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An analysis of the factors affecting the adoption of electronic commerce by SMEs

Evidence from an emerging market

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Abstract

Purpose – The study investigates the internet-based electronic commerce (EC) adoption profile of small and medium-sized enterprises (SMEs) in Turkey as well as the factors affecting their willingness to adopt EC usage.

Design/methodology/approach – EC adoption is measured by a composite index of the usage frequency of 14 EC application tools. The study draws on the data obtained from a sample of 237 manufacturing SMEs with internet connection.

Findings – In was discovered that EC adoption was significantly influenced by its perceived benefits. However, the perceived limitations of EC applications were found to have no statistically significant effect on EC adoption. The analysis also showed that company and industry-specific factors, with the exception of amount of resources allocated for export development, did not appear to have any significant impact on EC adoption.

Research limitations/implications – More efforts have to be made to remove or at least mitigate the impediments to a SME's willingness to adopt EC. The results of this study show that the lack of legal regulations is cited as one of the most serious limitations of EC and hence EC is rarely used for payment purposes. One of the most vivid implications of internet-based EC for SMEs is the potential for external communication and information gathering for market and product research.

Originality/value – This study is significant for two reasons. First, it presents new data and insights into the internet-based EC adoption of SMEs. Second, this study focuses on a relatively unexplored research area in an emerging market – Turkish SMEs.

Keywords Electronic commerce, Internet, Small to medium-sized enterprises, Emerging markets, Turkey

Paper type Research paper

Introduction

The two most powerful forces affecting the world economy and commerce today are the increasing rate of globalisation and advances in information and communication

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technologies (ICTs). In recent years, the exponential growth in ICTs and the resulting rapid emergence of electronic commerce (EC) have drastically been reshaping the business world. It was pointed out that e-commerce now has reached a phase of change where a revolutionary ideas becomes more evolutionary in nature (Lee *et al.*, 2001). It has been estimated that the expenditures on ICT industries had been growing at about 8 per cent annually during the 1990s, and more than $2 trillion was spent worldwide in ICT industries alone in the year 2000 (Torre and Moxon, 2001). Commensurate with this trend, the volume of worldwide EC activities is expected to grow from $5,520 billion in 2001 to $11,999 billion in 2004 (Computer Economics, 2001).

Nearly 1 billion internet users, about 15 per cent of the world's population, will generate more than $5 trillion in internet commerce by the end of 2005, up from $354 billion in internet spending in 2000. Internet use in Asia/Pacific and the rest of the world (especially Latin American countries) to quickly outpace growth in developed economies such as the USA, Canada, and the EU member countries. In 2000, the USA accounted for 34 per cent of internet users, followed by Europe with 29 per cent, Asia-Pacific (excluding Japan) with 16 per cent, Japan with 10 per cent, and the rest of the world with 11 per cent. In terms of internet usage penetration, by the end of 2005, Asia-Pacific (48.6 per cent) will rival Europe (35.5 per cent) for a second place after North America of the first place (67.4 per cent) (Anonymous, 2001).

EC is often touted as a global phenomenon. Despite this, most studies of EC have focused predominantly on developed Western countries. While it is extremely important to understand EC in the context of more advanced countries, it also impacts developing countries (Van Slyke *et al.*, 2005). However, until recently most emerging country markets in Africa, the Middle East, and certain parts of Asia were unable or reluctant to infuse EC into their business processes. The slow development of EC in these countries may be explained by the lack of necessary physical infrastructure (e.g. lower personnel computer penetration, poor telecommunication infrastructure as most of these countries possess analogue systems as opposed to digital systems of developed Western countries, and inefficiently managed telecommunication systems) as well as supportive institutional environment that facilitates the building of transactional integrity (Oxley and Young, 2001). In spite of this inertia, many emerging markets of Latin America/Caribbean Region are investing immensely to build ICT infrastructure that will facilitate EC activity in the years to come. Emerging country markets accounted for 18 per cent of global expenditures in ICT in 1999. Of these countries, Turkey along with China, Poland, India and Brazil achieved remarkable annual growth rates in ICT expenditures for the period 1992-1999 averaging between 28 and 20 per cent (Torre and Moxon, 2001). The value of EC transactions in these countries is projected to more than quadruple, growing from $188 billion in 2001 to $786 billion by the end of 2004 (Computer Economics, 2001).

This present study essentially aims at investigating the internet-based EC usage profile of small and medium-sized enterprises (SMEs) in Turkey as well as the factors affecting their willingness to EC usage. The study also analyses both the benefits and limitations associated with the use of internet for EC in Turkish SMEs. By means of multiple regression analysis, an attempt was made to identify the factors that encourage firms to do EC via internet.

The empirical study undertaken is significant for two reasons. First, it presents new data and insights into the internet-based EC adoption of SMEs. There is a paucity of research in identifying issues that may assist managers in the use of the internet for business purposes in an international context. Although there is strong evidence that the internet has been widely used by firms and individuals, most of it is anecdotal. There is also a dearth of research on business-to-business (B2B) EC in emerging markets (Kendall *et al.*, 2001). While prior research shows that the SMEs in emerging markets are still in the infant stage of EC, they do not explain why they are lagging in terms of EC adoption (Poon and Swatman, 1999). Second, this study focuses on a relatively unexplored research area in Turkey – the SMEs. In view of the fact that SMEs are regarded as the powerhouse of several countries, the success of SMEs has a direct influence on the national economy. SMEs also play a very important role in Turkish economy as they are considered as engine for growth. At present, they constitute 99 per cent of all business establishments and employ 53 per cent of the workforce in the manufacturing sector (Sariaslan, 1994; Taymaz, 1997). The current study, focusing on SMEs and on B2B, fills a knowledge gap on EC adoption in emerging countries and aims to identify the relative importance of the factors influencing the receptivity of Turkish SMEs to engage in EC.

