ANALYSIS OF THE USE OF E-PROCUREMNT IN THE PUBLIC AND PRIVATE SECTORS OF THE UK CONSTRUCTION INDUSTRY

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SUMMARY: Eadie et.al (2010a, 2010b) identified 20 advantages in the adoption of e-procurement within a construction organisation. The Glover report (2008) indicated that by the end of 2010 all public sector procurement should be electronic. The use of e-procurement within the construction industry has been inadequately researched. Martin (2009) examined quantity surveying organisations perspectives on the use of e-procurement across the United Kingdom. This paper seeks to address the knowledge gap that exists in the analysis of the level of usage of e-procurement within the construction industry. It compares the findings for the construction industry with other industries on company size and spend. Martin (2009) does not seek to investigate the size or spend on procurement activities of those quantity surveying organisations who have adopted e-procurement.

This paper investigates the correlations between size, procurement spend and adoption of e-procurement in construction organisations comparing it with other industries. It concludes that the findings of Griloa and Jardim-Goncalves (2010) and European Commission (2007) were correct in suggesting that the AEC sector has been lagging behind other sectors in the adoption of e-procurement and provides a breakdown of the different types of organisations who currently use e-procurement.

It further identifies the size of organisations which have implemented e-procurement within construction. On the client and consultant side in traditional contracts, company sizes of 21-50 employees make the highest use of e-procurement. This confirms that when analysing according to the size of organisation, construction organisations perform in a similar way to other industries as reported in Batenburg (2007) and Gunasekarana and Ngai (2008). However, this study indicates that very small companies may still be put off by the costs of software (corroborates De Boer et al, 2002; Kauffman and Mohtadi, 2004).

The study proposes the types of construction organisation most likely to be utilising the benefits of e-procurement in construction by procurement spend and size. It also indicates that the deadlines in the Glover report (2008) relating to e-procurement in construction are unlikely to be met.

KEYWORDS: e-procurement, Use of e-procurement

1. INTRODUCTION

E-business generally has been seen to promote sustainable use of energy (European Commission, 2010). E-procurement (a sector within e-business) has also been promoted as a means of producing cost savings through even a minor uptake in adoption within the construction sector (European Commission, 2007). However, there have been a limited number of studies on construction e-procurement within the UK which assess the starting point for increased uptake. The European Commission (2007) identified that the major driving force in the implementation of e-procurement in construction is driven by its introduction in large European construction enterprises. However, this Europe wide assessment gives little insight into the UK construction industry where 97.9% of construction businesses employ less than 49 employees (BIS, 2010). While the figure compares with the European 97% (European Commission, 2007) the European Commission report does not investigate the UK in depth having a small sample size with only six case studies coming directly from the UK.

This current research needed to be carried out to provide an overview determining organizational size, expenditure on procurement specifically within the UK to document the impact of any future benefits including cost savings and compare this with other industries that have adopted e-procurement.

In his investigation of construction e-procurement Rankin (2006) defines e-procurement as a commercial organisation acquiring and selling of products and services by electronic means (primarily through the internet). Hore et al (1997) classified tendering as "*a procedure to select a suitable contractor, at a time appropriate to the circumstances, and obtain from him at the proper time, an acceptable offer upon which a contract can be let.*" IDEA (2008) defines the scope of the electronic tendering process (e-procurement) as "*an electronic tendering solution that facilitates the complete tendering process from the advertising of the requirement through to the placing of the contract*".

E-procurement has been utilised worldwide but analysed mainly for the goods and services sector. Examples of its implementation worldwide are addressed in Davila *et al*. (2003), USA, Hawking *et al*. (2004), Australia, Carayannis and Popescu (2005) in the European Union, Kheng C. and Al-hawamdeh S. (2002), Singapore and Rankin (2006) Canada. Despite these initial investigations into implementation, little by way of statistics charting the ongoing uptake of the process has been published.

Pearcy & Guinipero (2008) examined supply management organisations of a variety of sizes in the USA to determine if larger firms were more likely to use e-procurement. The results concluded that there was a correlation between firm size and implementation of integrated systems and that the use of non-integrated systems was prevalent. Wang et al. (2004) investigated firm size-technology adoption relationship. Wang et al. (2004) suggested that firm size impacts the on the adoption of different types of e-procurement system. Wang et al. (2004) proposed that organisation size is related to the use of integrative types of IT. However, there is currently no literature regarding the size / adoption studies of e-procurement in construction.

Batenburg (2007) investigated e-business in the UK in Chemical, ICT, Healthcare, Textiles, Electrical machinery, Transport Equipment, Business Services, Tourism and Retail sectors. It concluded that e-procurement adoption was lower in countries with uncertainty avoidance. The OGC (2005) indicates that the UK along with France and Spain are some of the country's most resistant to change in e-business and therefore there is the need to have cultural change within the UK public sector for a high adoption of e-procurement. However, Batenburg (2007) suggests that the UK is not a country resistant to change in other industries, leading to a higher level of adoption of new technologies. A recent study of Spain by De-Miguel-Molina (2010), suggests that Spain is making progress but it is too early to fully evaluate its use of Snellen's Model in the public sector. However, adoption statistics for construction are not available. Batenburg (2007) further asserts that adoption in different countries varies.

Procurement in construction was determined as being different than that in the goods and services industries by the courts (Eastern v. EME Developments 1991 55 BLR 114). This is further emphasized when Eadie et. al. (2010b) shows that the drivers and barriers for e-procurement in construction act differently than those in the

goods and services industries. Therefore, it is clear that the adoption of e-procurement within the UK and specifically in the construction industry can vary significantly.

Martin (2009) investigated e-procurement use in construction across the United Kingdom from the standpoint of quantity surveying organisations on behalf of the Building Cost Information Service (BCIS) a part of the Royal Institution of Chartered Surveyors (RICS). Martin (2009) sample contained all quantity surveying organisations who were members of the RICS who issued 50 or more tenders per year. This provided information for the promotion of electronic systems of procurement within quantity surveying organisations. Tindsley and Stephenson (2008) provide a UK perspective but do not suggest overall uptake statistics within the private sector. The public sector uptake of e-procurement within the UK has not been investigated in-depth. The importance of such an investigation is evident as the UK government Glover report has specified that *"Businesses should be permitted to tender electronically for all public sector contracts by 2010; no "paper only" tenders should be required after this date, with an ambition for all tenders to be electronic by 2012"* (Glover, 2008). It was envisaged that a step change within the public sector would be needed if these targets were to be met.

