicated in this analysis, diffusion of information systems in an organization involves societal spectrums such as politics, geo-economic situations, culture, educational level, overlapping working hours, local computing and labor regulations, potential theft issues, sabotage and terrorism, unreliable power supply, availability of redundant network backup capabilities among others. As a tool, the client/server model will enhance the infusion. This model involves the servers and the clients sharing computer activities. The servers perform database access and intensive computing tasks. The clients perform the displays and user interface tasks for the required calculations. This model distributes the computer loads throughout the network and takes the advantage of the power available on the respective desktops.

Many problems will be encountered as the process progresses. Although these problems may not necessarily manifest in any one MNC, the recommendations are individualized to each factor. This analysis concludes that holistic thinking approach should be applied and the prescribed recommendations will enable WIS managers to become more aware of the problems and methods of handling the infusion.

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