The remainder of the paper is set out in the following way. The background literature on internet-based EC adoption as well as its perceived benefits and limitations are discussed in the following section. The research methodology for the study is provided in the third section. The forth section provides results and discussion. A summary and implications are in the last section.

Literature review

As the internet became more commercialised and users began to participate in the world wide web in the early 1990s, the term EC was coined and EC applications expanded rapidly (Turban *et al.*, 2002). Although there are various electronic tools or devices widely used in EC such as electronic funds transfer (EFT) and electronic data interchange (EDI), most EC is currently done over the internet. In the past, large-sized companies had increasingly utilized private networks to undertake EC, but high costs impeded to reap the resulting benefits by most SMEs. The internet, however, has changed this equation by making it easier and cheaper for all businesses to transact business and exchange information.

The definitions of EC are many and varied. World Trade Organization (WTO) defines the EC as: "the production, distribution, marketing, sale or delivery of goods and services by electronic means" (Baker and McKenzie, 2001). Another definition, which is provided by the Electronic Commerce Team of European Union, exclusively confines EC activities to the internet and reads as: "electronic commerce refers specifically to buying and selling products or services over the Internet" (Schulze and Baumgartner, 2001). Since there is no commonly agreed definition of EC, for the purposes of this paper we have adopted the description provided by Globerman *et al.* (2001) to define internet-based commerce as: "any economic transaction where the buyer and seller come together through the electronic media of the Internet, form a contractual agreement concerning the pricing and delivery of particular goods and services, and complete the transaction through the delivery of payments and good or services as contracted".

As EC may include a wide variety of sub-fields, in general EC activities can be broadly classified into following three sub-fields:

(1) the linking of a firm to its forward and backward channel allies (e.g. retailers, distributors and suppliers), that is, EC between firms (B2B);

(2) the commercial activities between firms and final customers (B2C); and

(3) the management within the enterprise, which focuses on supporting corporate activities and the integration of departmental activities (Shaw *et al.*, 1997).

The intranet and extranet applications are among the examples of pre-internet B2B EC activity. While intranet enables data interchange within the company through the intra-company net system, extranet refers to the EC activities between large companies and their business partners and suppliers via established special nets. Compared with the intranet and extranet applications, EC via internet not only connects specified producers, suppliers and distributors but also offers equal opportunities to all users with internet access.

Benefits and limitations of internet for EC

Owing to its remarkable feature of connectivity, which renders the physical distance meaningless, the internet has become the indispensable tool of EC for SMEs. A new paradigm may be needed to take into consideration the EC, both in the process of entering foreign markets, and in the management operations within those markets (Karavdic and Gregory, 2005). It was estimated that the small business share of EC worldwide would rise from 17 per cent in 1997 to 30 per cent by the end of 2003 (Goldman Sachs, 1999). SMEs especially can take advantage of the opportunities offered by the internet, which enables them to go global virtually overnight. As such, EC is re-defining location needs for a new generation of companies small and large set to expand overseas (Jacoby, 2000). The internet and EC have become increasingly diffused globally, bringing countries together into a global networked economy (Gibbs and Kraemer, 2004). The small entrepreneur, for instance, can compete on the internet simply by setting up a home page (Sterrett and Shah, 1998). While there are numerous benefits of conducting business on the internet, the most prominent ones are:

- it offers direct links with customers, suppliers and distributors and facilitates transactions;
- facilitates information transfer;
- enables companies to develop new products and services for existing and new customers (Walters and Lancaster, 1999); and
- offers opportunities for companies to market their products around the world without physically contacting customers or advertising in other parts of the world (Karakaya and Karakaya, 1998; Tiessen *et al.*, 2001).

Among the principle benefits of internet-based EC that are more directly relevant for SMEs include: direct savings such as product promotion, new sales channels, quick product delivery, more satisfaction of customers, inexpensive advertising medium, enhanced company image, new business opportunities, efficiency in information gathering and better support from suppliers (Walczuch *et al.*, 2000; Nath *et al.*, 1998; Poon and Swatman, 1999).

Despite its benefits, there are a number of technical and non-technical limitations associated with internet-based EC (Turban *et al.*, 2002). The two major technical limitations are related to security concerns and infrastructure. First, when a firm uses the internet to engage in EC, it exposes itself to security risks, which fall into three general categories: client/server risk, data transfer and transaction risk, and virus risk. Security and privacy issues are particularly important in the B2C area, though privacy protection measures are constantly being improved. Second, in many areas, telecommunications bandwidths are inadequate. Software development tools are still evolving and changing rapidly, and it becomes difficult to integrate the internet and EC software with some existing applications and databases.

Some of the major non-technical limitations that slow down the spread of internet-based EC among SMEs are as follows: first, SMEs are highly concerned with the start-up costs of developing EC in-house. There are four basic components of the cost involved with EC acting as significant impediments to EC adoption by SMEs. These include connection costs to the internet, the cost of adequate hardware/software, set-up and maintenance costs (Nath *et al.*, 1998). The relatively large number of customers and suppliers not being online and decreasing productivity level due to unnecessary usage is another limitation associated with internet-based EC (Walczuch *et al.*, 2000). Another impediment to conducting EC on the internet is the lack of government regulations and standards to deal with the intricacies of EC. With the emergence of EU entry, the Turkish government will have to comply with the European Telecommunication Commission rules and regulations to bring Turkish EC standards in line with those of European Union. This will also streamline the operational policies and practices of EC among Turkish SME's.