In addition, Martin (2009) does not seek to identify the sizes or spend on procurement activities by those quantity surveying organisations who have adopted the use of e-procurement. This means that there are little by way of statistics to identify the size of organisations most likely to want to adopt e-procurement. This paper provides details of those organisations which are most likely to wish to implement e-procurement by investigating the correlations between size, procurement spend and adoption of e-procurement.

2. AIM OF THE RESEARCH

The aim of this study is to allow those promoting e-procurement within construction to identify by size and procurement spend, those companies which are most likely to adopt e-procurement as a process and therefore increase the speed of meeting the targets laid down for organisations working for local government in the Glover report (2008).

3. METHODOLOGY

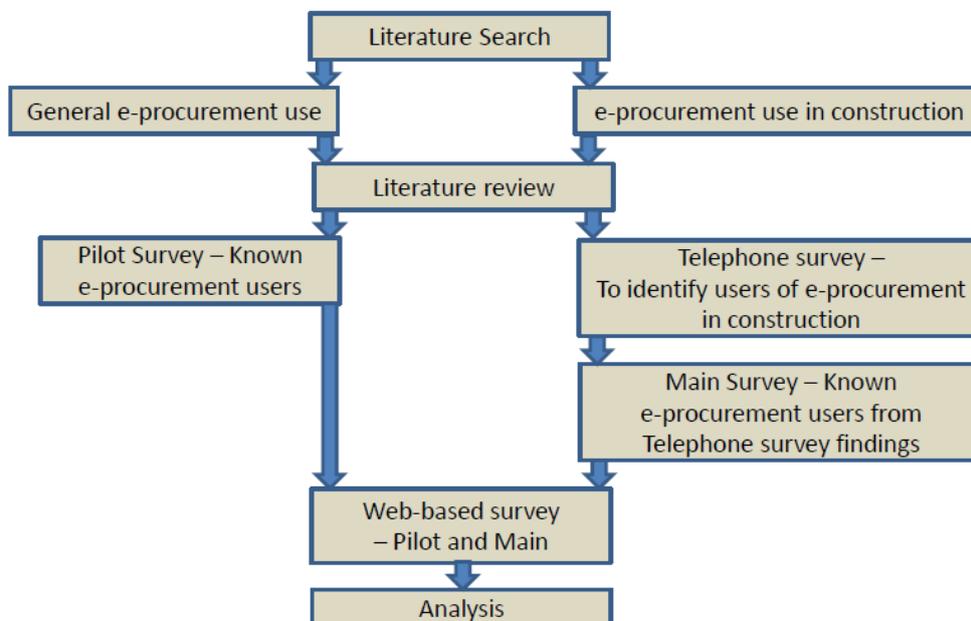The research methodology followed is summarised graphically in FIG. 1

FIG. 1: Methodology for Study

The study was to identify the type and size of organisations using e-procurement in the construction industry. It was designed to reach all types of organisations within construction. The pilot study completed using the pilot survey indicated in FIG. 1 contained the views of known e-procurement users from the construction contractor discipline. During this time a telephone survey was completed as part of the main study for the remainder of the disciplines within the construction industry namely, surveyors, public sector clients, architects, private sector clients and Consulting Engineers. This contained two questions and is appended to the end of this paper. On confirmation of adoption of e-procurement in the telephone questionnaire they were asked to complete the main survey. The main survey contained similar questions to the pilot survey. The questions from the pilot survey and the main survey are attached at the end of this paper. The remainder of the questions relating to e-procurement Drivers and Barriers are not reported in this paper. They are reported in Eadie at al. (2010a, 2010b).

3.1 Pilot Survey

The pilot study focused on construction contractors. As Roads Service had adopted an e-procurement system in late 2001 this ensured that a sample that contained 70 contractors who had registered interest in or tendered for Roads Service contracts in Northern Ireland would be familiar with e-procurement in construction. As the sample was 70, out of a total of 114 civil engineering contractors registered with the Construction Industry Training Board (CITB) in Northern Ireland, it was regarded as being representative of the Northern Ireland Construction Industry contractors and ensured this sample was homogeneous with all members having shared convictions and beliefs, thus reducing ambiguity (Naoum, 1995).

Tindsley and Stephenson (2008) suggest that there is a wide discrepancy between the views of contractors and consultants and clients in their views regarding e-procurement. The study therefore segregated the contractors as the pilot before completing a major sample of the remainder of the industry.

3.2 Main Survey

The main survey was used to investigate e-procurement use across all parts of the United Kingdom, namely England, Scotland, Wales and Northern Ireland. To ensure that the knowledge gap identified in the introduction was addressed a variety of disciplines within construction were surveyed. These included quantity surveyors, public sector clients, architects, private sector clients and consulting engineers. This when combined with the pilot study provided a holistic view of the construction industry.

A total of 775 construction organisations were identified and surveyed from January to March 2008: namely, 483 surveyors, 42 Public Sector clients, 172 Architects, 35 Private sector clients and 43 Consulting Engineers. To allow comparison with the Martin (2009) surveys all 483 quantity surveying practices on the RICS website were contacted. A total of 42 Public Sector Clients were identified from published sources such as the "Local gov" website and the yellow pages for Central Government departments. A further 35 private sector clients were identified from a list of clients who had carried out housing scheme work. The study included all 172 architects listed on the Royal Institute of British Architects, Northern Ireland. All 43 consulting engineers who were members of the Association of Consulting Engineers, Northern Ireland were also included in the study. This provided a large construction sample which was deemed to be representative of all aspects of the construction industry but did not identify whether these organisations used e-procurement.

