

Determinants of e-business and ICT adoption among SMEs in Macedonia – An application of TOE Framework

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ABSTRACT

Research has demonstrated that firms using e-business culminate with considerable returns through efficiency improvement, inventory reduction, sales increase, customer relationship enhancement, new market penetration, and ultimately financial returns. However, there is little systematic research in terms of e-business adoption patterns in firms using TOE (Technology-Organization-Environment) framework. This paper illustrates the potential of adoption and use of ICT and e-business applications in small and medium sized enterprises (SMEs) in Macedonia. In the paper we present preliminary results of a survey of around 60 SMEs. In this study we explore several factors enabling or impeding the successful adoption and use of e-business and ICT by Macedonian SMEs. Based on technology-environment-organization (TOE) theory, three aspects influence e-business adoption: technological context (we explore technology integration among firms, more specifically the type of ICT adoption and applications), organizational context (we try to discover the motivations to invest in ICT, the benefits and barriers of ICT and e-business in particular) and environmental context (here we investigate trusted sources of IT advice, challenges of implementations and competitive pressure). We find that SMEs are generally satisfied with their investment in ICT but they are concerned about the cost of such investments and are uncertain about the business benefits, failing to recognize ICT's strategic potential to increase business flexibility, to increase productivity and to support globalization. Besides the concern about the ICT related cost, other major obstacles in adopting ICT were lack of internal ICT capabilities and lack of information about selecting, implementing and evaluating suitable ICT solutions. Our findings have important implications for policy aimed at ICT adoption and use by SMEs and will provide a foundation for future research by helping policy makers to understand, assist and support the SME sector.

Keywords: *SMEs, ICT, TOE, e-business, adoption, challenges, obstacles*

1. INTRODUCTION

The potential benefits of Information and Communication Technologies (ICTs) to small- and medium-sized enterprises (SMEs) are well known. ICTs improve SME

efficiency, reduce costs, and extend market reach, both locally and globally. Because the SME sector plays a vital role in national economies, these benefits to individual SMEs collectively translate into positive results in the form of job creation, revenue generation and overall country competitiveness. Unfortunately, a number of factors prevent or discourage SMEs from fully realizing the benefits of ICTs, including, among others, lack of knowledge, resources and trust. The process by which a firm adopts and implements technological innovations is influenced by the technological context, the organizational context, and the environmental context [1].

The technological context includes the internal and external technologies that are relevant to the firm. Technologies may include both equipment as well as processes. The organizational context refers to the characteristics and resources of the firm, including the firm’s size, degree of centralization, degree of formalization, managerial structure, human resources, amount of slack resources, and linkages among employees. The environmental context includes the size and structure of the industry, the firm’s competitors, the macroeconomic context, and the regulatory environment [1].

Descriptions of the relationships between the key constructs of the framework are given and suggestions with respect to ICT adoption are also provided.

2. THEORETICAL BACKGROUND FOR THE RESEARCH

Many studies show that SMEs are the driving engine of growth, job creation, and competitiveness in domestic and global markets. They also play a pivotal role in innovation and productivity growth [2]. ICT adoption in organisations has grown considerably throughout the past three decades. By 1998, in the developed world, ICT accounted for more than 50% of organisations annual capital investments and was expected to account for 5% of revenues by 2010 [3]. The main driving force behind this large-scale ICT investment is the promise of increased competitive advantage[4], as ICT is regarded as a strategic weapon that can positively effect organisational change [5]. Most SMEs lag behind the large firms in their use of ICT both operationally and strategically. SMEs characteristically lack of managerial skills to conceive, plan and implement ICT and reluctantly update technology [6]. Constrained by resources, hemmed in by competing demands, caution and suspicion often greet new technological opportunities. Large firms for example, have adopted e-commerce much faster than SMEs [7]. There is certainly evidence that SMEs are reacting with caution to the possibilities of e-commerce, considering it a high-risk strategy [8], introducing e-commerce very slowly into their existing set of operations [9].

