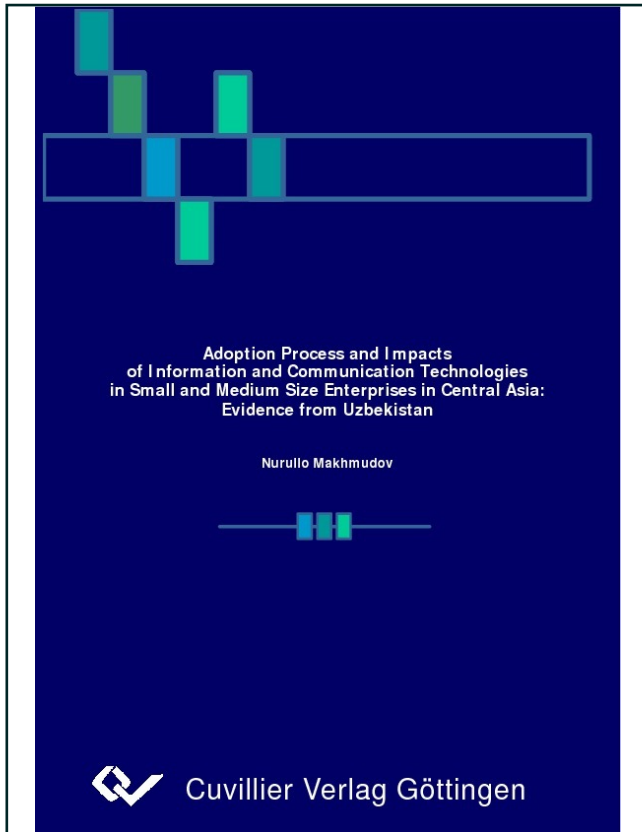




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# **Adoption Process and Impacts of Information and Communication Technologies in Small and Medium Size Enterprises in Central Asia: Evidences from Uzbekistan**



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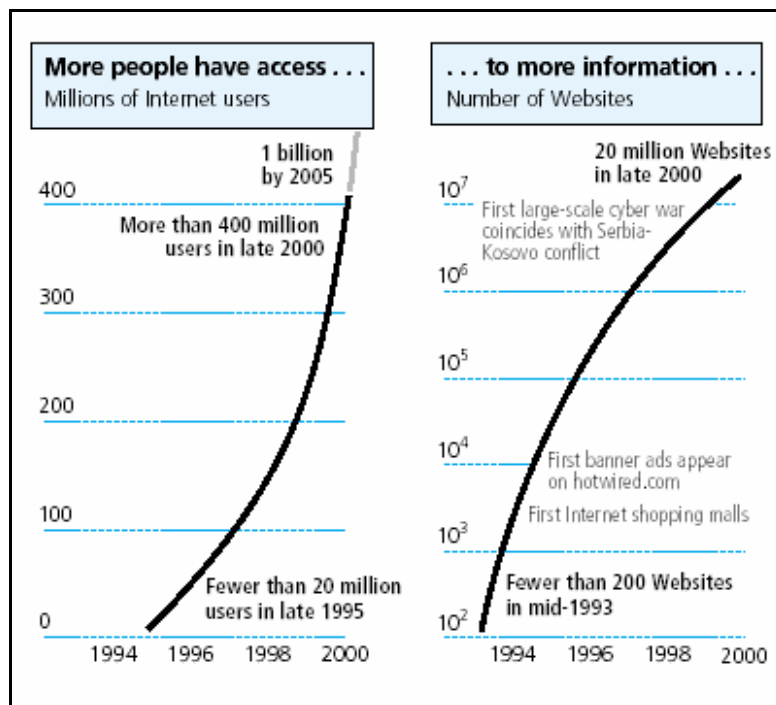
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# 1 Problem-statement

## 1.1 Introduction

The importance of the topic of diffusion of information and communication technologies (ICT) has significantly increased over the last years. In the course of the last three decades there was a significant digitalization of economies spurred by the introduction and rapid spread of different ICTs. Since 1970s the share of the annual IT investment has been steadily rising in the total business investment in most of the industrialized countries. For example, in the US it increased more than eightfold between 1970 and 1999 respectively from 2.6 percent to 22 percent (Dedrick *et al.*, 2002). The demand for information access, processing and transmission has also significantly increased over the last years and the trend is expected to continue (see Figure 1-1).