In addition, most SMEs are far from reaping significant benefits from internet-based EC due to difficulties of finding and retaining qualified personnel with required skills and knowledge. As time goes on, more SME's establish their EC systems as employment in the industrial automation and information technology sectors are growing in Turkey at a rate of 30 per cent annually (Fielding, 2005, p. 16).

Measurement of internet-based EC adoption

Despite the commonly accepted advantages of internet, there is a lack of any established criteria for measuring the use of internet-based EC. Avlonitis and Karayanni (2000), for instance, measured the internet usage by the most popular internet services of e-mail, Usenet, file transfer protocol (ftp) and the www.

In their study of 80 companies located in six European countries, Dutta and Evrard (1999) measured the internet usage in the following categories: communication, researching information, marketing, business with suppliers/partners and business with customers. In another study, Pawar and Sharda (1997) specified internet utilities in terms of four broad categories:

(1) communication utilities such as e-mail, mailing lists and newsgroups;

(2) various resource locator tools such as web pages;

(3) information retrieval tools such as ftp and web pages; and

(4) browser tools including telnet and www.

Finally, in a Stanford study 17 different usage categories were identified where the highest usage was for e-mail and the lowest usage was for trading stocks.

In her survey of internet use for business in Bahrain, Palmer (2000) evaluated the internet use in two main categories: internet tools used and applications used on the internet. The resulting rank order of the former category was e-mail, Netscape, www, ftp, Usenet, Archie and gopher, while the rank order of the latter was e-mail, financial news, market research, information gathering, electronic marketing, post answers to queries, receive orders, job posting and receive payment. In a similar survey focusing on the use of internet by SMEs in The Netherlands, Walczuch *et al.* (2000) noted that the first three ways of using the internet in terms of the highest usage percentage included e-mail, searching for company web sites and randomly looking for information. Conversely, the ways with the lowest usage percentage figures were found to be receiving orders from customers, voice/video conferencing and placing job vacancies.

A survey by Grant Thornton International (2000) on SMEs in 15 member states of EU together with Sweden, Norway, Poland and Turkey revealed that in ten of the stated countries no other issue was regarded as more important than the issue of ICTs. The survey's overall sample also included 250 SMEs from Turkey. Based on the survey results, it was found that the ratio of companies with web site is 44 per cent for whole sample and 51 per cent for Turkish sample. Seventy-three per cent of Turkish SMEs use e-mail for internal communication while 75 per cent use it for external communication. Also, ninety-one per cent of Turkish SMEs use internet for information gathering, while this ratio is 51 per cent for advertisement, 40 per cent for procurement and 37 per cent for marketing.

On the other hand, in their review of EC applications, Ngai and Wat (2002) identified the main EC usage factors as interorganizational systems, electronic payment system, financial services, retailing, online publishing, auctions, intranet, education and training, marketing and advertising. In another study, main dimensions of EC are set out as follows: intranet, linking with suppliers, interface with consumers, linking with distributors/retailers and global EC infrastructure issues such as security and digital payment (Shaw *et al.*, 1997). This list is in no way comprehensive. There are some other specific EC activities, which include the shipment of goods by roadway and railways, dissemination of critical information about workers, dispatchment of bill of ladings by electronic means and protection of industrial and commercial ownership rights.

There are concerns that despite government initiatives to promote adoption of EC, SME's still fail to realize its benefits. EC markets present a significant threat to SME's since they increase the level of competition and leave non-participants vulnerable to more e-enabled firms. There are a number of barriers as well as benefits of EC participation by SME's. Some of the barriers facing smaller firms in the EC environment are lack of standards, supply chain integration and global trading, enables a greater understanding of how SME's can plan effective strategies to gain from EC participation (Stockdale and Standing, 2004).

Research methodology

Users of EC perceive its benefits differently in different national cultures. For instance, the relative advantage, ease of use, compatibility, and the demonstrability of results of EC are seen in different lights in developed versus developing economies. The pattern of influence and use of EC differs according to a country's level of socio-economic development (Van Slyke *et al.*, 2005).

Survey instrument

The survey basically aims at revealing the profile of internet-based EC use by SMEs and identifying the factors influential on EC usage. To obtain adequate quantitative information on these factors, a survey questionnaire was devised drawing upon the prior literature reviewed and discussions based on semi-structured interviews with a representative sample of general managers (GM) who were not subject specialists.

The first part of the questionnaire consisted of a wide variety of internet-based EC applications. While there exist a plethora of EC applications on the internet, a set of 14 applications were identified ranging from e-mail to video-conference. Questions were designed to measure managers' perceptions of the relative frequency of each EC application or tool using three-point scales, i.e. 1 = "frequent use", 2 = "seldom use", 3 = "never use". In earlier studies, the advantages of using three-point or even two-point scales in developing countries were discussed. For instance, in the measurement of consumer preferences in these countries, the best approaches make use of pictorial or visual stimuli and requires inputs from the respondents using a simple binary scale (Kaynak, 1978; Malhotra, 1986, 1988).

The second part of the questionnaire included a set of questions in order to identify the respondents' evaluations on both benefits and limitations of EC along with 5 company – and industry-specific characteristics. First, the respondents were asked to indicate their level of agreement to a set of 18 internet-based EC benefits using five-point scales from 1 = "strongly agree" to 5 = "strongly disagree". Similarly, the respondents were also asked to rate their level of agreement to a set of 11 limitations associated with internet-based EC. Both benefits and limitations of internet for EC are based on individuals' experiences. All of these 14 application items, 18 benefits items, and 11 limitation items were extracted from the current EC literature. While such a definition is not an objective measure, it is important to the process of driving ongoing internet-based EC activities (Poon and Swatman, 1999). The respondents were also asked to express their evaluation of five company – and industry-specific characteristics which were taken as control variables: relative strength of the SME in the industry, international experience of the SME, amount of resources allocated for export development, technology-intensiveness of the sector and competitive intensity of the sector. For instance, respondents were asked to indicate "the relative strength of their firm in the industry" on a five-point scale from 1 = "very low" to 5 = "very high".

