
BARRIERS TO E-PROCUREMENT IN TURKISH AEC INDUSTRY

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ABSTRACT

E-procurement is beginning to offer opportunities for facilitating the traditional procurement processes in the AEC industry. Both supplier and buyer sides in the construction supply chain make use of e-procurement approaches as these facilitate the procurement process by providing opportunities for better communication and coordination and expanding the marketplace for both parties. With e-procurement, the buyer side holds the advantage of reaching more suppliers and products of lower cost, while suppliers have the advantage of reaching more customers in the online markets. In contrast to the globalisation of procurement in main production industries, e-procurement in the AEC industry mainly occurs at the national level (within a country). Furthermore, organisations within the AEC industry seem still to have not benefited from most aspects of e-procurement. This status quo in the industry is mainly due to barriers to e-procurement that arise from both supplier and buyer sides. The study presented in this paper explores the barriers to e-procurement in relation to the Turkish AEC Industry. Following the introduction, the paper provides a background by summarizing the previous research regarding the use of e-procurement in the industry. The following section discusses the key barriers in Turkey that were determined as a result of the web survey and interviews, and later the paper concludes by providing an analysis of the survey results.

Keywords: Barrier, e-Procurement, e-Commerce, Turkey, Survey, ICT, IT

1. INTRODUCTION

The AEC industry is one of the largest contributors of wealth creation to Europe's business economy, accounting for 9.7% of gross domestic product (GDP) and almost 60% of gross fixed capital formation (European Commission 2006). The industry is an extremely information-intensive and knowledge-based industry, and therefore AEC organisations need to fully embrace ICTs if they are to remain competitive (BERR 2008). In fact, ICT is still considered by the management of AEC organisations as purely a cost cutting tool or a utility that is owned and managed by their ICT departments. In parallel to this interpretation of ICT as only a cost cutting tool, organisations within the AEC industry do not seem to have benefited from most aspects of e-commerce and e-procurement. The implementation of e-procurement in construction has been slow until recently. As underlined by Eadie et al. (2010b), Martin (2008) indicated that only less than 20% of construction organisations use e-procurement in the UK. Although today several different production sectors have begun to make good use of the e-procurement, research in the field indicated that AEC industry needs to overcome various barriers in order to fully utilize this new approach to procurement. When the e-procurement is fully utilized, the buyer side (i.e. contractors, sub-contractors) would hold the advantage of reaching more suppliers and products of lower cost, while the suppliers would have the advantage of reaching more customers in the online market. This research explores the how well e-procurement is perceived in the Turkish AEC Industry . The research investigating the role of ICTs in the Turkish AEC Industry has an history over

ten years. Some recent research is summarised in the following. In a recent study, Sarshar and Isikdag, (2004) examined the ICT capabilities of the Turkish AEC Industry via 22 semi-structured interviews with senior construction professionals within government and private organizations. In the study, the authors investigated the usage and applicability of current information systems and technologies and assessed priority topics for the future of ICT. As a result, ten priority areas where IT use can facilitate processes were identified. Following this, Acar et al. (2005) analysed four major research questions associated with, perception of the impact of ICT, extent of investments in ICT, level of usage of ICT and the software preferences of the SMEs by conducting a questionnaire survey of 227 building construction organisations in Turkey. More recently, Tas and Irlayici (2007) investigated the current and the planned use of IT and its impact on the construction industry, in the case of acquiring building product information in Turkey. The authors conducted a questionnaire with both the supply side (manufacturers) and the demand side (architects). In the paper, the supply side's behaviour on providing building product information and the demand side's methods of getting product information were discussed. Finally, Isikdag et al. (2008) explored issues relating to the role of ICT strategy, reasoning behind ICT investments, barriers to the successful implementation of ICT in Turkish AEC Industry. In addition, Underwood et al (2010) presented a comparative analysis of the strategic role of ICT in UK and Turkish AEC Industries.

