The Feasibility and Rationale for using Early Contractor Involvement ECI in Northern Ireland

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Robert Eadie[1], Phillip Millar[1] Clare McKeown[1] and Mark Ferguson[1]
[1]School of the Built Environment,
University of Ulster, Newtownabbey, BT37 0QB
United Kingdom

Email: ***r.eadie@ulster.ac.uk; p.millar@ulster.ac.uk; c.mckeown@ulster.ac.uk; ferguson-b@email.ulster.ac.uk***

Abstract: The first project using Early Contractor Involvement (ECI), introduced by Highways Agency in 2001 has just commenced in Northern Ireland. The Nichols Report (2007) on the first five UK ECI schemes identified benefits and problems with ECI but admitted limited piloting and research. This research investigates these indicating that the timeline for delivery was the most important reason for choosing ECI. Ranking of benefits identify the top three to be *Improved Design Quality*, *Better Risk Management* and *Greater Trust and Understanding between Client and Contractor*. Cost savings and delivery of projects within budget through using this route are also confirmed. The building of greater trust and understanding between client and contractor is evidenced in 100% of cases and is an important by-product of choosing ECI. On the negative side the main barriers to ECI adoption are cultural, *client sharing* and *lack of embracing ECI by clients* are identified as the top two issues. The concluding section of the paper ranked ECI in relation to AEC critical factors identified from the OGC procurement guide documents (OGC, 2007a-k). *Integrated project team, risk and value management and integrated design* were the top ranked critical factors by the respondents, with *Roles and Responsibilities* and *focus on whole life costs* being the lowest in line with the findings of the Nichols (2007). This research indicates that the negative issues relating to ECI stated by Owen (2009) are not shared by practitioners with initial opinions and statistics on the use of ECI being very positive.

Keywords:- Government Procurement, Early Contractor Involvement

Biographical notes:

Robert Eadie is the Course Director for MEng/BEng Hons Civil Engineering at the University of Ulster. He holds a PhD in Art Design and the Built Environment with the topic being e-procurement in construction. His research focuses on procurement and pedagogy. He spent 20 years in industry prior to moving into research implementing e-procurement within a government department and sitting on the Northern Ireland Civil Service e-procurement strategy working group.

Phillip Millar is the Course Director for BSc Hons Civil Engineering (Geoinfomatics) at the University of Ulster. His research interests include application of GIS within construction and civil engineering disciplines including sustainable procurement, application of close range photogrammetry and pedagogy. He has held posts in public authority, private practice and further and higher education.

Clare McKeown is the Course Director for BSc Hons Construction Engineering and Management (part time course) at the University of Ulster. She holds an LLM specialising in Construction Law. Her research interests include procurement, PPP/PFI and dispute resolution. She spent 15 years in industry and has worked in the public sector on PFI procurement and contract management. She is a Chartered Arbitrator and has worked in construction dispute resolution in the private sector.

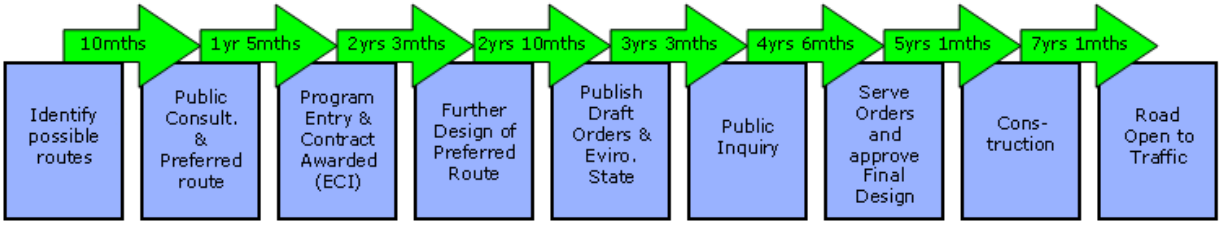
Mark Ferguson has worked in Government for Central Procurement Directorate, a Centre of Procurement Expertise (COPE) in Northern Ireland for a number of years. His undergraduate degree in Civil Engineering is from the University of Ulster.

1. BACKGROUND AND INTRODUCTION

Early Contractor Involvement (ECI) was introduced by Highways Agency (HA) in 2001 (Bourn, 2007). However, Nichols (2007) suggests ECI was implemented with limited piloting or research into this form of procurement and identified this limited knowledge and understanding of ECI as one of the barriers to greater ECI implementation. Despite this lack of research the Department of Regional Development Roads Service within Northern Ireland has started the first Early Contractor Involvement (ECI) project (A5WTC, 2010). This is in an effort to involve contractors at an earlier stage than the traditional procurement process and ensure contractors have a more active role to play in the route planning and development of the infrastructure scheme.