Figure 1-1: Trend of increasing demand for information access



Source: UNDP (2001b)

As a result of the digitalization of economies information is increasingly considered as a separate “factor of production” (Barton and Bear, 1999). The volume of online transactions in both areas - business-to-businesses (B2B) and business-to-consumer

(B2C) commerce, is also continuing to rise despite of the recent crash of technology stocks. To illustrate, experts estimate that the volume of global B2B revenues would exceed 1.4 trillion USD by the end of 2003 and would almost double to the 2.7 trillion USD level by the year 2004<sup>1</sup>. Increasing digitalization of economies has led to the emergence of such terms as “information revolution”, “information age”, “new economy”, etc. This trend, which is predominantly taking place in the developed countries, is expected to continue into the future. Thus Barton and Bear (1999) suggest that in the coming few years 70 percent of all employment in OECD countries will be information related. The wide spread and use of new information and communication technologies are affecting many diverse areas including economic, political, and social spheres. Among the economic impacts associated with digitalization of economies are: 1) acceleration of economic growth (Jorgenson and Stiroh, 2000; Oliner and Sichel, 2000; Whelan, 2000); 2) creation of new products and services; 3) changes in the way businesses operate; 4) alteration of economic structures (Barton and Bear, 1999).

**The described persistence and pervasiveness of the digitalization trend in industrialized nations has a direct relevance for developing countries.** There is a concern that less developed countries, where access to information and use of ICTs is still very low, may be excluded from these important developments in the global economy. As a result they may find it increasingly difficult to compete internationally with developed economies, which are able to achieve significant improvements in price, design and quality of products due to widespread use of ICTs (Hanna *et al.*, 1995). Difference in the spread of ICTs between developed and developing countries is referred to as “digital divide” (ITU, 1998). The digital divide can be illustrated by the fact that less developed economies, while accounting for 85% of the world’s population in 2000, had only 10% share in the global spending on IT (Clarke, 2001). Concerns in this area have led a number of influential multilateral agencies and forums - like World Bank, G8, OECD, UN, ITU, etc. to initiate measures for promoting ICTs in less developed countries (Seibel *et al.*, 1999; Altenburg *et al.*, 2002).

There may be many explanations for the low level of technology adoption in developing countries, such as: lack of financial resources, lack of awareness and

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<sup>1</sup> “Worldwide B2B revenues to pass one trillion”, at <http://www.nua.ie/surveys/> 15.07.2003

knowledge, scarcity of qualified employees, inadequate technological infrastructure, inappropriate legal and regulatory conditions, etc. However, for finding out which of these factors are more important in a particular country and situational context, there is a need for empirical studies on them.

## **1.2 Problem statement**

Given the abundance of areas that can be studied within the field of ICTs in developing countries, there is a need for the current study to specify its focus, both in terms of the research topic and the geographical area. Current study's main area of interest is "Adoption Process and Impacts of Information and Communication Technologies in Small and Medium Size Enterprises in Central Asia". There are two important reasons for specifically concentrating on this topic: 1) inadequacy of ICT studies on developing countries, generally, and on Central Asian region, specifically, 2) insufficiency of studies on ICT use and impacts in small and medium size entities (SME).

### *1.2.1 Lack of studies on developing countries*

Much of the ICT research done **so far was focused on the industrialized countries** such as US, UK and countries of the Western Europe (Morrison, 1997; Fink, 1998; Tam, 1998). On the other hand, the topic of ICTs in developing countries has not been sufficiently researched yet (Altenburg *et al.*, 2002). This is also true for transition economies in Central Asian region, for which there are almost no studies conducted on this topic. The research was mostly concentrated on developed countries, because of greater availability of data and resources there. Considering this inadequacy of studies on developing countries, the question is whether results from the industrialized countries are applicable to the developing ones. Whether conducting a separate research on the Central Asian region is necessary?