The research presented in this paper aimed to determine the barriers to e-procurement in the Turkish AEC Industry. The research started with a literature review on the studies related to e-procurement in the AEC industry. The studies from the literature were evaluated and used in determining a set of barriers in 5 distinct areas, including barriers related to technology, organisational strategy, marketing, human factors and processes. Following this, a web survey and a series of telephone interviews were conducted to determine the most critical barriers among the ones that were determined by the literature review. The paper begins with a background section summarizing the previous research in the field, the following section discusses the key barriers that appeared as a result of the web survey and interviews, and the paper finally concludes by providing an analysis of the survey results.

2. E-PROCUREMENT IN THE CONSTRUCTION INDUSTRY

Studies related to the implementation of e-procurement in AEC industry emerged around the early 2000s. For instance, in 2001, McIntosh and Sloan (2001), described the role of Electronic Procurement and Global Sourcing techniques in the UK construction industry. The authors mentioned that for increasing efficiency, competitiveness and profits, the construction industry should change from their traditional methods of sourcing and utilize the global marketplace. Tserng and Lin (2002) then proposed a subcontracting and procuring model to take subcontracting and procuring processes into re-engineering, through omnipresent internet and develop a web-based decision support system for general contractors to provide decision support for an appropriate trade-off between risk and profit for different combinations of subcontractors. Chao and Hua (2002) focused on a research regarding process modelling of e-procurement in construction. Dzung and Lin (2004) examined common negotiable issues and options for construction material procurement. An agent-based system, named C-Negotiators, was developed by them to help contractors and suppliers to negotiate via the Internet. The results of the research indicated that C-Negotiators improved negotiation efficiency by reducing negotiation time and cost, and effectiveness was improved by suggesting a better agreement with higher joint payoff. Luu et al. (2006) proposed a strategy for evaluating a fuzzy case-based construction procurement selection system. Hadikusumo et al (2005) proposed a decentralized database system equipped with electronic agents for material procurement. The benefits of the system were identified as follows; (i) reducing communication between buyer and supplier, (ii) reducing supplier selection and evaluation problem, (iii) reducing excessive time and labour consumption for material procurement purposes, (iv) reducing information lost, (v) reducing unnecessary costs. Stephenson and Chia (2006) made an assessment of e-procurement practices of UK construction sector. The findings from the research have indicated that (i) e-procurement solutions and applications were still in their infancy and construction organizations were currently experiencing development issues. (ii) e-procurement brings benefits such as reduction of purchase price, process efficiencies and reduction of process costs. (iii) IT change, culture, cost, and time issues were the identified barriers

and risks that mostly concerned organizations. Rankin et al (2006) examined e-procurement in an effort to identify the issues surrounding the development of a critical mass of participants required to overcome the organizational and technology challenges. Perera et al. (2006) presented a methodology for developing a model for the analysis of e-procurement capability maturity of construction organizations. The results of the pilot study indicated that 71% of construction organizations receive less than 10% of contact documentation in an electronic form. 80% of organizations have never used CITE approved software for bills of quantities preparation or pricing while 84% of organizations use and prefer spread sheets over CITE approved format for data exchange. 'Improving communication' and 'reduced administration costs' were identified as the two most important drivers while 'security of transactions' and 'being unsure as to the legal position of e-procurement' were pointed as the two most important barriers to construction e-procurement. Vitkauskait and Gatautis (2008) aimed to identify the most important internal processes for small and medium enterprises (SME) in the construction industry and to estimate opportunities to adapt ICT in order to optimize those processes. Findings showed that the speed and efficiency of initial Selection of Suppliers would increase with the successful implementation of a "Procurement Configurator" web service. Meanwhile, successfully implemented "Agent for Analysis of Quotations" integration service would improve analysis of offers/quotations received in order to select the best possible supplier. Alarcón et al (2009) analysed the benefits that have accrued as a result of using e-marketplace to carry out the procurement process. The study showed that despite the characteristics of the construction industry that hinder the implementation of e-marketplaces, there were many companies that have adopted this new technology and have experienced important benefits through e-commerce. Gatautis and Vitkauskait (2009) identified the most important internal processes of construction small and medium enterprises (SME) and evaluated possibilities to use information communication technologies to optimize those processes. Twelve internal processes of construction SMEs were identified and out of those, four most important ones were selected according to predefined criteria as e-Tendering, e-Site, e-Procurement, e-Quality.