This decision was made in an effort to eradicate the 'bid low, claim later' attitude encouraged by traditional contracts which ultimately led to the growth of adversarial relationships between HA and the suppliers (Bourn, 2007; Wolstenholm, 2009). HA tried other procurement routes in an attempt to address this problem such as Design, Build, Finance and Operate (DBFO) and Design and Build (D&B) before adopting ECI (Nichols, 2007). A typical timescale and process of an ECI scheme is outlined in Figure 1.

Figure 1Typical process and timeline for an ECI scheme (Bourn, 2007)



Since the start of the A500 Stoke Road / City Project in 2001, HA have procured a further 68 schemes by ECI however, and by 2007 only 5 schemes were classified as complete (Highways Agency, 2010; Nichols, 2007). In 2009 there were 14 completed ECI schemes within the UK, and the majority of the UK Schemes came in under budget (Owen, 2009). The National Roads Authority in the Republic of Ireland has closely followed developments in the UK in relation to ECI and it was only a matter of time before the concept found its way to the Republic of Ireland (Stowe, 2005). The N8 Cashel / Mitchelstown project was completed in July 2008 and had previously been procured through ECI (Stowe, 2005). The Irish government has also made a funding commitment to the A5 Western Transport Corridor as it will improve transport, trade and tourism to and from Londonderry and further west to Donegal (A5WTC, 2010). This research collected data from both UK schemes and the single scheme in the Republic of Ireland procured in this manner.

The theory behind using the procedure is that ECI will result in added value for money and hence, best value for taxpayer's money by providing a mechanism for additional input from contractors during the early stages of the infrastructure development process. It is suggested that the improvements may come as a result of innovative solutions, better project control, and savings on time and money.

Nichols (2007) was positive regarding the ECI process and wholly recommended its continued use, but warned that Highways Agency need to take urgent action to improve their delivery

capabilities. A summary of the findings of the Nichols Review (Nichols, 2007) in relation to suggested benefits and problems with ECI is outlined below. This research ranks the importance of each.

Suggested benefits of ECI identified by Nichols (2007)

1. It allows the contractor to impact on planning decisions and design development at the start of the project which is the most beneficial time.
2. It has the potential to reduce preparation time by 30-40%, (up to 3 years has been suggested) by allowing progression of packages of the development to occur simultaneously rather than sequentially.
3. It affords cost certainty, after the Target Price is decided.
4. It increases innovation by expediting value management and value engineering which can result in major cost and time savings.
5. It removes an element of adversarialism as client and supplier work as a team resulting in an open and honest process.
6. It includes an element of open book accounting which facilitate cost tracking throughout the project cycle leading to greater cost control.

The disadvantages of the ECI process identified by Nichols(2007) can be summarised as follows:

1. ECI was adopted as a preferred procurement option with little research or piloting.
2. With teamwork to the fore in ECI there is a significant difference in culture needed to achieve success in an ECI project for those who have experience of D&B contract. HA still need more recruitment and training to embrace fully the cultural needs of ECI.
3. Lack of training in ECI has been carried out resulting in a lack of commitment from HA staff at all levels. It has been suggested that the results indicate that the HA lack the ability to *set sensible budgets, challenge Target Prices and manage the process effectively*.
4. Duplication of costs occurred at early design stage in some schemes.
5. Incorrect cost estimates have resulted in the initial incentivising mechanisms failing to produce as the pain/gain incentive formula operates properly only if the early cost estimate is correct.

Achieving Excellence in Construction (AEC) guidance and the NI Construction Procurement Guide identify the following as critical factors to a successful project (DFP, 2006; OGC, 2007a-k as mapped below):

- Leadership and commitment from the project's Senior Responsible Owner (SRO) (OGC, 2007a; OGC, 2007b)
- Involvement and incentives for key stakeholders throughout the project (OGC, 2007c; OGC,2007e; OGC, 2007f)
- Roles and responsibilities clearly understood by everyone involved in the project, with clear communication lines (OGC, 2007a)
- An integrated project team consisting of client, designers, constructors and specialist suppliers, with input from facilities managers/operators (OGC, 2007f; OGC, 2007i)
- An integrated process in which design, construction, operation and maintenance are considered as a whole (OGC,2007c; OGC,2007i)
- Design that takes account of functionality, appropriate build quality and impact on the environment (OGC, 2007a; OGC,2007i)

- Commitment to excellence in health and safety performance (OGC, 2007c; OGC, 2007e; OGC,2007j)
- Procurement and contract strategies that ensure the provision of an integrated project team (OGC, 2007e; OGC, 2007f)
- Risk and value management that involves the entire project team, actively managed throughout the project (OGC,2007c; OGC, 2007d; OGC, 2007e; OGC, 2007f; OGC,2007g)
- Award of contract on the basis of best value for money over the whole life of the facility, not lowest tender price (OGC,2007g)
- Commitment to continuous improvement (OGC,2007e, OGC, 2007f; OGC, 2007h)
- Commitment to best practice in sustainability (OGC, 2007i, OGC,2007j)

This research is the first to rank these critical factors in relation to ECI.