Many scholars argue that **findings from industrialized economies are not directly transferable to developing countries**. This is so, because information systems implementation depends on specific social, cultural, economic, legal and political context, which may differ significantly between countries (Stiglitz, 1988; Shore, 1998; Thong, 1999; Spanos *et al.*, 2002). An empirical example demonstrating that differences

in country-contexts can lead to different ICT use and impact patterns is provided by Dewan and Kraemer (2000) and Pohjola (2001). These scholars found in cross-country studies the existence of a strong relationship between IT and productivity in developed countries, but not in developing ones. Additional evidence for the importance of country-specific contextual factors is shown by the findings of Dasgupta *et al.* (1999) and Clarke (2001). Specifically, while the first found that foreign participation in firm's equity has no impact on ICT adoption in India, the latter arrived at the opposite conclusion for countries in transition. In fact, some scholars believe that abundance of low-cost labor and high capital-costs in developing countries reduce the possibility for labor-technology substitution in them compared to developed ones (Dedrick *et al.*, 2002). Therefore, considering such inter-country differences is important and helps reducing the risk of systems implementations failure (Harris and Davison, 1999). This non-applicability of results from industrialized countries is not specific only to the ICTs, but has been also argued in general for the conventional western theories on the organization-environment interaction (Hofstede, 1991; Sawyerr, *et al.*, 2000). Therefore, in order to determine variables that are critical for ICT adoption and use by SMEs in the transition economy of Uzbekistan, one needs to conduct a separate empirical study locally.

The necessity for the current research arises not only due to non-transferability of findings from studies on industrialized countries, but also because of the **discrepancy in their conclusions** (Lefebvre and Lefebvre, 1996; Thong, 1999; Müller-Falcke, 2001). Therefore, there is a need for further research to reconcile the existing discrepancies. Only by means of congregating the empirical evidence from different environments will it be possible to come up with generalizations relating to the adoption and use of ICTs (Spanos *et al.*, 2002). Thus justifications for the current study are: 1) the lack of ICT studies on developing countries, 2) non-transferability of earlier findings and 3) existence of some discrepancies in the conclusions.

### *1.2.2 Lack of studies on SMEs*

Much of the research so far was focused on large firms operating in manufacturing sector (Brynjolfsson and Hitt 1996; Barua and Lee, 1997; Doms *et al.*, 1997; Dewan *et al.*, 1998). On the other hand, **the question of ICT adoption by SMEs**

**operating in different sectors has not been sufficiently researched** so far. Most of the existing work in this area is still of a case-study nature (Elliot, 1996; Tam, 1998; Barton and Bear, 1999). And yet SMEs are very important economic agents in every country and, especially so, in the developing economies (Thong, 1999). Specifically, they employ up to 70 percent of the labor force in the developing countries and thus contribute to income generation of the broad population base. Furthermore, SMEs play a key role in the economy by producing goods for export and domestic markets, and contributing significantly to innovations (Longenecker *et al.*, 1994; Schneider-Barthold, 1998; Hallberg, 2000). Given the scarcity of a large-sample empirical research on SMEs, there is a need for their more systematic study. This need for a special focus on SMEs is also necessitated by the fact that smaller firms are argued to have a different technology adoption pattern compared to large enterprises (Iacovou *et al.*, 1995; Sillince *et al.*, 1998).

Another justification for the study of ICT impacts in SMEs relates to the prevailing common uncertainty about the technology's return in businesses. In the earlier years there were large investments in ICTs caused by the prevalence of a significant euphoria about the potential benefits of technology and the expectation that its importance will continue to grow in the future. However this technology optimism has recently changed into the widespread pessimism. The recent burst of the IT-bubble in the stock markets, which was caused by the non-realization of the expected IT returns and consequent bankruptcy of many technology firms, threw some doubt onto the contribution and importance of ICTs. Such fluctuations in the expectations and an uncertainty about the returns from ICTs require **objective scientific assessment of their real contribution** by studying the types of impacts, conditions for their occurrence, and the factors that affect their extent.