All these organisations mentioned were contacted by telephone to confirm they had e-procurement experience and were willing to partake in the survey. Once these confirmed e-procurement use in construction and willingness to partake in the survey they were asked to complete the web-based survey. The study thus provided statistics for use of e-procurement within the United Kingdom across the disciplines. A breakdown of the response rates for the telephone survey is included in TABLE 1.

Martin (2009) shows that less than 20% of the Quantity Surveying organisations said that they carried out e-procurement in construction. The current research produced a similar result showing a slight increase with 25% of Quantity Surveying organisations surveyed using e-procurement. It further shows that public sector clients are the leaders in relation to e-procurement adoption with 47% adopting e-procurement. The industry average value from TABLE 1 is 27%. In e-procurement in other sectors, Batenburg (2007) suggests that over 60% of the respondents from German and British firms say they use online purchasing compared to about 40% of the other

(Estonian, Polish, French, Italian, and Spanish) organizations. The findings of the telephone survey below indicate two things: e-procurement in construction lags behind these industries by over 50% within the UK and secondly that it is still less used than general e-procurement in a European context.

TABLE 1: Sample Valid Response Breakdown by Discipline

Discipline	Total Number of Organisations	Number using E-Procurement / percentage using E-Procurement	Number of not using E-Procurement	Number not contactable, no longer trading or unavailable for comment	% valid response
Quantity Surveyors	483	83 / 25%	247	153	68%
Public Sector Clients	42	29 / 47%	10	3	93%
Architects	172	12 / 19%	156	4	98%
Private Sector Clients	35 in sample	0 / N/A	35	Not applicable	
Engineers	43	4 / 15%	25	14	67%
	775	128 / 27%	473	174	77%

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TABLE 1 shows the number of organisations contacted during the telephone survey and the percentage valid response from the total sample. These results show that a good level of response was achieved; it is above the 50% threshold suggested for external validity (OIG, 1997). They further indicate the extent of the survey and show that the results can be generalised across the industry.

The organisations identified through the telephone survey as being involved in e-procurement were asked if they were willing to partake in the web-based survey. Limesurvey™ was used to conduct the survey via the Internet. This software package gathered responses from the organisations through a web-based interface and stored these in an on-line MySQL™ database.

3.3 Analysis of results

The web-based survey investigated and allowed analysis on expenditure on pricing documents and the sizes and staffing involved in the organisations involved. The Data collected for both web-based surveys was exported directly into SPSS™ for analysis. This ensured that there were no transcription errors.

4. E-PROCUREMENT IN CONSTRUCTION

The pilot study of Northern Ireland Contractors was first used to determine the size of contractors who were adopting e-procurement. This was followed by the UK-wide survey which detailed electronic contract use for other disciplines.

The sample by its composition, incorporated all sizes of companies. FIG. 2 shows a breakdown of respondents by organisation size based on the number of employees within the organisation. It can be seen that the category containing 35% of the sample consisted of companies who employed 21-50 people. An even percentage of organisations were represented for those employing over 100, employing between 51-100 and employing between 11-20 categories containing 20%, 21% and 20% of the sample respectively. The last category employed

between 1-10 people. These very small organisations were specialist in nature and are unusual with regard to winning public sector work. This accounted for the sample representation to equate to only 4%.
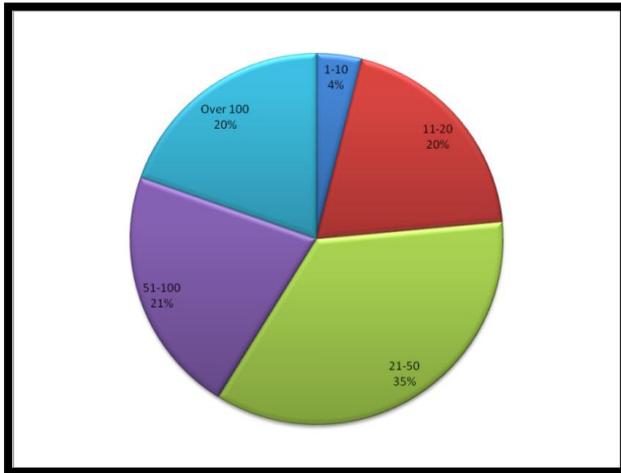

FIG. 2: Breakdown of organisation size in the pilot study

The organisations represented in FIG. 2 were then asked to supply data on the amount of electronic contract documentation received in comparison with paper based tenders.

5. USE OF ELECTRONIC CONTRACT DOCUMENTATION IN NORTHERN IRELAND FROM PILOT STUDY

FIG. 3 demonstrates that 47% of contractors within the sample, who tender for Roads Service work, received only 1-10% of their Schedules of Rates/Bill of Quantities in electronic form. Of the remaining 53% of the sample, 26% received between 11% and 30% of documentation in electronic form. The six percent who had 91-100% of documentation in electronic form worked solely for Roads Service. As Roads Service carry out the majority of their procurement electronically on write-once CD this is reflected in the percentage.
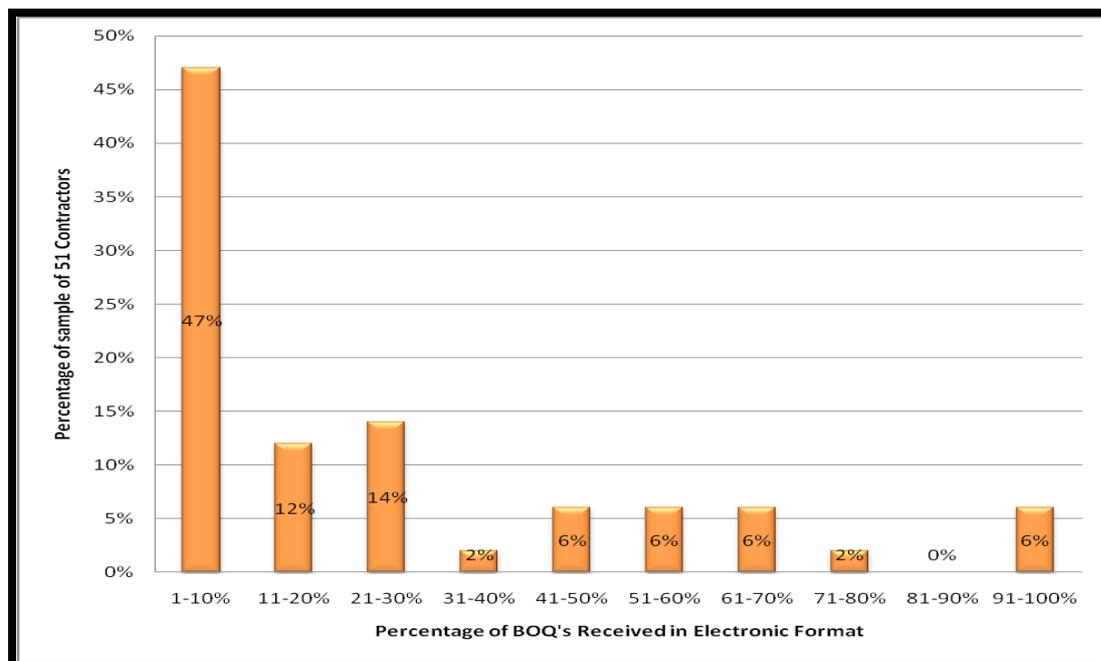
FIG. 3: Percentage of BOQ received in Electronic Form by Contractors in Northern Ireland