Song et al (2009) comment that the people involved in ECI projects, which have been successfully delivered, have a wealth of knowledge and experience to share with the industry and could help provide a better understanding of the ECI process. Therefore the aim of this research will be to identify the importance of each positive and negative of ECI within completed ECI schemes.

2. RESEARCH METHODOLOGY.

In order to tap into this wealth of knowledge and experience one of the key criteria for this survey required the participants to have been active and key members of an Integrated Project Team (IPT) on a completed ECI project. Owen (2009) stated that there were fourteen completed ECI schemes within the UK by 2009 with sixty-eight schemes currently being progressed. There has been only one completed ECI scheme in Ireland. So, from 2007 to 2009 nine schemes were completed (Nichols, 2007; Owen, 2009).

For Highways Agency ECI projects the IPT roles breakdown into three areas, Client, Consultant and Contractor (Mosey, 2009). However, the study needed to factor in the number of different representatives on an ECI scheme. Fifteen schemes by three roles giving a population of forty-five is too simplistic. Therefore reasonable assumptions have to be made based on literature (Oppenhiem, 2001; Bryman, 2004).

Full-time IPT members are usually the Project Manager (PM), contractor and consultants (OGC, 2007). The client roles are generally part-time within a project and therefore it can be assumed that Senior Responsible Officers (SROs) and Project Sponsors (PSs) could have worked on five to six schemes (OGC, 2007). These figures are supported by Bourn (2007) who stated that 80% of ECI schemes had been awarded to seven contractors, one of which had been awarded 20% of the schemes. It was assumed that there would be at least 3 representatives from the contracting side on the IPT and two from the consultants giving a total population in the region of 70 people. A web-based search relating to ECI schemes identified subjects involved in ECI. Inquiries were made by telephone and email and suitable personnel identified who were willing to participate in research. Of those who were contacted many were unwilling to take part in the research. However, 27 people agreed (equating to approximately two fifths of the total population) and an electronic questionnaire was sent to each of these. On receipt of the questionnaire two withdrew, of the remaining 25, 14 completed responses were returned to the MYSQL database linked to the Limesurvey™ questionnaire for analysis. This achieved a 56% response rate. Based on

Mangione, (1995) and Ruben and Babbie (2004) acceptable and unacceptable response rates are defined as follows; <50% - Unacceptable, 50-59% - Acceptable, 60-69% - Good, 70-84% - Very Good, >85% - Excellent. Therefore the response was in the acceptable category.

Chan and Kumaraswamy (2001), identify a method for calculating relative importance index (RII). This paper uses a similar method to establish the respondent's opinion on the importance of each element of the ECI process. RII is defined by the following formulae:-

$$Relative\ Importance\ Index(RII) = \frac{\sum W}{A\ x\ N}\ (0 \leq index\ \leq 1)$$

Where:
W is the weighting given to each element by the respondents. This will be between 1 and the number of attributes being investigated, where 1 is the least significant element and the largest number of attributes is the most significant element;
A is the highest weight; and
N is the total number of respondents.
The closer the RII is to 1 the more important the result.

3. FINDINGS

The organisations involved in ECI were asked about their size. All but one had over 500 employees. The other one had between 100 and 500 employees. This indicates that only large organisations appear to be carrying out this type of work.

3.1 Findings on reasons for using ECI as a procurement route

The next question ascertained the reasons for using ECI. Firstly, by using multiple choices the participants were asked to identify the reasons for using ECI and secondly they had to rank the options provided from most important to least important. The rankings provided by the respondents were used to calculate the RII for each option as well as identifying the most common choices.

Table 1Reasons for choosing ECI as a procurement route

Rank	Relative Importance Index (RII)	Reasons for Choosing ECI as a Procurement Route	Percentage choosing this option as a reason
1	0.77	Timeframe for Delivery	42.86%
2	0.69	Complexity of Project	50.00%
3	0.60	Scale of Project	21.43%
4	0.50	Value of Project	14.29%
5	0.45	Organisation / Company Policy	28.57%
6	0.39	Funding Arrangements	14.29%
		Other	28.57%

Table 1 identifies the key reason for choosing ECI as the timeframe for delivery of the scheme. However, the most common reason was the complexity of the project. ECI is the preferred option for HA (Nichols, 2007) explaining why Organisation / Company Policy is the third most common reason. However, respondents are aware that it is not a vital reason for using ECI. The

rank of 5 out of 6 suggests agreement with the decision taken by Highways Agency in 2009 to no longer use ECI as an automatic choice for procurement (Owen, 2009).