A limited number of studies investigated the barriers to e-commerce and e-procurement in the AEC industry. Love et al. (2001) provided an empirical analysis to determine the barriers that small-medium sized contractors experience when confronted with the need to implement e-commerce to sustain their competitiveness. The substantial barriers to implement e-commerce, which can affect organizational performance at a micro and macro level were identified as technical, financial, organizational and behavioural. In addition, the underlying factors that acted as constraints to the introduction of information and communication technologies to support an e-commerce infrastructure were identified as risk, uncertainty, change and knowledge. Eadie et al. (2007) examined the drivers and barriers for e-procurement in construction within Northern Ireland. Drivers and barriers had been ranked using a selection of 70 contractors who have expressed interest in tendering for Roads Service Northern Ireland (RSNI) contracts. The results of this study had been compared with studies of a similar nature carried out in Australia and America in general goods and services e-procurement. Findings in this Northern Ireland study showed that the two highest ranked drivers by the contractors were improving communication and reduced administration costs, while the two most important barriers were security of transactions and the uncertainty surrounding the legal issues of e-procurement. Eadie et al. (2010a) and Eadie et al. (2010b) presented a research where a set of barriers to e-procurement were identified from the literature, verified and ranked. Eadie et al. (2010a) aimed to investigate the reasons for the poor uptake of e-procurement in construction through the identification of drivers and barriers to construction e-procurement. The authors analysed how these drivers and barriers were perceived by the quantity surveying discipline, as the quantity surveyors are the professionals of the construction industry who normally perform the tender process and procurement in traditionally procured contracts. A collated set of drivers and barriers to e-procurement containing 20 drivers and 30 barriers were revealed through the literature search. The drivers and barriers were grouped into different bands by the authors as barriers relating to General, Cost, Time, Quality, Cultural, Infrastructure, Security, Legal, and Compatibility. The lists of drivers and barriers to construction e-procurement were then ranked by using a web-based questionnaire survey. In Eadie et al. (2010b), a total of 775 construction organisations were surveyed regarding the barriers and drivers determined in Eadie et al. (2010a) to provide a cross discipline comparison of drivers and barriers to

construction. The participants included 483 surveyors, 42 Public Sector clients, 172 Architects, 35 Private sector clients and 43 Consulting Engineers. All the organisations were contacted by telephone to confirm they had e-procurement experience and were willing to partake in the survey. Once these conditions were established the representatives of the organisations were then asked to complete the web-based survey. The ranking of 20 drivers and 30 barriers based on the cross-discipline comparison were presented as the results of this study.

3. A SURVEY ON BARRIERS TO E-PROCUREMENT

Following the literature review on studies related to e-procurement in AEC industry and barriers to e-procurement, the study explained in this paper continued with a web-based questionnaire survey to determine the key barriers to e-procurement in Turkish AEC Industry related to the technology, organisational strategy, market, human factors and processes. The survey is designed in form of a web survey and sent to 200 participants including engineers, architects from the public and private organizations (such as contractors, sub-contractors), in addition to the providers of e-procurement services. In the survey, a set of barriers which were defined based on the literature review, were presented to the participants in 4 groups as, barriers related to technology, organisational strategy, market, human factors and processes. The following list provides the barriers presented to the participants in the survey:

Technology Related Barriers

- Slow shift towards digital signatures
- Technology related security concerns in transfer of valuable information
- Difficulties in establishing the e-commerce environment (web site/portal etc.)
- Problems related to internet infrastructure and bandwidth in implementing and running an e-commerce site
- Problems in management of servers(database/auction/ad/mail/transaction processing)
- Difficulties in hosting or outsourcing decision
- Problems in establishing security mechanisms
- Lack of trust in the validity of electronic documents in dissemination or approval of physical products
- Problems in Integration of e-Commerce environments with ERP Systems