The ability of an SME to innovate is a relevant pre-condition for the successful utilization of inventive resources and new technologies. An organizational innovation is defined as a process, system, or service that is either internally developed or purchased from an external source, where the innovation is new to the

firm [10]. Organizations support the introduction of innovations when the existing process or service is replaced with one expected to be an improvement over the current system [11].

To study the adoption of technological innovations in general, Tornatzky and Fleischer (1990) created the technology-organization-environment (TOE) framework to describe the organizational components that affect the firm’s adoption decisions. These three elements present “both constraints and opportunities for technological innovation” [1]. Thus, these three elements influence the way a firm sees the need for, searches for, and adopts new technology. Through this research we would like to know more about the effects and usage of ICT by SMEs using the TOE framework as theoretical foundation. We investigate the types of ICT adoption and applications, the overall motivation for ICT investments, the advantages gained from ICT, the motive of using Internet and the difficulties in implementing e-commerce applications.

3. KEY FINDINGS

Figure 1 depicts the proposed framework for exploring the effects of technological, organizational and environmental factors on identifying the determinants of e-business and ICT adoption among SMEs in Macedonia.

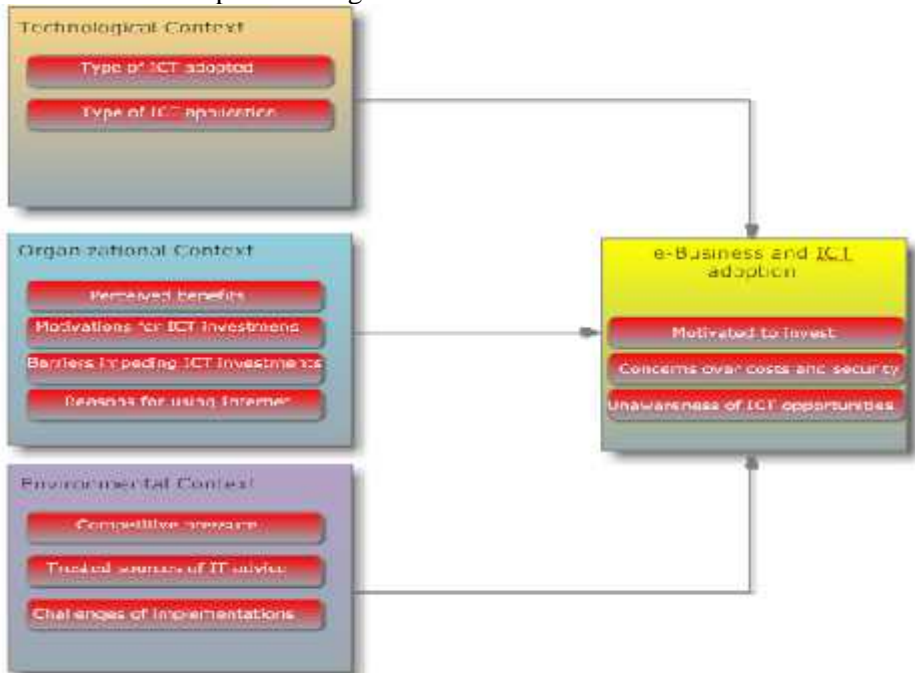


Figure 1. Conceptual model for e-business and ICT adoption

Explicitly, factors for each of the contexts within the TOE framework were formulated and supported including: (1) technological factors (type of ICT adopted, and type of ICT application); (2) organizational factors (perceived benefits,

motivations for ICT investments, barriers impeding ICT investments, and reasons for using ICT); and, (3) environmental factors (competitive pressure, challenges of implementations, trusted sources of IT advice,).

In order to identify and qualify the SMEs, for the purpose of this research, we use the definition given by [12] where businesses with less than ten employees are qualified as Micro Enterprise, between ten and fifty as Small Enterprises, and between fifty to two hundred and fifty employees as Medium sized Enterprises. Based upon these definitions, 32% of SMEs we have surveyed can be classified as Micro Enterprises, 48% as Small Enterprises and 20% are Medium sized Enterprises.