Having presented above some justifications for focusing on the topic of ICT adoption and use in SMEs, one needs here to specify the geographical focus of the study. This research focuses on Uzbekistan, due to several reasons. First, the country is representative of the economies in transition in Central Asia in terms of its level of development. Second, it is the most populated country of the region with 26 million inhabitants. Furthermore, it plays one of the most important roles in the region in terms of

political, military and economic influence. Therefore, it serves as a worthwhile candidate for studying the research topic.

### **1.3 Research questions and objectives**

Based on the above, the research questions of this study relate to the factors that affect the diffusion of ICTs in developing country SMEs and the impacts of the technology adoption on their operations. The specific questions to be examined in the current study are as follows:

1. What factors determine the **likelihood of adoption** of fixed telephone, fax, mobile telephone, computer, email and world-wide web (WWW) in SMEs in Uzbekistan?
2. What factors influence the **intensity of adoption** of various ICTs in SMEs?
3. What are the barriers faced by SMEs to adopting ICTs?
4. What **types of impacts** occur in the firms using different ICTs?
5. What factors explain the **degree of occurrence of different ICT impacts** in technology-user SMEs?

With regards to the adoption, **the objective is to understand the technology adoption behavior of small and medium-size firms** and the factors driving or hindering their technology adoption. The research intends to identify the reasons for the slow rates of ICT diffusion among the developing country SMEs, despite of the significant potential payoffs associated with the technology. For example, ICTs are claimed to alleviate many problems faced by SMEs by increasing their access to information resources, and enabling them to communicate with their business partners in a more effective and efficient manner (Hamill, 1997). Nevertheless, the empirical evidence shows that only small proportion of SMEs currently uses ICTs. To illustrate, in year 2001 only 42% of the European SMEs had access to the Internet, which is below the rate of adoption among households (Altenburg *et al.*, 2002). Furthermore, even among those enterprises that have access to the ICTs, the degree of technology access and use varies. Most of the firms are reported to use the technology for relatively simple purposes such as only for obtaining information. A more proactive utilization of technology tools such as for online selling and systematic exchange of operational data with business partners is still rare among

SMEs, especially in developing countries.

With regards to the impacts of ICTs, the objective is to provide an unbiased and objective documentation of the *types* and *extent* of firm-level ICT impacts occurring in the developing country SMEs. Conclusions reached with regards to both research questions will help to further understand the reasons for the persistence of the “digital divide” and help formulating policy actions to promote ICT adoption in Uzbekistan. Otherwise, developing countries risk falling behind other countries in participating in the global information community at the time, when timely availability of information is increasingly becoming a source of a competitive advantage (Barton and Bear, 1999).

There are two research areas, to which the current study contributes. Firstly, it **fills the insufficiency of research on the topic** of ICT adoption and impacts in small and medium size firms. Secondly, by providing additional empirical evidence from the context of a Central Asian transition country – Uzbekistan, it **fills the lack of research conducted on this geographical region**

#### **1.4 Study outline**

The current study consists of several parts. Chapter 2 presents prevailing economic theories on the value of ICTs for development of developing countries and SMEs. It also defines SMEs and ICTs by describing their properties and characteristics. Chapter 3 examines the current state of development of ICTs in Central Asian region. It reviews the legal and regulatory framework conditions prevailing in the ICT sectors in Uzbekistan, Kazakhstan and Kyrgyzstan. It analyzes the present level of development of technological infrastructure in these countries and compares it with international benchmarks. **Chapter 4** deals with the first of the two research questions, namely, with the determinants of ICT adoption in SMEs in Uzbekistan. For this purpose, it first examines the main elements of the *theory of innovations diffusion* to provide a broad understanding of the diffusion process. The second part of the chapter constructs a *model* of the ICT adoption process by SMEs in developing countries by outlining the influence of the various categories of factors. Thirdly, the chapter estimates the *likelihood* and the *intensity of adoption* for each type of ICT by means of the econometric regressions. **Chapter 5** deals with the second research question of the study, namely, with the types of