3.2 Findings on costs related to using ECI as a procurement route

Target Cost was identified as being used by all the participants as part of the ECI schemes they had been involved with. The lowest Target Cost value was £11.5m and the highest was £270m and the combined value of ECI schemes was £1,625m with an average Target Cost of £125m. When asked how the project performed it was found that 30.77% met the target cost, with 61.54% coming in under target cost and 7.69% going over target cost.

Nichols (2007) assessment of ECI was that once the Target Cost was agreed ECI had the capability to deliver these schemes within budget. Owen (2009) also comments that the majority of ECI schemes are delivered within budget. This research agrees with these opinions and finds that 92.31% of ECI schemes that respondents had worked on were delivered within budget.

The final cost figures provided by respondents for the schemes indicate a reduction in price through implementing ECI. The highest final cost was £268m and the lowest final cost was £10.4m. The combined final cost for all the schemes was £1607m with an average final cost of £123.7m. Therefore, when compared with the Target Costs for these ECI schemes a total saving of £18m has been made with an average saving of £1.3m per scheme. These results are significant as Egan (1998) set targets for the construction industry to deliver cost certainty. Construction Excellence (2009) indicates that the UK construction industry delivered 48% of projects on cost or better, while 88% of demonstration projects were delivered on cost or better. ECI delivered 92.31% of schemes on cost or better and therefore clearly provides a high level of cost certainty when compared with the industry's overall performance.

Impacts of the use of target cost in terms of time on the scheme were investigated. Figure 1 shows that the target cost enabled 92.86% of the projects to be delivered within time. This is a significantly better performance than the construction industry overall which delivered 45% of projects on time (Construction Excellence, 2009). The target cost ensured the client and contractor worked together on 85.71% of the projects. In terms of quality 85.71% of projects were delivered to the required standard and the use of target cost led to 71.43% of projects experiencing cost savings through innovation. Significantly none of the projects experienced adversarial relationships which provide support to those with the opinion that ECI can break down and overcome the culture of adversarialisim in the UK construction industry (Mosey, 2009).

Table 2 Impact of Target Cost

Impact of Target Cost	**Achieved by % of ECI contracts**
Project delivered within time	92.86%
Project delivered to the required quality	85.71%
Client and Contractor worked together to obtain target cost	85.71%
Innovation within scheme led to cost savings	71.43%
Contractor happy with profit made	64.29%
Client happy with savings made	57.14%
Contractor incentivised to early completion	50.00%
Contractor unhappy due to lack of profit	14.29%
Contractor unhappy at not obtaining value for money	7.14%
Development of adversarial relationships	0.00%

Finally, within the Target Cost section participants were asked if they believed Target Cost was essential to the ECI process with 79% responding yes, further research is required in order to identify their reasons. Overall, ECI clearly has a positive impact on target cost delivering significant savings and reducing adversarial relationships. However, how the project performs against the target cost is only highlighting savings made throughout the construction phase. One participant noted that ECI saved the client £2.1m during the design phase and therefore, the target cost was set at £11.5m instead of £13.6m. The participant provides the final construction cost of this project as £10.4m leading to a total saving to the client of £3.2m. The £2.1m identified by this participant during the design phase is not included in the total £18m of savings identified by target cost.

3.3 Findings on the general benefits of using ECI as a procurement route

Participants were asked to choose which benefits of ECI were realised on their scheme and to rank the options from most important to least important. The RII was then calculated for each option to identify their importance. Table 3 indicates the most common benefits and presents these in RII rank order. The most commonly achieved benefits within the projects were identified as greater trust and understanding between client and contractor with 100%, better risk management followed with 92.86%, improved design quality with 71.43% and reduced timeframe also with 71.43% followed.

Table 3 Benefits of ECI

Rank	RII	Benefits of ECI as a Procurement Route	Percentage choosing this option as a benefit
1	0.78	Improved Design Quality	71.43%
2	0.73	Better risk management	92.86%
3	0.70	Greater trust and understanding between client and contractor	100.00%
4	0.66	Reduced Timeframe	71.43%
5	0.59	Increased Value for money	64.29%
6	0.52	Improved Build Quality	42.86%
7	0.45	Improved Production and supply	64.29%
8	0.42	Better Project Administration	42.86%
9	0.29	Increased Contractor Profit	21.43%
10	0.29	Improved Contractor Cash Flow	28.57%