Sample selection and data collection method

In line with small business research, this study adopted the number of employees as the base for the definition of SME. An SME is identified as one that employs fewer than 100 persons. The minimum of at least ten employees was also chosen in order to exclude very minor firms that would not be suitable for the purposes of this study. This range is consistent with the definition of an SME used by the Turkish State Institute of Statistics (SIS) as well as the Turkish State Planning Organization (SPO). The second restriction for specifying the sample companies was to have connection to internet at the time of conducting the survey. Finally, only manufacturing firms were included in the sampling frame in order to ensure the consistency of the sample.

A set of 1,200 firms was randomly selected from the databases of major provincial Chambers of Commerce and Trade scattered throughout Turkey so as to make the sample sufficiently large but also manageable. A self-administered mail questionnaire

was used to reach the sampled firms located nationwide at low cost. Of the 1,200 questionnaires posted, 117 were returned as address unknown. A total of 438 questionnaires were returned after one follow-up. Twenty-seven questionnaires were eliminated due to largely missing values. The overall response rate was thus 37.9 per cent (411/1,083). Of the 411 respondents from the original data set, a sub-sample of only those firms with the employment criterion of 10-99 employees was created. This study thus reports on the data concerning the responses of 237 firms complying with the SME criterion.

Sample characteristics

Most of the Turkish SME's is operating in the manufacturing sector, hence the focus in the sample is on manufacturing firms. From the SMEs in the sample, 91 (38.6 per cent) are joint stock companies, 134 (56.7 per cent) limited liability companies with the remainder being sole proprietorships. The majority of the sample firms are located in three main geographic locations including Southern Anatolia, Central Anatolia and Aegean region. The industry category of the SMEs is as follows: machinery and equipment (24.6 per cent), food production (17.4 per cent), textile and garments (17.4 per cent), marble (11.5 per cent), plastics (9.8 per cent), forest productions (9.0 per cent), chemical goods (3.5 per cent) and others (7.7 per cent).

In terms of the length of internet access, 168 SMEs (70.9 per cent of the total) have been connected to internet for less than 3 years and the remaining 69 (29.1 per cent) have been connected to internet for at least 3 years and more. Of the sample firms, 142 SMEs (59.9 per cent) have their own web sites, while the remaining 95 (40.1 per cent) are without a web site. From the total of 142 SMEs with their own web sites, 69 have web sites in more than one language. Nearly 70 per cent of the sample firms have been involved in foreign trade activity. The characteristics of the sampled firms are summarized in Table I.

Results and discussion

Internet-based EC adoption

The extent of internet-based EC adoption for the sample of 237 SMEs, based on the mean measure of the usage frequency across the 14 EC applications, is shown in Table II. Scores are significantly different on the Friedman two-way ANOVA test ($p < 0.001$). For the full set of 14 EC applications, the first group of EC applications with the largest frequency of usage is as follows: "e-mailing" (1.33), "browsing company homepages" (1.54) and "market and product research" (1.57). It is clear from Table II that the highest ranked EC applications in terms of the frequency of usage are principally concerned with external communication and gathering information for market and product research.

The second group of EC applications (those ranked 4-10) are cantered around the median value of 2: "exchange of information with clients" (1.91), "information search" (1.93), "exchange of information with suppliers" (1.99), "Usenet" (2.18), "receiving orders from clients" (2.22), "placing orders to suppliers" (2.25) and "intra-company communication" (2.39). This group of EC applications is particularly associated with SMEs' willingness to do business electronically in terms of both B2B and B2C dealings.

The third and lowest ranked group (11-14) consists of a number of distinct applications: first, SMEs are less likely to adopt the EC as a "medium of payment" (2.43). Similarly, EC

	No.	Per cent
Legal status of SME		
Joint stock company	91	38.6
Limited liability	134	56.7
Sole proprietorship	12	4.7
Geographical location		
Marmara	70	29.5
Aegean	65	27.4
Central Anatolia	12	5.1
Southern Anatolia	85	35.9
Other	5	2.1
Sectoral breakdown		
Machine and equipment	58	24.6
Food production	41	17.4
Textile and garments	41	17.4
Forest productions	21	9.0
Marble	27	11.5
Plastics	23	9.8
Chemical goods	8	3.5
Other	18	7.7
Total	*237*	*100*
Length of connection to internet		
1 year and less	69	29.1
1-3 years	99	41.8
3 years and more	69	29.1
Job classification of internet users		
Members of board	31	13.1
Top executives	53	22.4
Managers	50	21.1
Clerks, secretaries	14	5.9
Combination of the groups	89	37.6
Existence of web page		
Yes	142	59.9
No	95	40.1
Having web sites in multiple languages		
Yes	69	29.1
No	168	70.9
Involvement in foreign trade activity		
Yes	165	69.6
No	72	30.4
Total	*237*	*100*

Table I.
Sample characteristics

applications of "ftp" (2.60) and "placing job recruitment and advertisement" (2.71) are hardly used by Turkish SMEs. Finally, "video-conferencing" (2.91) is the lowest ranked EC application for this sample of SMEs.

