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EXPERTS' PERCEPTIONS OF INFRASTRUCTURAL AND INSTITUTIONAL FACTORS FOR EFFECTIVE E-COMMERCE IN SUB-SAHARAN AFRICA

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Introduction

E-commerce has taken the world by storm, providing a very important new channel that connects the globe digitally for international commercial transactions. . . . So the story is told, except when we examine the progress of e-commerce in developing countries. As Petrazzini and Kibati noted, "A closer look reveals great disparities between high- and low-income regions in terms of both Internet hosts and users. More than 97% of all Internet hosts are in developed countries that are home to only 16% of the world's population." It is critical to focus attention on these low-income regions of the world, so that we can begin to make headway into balancing out this situation.

Numerous studies documenting the spread of the Internet in various parts of the world have highlighted the fact that Sub-Saharan Africa (SSA) is the region with the lowest level of economic, technological, and Internet development in the world (Petrazzini and Kibati 1999). The reasons for this state of affairs are numerous and beyond the scope of this study, but suffice it to say that this part of the world is probably the region most in need of research that can contribute to the reversal of its undeveloped technological state. This study joins the growing body of literature that studies the factors that affect the diffusion and expansion of information and communication technologies (ICTs), particularly the Internet, into Sub-Saharan Africa (see Mbarika (2001) for a review).

There are a number of ways that ICTs, and the Internet in particular, could contribute towards solving some of the most important socioeconomic problems in SSA.

Research Questions

E-commerce is one of the most visible examples of the way in which information and communication technologies (ICT) can contribute to economic growth. It helps countries improve trade efficiency and facilitates the integration of developing countries into the global economy. It allows businesses and entrepreneurs to become more competitive. And it provides jobs, thereby creating wealth.

Koffi Annan, Secretary General of the United Nations

This statement by the Secretary General (UNCTAD, 2002) points to the paramount importance of electronic commerce (e-commerce) diffusion as a major impetus for socioeconomic development in developing countries. Specific to Sub-Saharan Africa, the business use of the Internet is critical for sustainable development. Rather than giving Africans the fish of foreign aid, it is critical that Africans learn to fish for themselves by developing viable economic models that fit well with their socioeconomic environment. The Internet has huge potential in general, but specific afro-centric models are needed. Tourism in Africa has already been rejuvenated, since tourist companies can advertise internationally now, without having to go through Western travel agents. Within Africa, Africans can establish electronic markets that inform them about the business opportunities with their own neighbors, encouraging internal trade. The first research question this study asks is:

1. *What are the pertinent factors that are necessary for the establishment of viable e-commerce in Sub-Saharan Africa, and how do they interact with each other?*

Among the various potential benefits that the Internet promises to developing countries, e-commerce stands out in that it involves citizens engaging in commercial enterprise that generates income from economic activities. Moreover, it provides employment and generates government revenues in taxes. Thus, e-commerce has the potential to be self-propagating and self-sustaining, the holy grail of development researchers and organizations. Hence, focusing on the commercial applications of the Internet in developing countries is a valuable perspective, since such applications potentially would have significant beneficial effects on all other applications of the Internet. In view of this unique promise of e-commerce, it is important to ask:

2. *What is the relationship between e-commerce and economic development in Sub-Saharan Africa?*

While development research has identified numerous factors that are important to economic development, not much work has been done that empirically relates them to e-commerce. Thus, to better understand the expanding role that e-commerce plays in economic development, we also ask in this study:

3. *What is the mediating effect of e-commerce in the relationship between various determinants of economic development in Sub-Saharan Africa?*

Model of E-Commerce Outcomes in Sub-Saharan Africa

Since around 1993, when the Internet began to be researched in the IS literature, there has been a number of frameworks developed that examine different dimensions of infrastructure, features, and factors necessary for the support of e-commerce (Ngai and Wat 2002). Theories on technology and innovation transfer, adoption, and diffusion have emerged are helpful in understanding how ICTs can spread in a country (Fichman 2000; Moore and Benbasat 1991; Rogers 1995). There has been an increasing amount of literature on the factors that affect development of the Internet and e-commerce in developing countries (Dutta 1997; Mbarika 2001; Montealegre 2001; Travica 2002; Wolcott, Press, McHenry, Goodman and Foster 2001) Major findings are that Internet and e-commerce diffusion occurs very differently in developing countries than in developed countries. There is a strong need to understand the contextual settings of the developing countries being studied in order to effectively apply Internet and e-commerce technologies—developed in the West—to these countries. A particularly important theory from this stream is the IT diffusion model for developing countries developed by Detmar Straub and colleagues (Checchi, Sevcik, Loch and Straub 2002; Straub, Loch, Evaristo, Karahanna and Srite 2002; Straub, Loch and Hill 2001).

Drawing from these different streams of e-commerce frameworks, ICT diffusion, and ICTs in developing countries, we have developed a general model that explains what pertinent factors effect e-commerce in SSA. In our model, the primary dependent variable is **E-commerce Outcomes**, indicating the practice of e-commerce (APEC 2000; CID 2000; Kardaras and Karakostas 2001; Zhu and Kraemer 2002; Zwass 1996). We also have a secondary dependent variable, **Economic Development**, which reflects our goal of studying e-commerce for the purpose of enhancing the economic performance of Sub-Saharan countries (Dutta 2001; Easterly and Levine 2002; Sachs and Warner 1997).

