EXPLORING THE VALUE OF DEMOLITION CONTRACTOR INVOLVEMENT AT THE DESIGN STAGE OF CONSTRUCTION

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It is clearly understood that the design teams have a critical role to play in achieving circularity in the built environment. However, little attention has been given to the demolition industry and its contribution at the design stage of construction. The purpose of this paper is to investigate the role of the demolition industry in the movement towards the circular economy through exploring the benefits and challenges of involving demolition contractors at the design stage of construction. This study reports the findings from 12 in-depth interviews undertaken with professional demolition practitioners. The following questions were asked: Are there benefits to involving a demolition contractor at the design stage? What roles and responsibilities might be appropriate for the demolition contractor at the early stages of design? What knowledge does the demolition contractor possess that is of value to designers and clients? And what challenges might arise? The findings show that early demolition contractor involvement is more likely to ensure that end-of-life factors are considered at early phases of design. The input of a demolition contractor at the design stage will encourage designers to design for deconstruction; thus, fulfilling a closed-loop concept. However, a series of challenges were also revealed. Results show that adversarial relationships, cost, and time are the biggest challenges to involving a demolition contractor at the design stage. This study shows the essential need to revise the current linear models followed within the construction cycle and articulates the important role the demolition industry has in the continued movement towards a circular economy.

Keywords: Early Contractor Involvement, deconstruction, demolition

INTRODUCTION

The concept of the circular economy in the built environment is to keep materials and components at their highest value either by direct re-use in another building, or by 'upcycling' - retaining or even increasing their value (Lemmens and Luebkeman, 2016). The ultimate aim is to create a regenerative built environment that prioritise retention and refurbishment over demolition and rebuilding (Cheshire, 2016). One of the core principles of the movement towards a circular economy approach is through collaboration across the construction cycle (Leising *et al.,* 2018). Many reports have investigated the vital role of designers in transitioning towards a circular approach (Lemmens and Luebkeman, 2016; Cheshire, 2016), as many believe that change

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should start at the beginning of life of the construction cycle. Also, the importance of integrating construction knowledge into the design process has long been recognised by the construction industry (Laryea and Watermeyer, 2015). As a result, many researchers have investigated the essential role of involving contractors at early stages of the project (Song *et al.,* 2009; Rahman and Alhassan, 2012; Sødal *et al.,* 2014; Laryea and Watermeyer, 2015) and this is known as Early Contractor Involvement (ECI). However, the role of the demolition contractor is often neglected and not many have emphasised the importance of involving demolition in the construction cycle. Some studies allude to the importance of consulting a demolition contractor at the design stage. They considered it as a critical success factor for diverting end-of-life waste from landfills (Akinade *et al.,* 2017) and to delivering demolition projects successfully (Osaily *et al.,* 2018). These studies, however, have not addressed the benefits and challenges to engaging a demolition contractor at early stages of design and its impact on the movement towards the circular economy. This study therefore sets out to fill this gap. As a starting point the ECI literature is outlined as it forms a sound foundation for the study. Very little academic literature has been published on early demolition contractor involvement.

Early Contractor Involvement

Early contractor involvement (ECI) in defined as a relationship between a contractor and an owner or a designer that engages the contractor from the early design stage and allows the contractor to contribute construction knowledge and experience to design (Song el al., 2009). The concept of ECI emerged in the early 2000s in the UK due to many reasons. To begin with, many studies identified current traditional procurement methods as broken and in need for revision (Bundgaard *et al.,* 2011), because designers and clients intend to make key decisions long before the engagement of the contractor. Arditi *et al.,* (2002) noted that clients and designers make those decisions while lacking construction experience and awareness of construction knowledge. Additionally, Song *et al.,* (2009) argues that their decisions are predominantly driven by factors such as aesthetics, functionality, and budget. Therefore, and with the ever-growing construction projects complexities, this method is no longer feasible, as it diminishes the potential input for experts (i.e. contractors) at early stages (Song *et al.,* 2009). According to Bundgaard *et al.,* (2011), experts should be engaged from the beginning of the project; they should be proactive rather than reactive to designers' decisions.