In order to compare with the usage statistics from other industries regarding usage versus organisation size, (Batenburg; 2007; Gunasekarana and Ngai, 2008), during analysis of the pilot study, the percentage of contracts received in electronic format was compared to the size of the companies. The organisation sizes analysed are 11-20, 21-50, 51-100 and over 100. There was one other organisation size 01-10. This was not analysed as only two responses from contractors were received from this group and a median value would have produced a false value. FIG. 4 shows that contractor size was not a factor in receiving electronic contract documentation. This would be expected as the tender documentation is more likely to be produced from the clients design team in a traditional contract. The median percentage of contract documentation received electronically was around 25% for all sizes of contractor.

Further data was gathered in the main study to see if this level was carried across the complete industry. Batenburg (2007) indicates in other industries, only 50% of the small firms complete more than 5% of their purchases online, while this percentage is a little lower among the larger firms. They state that this indicates "*that the size does determine the probabilities of e-procurement adoption but not the share of e-procurement in the total purchase process*". The findings of the survey reported in this research indicate the opposite is true in relation to construction contractors. The percentage by size remained around 25% for all sizes of contractors in relation to e-procurement adoption.
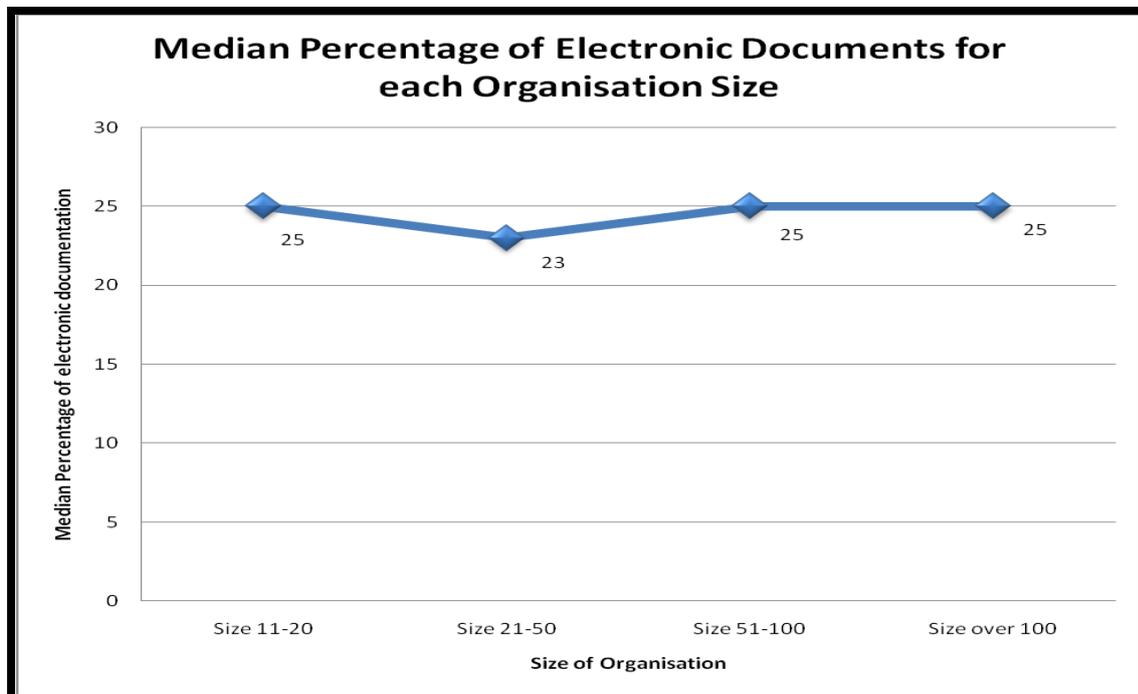
FIG. 4: Median Percentage of Electronic Contract documentation by Northern Ireland contractor size

However, when procurement spend is taken into consideration it indicated a difference in e-procurement uptake. The median percentage of electronic documents was examined against organisation procurement spend. It can be seen from FIG. 5 that the contractors that spend least and most on procurement use more e-procurement than those who spend between £1000 and £50,000 on procurement per annum. These findings were substantiated through comparison with the main study findings.