Strategic Barriers

- Lack of nation-wide information exchange standards
- Inadequacy of legal infrastructure supporting e-commerce
- Lack of organizational focus
- Lack of top management support to move towards e-commerce
- Lack of knowledge regarding national/global taxation regime related to e-commerce
- Organizational reluctance to move from "bricks" to "brick-and-clicks"
- Lack of bodies supporting the shift towards e-commerce
- Lack of best practice studies and pilot projects

Market Related Barriers

- The traditional media being still much stronger than new media in marketing and public communication
- The inefficiencies in making use of user-generated content for online marketing
- The concerns related to the number of customers that can be targeted in the online environment
- The resistance of intermediaries against online commerce
- The fear of price transparency in e-procurement
- The lack of pioneering agents/firms

Human and Process Related Barriers

- The lack of IT skills of staff
- The fear of unauthorized access to critical project information
- The inadequacy of interaction in online environment during personal communication
- The lack of trust between parties in the electronic commerce
- The lack of training regarding the implementation and use of e-commerce systems
- The resistance against the new way of working brought about by moving towards e-procurement and commerce

- The difficulties in re-engineering of business processes for supporting the information flows e-procurement

Following this, the participants were asked to rank the severity of the barriers with 5 levels of a likert-scale, in the form of most severe one being ‘vital’ and the least severe one being ‘not important’ (i.e. 1. Vital ; 2. Key; 3. Important; 4. Less Important and 5. Not Important). The return rate of the survey was around 30%, with 64 responses being received from the survey participants. 60% of the respondents were from the group of engineers, architects from both the public sector and private organizations (such as contractors, sub-contractors), and 40% of the respondents were from the providers of e-procurement services(service providers and material suppliers. The breakdown of respondents is as follows. 35 of them were technical staff of contractors and 3 of them were technical staff of sub-contractors, 12 of them were from technical (e-)service providers , 3 of them were material suppliers, 11 of them classified themselves in the “other” category 3 being on the buyer and 8 being on the provider/supplier side. The respondents were main procurement or sales representatives of the organisations.

Following the completion of the survey, the percentage of answers regarding the severity level of each barrier was determined. Next, a value named ‘Vitality Percentage’ was calculated by summing up the percentages of first two severity levels (1: Vital and 2: Key). If the ‘Vitality Percentage’ was found to be over 70% for a barrier, that barrier was considered as a key barrier in that group. If less than two barriers with ‘Vitality Percentage’ > 70% appeared in one group, then the two barriers with highest ‘Vitality Percentage’ were accepted as the key barriers of that group. Following the determination of the key barriers, 20 telephone interviews were conducted with randomly selected set of respondents to understand their views on the reasons behind the key barriers. The following section elaborates on the key barriers to e-procurement that were found as the result of the survey, based on the feedback obtained by the telephone interviews.

3.1 Key Barriers to E-Procurement

The survey results have shown that there are two technology related key barriers that prevent the successful implementation of e-procurement in the Turkish AEC Industry and both barriers have found to be of equal importance/severity (Fig. 1).