Table 1. Types of surveyed SMEs

Type of SMEs	Percentage
Micro Enterprises	32
Small Enterprises	48
Medium Sized Enterprises	20

3.1 TECHNOLOGICAL CONTEXT

Based on an extensive literature review, the technological factors that are found to be relevant on ICT and e-commerce adoption are the type of adopted ICT and the type of ICT applications.

3.1.1 Type of adopted ICT

In this section, we provide the results about the type of adopted and used ICT. Our goal was to investigate if these companies have: Internet connection, website, Extranet, e-mail, any computer network, including wireless technology and EDI (Electronic Data Interchange).

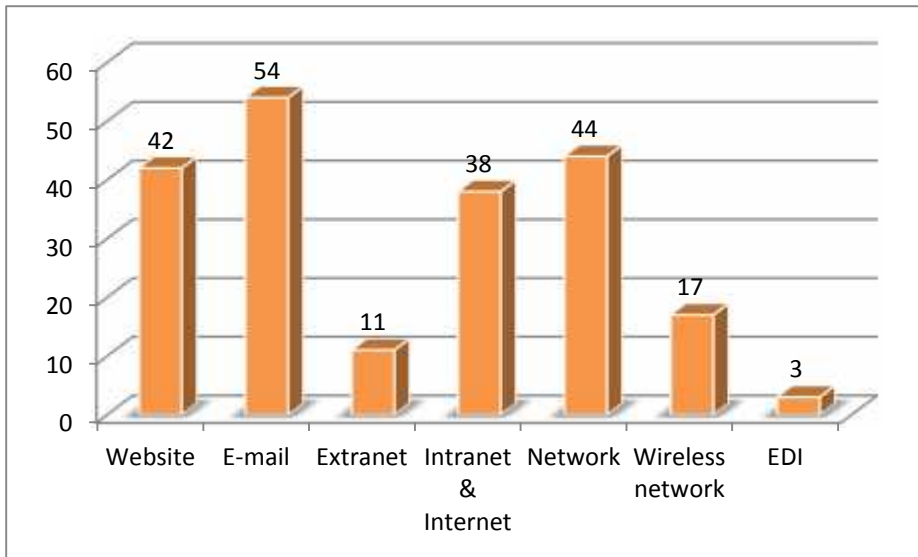


Figure 2. Type of ICT adopted

Figure 2 indicates that across three sectors, e-mail is widely used by 54 firms. Through this survey we noticed that the majority of firms did not have official e-mail address, but they used standard mail such as hotmail, Yahoo Mail etc. About 44 firms have established network and 42 of them had their own website. Surprisingly, the survey reveals that 38 firms use Intranet whereas only 11 of them have Extranet to control access from the outside for their business purposes. Considering the more advanced and complex technology, only 3 firms from production sector use EDI to transfer electronic documents or business data.

3.1.2 Type of ICT application

Figure 3 shows the type of ICT application used by SMEs. We can distinguish that ICT applications are mostly used to automate the sales record, manage the documents and for processing orders. About 21 firms use system for design. Applications such as human resource management, market research, enterprise resource planning (ERP), and business intelligence are very modestly spread among investigated firms.