Median Percentage of Electronic Documents for Organisation Procurement Spend
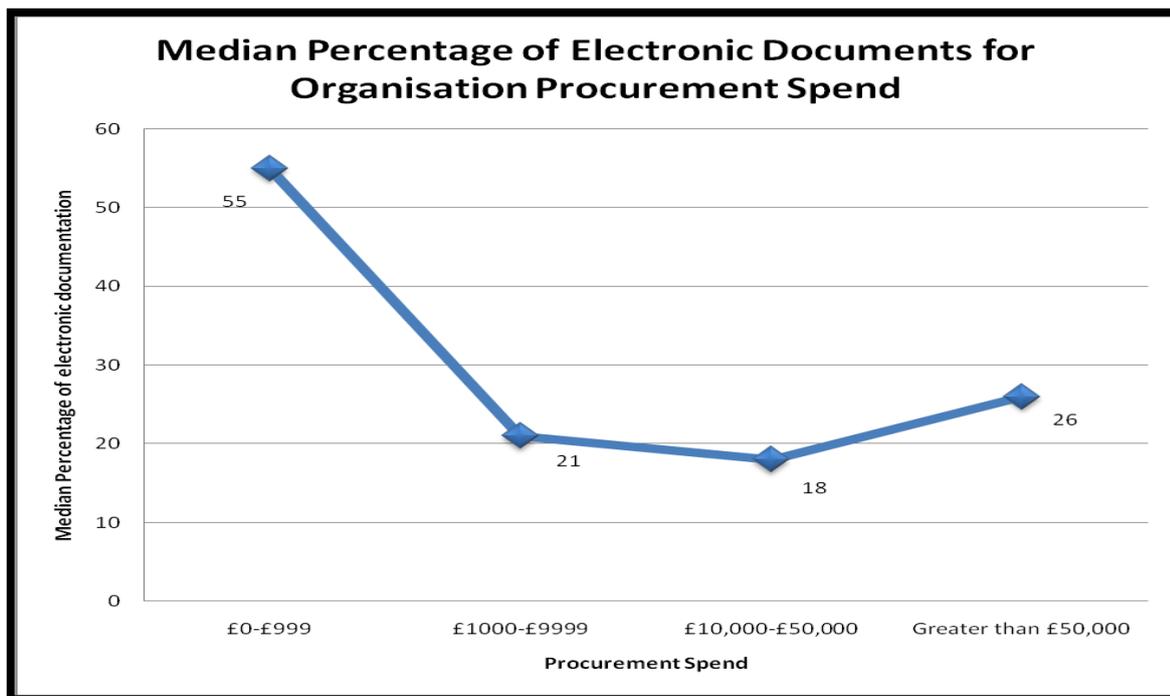
FIG. 5: Median Percentage of Electronic Documents for Organisation Procurement Spend (Pilot Study)

The conclusions that can be drawn from FIG. 5 are that smaller firms that rely on efficiency for survival and larger firms that have identified the cost savings that e-procurement in construction brings, have led the way in implementation of e-procurement. Batenburg (2007) cites Rogers (1983) in suggesting that larger organizations are more innovative. These findings would support that view. Smaller firms may only be tendering for work which is being provided electronically by government departments which may be reflected in the results shown in FIG. 5. Therefore organisations with an e-procurement product should target smaller organisations and larger organisations as they are most likely to buy the system that they are promoting.

6. USE OF ELECTRONIC CONTRACT DOCUMENTATION (UK WIDE) FROM MAIN STUDY

This section details the main study results and investigates e-procurement usage among professionals from the following disciplines, quantity surveyors, public sector clients, architects, private sector clients and consulting engineers. Following the phone survey, it was found that 135 organisations out of the 795 carried out e-procurement equating to 17% use UK-wide. This is similar to and corroborates the findings of Martin (2009) who showed that 20% of Quantity Surveyors used e-procurement. However, it is short of the European Commission (2007) average figure of 59% of organisations which have utilised e-business Technology across Europe. This shows that there is scope for large savings within construction if it manages to implement e-procurement on a par with other sectors.

The percentage response overall to the survey is 68%. Looking at external validity, Rubin and Babbie (2004) suggested ranked a 60% response rate for electronic surveys as good for generalisation, 70% as very good and 75% and above as excellent. It can be seen that the survey is between the good and very good categories and therefore the results can be generalised across the UK.

Organisations using e-procurement were asked to give their size by number of employees. This was compared with the percentage of Bills of Quantities produced in electronic form by organisation size. A similar breakdown of organisation size was used in the main study to that in the pilot study. This allowed comparison of the two studies in regards to the amount of e-procurement use by organisation size.
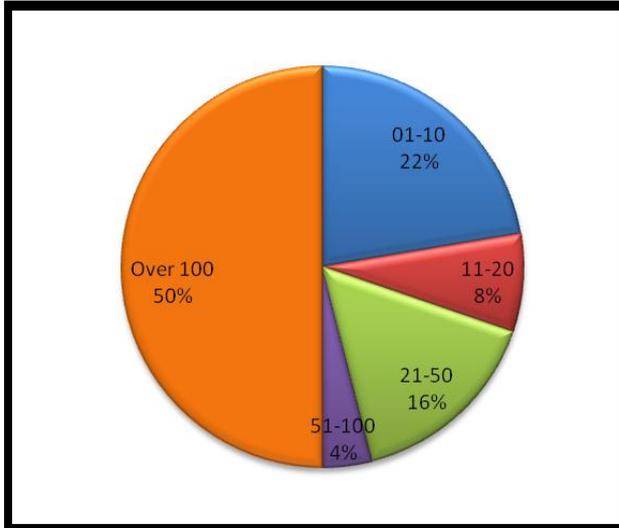
FIG. 6: Breakdown of organisation size in the Main Study sample returns

It can be seen that the organisation size in the main study contained 30% more large organisations with over 100 employees. This is to be expected as it contained many government departments which have a large number of employees. It can be seen from Figure 1 that large companies (over 100 employees) and micro companies (between 1 and 10 employees) lead the way in e-procurement adoption. These findings differ from the European Commission (2007) report on general e-procurement uptake which showed in Exhibit E-4 a progression from smaller companies who had least e-procurement adoption to larger companies which had most. This study however identifies that construction is performing differently with the largest and smallest organisations have adopted e-procurement the most. Further investigation in section 7 investigates the median percentage of uptake within the organisation.