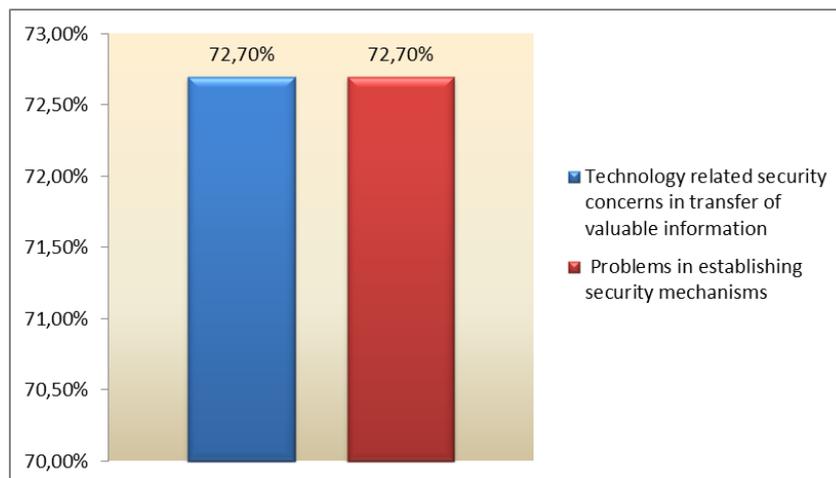


Figure 1: Key Barriers Related to Technology

72% of the participants believed that security is a key issue as the transactions regarding procurement of construction materials involve the transfer of high amounts of money in the construction phase. In addition, when a service (i.e. design) is procured in the design phase the key details about a project needs to be exchanged between the stakeholders which might threaten the competitiveness of the company when this information is acquired by its rivals/competitors. In addition, as the implementation and the use of digital signatures and SSL certificates in the sites related to AEC procurement is not common in Turkey, same amount of respondents (i.e. 72%) expressed their

concerns regarding this situation, and they mentioned that their organisation would not change its business practices from traditional procurement to e-procurement unless this situation changes. In summary, the barriers related to security appeared as the biggest technological barriers against the development of the e-procurement practices in the industry.