Improved design quality was identified as the most important benefit facilitated by ECI, closely followed by better risk management. This indicates that the findings of Bennett and Pearce (2006) and Mosey (2009) for general procurement that the earlier the appointment of the contractor and design team the more successful the design process and risk management will be hold good for ECI. Song et al (2009) also acknowledge that the early involvement of the contractor during the design phase improves relationships between the contractor, client, consultants and stakeholders. The findings of this research indicate that 100% of respondent's schemes achieved greater trust and understanding within the project team. This suggests that, ECI can successfully break down adversarial relationships agreeing with Mosey's (2009) findings for general construction procurement. In some of the qualitative feedback received one of the respondents stated: "*ECI broke down traditional adversarial barriers to success."*

3.4 Findings on the scheme specific positive impacts of using ECI as a procurement route

Respondents were also asked to identify what positive impact the benefits of ECI in Section 3.3 had within their specific project. Table 4 presents a list of positive impacts and the percentage of ECI projects they were achieved in.

Table 4 Positive impacts of ECI

Positive Impact of ECI	**Achieved by % of ECI contracts**
Contractor knowledge lead to innovation within the design stage	92.86%
Contractor knowledge identified buildability problems at the design stage	92.86%
Risks were clearly identified and passed to / shared with the contractor	92.86%
Contractors knowledge was beneficial in dealing with public inquiries and statutory processes	85.71%
Contractors knowledge provided accurate estimates of cost throughout the project	78.57%
Overlapping of design and construction stages lead to a reduction in time	78.57%
Contractors knowledge of design led to improved productivity throughout construction	71.43%
Contractors knowledge of design led to improved Health and Safety performance	57.14%
Specialist suppliers input at design stage led to innovation	50.00%
Specialist suppliers input at design stage identified buildability problems	42.86%

The top three positive impacts of ECI identified in Table 4 by the participants occur during the preconstruction phase. ECI facilitated innovation during design, identification of buildability problems during design and successful management of risks in 92.86% of projects. This is in agreement with Mendelshon (1997) who notes that construction knowledge introduced at the early planning and design stages maximises the benefits to the scheme.

Another significant positive impact of ECI was identified by 85.71% of schemes which benefited from the contractors early involvement during the public inquiry and statutory process. Song et al (2009) also concluded that contractor involvement during design delivered a reduction in construction time and increased productivity. This research provides further confirmation from an enhanced number of ECI schemes that Song et al (2009) findings were correct as 78.57% delivered a reduction in time and 71.43% achieved increased productivity.

3.5 Findings on the problems in using ECI as a procurement route

Analysis of the responses shown in Table 5 indicates that the main problems in an ECI project are reluctance from the client to embrace the cultural change required for ECI, reluctance from client to share vital information and the large time and labour commitment required from the client and contractor. These findings from additional ECI schemes endorse of the findings of Nichols (2007) who recognised that the lack of training provided for staff by HA suggested that there was a reluctance to embrace ECI. Song et al (2009) also highlights the need for a better understanding of ECI to enable it to be fully embraced by all. In the qualitative section the following was provided by one of the respondents and clearly identifies the reason for these risks *"Above all ECI is a mindset / culture. Currently clients may invite contractors to tender ECI*

contracts without first committing key staff to the concept of ECI. Unless key staff from both sides are committed to ECI then it will be difficult to get their full attention and time."

Table 5 shows the full results for the problems with ECI identified by the survey in rank order. It is seen that the most common problem experienced on 42.86% of respondent's projects was the cost of project administration. While this is not recognised by the survey as a significant problem (less than 50% of schemes encountered it) it is, however, directly linked with the third most serious risk and second most common problem, which is the labour and time commitment required from both client and contractor staff. This occurred on 35.71% of ECI projects. Mosey (2009) acknowledges this problem with ECI, particularly on small or simple projects which may not justify the time commitment required from senior staff.

Table 5 Problems with ECI as a procurement route

Rank	RII	Problems with ECI as a Procurement Route	Percentage choosing this option as a problem
1	0.76	Reluctance from client to embrace the culture change required for ECI.	21.43%
2	0.67	Reluctance from client to share vital information.	7.14%
3	0.64	Large time and labour commitment required from client and contractor.	35.71%
4	0.58	An "us verses them" attitude can occur when a company's business conditions change.	7.14%
5	0.56	Reluctance from contractor to embrace the culture change required for ECI.	7.14%
6	0.55	Lack of price competition.	14.29%
7	0.54	Correct project administration is costly	42.86%
8	0.52	Uneven levels of commitment from the companies can lead to technical, cost and time problems.	14.29%
9	0.46	Reluctance from contractor to share vital information.	7.14%
10	0.34	Contractor reluctant to provide open book accounting.	0.00%

3.6 Findings on ranking ECI against the AEC critical factors

Respondents were asked to rank a number of attitude statements based on the AEC Critical Factors for a successful project stated earlier. The Chan and Kumaraswamy (2001) formula for the RII was again used to calculate how applicable ECI was in the delivery of these success factors. The results are shown in Table 6.