The model has six independent variables that we postulate directly affect e-commerce outcomes. **National ICT Policies** reflect the aspirations of government policy makers to prioritize ICTs for national development (King et al 1994; Mbarika 2001). It reflects both general ICT Policies and those specific to e-commerce. **ICT Infrastructure** is the telephone, wireless, and telecommunications infrastructure in a country that facilitates data communications (Dutta 1997; Dutta 2001; Mbarika and Byrd 2003; Mbarika, Byrd, Raymond and McMullen 2001). We postulate that both ICT Policies and ICT Infrastructure have a direct effect on e-commerce outcomes, and that ICT Policies also have a direct effect on ICT Infrastructure.

Next we have **Institutional and commercial factors** that affect the practice of business in general, and—in our model—e-commerce in particular (Travica 2002). These factors include the effectiveness of governance, and the conduciveness of the traditional commercial environment. **ICT Transfer and Implementation** affects the effectiveness of the process of adopting e-commerce tools and practices in a Sub-Saharan context (Fichman 2000; Moore and Benbasat 1991; Rogers 1995). The last component of our model is two Culture factors: **Culture-Specific Beliefs and Values** and **Technology Culturation**, different aspects of culture that affect e-commerce outcomes (Checchi et al 2002; Straub et al 2002; Straub, Loch and Hill 2001). The Culture factors affect e-commerce directly and also through their moderating effect on ICT Transfer and Implementation. Figure 1 graphically portrays the model we propose here, while Table 1 details the hypotheses that interrelate the constructs.

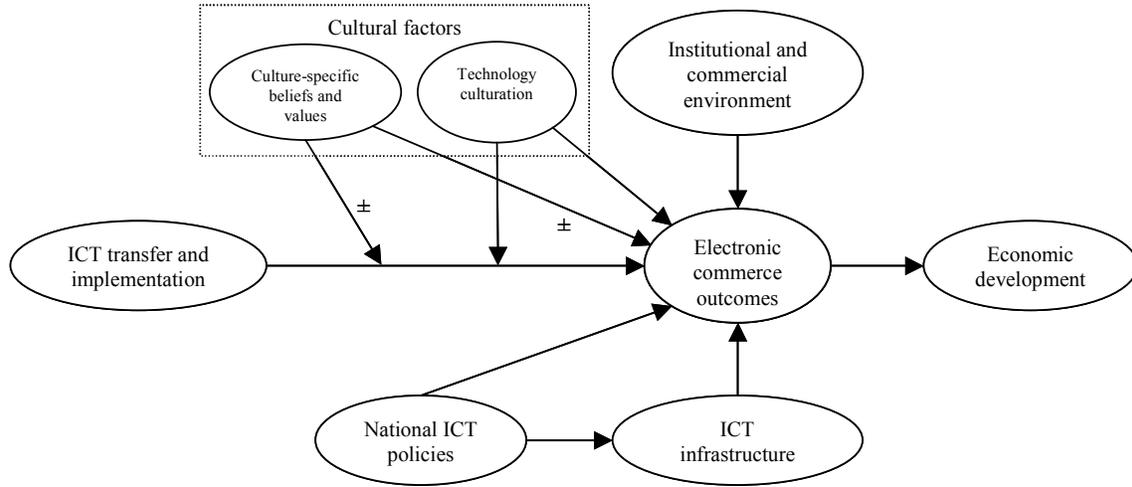


Figure 1. Model of E-Commerce Outcomes

Table 1. Hypotheses for Model of E-Commerce in Sub-Saharan Africa

Number	Hypothesis
1	Favorable e-commerce outcomes will increase economic development in Sub-Saharan Africa.
2	National policies that favor the development of ICTs will increase the level of ICT Infrastructure in Sub-Saharan Africa.
3a	National policies that favor the development of ICTs in general will yield favorable e-commerce outcomes in Sub-Saharan Africa.
3b	National policies specifically tailored to promote e-commerce will yield more favorable e-commerce outcomes in Sub-Saharan Africa than more general ICT Policies.
4	The existence of ICT Infrastructure will increase favorable e-commerce outcomes in Sub-Saharan Africa.
5	The presence of a favorable institutional and commercial environment will yield favorable e-commerce outcomes in Sub-Saharan Africa.
6	The presence of factors that favor ICT Transfer and Implementation will yield favorable e-commerce outcomes in Sub-Saharan Africa.
7a	Technology Culturation of citizens will yield favorable e-commerce outcomes in Sub-Saharan Africa.
7b	Culture-Specific Beliefs and Values consistent with e-commerce practice in technologically advanced nations will yield favorable e-commerce outcomes in Sub-Saharan Africa.
7c	Culture-Specific Beliefs and Values inconsistent with e-commerce practice in technologically advanced nations will impede favorable e-commerce outcomes in Sub-Saharan Africa.
8a	Technology Culturation of citizens will enhance the favorable effect of ICT Transfer and Implementation factors on e-commerce outcomes in Sub-Saharan Africa.
8b	Culture-Specific Beliefs and Values consistent with e-commerce practice in technologically advanced nations will enhance the favorable effect of ICT Transfer and Implementation factors on e-commerce outcomes in Sub-Saharan Africa.
8c	Culture-Specific Beliefs and Values inconsistent with e-commerce practice in technologically advanced nations will mitigate the favorable effect of ICT Transfer and Implementation factors on e-commerce outcomes in Sub-Saharan Africa.