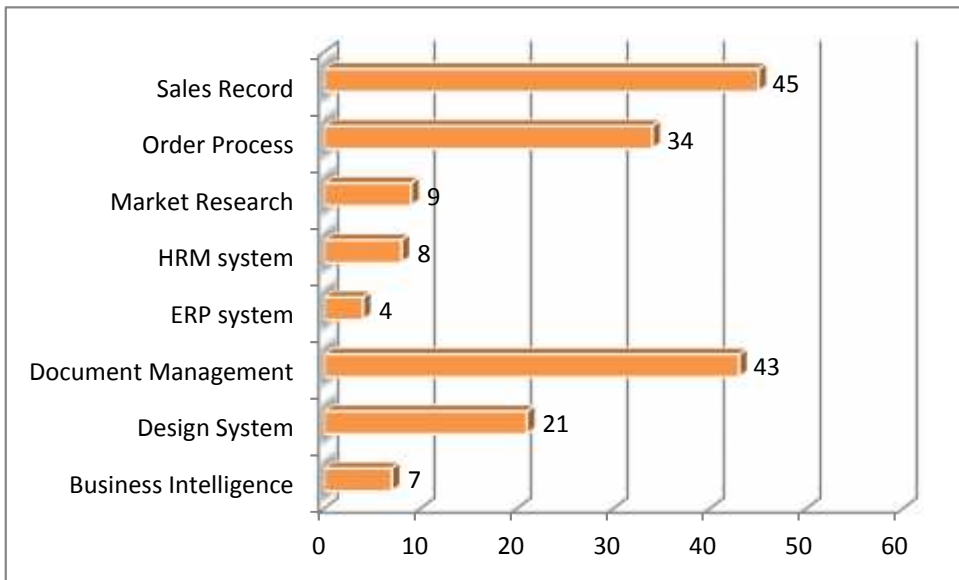


Figure 3. Type of ICT application

3.2 ORGANIZATIONAL CONTEXT

According to our review of the literature, the organizational factors that are crucial to e-business and ICT adoption among SMEs include benefits gained from ICT, motivations for ICT investments, barriers impeding those investments and reasons for using ICT.

3.2.1 Benefits gained from ICT

In this section we report the benefits gained from ICT. As our next figure shows (Figure 4), the most cited benefit as a result of ICT use and adoption is improved quality of service (85% of firms). The second most answered benefit is keeping up with rivals, experienced by 75% of firms, followed by increasing sales which is cited by 65% of firms. Close to 57% of the firms cited increased productivity as a benefit. ICT is not seen as driving force to improve working on joint projects with other firms (cited by 7 firms), and reduce the staff number (cited by 4 firms). About 5% of firms highlighted that there are no experienced benefits from ICT.

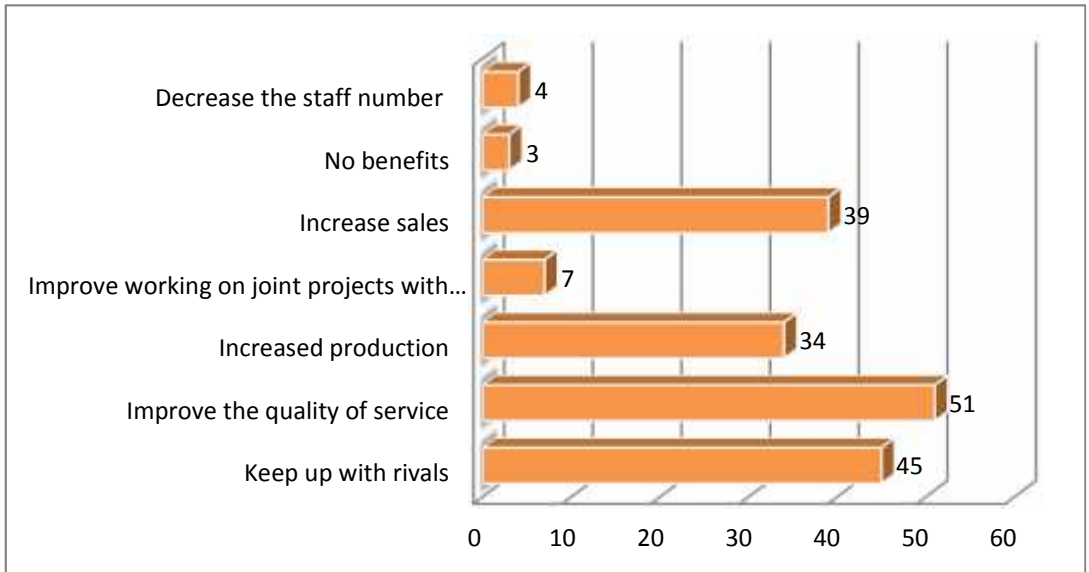


Figure 4. Benefits gained from ICT

3.2.2 Motivations for ICT investment

Here we study main driving force behind ICT investments. It is well known that SMEs are constrained by resources to invest in new technological opportunities. Nevertheless, our study reveals that almost all firms are open to invest in ICT in order to gain competitive advantage and to increase their business efficiency. As shown in Figure 5, about 90% of firms are motivated for ICT investments in order to improve relationships with clients and 85% of them are ready to invest in ICT to keep pace with rivals, followed by keeping up with new trend (41 firms) and then increase the operational efficiency. Very few firms (39 firms) invest in ICT to increase the satisfaction among employees.