Table 6 ECI rankings against AEC critical factors

Rank	RII	AEC Critical Factors for a Successful Project	% choosing this factor achieved by ECI	% choosing this factor hindered by ECI
1	0.94	Providing an integrated project team that work together to reduce waste, improve quality, innovate and deliver the project.	100.00%	0.00%
2	0.91	Carrying out effective risk and value management which involves the whole project team and is actively managed throughout the project.	78.57%	7.14%

Rank	RII	AEC Critical Factors for a Successful Project	% choosing this factor achieved by ECI	% choosing this factor hindered by ECI
3	0.90	Providing a design that takes account of functionality, appropriate build quality and impact on the environment.	92.86%%	0.00%
4	0.87	Providing an integrated process in which design, construction, operation and maintenance are considered as a whole.	78.57%	0.00%
5	0.87	Involving key stakeholders throughout the project.	100.00%	7.14%
6	0.86	Providing commitment to excellence in health and safety performance.	92.86%	0.00%
7	0.84	Providing an appropriate Procurement route and strategy for the scale and value of the project.	64.29%	14.29%
8	0.81	Providing a design which delivers whole-life value for money.	71.43%	7.14%
9	0.81	Providing leadership and commitment from the projects Senior Management.	78.57%	7.14%
10	0.80	Providing personnel in the key roles that have the appropriate skills and capabilities to carry out their tasks.	100.00%	7.14%
11	0.80	Providing and identifying clear lines of communication.	78.57%	7.14%
12	0.79	Defining clear objectives and success criteria at the start of the project.	85.71%	21.43%
13	0.79	Providing a focus on whole life costs and quality to deliver best value for money.	50.00%	35.71%
14	0.74	Identifying clear roles and responsibilities which are clearly understood by everyone involved in the project.	78.57%	14.29%

Integrated project team, risk and value management and integrated design were the basis of the top ranked critical factors by the respondents, with roles and responsibilities and focus on whole life costs being the lowest in line with the findings of the Nichols (2007) on the first five ECI schemes in the UK. One hundred per cent (100%) of respondents projects successfully achieved; integration of the design team, involvement of stakeholders and the provision of skilled personnel in key roles. Integration of design and commitment to health and safety were achieved on 92.86% of projects. When asked why ECI enabled the delivery of these critical factors one of the participants commented: "*Bringing the Contractor in early builds an effective project team, provides good communication and identifies and manages problems early"*

These results and the additional comment agree with Bennett and Jayes (1998) findings generally in procurement who show that the good relationships which are established early within a contract are beneficial when carrying out activities such as identifying the aims and objectives of clients and stakeholders, risk management, value management and engineering. They further show that ECI performs in the same way as other procurement routes in this regard. ECI also enables the contractor to contribute their construction knowledge and experience to the design in order to obtain best value (Song et al, 2009).

Providing a focus on whole-life costs was only achieved on 50% of projects and more significantly was hindered on 35.71% of projects. Nichols (2007) comments that the focus of ECI projects is on the capital cost and while whole-life costs are important within a project there is *no incentive for the contractor to trade-off capital cost against maintenance or operational*

costs. Broome (2002) however highlights that the contractor can be incentivised to achieve whole-life savings but based on the findings of this research ECI does not benefit the delivery of whole-life costing.

Overall, all the participants were satisfied with the ECI process and note that ECI successfully delivered the majority of the critical factors for success and did not significantly hinder the delivery of any. However, some of the comments note that any issues that did occur were not directly related to the ECI process but individuals not embracing the new culture. One comment suggests that this could happen on any project particularly one embracing a new process such as ECI. Nichols (2007) and Song et al (2009) also agree with this and recognise that the biggest barrier is the lack of understanding of, and commitment to, the ECI process by the people implementing it. This investigation into further ECI schemes provides confirmation that the initial assessments in other literature appear to be correct.

The final question of the questionnaire asked if the participants project was a success and to provide an explanation why. One hundred percent (100%) identified the project as a success. The comments provided identified the provision of strong partnership and teamworking as key to success in addition to the contractors contribution throughout the preconstruction phase contributing to significant cost savings. One participant summed up the benefits by stating: *"It did what it said on the tin. ECI- Early involvement, more informed statutory procedure, less change at detailed design stage and early completion to quality and price targets."*

4. CONCLUSIONS

The paper identified the timeline for delivery as the most important reason for choosing ECI. This was followed by the complexity of the project. The paper proves for the first time that the two main reasons suggested by the Nichols report (2007) namely timeliness and innovation through value engineering and value management have followed through and clients are choosing this route on the basis of the results of Government procurement advice. However, the substantially lower values of those who chose these reasons indicate that not all of those involved in ECI are aware of the policy background information.