Based on the managers' evaluations of the usage frequency of 14 EC applications, an index was developed by summing up the responses to these 14 statements. In that way, the EC usage index score for each company varies between 14, where all EC applications are frequently used and 42, where none of the applications are used. The Cronbach alpha value for this scale is 0.75, exhibiting a satisfactory level of construct reliability (Nunnally, 1978).

EC applications	Rank	Mean	SD
E-mail	1	1.33	0.57
Browsing company homepages	2	1.54	0.66
Market and product research	3	1.57	0.70
Exchange of information with clients	4	1.91	0.78
Information search	5	1.93	0.69
Exchange of information with suppliers	6	1.99	0.81
Usenet	7	2.18	0.82
Receiving orders from clients	8	2.22	0.82
Placing orders to suppliers	9	2.25	0.79
Intra-company communication	10	2.39	0.82
Medium of payment	11	2.43	0.81
Ftp	12	2.60	0.60
Placing job recruitment advertisement	13	2.71	0.56
Video-conference	14	2.91	0.32

Table II.
Extent of EC adoption

Notes: The mean is the average on a scale of 1=frequent use, 2=seldom use and 3=never use; SD=Standard deviation; Scores are significantly different on the Friedman two-way ANOVA test ($p < 0.001$); N=237

Benefits

The benefits of internet-based EC are set out in rank order in Table III. As is clear from Table III, the sample companies widely agree to the perceived benefits with the mean values of whole set of 18 benefits being less than the median value of 3. Of the highest ranked perceived benefits with a mean value of less than 2 are: "24-hour accessibility" (1.67), "low-cost communication" (1.73), "easy access to international

Benefits	Rank	Mean	SD
24 h accessibility	1	1.67	0.77
Low-cost communication	2	1.73	0.92
Easy access to international markets	3	1.83	0.81
Easy access to potential customers	4	1.91	0.85
Gathering information about potential markets	5	1.93	0.84
Enhancing the company image	6	1.94	0.85
Creating a global image	7	1.99	0.89
Creating new business opportunities	8	2.03	0.87
Cost reduction in advertising expenditures	9	2.08	0.95
A means of providing better customer service	10	2.08	0.87
Savings in telephone bills	11	2.09	1.09
Providing more effective promotion	12	2.14	0.94
Getting more efficient service from suppliers	13	2.22	0.90
Achieving more customer satisfaction	14	2.31	0.95
Online sales and operation	15	2.42	0.96
Monitoring the performance of competitors	16	2.43	1.00
Increase in sales	17	2.47	0.95
Decrease in sales staff's travel time	18	2.59	1.05

Table III.
Perceived benefits of EC

Notes: The mean is the average on a scale of 1=strongly agree to 5=strongly disagree; SD=standard deviation; Scores are significantly different on the Friedman two-way ANOVA test ($p < 0.001$)

markets" (1.83), "easy access to potential customers" (1.91), "gathering information about potential markets" (1.93), "enhancing the company image" (1.94), and "creating a global image" (1.99).

Owing to potential conceptual and statistical overlap (Spearman correlation coefficients between perceived benefits revealed a number of low to moderate intercorrelations), an attempt was made to produce a set of parsimonious distinct, non-overlapping perceived benefits of internet-based EC from the full set of 18 items. Exploratory factor analysis (EFA) using varimax rotation, as shown in Table IV, extracted four underlying factors explaining 59.1 per cent of the observed variance. An internal reliability test showed strong Cronbach alpha values for the multi-item factors ranging from 66 to 81 per cent, suggesting satisfactory reliability for an exploratory study of this nature. These four factors were labelled as: market development, efficiency of sales and promotion, ease of accessibility, and cost reduction.

Limitations

The rank order of the perceived limitations of internet-based EC, based on the mean measure of the relative degree of agreement to the 11 limitations, is shown in Table V. For the full set of SMEs, those with the mean values of less than the median measure of 3 are: "limited number of internet users" (2.43), "efficiency reduction by unnecessary internet use" (2.57), "lack of legal regulations" (2.57), "suppliers and/or customers being offline" (2.60), and "risk of dissipation of company-specific knowledge" (2.84). Based on these findings, it can be argued that the managers of the sample companies in general do not indicate relatively high level of agreement to the perceived limitations of EC on the internet.

For the purpose of producing a parsimonious set of distinct non-overlapping variables, factor analysis was applied to the full set of 11 perceived limitations of internet-based EC. EFA produced initially four factors. A content analysis was conducted to purify the uncovered factors, since items measuring the same factor must have consistent substantive meanings. Recognizing that an EFA can result in factors that lack substantive meanings, one item with inappropriate loading "unnecessary internet use decrease productivity", was dropped from the analysis. The remaining ten items were again factor analysed and produced three factors that make good conceptual sense and explained 54.8 per cent of the observed variance, as shown in Table VI. Cronbach alphas for the underlying factors range from 51 to 69 per cent with all values being well over 50 per cent. These factors were labelled as: cost disadvantages, limited number of users, and security concerns.