7. PERCENTAGE OF ELECTRONIC CONTRACT DOCUMENTATION IN MAIN SURVEY

The complete main survey sample was analysed in regards to organisation size, amount of documentation received in electronic form and procurement spend. FIG. 7 demonstrates that within the main UK sample, a similar pattern emerges to the contractors in the pilot study with the majority of organisations across the disciplines in the UK, principally only receiving 1-10% of their Schedules of Rates/Bill of Quantities in electronic form. Forty-one percent (41%) of the 76 organisations are in this category. Similarities exist again in the following category where the next 22% are between 11-30%.
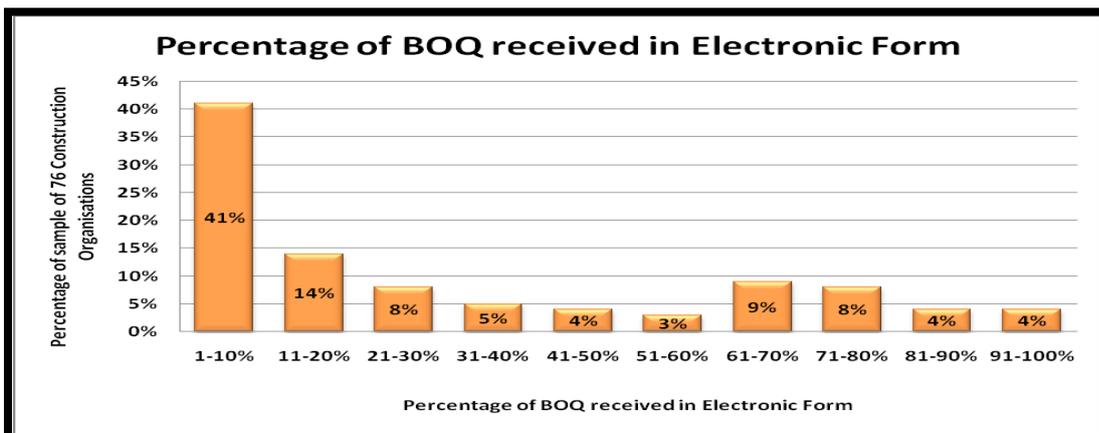
FIG. 7: Percentage of BOQ received in Electronic Form by Construction Organisations in UK

FIG. *8* shows that the median percentage of electronic documentation when the results are combined shows a very different picture to that of the contractors. FIG. 4 showed the median value remaining constant, the combined disciplines show that organisations with between 21-50 employees are the most likely to use e-procurement. Batenburg (2007) indicated that smaller organisations had a greater share of purchases on-line in the use of e-procurement (7% greater) than medium sized organisations across a range of industries. A similar scenario can be identified in construction from FIG. *8*. While the bandings that Batenburg (2007) used were 10-49, 50-250 and Greater than 250 and cannot be directly compared, FIG. *8* does indicate that the sum of the responses from organisations with less than 50 employees will be more than those with more than 50 employees. This supports Batenburg's (2007) view that smaller organisations make more use of e-procurement. Gunasekarana and Ngai (2008) carried out a similar study for Hong Kong. This study contained two construction organisations out of seventy-six. It too indicated that organisations with less than 50 employees were more likely to adopt e-procurement. The rate of adoption of e-procurement falls, larger the organisations become. However, the percentage difference is 2.6%, much smaller in the Gunasekarana and Ngai (2008) study compared to this research and Batenburg (2007).

The findings of this study indicate that within the construction industry the very small organisations are less likely to adopt e-procurement in construction than those in the 21-50 size group. The banding of 1-50 employees was used in Batenburg (2007) and Gunasekarana and Ngai (2008). This study recognising that within construction the organisation sizes are generally smaller split this into three sizes: 1-10, 11-20 and 21-50. The combination of the responses indicate that construction performs in a similar manner to other industries. However, it provides a fuller picture by indicating that the majority of these organisations are in the 21-50 size brackets. Griloa and Jardim-Goncalves (2010) support this view by stating that the AEC sector has been lagging behind other sectors in the adoption of e-procurement as procurement lacks structure within construction.
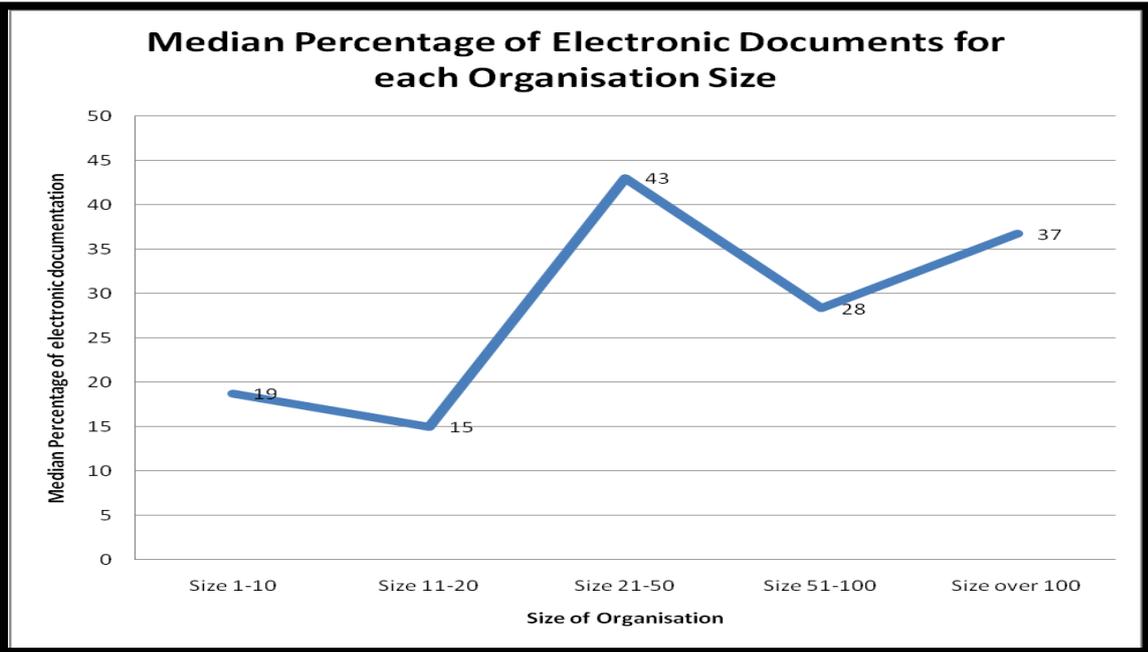
FIG. 8: Median Percentage of Electronic Contract documentation by organisation size

De Boer et al (2002) indicate that this is important in terms of e-procurement as the non-product related costs go up but the costs of executing tactical purchasing activities fall. It can be seen from FIG. *8* that these initial costs may be the reason for smaller organisations not carrying out e-procurement to the same level as larger ones.