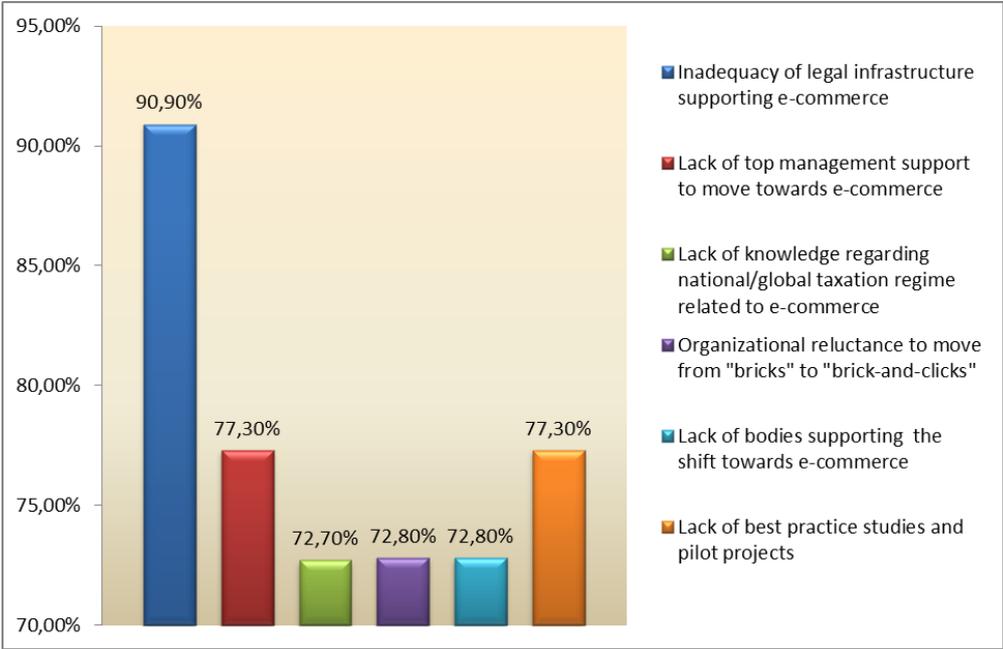


Figure 2: Key Barriers Related to Strategy

The survey results indicated five key barriers that are related to strategic aspects (Fig.2). Firstly, a very high majority of the respondents (91%) believe that the legal infrastructure (rules and regulations for supporting e-commerce and e-procurement) is inadequate, and this creates a huge barrier against the move to e-procurement in the industry. In addition, the majority of the respondents from the telephone interviews stated that the shift towards e-procurement is not encouraged through regimes such as tax deduction and concession. The majority of participants (77%) have an agreed view related to the lack of top-management support in move from traditional to electronic procurement. The respondents indicated that top management is mainly over-focused on everyday tasks and thus, mostly stays short-sighted with a vision of saving-the day. This short-sighted mentality and short-term focused reasoning of the top-level management was mentioned as one of the highest intra-organizational barriers against the move towards e-procurement. The participants indicated that this vision would remain similar to the status-quo, and might continue to remain so, unless best practice cases and pilot projects would be introduced within the AEC industry.

A high majority of the participants (77%) mentioned that the lack of best practice studies and pilot projects is the main reason behind the lack-of-awareness related to the benefits of e-procurement. The respondents stated that this in-turn causes the industry to remain adopting the status-quo (i.e. the traditional procurement). The survey participants mostly (i.e. 73%) clarified that the level of knowledge related to taxation regimes for e-procurement within their organisations is very low, and this generates an apprehension towards implementing e-procurement methods within the organisation. They mentioned that the authorities are sometimes reluctant in providing such information to organisations, and this negatively affects the organisational motivation towards process change. The survey results (as stated by 73% of the respondents) indicated that there is not much enthusiasm in organisations towards implementing e-procurement as their new procurement strategy. In addition, the participants from the telephone interviews (some of which are staff of the AEC related retail stores) expressed that even big nation-wide retail stores only use the internet for promoting their products but not for selling them online. They mentioned that this current situation related to retail stores provides a clear picture showing that the shift-towards e-procurement is not being realized on the supply-side. In

other words, the move from ‘brick’ stores to ‘brick and click’ stores is not happening currently in the Turkish AEC Industry. Another key barrier that has risen against the implementation of e-procurement within the industry was mentioned as the lack of bodies promoting and supporting the shift towards e-commerce and procurement (by 73% of the participants). The telephone interviews revealed that most of the organisations are feeling isolated when they decide to implement e-procurement in real-life projects, as there is nearly no (non-profit) organisations supporting the move towards e-commerce and e-procurement in the AEC industry. Furthermore, the participants indicated that two main (industrial non-profit) associations in the field of e-commerce namely ETID and ETICAD have nearly no members from organisations in AEC supply-chain. This situation also proves that the AEC suppliers are falling behind in terms of moving to e-procurement.