Factors affecting the internet-based EC adoption

Perceived benefits and limitations of internet for EC are considered to have significant impact on SMEs' decision to adopt and continue to use the internet for EC (Poon and Swatman, 1999; Sathye and Beal, 2001). Hence, multiple regression analysis was conducted to investigate the functional relationships that may exist between the SMEs' willingness to adopt EC and the perceived benefits and limitations of conducting EC over the internet. As shown in Table VII, two regression models were developed. The EC usage index was used as the dependent variable in both models. The independent variables of the first model are four underlying factors of perceived benefits and three factors of perceived limitations associated with internet-based EC. Five company and

Table IV. Factors of perceived benefits of EC

Factors	Factor loads	Eigen value	Percentage of variance explained	Cumulative (per cent)	Cronbach α
Factor 1		7.33	18.2	18.2	0.81
Market development					
Creating new business opportunities	0.73				
Getting more efficient service from suppliers	0.69				
Gathering information about potential markets	0.61				
Enhancing the company image	0.54				
Creating a global image	0.53				
A means of providing better customer service	0.45				
Factor 2		1.23	16.7	34.9	0.81
Efficiency of sales and promotion					
Online sales and operation	0.70				
Monitoring the performance of competitors	0.69				
Cost reduction in advertising expenditures	0.59				
Providing more effective promotion	0.57				
Increase in sales	0.49				
Factor 3		1.07	14.2	49.1	0.71
Ease of accessibility					
Low-cost communication	0.81				
24 h accessibility	0.56				
Easy access to potential customers	0.55				
Easy access to international markets	0.49				
Factor 4		1.02	10.0	59.1	0.66
Cost reduction					
Decrease in sales staff's travel time	0.81				
Savings in telephone bills	0.77				

Notes: Principal components factor analysis with varimax rotation; K-M-O measure of sampling adequacy: 0.910; Bartlett test of sphericity: 1764.03; $p < 0.000$

Limitations	Rank	Mean	SD
Limited number of internet users	1	2.43	1.07
Efficiency reduction by unnecessary internet use	2	2.57	1.20
Lack of legal regulations	3	2.57	1.02
Suppliers and/or customers being offline	4	2.60	0.92
Risk of dissipation of company-specific knowledge	5	2.84	1.13
High installation costs	6	3.09	1.07
Unfamiliarity with internet use	7	3.11	1.08
Uncertainty regarding the message delivery	8	3.22	1.11
No reduction in operating costs	9	3.23	1.15
No efficiency in operations	10	3.60	1.00
Technically complex to use	11	3.71	1.00

Notes: The mean is the average on a scale of 1=strongly agree to 5=strongly disagree; SD=Standard deviation; Scores are significantly different on the Friedman two-way ANOVA test ($p < 0.001$)

Table V.
Perceived limitations of EC

industry specific variables were treated as control variables in the regression procedure. Prior to running the regression analysis, a correlation matrix of the variables was prepared. The pair wise correlations were not large enough to warrant concern about possible multicollinearity problems.

Model 1 captures the effects of perceived benefits of internet for EC on SMEs' willingness to EC adoption. This model is significant ($F = 6.35$; adjusted $R^2 = 0.17$). All four factors of EC-related benefits affect SMEs' adoption to EC significantly. The signs on all four factors are positive, as anticipated.

Model 2 is the full model with all the independent variables. This model offers a stronger, multivariate analysis of the independent variables and allows examination of how perceived benefits and limitations of internet for EC simultaneously affect SMEs' willingness to EC adoption. This model is significant at the $p < 0.01$ level ($F = 5.25$; adjusted $R^2 = 0.18$). The coefficients of all four factors of perceived benefits for EC – market development ($p < 0.01$), efficiency of sales and promotion ($p < 0.05$), ease of accessibility ($p < 0.05$) and cost reduction ($p < 0.05$) – are significant and have positive impact on EC adoption. However, none of the factors of perceived limitations associated with internet-based EC is found to have statistically significant effect on EC adoption by SMEs ($p > 0.1$). Thus, it can be asserted that the SMEs' willingness to adopt EC is hardly influenced by the limitations of internet for EC. In both models, The effects of control variables with the exception of the variable "the amount of resources allocated for export development" ($p < 0.05$) are found to be insignificant ($p > 0.1$) and the signs on all five control variables are negative. This finding shows that firm and industry-specific characteristics in general do not affect the extent of SMEs' adoption of internet for EC. The significant and negative sign on the variable "the amount of resources allocated for export development" indicates that an increase in the resources allocated for export development leads to an increase in EC adoption by SMEs, a finding, which can be interpreted as evidence to a view that EC is used widely for international trade activities.

Discussion and implications

The study served two major goals. First, it provided a descriptive account of perceived benefits and limitations associated with internet-based EC activities by manufacturing

Table VI.
Factors of perceived limitations of EC

Factors	Factor loads	Eigen value	Percentage of variance explained	Cumulative (per cent)	Cronbach α
Factor 1		3.06	21.5	21.5	0.69
Cost disadvantages					
High installation costs	0.72				
Unfamiliarity with internet use	0.69				
No efficiency in operations	0.68				
No reduction in operating costs	0.61				
Technically complex to use	0.52				
Factor 2		1.37	18.3	39.8	0.62
Limited number of users					
Suppliers and/or customers being offline	0.79				
Limited number of internet users	0.69				
Lack of legal regulations	0.68				
Factor 3		1.05	15.0	54.8	0.51
Security concerns					
Risk of dissipation of company-specific knowledge	0.78				
Uncertainty regarding the message delivery	0.66				

Notes: Principal components factor analysis with varimax rotation; K-M-O measure of sampling adequacy: 0.776; Bartlett test of sphericity: 403.742; $p < 0.000$

	Model 1	Model 2
Constant	33.81***	33.71***
Independent variables		
Market development	0.18***	0.195***
Efficiency of sales and promotion	0.11*	0.14**
Ease of accessibility	0.18***	0.18**
Cost reduction	0.12**	0.12**
Cost disadvantages		0.11
Limited number of users		−0.06
Security concerns		−0.07
Control variables		
Relative strength of the company in the industry	−0.06	−0.06
International experience of the company	−0.12	−0.11
Amount of resources allocated for export development	−0.17**	−0.19**
Technology intensiveness of the industry	−0.01	−0.00
Competitive intensity of the industry	−0.03	−0.03
Adjusted R^2	0.17	0.18
F value	6.35***	5.25 ***
$N = 237$		

Notes: *$p < 0.1$; **$p < 0.05$; ***$p < 0.01$

Table VII.
Determinants of EC adoption

SMEs in Turkey. In mid-December of 2004, European Union agreed to start negotiating with Turkey in October of 2005 about admitting the country into the EU by 2015. For the past two decades, Turkish SME's have been exporting aggressively into Europe, Russia, Central Asia, and North America. They not only export but buy companies and engage in manufacturing operations abroad. In this endeavour, they make use of EC knowledge and expertise to be competitive.