A similar examination was carried out to the pilot study in regard to the median percentage of electronic documents against procurement spend. It showed a similar trend with organisations that spend most and least on procurement having the greatest median percentage of e-procurement. This provides further weight to Batenburg (2007) citing Rogers (1983) in suggesting that larger organizations are more innovative. FIG. 9 shows a very

large median percentage (76%) for those organisations with procurement spend greater than £50,000. It can be seen from FIG. 6 that 50% of the sample are companies with over 100 employees. These are more likely to have spent large amounts on procurement.

Kauffman and Mohtadi (2004) propose a trend in general e-procurement namely adoption of standard e-procurement platforms needs to assess costs and therefore risk tradeoffs for small and large firms. They suggest that smaller organisations tend to use open source rather than expensive solutions and larger firms have invested in state of the art solutions. The findings of this research would support that view in that organisations that spend most and least on procurement have the greatest median percentage of e-procurement.
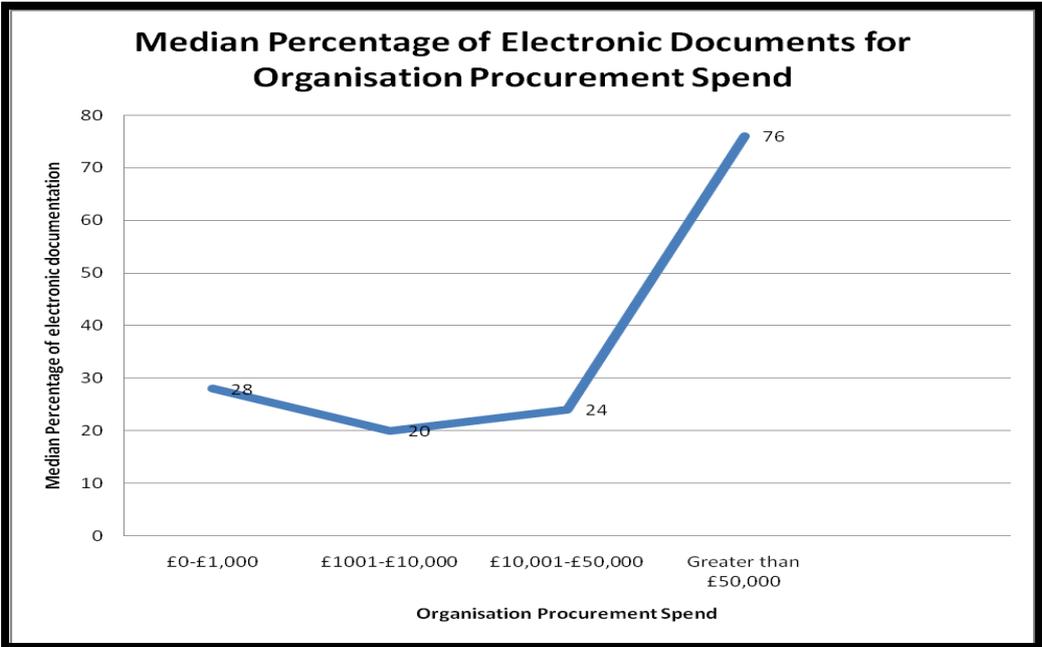
FIG. 9: Median Percentage of Electronic Documents for Organisation Procurement Spend (Main Study)

The testing by breaking the main study sample down into the different disciplines did not fully reflect a similar correlation between the sizes of companies. It did give an overall suggested median percentage for the amount of e-procurement for each of the disciplines. While the sample size is small for many of the disciplines it gives a guide to the e-procurement usage within each part of the construction industry.

TABLE 2: Median Percentage of Electronic Documentation for each organisation type

Organisation Type	Median Percentage of Electronic Documentation for those who use e-procurement	Sample Size
Government Procurement Officials	47%	12
Project Managers	45%	5
Contractors	34%	14
Quantity Surveyors	26%	25
Consultant (Other)	25%	5
Architect	19%	5
Clients	18%	9
Structural Engineer	15%	1
Total Sample		76

Table 2 shows the sample size and median percentage of electronic documentation. It shows that the public sector is leading the way as far as the amount of e-procurement is concerned. The sample of five project managers are split into three who work for the public sector (who were under the public sector clients' section but choose project manager as their personal role) and two who are in private sector practices (both were multi-

disciplinary organisations with quantity surveying/cost consultancy as their main forte). Within the project management grouping, it is the public sector project managers who use e-procurement to a greater degree thus moving the median percentage towards the figure shown for the Government Procurement Officials. The private sector lags behind the public sector in its use of e-procurement according to the survey findings. With the Glover report (Glover, 2008) seeking to establish electronic procurement in the public sector by the end of 2010 the gap between adoption in the public and private sectors could widen further.

8. CONCLUSIONS

This study, in the absence of direct comparators in the construction industry, investigated and compared e-procurement in construction with its implementation in other industries. The findings of this research broadly support the Griloa and Jardim-Goncalves (2010) and European Commission (2007) view that the AEC sector has been lagging behind other sectors in the adoption of e-procurement. The size of organisations which have implemented e-procurement within construction was identified. The results indicate that contractor size was not a factor for implementing e-procurement. However, on the client and consultant side in traditional contracts, company sizes of 21-50 employees make most use of e-procurement, followed by large companies (Over 100) then smaller companies (1-10). Companies between these sizes (11-20, 51-100) make less use of e-procurement in construction. This confirms that when comparing similar sized organisations, construction organisations perform in a similar way to their counterparts in other industries as illustrated in Batenburg (2007) and Gunasekarana and Ngai (2008). However, this study analysing in depth, indicates that very small companies (Micro level organisation) may still be put off by the costs of software (De Boer et al, 2002; Kauffman and Mohtadi, 2004).