Benefits of Early Contractor Involvement

The prospects of benefits are likely to increase with the implementation of ECI (Mosey, 2009). The engagement of contractors at early stages of projects and their interaction with the developers and consultants whilst integrating their knowledge would reflect positively on the project from many aspects (Sze Boon, 2015). One of the key areas that are improved through ECI is better management of risks (Sødal *et al.,* 2014; Boon, 2015); engaging contractors at the design stage would enhance the team's risk perception and would enable a more thorough identification and more quantification of risks (Sødal *et al.,* 2014). Thus, overall management of risks is improved. Additionally, one of the significant benefits of ECI is contractors input to design. Contractors can implement their knowledge and expertise of construction materials, methods and local practice, to develop improved design (Rahman and Alhassan, 2012). Also, contractors input to design have a direct impact on their own construction performance (Song *et al.,* 2009), in terms of cost, time, quality and

safety, as they are responsible for the actual construction works (Rahman and Alhassan, 2012). More benefits of ECI are shown in table 1.

Challenges of Early Contractor Involvement

Seeing as ECI implementation necessitates a radical change in the industry moving away from traditional practices (Song *et al.,* 2009); the implementation of ECI is thus faced by many challenges. Contrasting from traditional tender approaches, ECI process requires the commitment of everyone involved including developers, consultant team, and contractors (Boon 2015).

Table 1: Benefits for Early Contractor Involvement

	Benefits of ECI	Source
1.	Better integration amongst the project stakeholders at the conceptual stage of the project, enabling the input of contractors to be brought into the design process.	Mosey (2009)
2.	Identification and proposed approaches to overcome critical project constraints and risks	Boon (2015)
3.	Greater awareness of risk and understanding	Mosey (2009)
4.	Contractors knowledge will assist in developing a more realistic and reliable schedule and cost estimate for the project.	Laryea and Watermeyer (2015)
5.	Improves construction methodology and technology	Sødal et al. (2014)
6.	Provide better forecast of project outcomes	Rahman and Alhassan (2012)
7.	Joint problem-solving addressing unknowns	Bundgaard et al. (2011)
8.	Early involvement of contractor ensures that construction factors are considered in the decision-making.	Sødal et al. (2014)

Thus, it will require a paradigm shift for all parties involved. There is an essential need for a change in culture as well as a change in the traditional ways of working (Bundgaard *et al.,* 2011). Additionally, it could be challenging to ensure commitment and collaboration from everyone involved (Sødal *et al.,* 2014); according to Rahman and Alhassan (2012), the involved parties might be unwilling to show commitment to build a friendly relationship with each other, which will lead to instability in the working environment, lack of trust and transparency, and lack of a win-win attitude. Furthermore, one of the key issues with ECI implementation is the lack of knowledge of the process itself that causes construction parties to avert from the process (Mosey, 2009). Song *et al.,* (2009) considered the resistance to culture change as the biggest barrier to the implementation of ECI; this is resulted by lack of understanding of the concept and its benefits. Table 2 illustrates some of the challenges found in literature for ECI implementation.

METHODOLOGY

An exploratory method was suitable for this research as the concept of early demolition contractor involvement is still in its infancy. Data was collected through conducting 12 in-depth face-to-face interviews with experts in the demolition industry including demolition contractors, clients, and client's representatives. Selecting the participants was achieved through judgement sampling technique, or as also known purposive technique (Merriam, 1998). It is a technique typically used in a qualitative research to select the group of participants based on the qualities they possess regarding a phenomenon of interest (Patton, 2002) to gain an in-depth understanding of the phenomenon under investigation (Creswell and Clark, 2011). Therefore, the process of selecting the participants took into consideration their knowledge and experience regarding the researched area (i.e. demolition).