Second, relying on managerial perceptions an attempt was made to investigate the factors affecting the adoption of EC adoption by SMEs through the application of multivariate statistical techniques on a large set of questionnaire responses.

The extent of EC adoption by SMEs was measured based on the mean measure of the usage frequency across a set of 14 EC applications. The highest ranked EC applications were found to be principally concerned with external communication and acquisition of information for market and product research. An EC adoption index was then computed by taking the cumulative sums of the responses regarding the usage frequency of each EC application. Managers were also asked to evaluate perceived benefits and limitations of internet for EC. The findings indicate that while the company managers perceive the benefits of internet-based EC very favourably, they do not indicate relatively high level of agreement to the perceived limitations of EC on the internet.

Factors analysis was subjected to each set of perceived benefits and limitations to produce parsimonious set of distinct, non-overlapping factors. From the full set of 18 perceived benefits identified, the factor analysis yielded four factors that explained 59.1 per cent of the observed variance in the sample data. From the ten limitations identified, the factor analysis produced three factors, explaining 54.8 per cent of the observed variance.

A multiple regression analysis was undertaken in an attempt to investigate the functional relationships between the SMEs' willingness to adopt EC and the underlying

factors of perceived benefits and limitations of internet-based EC. This analysis provided strong evidence for the view that the perceived benefits of internet for EC positively affects the EC adoption by SMEs. However, no support was found concerning the impact of potential limitations of internet-based EC on SMEs' willingness to EC adoption. The analysis also showed that company and industry-specific factors, with the exception of amount of resources allocated for export development, did not appear to have any significant impact on EC adoption by SMEs.

The results of this research offer a number of implications for both managers and public policy makers. More efforts have to be exercised to remove or at least to mitigate the impediments to SMEs' willingness to EC adoption. First, the globally exploding EC activity has raised concerns for governments and regulatory bodies. The results of this study indicate that the lack of legal regulations is cited as one of the most serious limitations of EC and hence EC is least used for payment purposes. These findings confirm that legal and security issues are highly sensitive issues for SMEs. There are also some ambiguities concerning mainly the enforcement of contracts created through internet-based EC and whichever tax and tariffs to apply. Another leading issue that matters SMEs are security measures that should be taken to protect data transfer in internet environment. To this end, collaboration of governmental bodies to enact necessary rules and regulations within the framework of international law is essential in order to remove security concerns.

One of the most vivid implications of internet-based EC for SMEs is the potential for external communication and information gathering for market and product research. Although the breadth of activities pursued in EC field is limited at present, the continued growth of EC will enable companies to engage in currently under utilized applications such as job advertisements and video-conference. SMEs need to perceive that benefits of EC will outweigh the costs of EC. The Government and private sector should therefore provide various incentives to help SMEs engage in EC with minimal investment and costs. Studies in emerging markets indicate that top management generally does not understand what EC is all about and this lack of understanding lead them to underestimate the impact of EC and prefer to be followers rather than leaders in the adoption of EC technologies. In order to reap the advantages of EC, businesses must fully embrace it by making a group of managers aware of the potentials of internet. Another important conclusion emerging from this study is that there exists a positive relationship between the amount of resources allocated for export development and the extent of EC adoption of SMEs. This finding confirms the view that the internet can reduce the barriers to exporting faced by SMEs by lowering the costs of extending their geographic reach. The managers of such internationalising SMEs should, then, ensure that they are able to acquire the enabling and enlightening technical and cultural skills related to international EC usage. Policymakers in emerging markets can take steps to promote EC by SMEs by setting up dedicated information web sites similar to those offered by the governments of industrialized countries.

Future research avenues

The widespread impact of globalisation and emergence of EC on smaller firms offers avenues for future research. A more longitudinal approach in terms of case studies provides a basis for building more comprehensive, prescriptive research. The future

studies on the subject should also cover the SMEs in service industries to note differences between industries and the extent of willingness to adopt EC. The selection of large companies in sample will allow comparisons between small and large companies regarding the adoption of EC. Future studies may place further emphasis on examining the factors that will influence the EC adoption from a cross-country perspective.

References

Anonymous (2001), "1 Billion internet users to fuel $5 trillion in e-commerce by 2005", *Direct Marketing*, Vol. 64 No. 5, p. 12.

Avlonitis, G.J. and Karayanni, D.A. (2000), "The impact of internet use on the business-to-business marketing", *Industrial Marketing Management*, Vol. 29, pp. 441-59.

Baker and McKenzie (2001), *Doing E-Commerce in Europe*, Baker and McKenzie, Hong Kong.

Computer Economics (2001), *Internet & E-Business Strategies, Internet Trends*, Vol. 5 No. 4, pp. 3-5.

Dutta, S. and Evrard, P. (1999), "Information technology and organization within European small enterprises", *European Management Journal*, Vol. 17 No. 3, pp. 239-51.