This study corroborated Martin (2009) which indicated that in the construction industry less than 20% of the Quantity Surveying organisations carry out e-procurement. Martin (2009) investigated all the quantity surveying organisations who were members of the RICS. This study related only to the organisations that were part of the RICS on-line directory. This may mean that those organisations promoting themselves electronically were more likely to use electronic forms of procurement as the current research indicated only a slight increase to 25% for Quantity Surveying organisations surveyed. The average adoption rate across the industry is 27%, with government clients most likely to adopt e-procurement.

Table 2 further emphasises the difference in uptake between the public and private sectors. The private sector lags behind the public sector. The Glover report (Glover, 2008) by prescribing that all public sector procurement should be electronic by the end of 2010 may further extend this gap. The targets set for organisations being allowed to tender electronically for all public sector contracts by 2010 with no "paper only" tenders required after this date requires a large step change even within the public sector. This study indicates only 47% of government clients currently use e-procurement. Even this is short of the European Commission (2007) figure of 59% of organisations which have utilised e-business Technology across Europe. This indicates that there is potential for large savings within construction if it manages to implement e-procurement on a par with other sectors.

A further section of the study examined the amount spent on document preparation against the percentage of electronic documentation. It found that those who spent most and least on documentation were the most likely to have adopted e-procurement. This indicates that construction organisations are following the trend in general e-procurement suggested by Kauffman and Mohtadi (2004), where smaller organisations are using open source software to mitigate the cost barrier whereas larger organisations tend to purchase state of the art and bespoke systems. These findings are vital in future work in relation to the production of new systems and their location and pricing in the construction marketplace and the production of an e-procurement capability maturity model to increase e-procurement adoption across the construction industry.

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Telephone Questionnaire

Does your organisation carry out e-procurement in construction?

YES /NO

If YES

Would you be willing to complete a web-based survey on your use of e-procurement?

YES / NO

Contact Name / E-mail address …………………………………………………..

Main Questionnaire (Pilot and Main Study)

Q1: Contact position within the firm
Please write your answer here:

Q2: Please state organisation size

Please tick only one of the following:
    1-10
    11-20
    21-50
    51-100
    Over 100

Q3: Which of the following represent your / your companies / departments main role on projects?

Please choose only one of the following:
    Building Surveyors
    Project Manager
    Contractor
    Quantity Surveyor
    Architect
    Clients
    Structural Engineer
    Government Procurement Official
    Mechanical & Electrical Engineer
    Other

Q5: Please estimate your organisations procurement spend
Please enter the amount spent in formulating / pricing documents per year

Please tick only one of the following:

    £0-£999
    £1000-£9999
    £10,000-£50,000
    Greater than £50,000

Q6: Please state the percentage of tender documents your organisation receives / produces in electronic form

Please tick only one of the following:

    1-10%
    11-20%
    21-30%
    31-40%
    41-50%
    51-60%
    61-70%
    71-80%
    81-90%
    91-100%

Drivers to e-procurement

* Q7: Please rank the following Drivers for E-Procurement as they relate to construction

1 - No importance 5- High Importance	Please choose the appropriate response for each item:	1	2	3	4	5
	Process, Transaction and Administration Cost Savings	☐	☐	☐	☐	☐
	Service / Material / Product Cost Savings	☐	☐	☐	☐	☐
	Increasing Profit Margins	☐	☐	☐	☐	☐
	Strategic Cost Savings	☐	☐	☐	☐	☐
	Enhanced Inventory Management	☐	☐	☐	☐	☐
	Shortened Overall Procurement Cycle Times	☐	☐	☐	☐	☐
	Shortened Internal and External Communication Cycle times	☐	☐	☐	☐	☐
	Reduction in time through greater transparency (Less objections)	☐	☐	☐	☐	☐
	Reduction in Evaluation Time	☐	☐	☐	☐	☐
	Reduction in purchasing order fulfilment time - Contract Completion	☐	☐	☐	☐	☐
	Reduction in time through increased visibility	☐	☐	☐	☐	☐
	Increased Quality through increased	☐	☐	☐	☐	☐

competition					
Increased Quality through Benchmarking (Market Intelligence)	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Increased Quality through increased visibility in the supply chain	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Increased Quality through increased efficiency	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Increased Quality through increased competition	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Increased Quality through Improved Communication	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Gaining Competitive Advantage	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Increased Quality through increased accuracy (Elimination of errors through Computer use)	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Convenience of archiving completed work	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Develops the Technical Skills, knowledge and expertise of procurement staff	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

Barriers to e-procurement

* **Q8: Please rank the suggested Barriers to e-procurement:-**

1 - No importance 5 - High Importance

Please choose the appropriate response for each item:

Upper Management Support / Lack of Leadership	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Other Competing Iniatives	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Resistance to change	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Lack of a widely accepted e-procurement software solution	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Magnitude of Change	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Lack of a national IT policy relating to E-Procurement Issues	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Lack of Flexibility	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Bureaucratic dysfunctionalities	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Complicated procedures and extended relationships	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Lack of technical expertise	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Staff Turnover	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Lack of a forum to exchange ideas	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Company Access to the Internet	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Reluctance to "Buy-into" one off systems	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

Insufficient assessment of systems prior to installation	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Security in the process - Data transmission to the wrong person	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Confidentiality of Information - unauthorised viewing	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Prevention of Tampering with Documents - changes to documents	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Data Transmission reassembly - incorrect reassembly of data transmitted in packets	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Partial Data Display - incomplete documents provided	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Lack of Pertinent case law	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Different national approaches to e-procurement	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Proof of intent - electronic signatures	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Clarity of Sender and Tenderer Information	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Enforceability of Electronic Contracts	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Information Technology Investment Costs	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Perception of no Business Benefit Realised	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Internal and External interoperability of e-procurement software	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Lack of publicity / awareness of best practice solutions	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Investment in compatible systems	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5