Methodology of the Study

Sampling Procedure

We will employ a survey-based questionnaire methodology to collect data from experts on e-commerce in Sub-Saharan Africa. The first step in identifying the respondents to our survey involves clearly understanding our population of interest. We want to locate individuals who can accurately inform us about our research questions. The general public cannot do this, not even those living in SSA. For our study, we will need to solicit experts' opinions on this subject because it is the perceptions of relevant experts that should be closest to the actual objective factors than those of less experienced persons who might also have an opinion on what affects e-commerce in SSA.

Delbecq et al (1975: 124-137) provided detailed guidelines on how to go about soliciting qualified experts for a nominal group technique study. Although our purpose here is for a survey questionnaire, we can apply many of their principles to assure that we identify the most representative experts for our study. Following the guidelines of Delbecq et al (1975), we will follow a multiple-step iterative approach to identifying the appropriate experts. First, we will prepare a "Knowledge Resource Nomination Worksheet" (KRNW), divided into Disciplines or Skills; Organizations; and Related Literature. Second, we will populate the KRNW with specific names of experts. The third step involves contacting the experts we will have identified so far, and asking them to nominate other experts for inclusion on the list. Through this iterative process, we hope to identify between 300 and 500 experts.

Data Collection Procedure

After identifying the appropriate experts for the study, we will administer the survey. We will follow a rigorous approach to ensure that the study validly answers our questions concerning e-commerce in Sub-Saharan Africa. We will administer the questionnaires using e-mail, faxes, the Web, and regular postal mail. The panelists will be free to use whichever of these media is most convenient for them, and they can return different questionnaires using different media. Postal mail is a well-established medium for administering surveys, but the other multiple "rapid" media are becoming increasingly popular and established (Matz 1999). Studies have shown that there are no significant differences in means scores between paper- and Web-based surveys (Dillman 2000).

Data Analysis Procedure

Research Question 1

What are the pertinent factors that are necessary for the establishment of viable e-commerce in SSA, and how do they interact with each other?

Our literature review identified the following factors as pertinent for e-commerce in SSA, and specified their interrelationship: ICT Policies, ICT Infrastructure; institutional and commercial environment; ICT Transfer and Implementation; and culture. The portion of our model that specifies the determinants of e-commerce outcomes (that is, everything except the Economic Development construct) can be tested using structural equation modeling (SEM). This statistical technique is valuable for its ability to test complex models that feature interactions and multiple-cause effects. Multiple regression is an alternative technique that we could have considered, but it is not ideal for testing relationships such as when National ICT Policies affects both ICT Infrastructure and E-commerce Outcomes. Moreover, regression can only test unidimensional constructs, unlike SEM which is ideal for multidimensional constructs, such as we intend to operationalize. Thus, SEM is most appropriate for this test.

Research Question 2

What is the relationship between e-commerce and economic development in SSA?

Our literature review suggested that e-commerce outcomes will favorably aid economic development. Because of the multidimensionality of our constructs, and because of its suitability for testing causal direction, we will also use SEM for this test.

Research Question 3

What is the mediating effect of e-commerce in the relationship between various determinants of economic development in SSA?

With the two prior research questions combined, our overall model theorizes that all the factors we have specified positively affect economic development (with the possible exception of some culture-specific beliefs and values), and they do so through the mediating effect of e-commerce outcomes. Again, for testing this complex overall model, SEM is an appropriate technique.

Study Validation

We will carry out a number of steps to ensure that our study is valid and psychometrically sound. First, we will pretest the questionnaire with panels of experts who will assess the survey instrument for content and face validity. Second, we will test the modified instrument with a pilot study of 50 to 100 subjects to further assess the discriminant and convergent validity of our constructs and the reliability of our items. Then we will conduct our main study on our sample of experts, taking care to meet the statistical assumptions of SEM.

Contributions of this Study

This dissertation assesses the perceptions of experts of the infrastructural and institutional factors that affect the success of electronic commerce in Sub-Saharan Africa, a very under-researched part of the world. Based on the groundwork laid by this dissertation, future studies can progress by assessing each category and sub-category of the model in detail. Researchers could investigate the current state of Sub-Saharan Africa in each category, and then propose policy and business strategy measures that could be implemented to develop the category. This gives a comprehensive framework for a focused body of research in this area. The basic model presented here will need to be extended significantly. In particular, the framework could be refined to distinguish more clearly between the different needs of B2B and B2C e-commerce, both for physical goods and for services. With the model presented and tested in this study, we hope to assist in the establishment of self-sustaining Internet-based commercial enterprise in Sub-Saharan Africa, a critical need in bridging the digital divide.

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