Fielding, M. (2005), "Biz opportunities grow in Turkey, the latest EU hopeful", *Marketing News*, 1 April, pp. 13-14 & 16.

Gibbs, J.L. and Kraemer, K.L. (2004), "A cross-country investigation of the determinants of scope of e-commerce use: an institutional approach", *Electronic Markets*, Vol. 14 No. 2, p. 124.

Globerman, S., Roehl, T.W. and Standifird, S. (2001), "Globalization and electronic commerce", *Journal of International Business Studies*, Vol. 32 No. 4, pp. 749-68.

Goldman Sachs (1999), *B2B: 2B or not 2B?*, Goldman Sachs Investment Research, New York, NY.

Grant Thorton International (2000), *European Business Survey Prospects and Issues for SMEs*, No. 8, Appendix to the Journal of Capital.

Jacoby, C. (2000), "E-commerce hot spots", *Corporate Location*, No. 3, p. 18.

Karakaya, F. and Karakaya, F. (1998), "Doing business on the internet", *SAM Advanced Management Journal*, Spring, pp. 10-14.

Karavdic, M. and Gary, G. (2005), "Integrating e-commerce into existing export marketing theories: a contingency model", *Marketing Theory*, Vol. 5 No. 1, p. 75.

Kaynak, E. (1978), "Difficulties of undertaking marketing research in the developing countries", *European Research*, Vol. 6, p. 256.

Kendall, J.D., Tung, L.L., Chua, K.H., Ng, C.H.D. and Tan, S.M. (2001), "Receptivity of Singapore's SMEs to electronic commerce adoption", *Journal of Strategic Information Systems*, Vol. 10, pp. 223-42.

Lee, J., Claudine, K., Chris, C. and Sean, S. (2001), "Top e-players open to change", *Asian Business*, Vol. 37 No. 7, pp. 37-8.

Malhotra, N.K. (1986), "Why developing societies need marketing technology", *International Marketing Review*, Vol. 3 No. 1, pp. 61-73.

Malhotra, N.K. (1988), "A methodology for measuring consumer preferences in developing countries", *International Marketing Review*, Vol. 5 No. 3, pp. 52-67.

Nath, R., Akmanligil, M., Hjelm, K., Sakaguchi, T. and Schultz, M. (1998), "Electronic commerce and the internet: issues, problems, and perspectives", *International Journal of Information Management*, Vol. 18 No. 2, pp. 91-101.

Ngai, E.W.T. and Wat, F.K.T. (2002), "A literature review and classification of electronic commerce research", *Information & Management*, Vol. 39, pp. 425-9.

Nunnally, J.C. (1978), *Psychometric Theory*, 2nd ed., McGraw-Hill, New York, NY.

Oxley, J.E. and Yeung, B. (2001), "E-commerce readiness: institutional environment and international competitiveness", *Journal of International Business Studies*, Vol. 32 No. 4, pp. 705-23.

Palmer, J. (2000), "Internet access in Bahrain: business patterns and problems", *Technovation*, Vol. 20, pp. 451-8.

Pawar, B.S. and Sharda, R. (1997), "Obtaining business intelligence on the internet", *Long Range Planning*, Vol. 30 No. 1, pp. 110-21.

Poon, S. and Swatman, P.M.C. (1999), "An exploratory study of small business internet commerce issues", *Information & Management*, Vol. 35, pp. 9-18.

Sarıaslan, H. (1994), *The Financial Problems of SMS Companies*, TOBB Publications No: 281, Atak Ofset.

Sathye, M. and Beal, D. (2001), "Adoption of electronic commerce by SMEs: Australian evidence", *Journal of E-Business*, Vol. 1 No. 1, pp. 1-11.

Schulze, C. and Baumgartner, J. (2001), *Don't Panic, Do E-Commerce, A Beginner's Guide to European Law Affecting E-Commerce*, European Commission's Electronic Commerce Team.

Shaw, M.J., Gardner, D.M. and Thomas, H. (1997), "Research opportunities in electronic commerce", *Decision Support Systems*, Vol. 21, pp. 149-56.

Sterrett, C. and Shah, A. (1998), "Going global on the information super highway", *SAM Advanced Management Journal*, Winter, pp. 43-8.

Stockdale, R. and Craig, S. (2004), "Benefits and barriers of electronic marketplace participation: an SME perspective", *Journal of Enterprise Information Management*, Vol. 17 No. 4, p. 301.

Taymaz, E. (1997), *Small and Medium-Sized Industry in Turkey*, SIS, Ankara.

Tiessen, J.H., Wright, R.W. and Turner, I. (2001), "A model of e-commerce use by internationalizing SMEs", *Journal of International Management*, Vol. 7, pp. 211-33.

Torre, J. and Moxon, R.W. (2001), "E-commerce and global business: the impact of the information and communication technology revolution on the conduct of international business", *Journal of International Business Studies*, Vol. 32 No. 4, pp. 617-39.

Turban, E., King, D., Lee, J., Warkentin, M. and Chung, H.M. (2002), *Electronic Commerce*, 2nd ed., Prentice-Hall, Englewood Cliffs, NJ.

Van Slyke, C., France, B. and Varadharajen, S. (2005), "A comparison of American and Indian consumers perceptions of electronic commerce", *Information Resources Management Journal*, Vol. 18 No. 2, pp. 24-41.

Walczuch, R., Braven, G.V. and Lundgren, H. (2000), "Internet adoption barriers for small firms in the Netherlands", *European Management Journal*, Vol. 18 No. 5, pp. 561-72.

Walters, D. and Lancaster, G. (1999), "Using the internet as a channel for commerce", *Management Decision*, Vol. 37 No. 10, pp. 800-16.