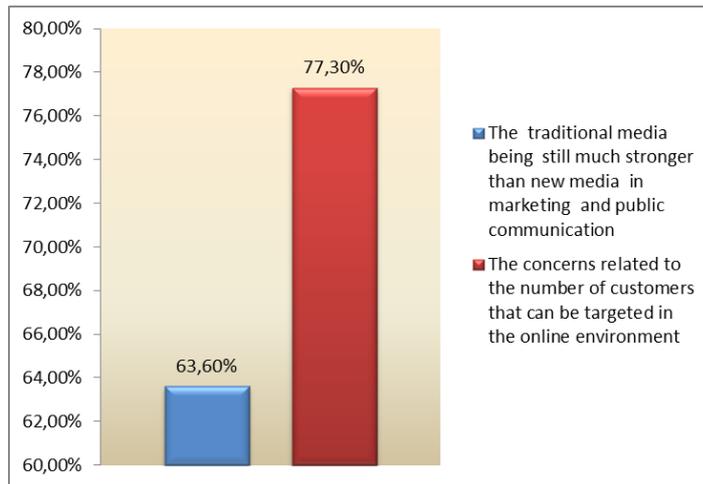


Figure 3: Key Barriers Related to Marketing

The results of the survey (as depicted in Fig.3) indicate that there are also significant barriers towards the implementation of e-procurement from the marketing perspective. 64% of the participants mentioned that the traditional media is still much stronger than the new media (i.e. the internet) in marketing and public communication. The respondents stated that the organisations in various nodes of the AEC supply chain still continue to use traditional media for promoting their products. A key example of this is in apartment sales and in real-estate. Most organisations use TV and newspaper ads, and prefer these to ads in the social media or search engines. Furthermore, promotion with mobile phone such as SMS messages is another well-known method of real-estate promotion. Big retail stores in the AEC supply chain mainly prefer to distribute flyers with newspaper, in fact catalogue sales are not a popular form of marketing in Turkey. As revealed by 77% of the respondents, organisations have concerns related to the amount of potential customers that can be targeted by marketing through online media. The participants indicated that these concerns are mainly caused by the lack-of-awareness regarding the potential of the online media in marketing and the opportunities provided by the use of social media and Web 2.0 technologies. Micro-blogs, news-aggregators and social network sites are now emerging as novel platforms which can form the basis of new marketing opportunities, in fact the participants stated that the AEC industry in Turkey does not appear to be benefiting from the opportunities provided by the new media.