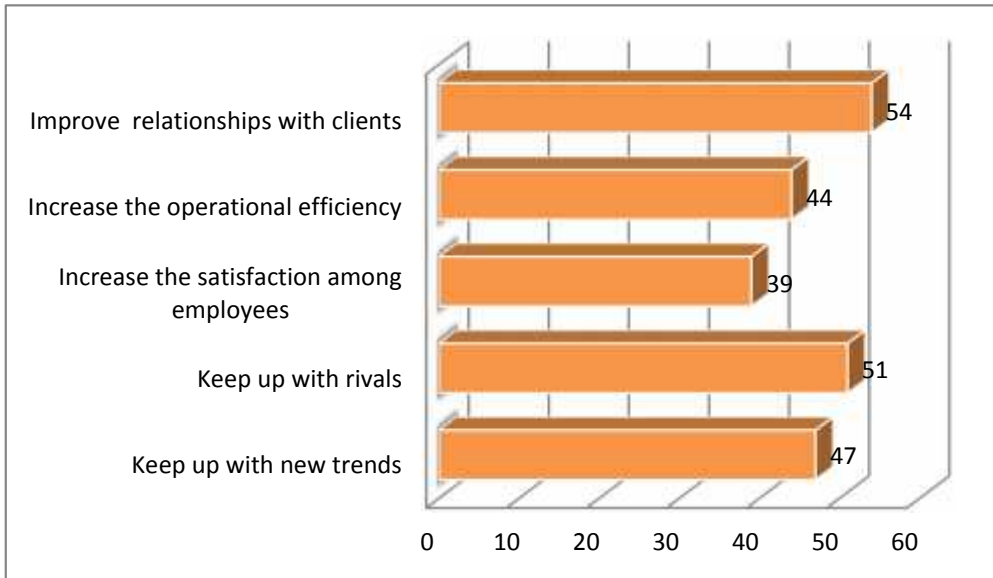


Figure 5. Motivations for ICT investments

3.2.3 Barriers impeding ICT investments

Even though some SMEs in Macedonia are aware of ICT benefits, there exist some constraints and barriers to ICT investments. Figure 6 shows that cost and security are the largest barriers cited by firms (above 82% of firms). SMEs are also uncertain over the benefits to their business (28 firms). Just 13 firms (about 22%) answered that they did not have enough IT experience inside the firm. The only barrier which was insignificant and is less cited was the concern about reactions of the staff, cited by only 5% of the firms.