The findings from the additional projects considered in this research support the cost savings and delivery of projects within budget identified for the first five UK ECI projects by Nichols (2007). The paper investigated figures for the target cost and compared this initial estimated cost with the final cost of the schemes. The findings indicated a saving of £18million on completed schemes to date with an average saving of £1.3million per scheme. As a consequence of these results it can be seen that ECI promotes cost savings and has only exceeded the target in 7.69% of schemes to date. This relates to the construction stage, however, some respondents highlighted savings of £2.1 million in the design phase.

The benefits of ECI were identified and ranked. This ranking indicated that if adopted the most important benefits of ECI are improved design quality, better risk management and greater trust and understanding between client and contractor. The findings of Bennett and Pearce (2006), Mosey (2009) and Song et al (2009) are therefore confirmed and extended. The building of greater trust and understanding between client and contractor is evidenced in 100% of cases and is an important by-product of choosing ECI. Other benefits identified in adopting the ECI route indicated that it increased innovation and buildability, and ensured that risks were correctly identified and dealt with in 92.86% of cases. This research provides further confirmation from an

enhanced number of ECI schemes that Song et al (2009) findings were correct as 78.57% delivered a reduction in time and 71.43% achieved increased productivity.

On the negative side the lack of cultural change is identified as the main barrier to ECI adoption with both client sharing deficiencies and lack of embracing ECI by clients identified as the key issues. This agrees with Nichols (2007) who identified a lack of training and showed this had resulted in a lack of willingness to adopt ECI. However, it indicates that in more recent projects that this issue is still prevalent. It is therefore suggested as a result of this research that training in ECI is provided by Government Departments. Staffing issues are identified as the third highest barrier due to the large time and labour commitment required from client and contractor.

The concluding section of the paper ranked ECI in relation to AEC critical factors defined in the OGC procurement guide documents (OGC, 2007a-k). Integrated project team, risk and value management and integrated design were the top ranked critical factors by the respondents, roles and responsibilities and focus on whole life costs being the lowest in line with the findings of the Nichols (2007). The benefits are in line with Government policy with the exception of a low figure for whole life costs. Further research is required to establish how whole life costing can be incorporated into the ECI process.

This research indicates that the negative issues relating to ECI stated by Owen (2009) are not shared by practitioners. Additional research may be necessary once more schemes have been completed to increase the sample size. However, this research confirms that initial opinions and statistics on the use of ECI are very positive.

5. REFERENCES

A5WTC. 2010. *Roads: A5 Western Transport Corridor (A5 WTC)*. (Available on-line at: http://www.graham.co.uk/whatwedodetail/12/50/a5-western-transport-corridor-a5-wtc.aspx?expanddiv=slide_12,slide_11 [Accessed August 2011]).

Bennett, J., Jayes, S. 1998. *Seven Pillars of Partnering*, Thomas Telford, London.

Bourn, J. 2007. *Estimating and Monitoring the Costs of Building Roads in England*, Department of Transport, National Audit Office, London. (Available on-line at: http://www.official-documents.gov.uk/document/hc0607/hc03/0321/0321.asp [Accessed August 2011]).

Broome, J. 2002. *Procurement Routes for Partnering: A Practical Guide*, 1st Edition, Thomas Telford Publishing, Thomas Telford Ltd.

Bryman, A. 2004. *Social Research Methods*, 2nd Edition, Oxford University Press, Oxford.

Chan, D. and Kumaraswamy, D. 2001. *A comparative study of causes of time overruns in Hong Kong construction projects*. In International Journal of Project Management. Vol. 15 No.(1). Pp. 55-63.

Construction Excellence 2009. *UK Industry Performance Report - Based on the UK Construction Industry Key Performance Indicators*, Construction Excellence for Department for Business Enterprise & Regulatory Reform, London. (Available on-line at: http://www.constructingexcellence.org.uk/news/pdf_news_articles/KPIv6.pdf [Accessed August 2011]).

DFP 2006. *Construction Procurement: Guide to Client Advisor and Project Management Service Delivery*, Central Procurement Directorate, Department of Finance and Personnel, Belfast.

Highways Agency 2010. *A500 City Road & Stoke Road Junction Improvement*, (Available on-line at: http://www.highways.gov.uk/roads/projects/5340.aspx [Accessed August 2010]).

Mangione, T.W. 1995. *Mail Surveys: Improving the Quality*, Applied Social Research Series Vol. 40, Sage, Thousand Oaks, California.