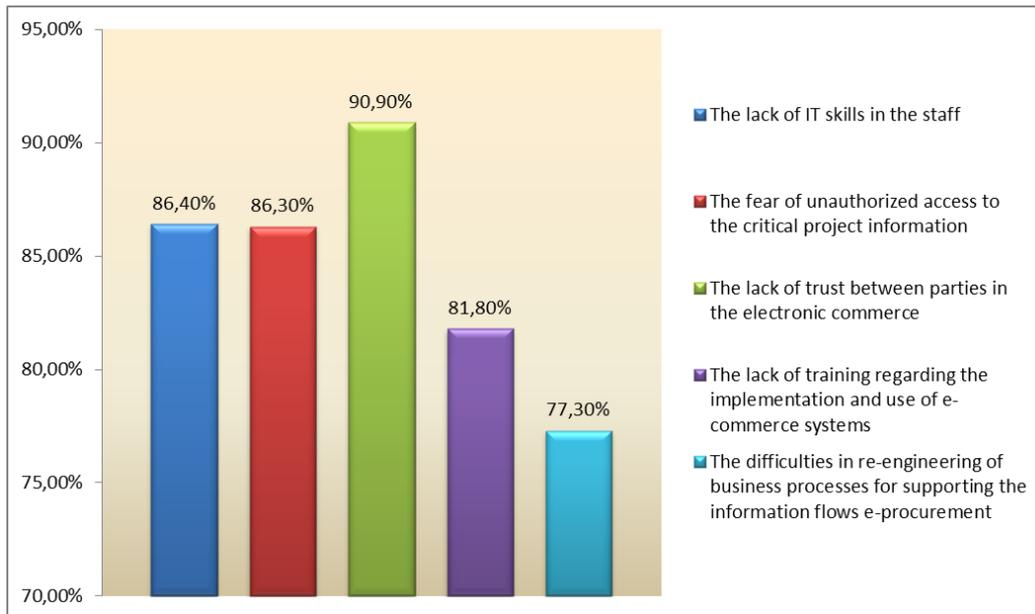


Figure 4: Key Barriers Related to People and Processes

The survey results illustrated that there are also considerable number of barriers related to human and process related factors. Most severe barrier in this group is human related. 91% of the participants thought that the lack of trust between the parties is a key barrier preventing e-procurement in the AEC industry. The traditional nature of the procurement in the industry is personal-network focused, i.e. most people and organisations are referred by other people or organizations. In other words, the people in the industry usually prefer to procure from the people that they know in-person. In contrast, e-procurement offers a different way of procurement where meeting or knowing the other party in-person is not required. As this contradicts with the traditional procurement practices of the industry, trust issues raise in relation to processes involving e-procurement. The participants indicate that these concerns would decrease in time, as e-procurement would become a part of the organisational culture. Although the role of IT has been seen as more critical in last 10 years of the AEC industry, (as indicated by 86% of the respondents) the lack of IT skills of staff still seem to be a problem towards the implementation of e-procurement in processes. The interviewees mentioned that the knowledge level of (non-IT) staff related to e-procurement and e-commerce is very limited, and in an attempt to implement e-procurement in the supply chain processes, questions regarding security are mostly raised and this forms a barrier towards timely implementation of an e-procurement system, thus causing delays in the everyday processes in the supply chain. There are also mentality related (psychological) barriers such as the fear of unauthorized access to critical information (such as the financial details of the project). 86% of the participants viewed this fear as a barrier against the move towards e-procurement. As mentioned by 82% of the survey participants, the lack of training regarding the implementation and use of e-commerce and e-procurement systems is also a barrier. The respondents mentioned that training aimed to support the use of e-procurement systems would be much beneficial for the industry and for the recognition and implementation of e-procurement approaches. The final key barrier that is indicated as a result of the survey was related with the difficulties in process reengineering (or re-alignment of processes) for supporting this new way of procurement. Although the processes would become more agile in the end result, as the process change involves lots of training and re-engineering effort, respondents mentioned that the contractors in the Turkish AEC Industry mostly prefer to lag behind in implementing e-procurement unless it is required as a sine-qua-non contract requirement. On the supply side, the situation is not much different with suppliers also being reluctant to process change and undertake re-engineering to become e-suppliers. Suppliers highlight the reason behind it as consumer demand, which is currently low towards buying their products online.

4. CONCLUSIONS

As has been witnessed in other areas of ICT within the AEC industry, e-Procurement is beginning to present opportunities for improving the traditional procurement processes by improving communication and coordination along with expanding the marketplace for both suppliers and buyers. However, it is evident that the AEC industry across the globe is not benefiting from e-Procurement. The status quo that currently exists in the industry mainly relates to barriers to e-procurement that arise from both supplier and buyer sides. The study presented in this paper has explored the barriers to e-procurement from both supplier and buyer perspectives in relation to the Turkish AEC industry. In line with the findings of Eadie et al. (2007), legal issues and the lack of a legal infrastructure in particular (i.e. rules and regulations in support of e-Procurement), were identified as a key barrier towards industry-wide adoption of e-Procurement within the Turkish AEC industry. From an organisational strategic perspective, the top-management of organisations are still very much focused on operational everyday tasks reflecting a very short-term vision which has implications on the longer-term strategic aspects of delivering value across the business from ICT. Furthermore, there is a lack of awareness towards the real benefits of e-Procurement as a result of best practice cases and pilot projects that truly demonstrate the benefits of shifting towards an e-Procurement approach. This lack of awareness is further being fuelled by a lack of not-for-profit bodies promoting and supporting the shift towards e-commerce and procurement. Also in line with Eadie et al. (2007), the key technological issues that were identified in the Turkish AEC Industry are mainly related to security; both in terms of the actual security of exchanging information (i.e. protecting competitively advantageous information) and also the mechanisms (technologies) by which the security of the information can be ensured such as digital signatures, SSL signatures, etc. This has further implications for people-related issues and their trust in the security of business-critical information. The issues around awareness and trust possibly have further implications for traditional media, as it is still being favoured over more advanced technologies in the marketing and promotion of products. The issues around lack of trust extend further beyond the technological aspects to that of process by which the process of procurement occurs through more personal and familiar networks. Furthermore, the lack of capabilities of re-engineering processes necessarily for facilitating this new way of procurement were also identified as a major barrier, which in turn, raised the issue around the training of people to develop the required core competences and skills to maximise the benefits of e-procurement. The study has highlighted a number of key issues in line with current literature associated with People, Process and Technology that are restricting the shift from traditional forms of procurement towards e-Procurement. The results indicate that the stakeholders within the Turkish AEC Industry continue to refrain from implementing e-Procurement unless made mandatory as a sine-qua-non contract requirement. In addition, there is a clear requirement for organisations in order to facilitate the paradigm shift from traditional procurement to e-procurement.

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