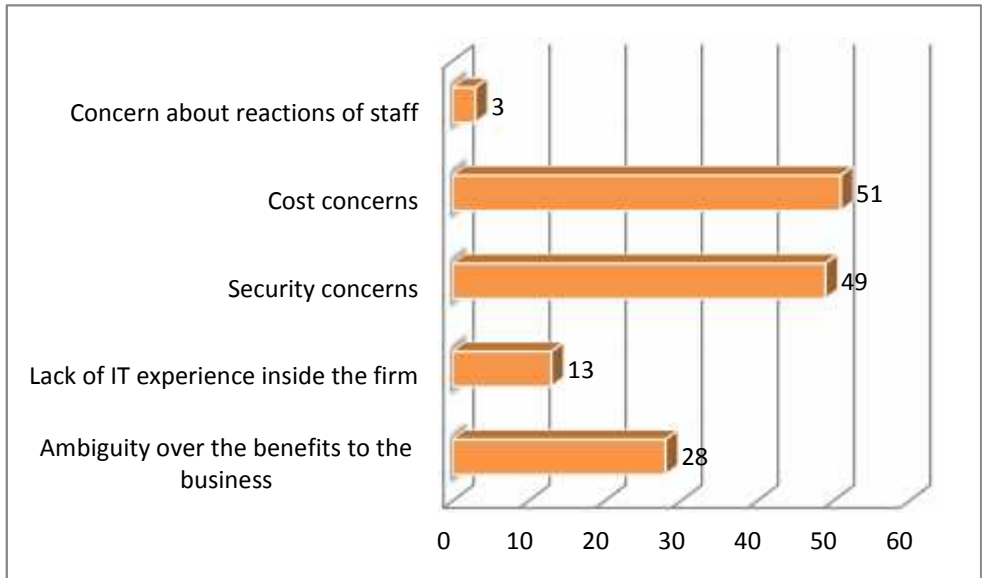


Figure 6. Barriers impeding ICT investments

3.2.4 Reasons for using Internet

We also questioned SMEs to list a few of the reasons why they're using the Internet. Figure 7 shows that most of the surveyed firms (95% of them) indicated that they use Internet to collect information. They are also using the internet to share information with suppliers (44 firms) and customers (38 firms), followed by making payments to suppliers (highlighted by 36 firms) and placing orders to suppliers (29 firms). Little interest is shown of using the internet to place orders from customers (19 firms) and to get involved in joint projects (only 4 firms).

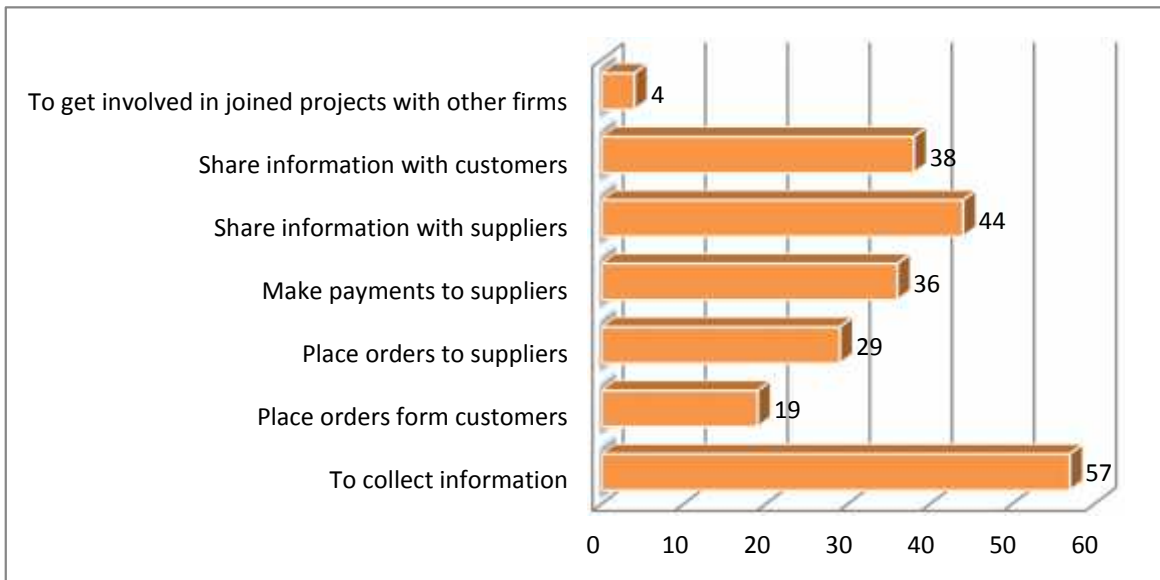


Figure 7. Reasons for using the Internet

3.3 ENVIRONMENTAL CONTEXT

According to the examination of the innovation literature [13], [14], [15], [16], competitive pressure has long been recognized as an adoption motivator. These studies have investigated various environmental factors that contribute to the adoption and implementation of various IS / IT. Among these factors, we include competitive pressure, trusted sources of IT advice, and challenges of implementations.