Mendelsohn, R. 1997. The *Constructability Review Process: a Constructor's Perspective***.** In ASCE Journal of Management in Engineering. Vol. 13, No. 3, May/June 1997, Pp. 17-19.

Mosey, D. 2009. *How to be good when times are bad: early contractor involvement*, (Available on-line at: http://www.building.co.uk/legal/how-to-be-good-when-times-are-bad-early-contractor-involvement/3135802.article#ixzz0gamXqvpv [Accessed August 2011]).

Nichols, M. 2007. *Review of Highways Agency's Major Roads Programme*, Report to Secretary of State for Transport, The Nichols Group, London. (Available on-line at: http://www2.dft.gov.uk/pgr/roads/nicholsreport/nicholsreport.pdf [Accessed August 2011]).

OGC 2007a. *Achieving Excellence Guide 01 - Initiative into Action*, Office of Government Commerce, London. (Available on-line at: http://www.ogc.gov.uk/documents/CP0061AEGuide1.pdf [Accessed August 2011]).

OGC 2007b. *Achieving Excellence Guide 02 – Project Organisation*, Office of Government Commerce, London. (Available on-line at: http://www.ogc.gov.uk/documents/CP0062AEGuide2.pdf [Accessed August 2011]).

OGC 2007c. *Achieving Excellence Guide 03 – Project Procurement*, Office of Government Commerce, London. (Available on-line at: http://www.ogc.gov.uk/documents/CP0063AEGuide3.pdf [Accessed August 2011]).

OGC 2007d. *Achieving Excellence Guide 04 – Risk and Value Management*, Office of Government Commerce, London. (Available on-line at: http://www.ogc.gov.uk/documents/CP0064AEGuide4.pdf [Accessed August 2011]).

OGC 2007e. *Achieving Excellence Guide 05 – The Integrated Project Team*, Office of Government Commerce, London. (Available on-line at: http://www.ogc.gov.uk/documents/CP0065AEGuide5.pdf [Accessed August 2011]).

OGC 2007f. *Achieving Excellence Guide 06 – Procurement and Contract Strategies*, Office of Government Commerce, London. (Available on-line at: http://www.ogc.gov.uk/documents/CP0066AEGuide6.pdf [Accessed August 2011]).

OGC 2007g. *Achieving Excellence Guide 07 – Whole-Life Costing*, Office of Government Commerce, London. (Available on-line at: http://www.ogc.gov.uk/documents/CP0067AEGuide7.pdf [Accessed August 2011]).

OGC 2007h. *Achieving Excellence Guide 08 – Improving Performance*, Office of Government Commerce, London. (Available on-line at: http://www.ogc.gov.uk/documents/CP0068AEGuide8.pdf [Accessed August 2011]).

OGC 2007i. *Achieving Excellence Guide 09 – Design Quality*, Office of Government Commerce, London. (Available on-line at: http://www.ogc.gov.uk/documents/CP0069AEGuide9.pdf [Accessed August 2011]).

OGC 2007j. *Achieving Excellence Guide 10 – Health and Safety*, Office of Government Commerce, London. (Available on-line at: http://www.ogc.gov.uk/documents/CP0070AEGuide10.pdf [Accessed August 2011]).

OGC 2007k. *Achieving Excellence Guide 11 - Sustainability*, Office of Government Commerce, London. (Available on-line at: http://www.ogc.gov.uk/documents/CP0071AEGuide11.pdf [Accessed August 2011]).

Oppenheim, A.N. 2001. *Questionnaire Design, Interviewing and Attitude Measurement*, Continuum, London

Owen, E. 2009. *Highways Agency to Review ECI*, New Civil Engineer, (Available on-line at www.nce.co.uk/highways-agency-to-review-eci/5200210.article [Accessed August 2011]).

Rubin, A., and Babbie, E., 2004. *Research Methods of Social Work*, Thomson Wadsworth, UK

Song, L., Mohamed, Y., AbouRizk, S.M. 2009. *Early Contractor Involvement in Design and Its Impact on Construction Schedule Performance*, in Journal Of Management In Engineering, ASCE, Vol. 25 No. 1, Pp. 12-20..

Stowe, R. 2005. *Early Contractor Involvement Contracts In Ireland*, Projects and Construction Group, Matheson Ormsby Prentice. (Available on-line at: http://www.mop.ie/dynamic/files/ProjectsGroup-EarlyContractorInvolvementContractsInIreland-RS-June2005.pdf [Accessed August 2011]).

Wolstenholme, A. 2009. *Never Waste a Good Crisis*, Construction Excellence, London. (Available on-line at: http://www.constructingexcellence.org.uk/pdf/Wolstenholme_Report_Oct_2009.pdf [Accessed August 2011]).