3.3.1 Competitive pressure

During our research, we also questioned the SMEs about the competitive environment. Figure 8 depicts that 11% of the surveyed firms think that by adopting ICT there should be beneficial governmental laws, 37% think that the adoption could leverage new ways to outperform competitors. Nearly 12% of the SME's cited that the ICT and e-business adoption could affect the structure in the industry, whereas 29% of the firms agree that the adoption can change the competition rules.

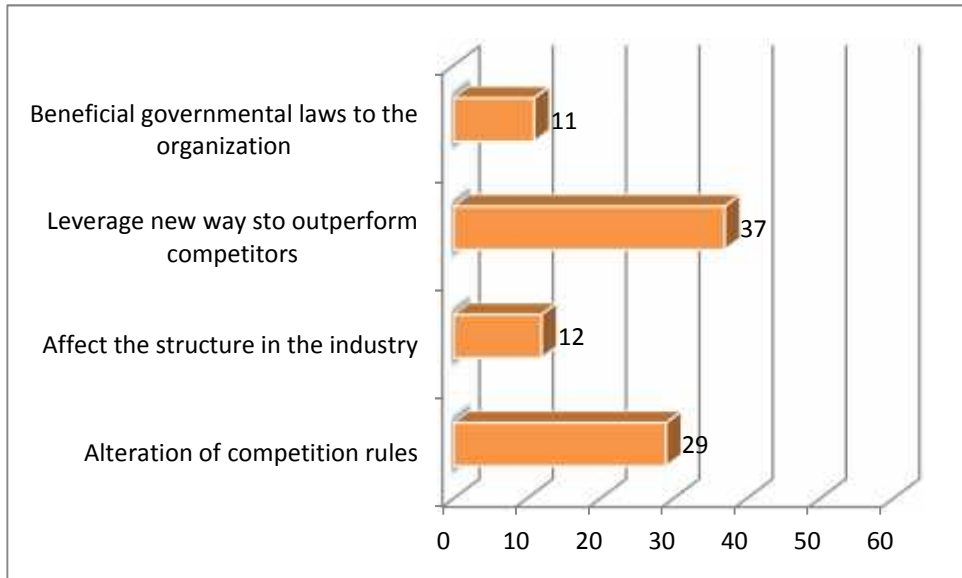


Figure 8. Competitive pressure

3.3.2 Trusted sources of IT advice

Here we attempt to find out where the firms get advice about ICT. As Figure 9 shows, about 80% of all surveyed firms highlighted the internet as source of advice. Further, the company itself is considered as source for IT advice by 35 firms. IT consultants and governmental/local authorities are also sources to get advice on ICT. Very few of SMEs get ICT advice from suppliers (6 firms) and the media (9 firms).

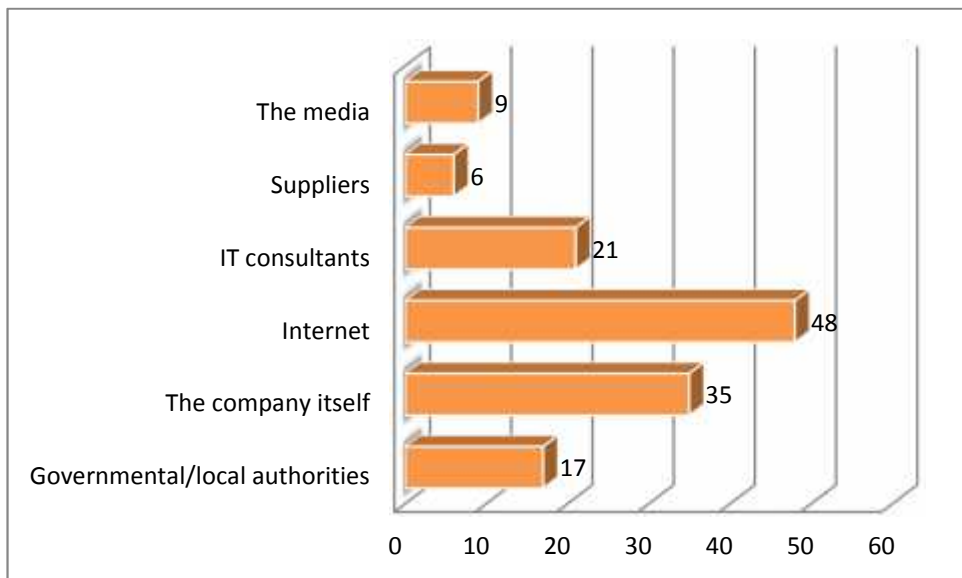


Figure 9. Reported sources of IT advice

3.3.3 Challenges of e-business and ICT implementations

We have also investigated the challenges and problems that SMEs have in implementing e-business and ICT. As shown in Figure 10, majority of SMEs that participated in this research (51 firms) highlighted the security as a challenge that have found in e-business implementation. Another serious challenge to putting e-commerce in place appears to be the internet fraud, cited by 46 firms (about 77% of firms). Less importance is given to the following questions: difficulties in finding technical advice from outside, suppliers are not ready for e-business, the cost of developing the website and customers don't want to change.

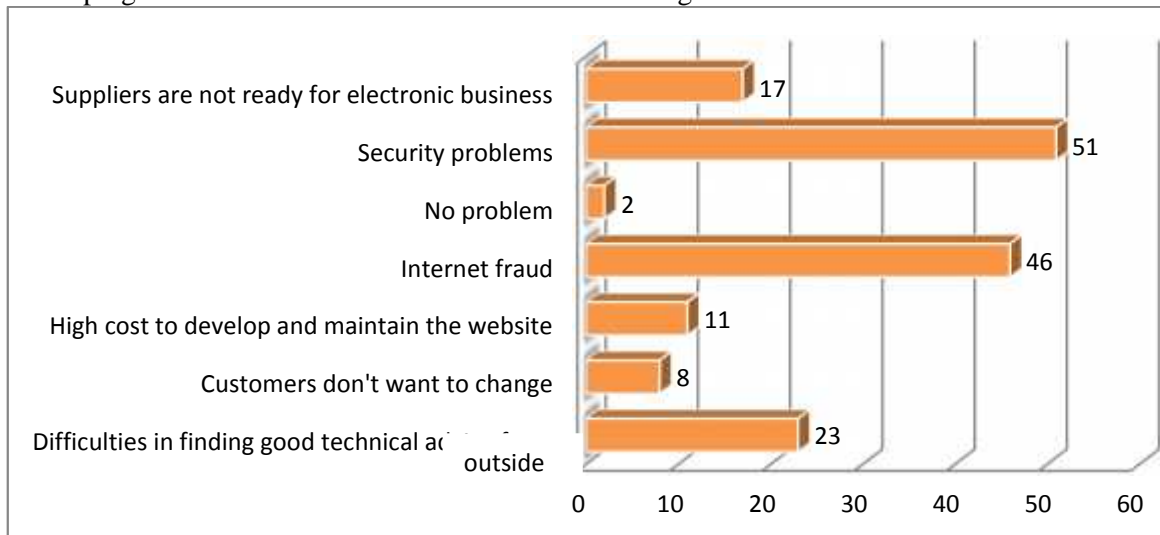


Figure 10. Challenges in E-business and ICT implementation

4. CONCLUSION

The model presented in this paper offers nine propositions based on the Tornatzky and Fleischer (1990) technology-organization-environment (TOE) framework to explain the principle organizational contexts in which the Macedonian SME's adopt and implement ICT and e-business.

The results of our study show that Macedonians SMEs have yet to grasp the full opportunities of IT. They are doing well in using common technologies such as e-mail, internet access and websites but are very limited to more sophisticated technologies such as EDI, ERP, HRM and business intelligence systems. Our survey reports that SMEs, in general, are motivated to invest in ICT, whereby the main driving force for ICT investment was to improve relationships with clients, to keep up with rivals and to be updated with new technological trends. Nevertheless,

our survey suggests that SMEs share concerns over cost of the ICT equipment and the security. With regard to awareness of the benefits of the internet, almost all of them use the internet for collecting information lacking the vision of internet and e-commerce opportunities.

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