Table 2: Challenges to Early Contractor Involvement

	Challenges of ECI	Source
1.	Absence of a Win-Win attitude	Rahman and Alhassan (2012)
2.	Resistance to cultural change	Boon (2015)
3.	Lack of understanding of the concept and its benefits; lack of explicit case studies illustrating the proper way of implementation	Song et al. (2009)
4.	Lack of trust and transparency amongst project team members	Bundgaard et al. (2011)
5.	Smaller sized companies may not be able to warrant ECI, as it may involve unnecessary charges	Mosey (2009)
6.	Some clients may not be willing to bear the extra cost incurred through ECI	Sødal et al. (2014)
7.	The challenge of who should lead the process in the early phases and who has the decision power	Rahman and Alhassan (2012)
8.	The challenge of requiring the commitment of all project participants	Sødal et al. (2014)

Thus, all the selected participants have a minimum of 20-year experience in the demolition industry or are directors at their company. Additionally, all the participants come from construction background; their combined knowledge of both construction and demolition made them competent and qualified them to answer the researched question. The interview questions were developed after exploring ECI benefits and challenges. This equipped the researcher with sufficient knowledge to develop the interview questions, to better govern the course of the interview, and to provide examples of potential benefits and challenges in case the respondents were uncertain. At the beginning of each interview, the concept of early demolition contractor involvement was proposed to the participant, and then the questions were asked in a semi-structured manner to help capture a more detailed narrative; thus, allowing the participants to speak freely about the subject and express their thoughts without limiting their answers (Laryea and Watermeyer, 2015). All interviews were recorded, transcribed and then analysed using thematic analysis. Thematic analysis is a method used to analyse, identify, and report patterns (themes) within data (Guest *et al.,* 2014). In order to find potential themes, the research adopted Braun and Clarke (2006) process. The process begins with getting familiar with the transcribed content in order to generate codes. The identification of the themes was then undertaken. All data relevant to a specific theme was grouped together in order to build up a convenient story regarding that theme. The process of generating codes and themes from the interviews was done using spreadsheets.

RESULTS

Introducing Early Demolition Contractor Involvement

Early demolition contractor involvement (EDCI) is a new concept introduced in this paper, which is inspired by the ECI contracting method. EDCI refers to the relationship between a demolition contractor and an owner, or a designer which involves a demolition contractor at the design stage of construction. Thus, allowing the demolition contractor to contribute end-of-life knowledge and experience to design. Direct demolition contractor involvement with designers at early stages fosters better cooperation between both parties and enable end-of-life factors to be considered at the design stage. Thus, leading to many benefits across the construction cycle. The implementation of EDCI, however, has many implications; the benefits and challenges of the new concept are explained below.

Benefits of Early Demolition Contractor Involvement

Ten main benefits for EDCI were identified from the interviews conducted. The majority of the benefits have an impact on the end-of-life phase solely. These benefits

are illustrated in Figure 1. The highest-ranking benefits of EDCI are: (1) ensuring end-of-life factors are considered at the design stage, (2) the development of an integrated deconstruction methodology for whole of life cycle, (3) engagement with demolition contractors and the wider design team improves understanding and appreciation of roles and responsibilities and associated expertise, (4) direct contribution to planning applications concerning end-of-life phase, and (5) improved risk assessment for end-of-life phase with design teams. Other interesting benefits which have direct impact on the movement towards the circular economy were obtained. All participants who were aware of the circular economy agreed upon the following two benefits .Firstly, engagement with demolition contractors by design and construction professionals raises the profile of the circular economy and increases adoption of suitable process and practice. Also, engaging a demolition contractor at the design stage fulfils a closed-loop concept due to the valuable advice given by demolition contractors concerning choices of materials to designers.

Challenges to Early Demolition Contractor Involvement

In contrast to the benefits, ten challenges were also identified to the implementation of EDCI. Figure 1 articulates those challenges. Two main challenges were agreed by all participants: (1) clients would not be willing to take the burden of paying the extra cost for the expertise of the demolition contractor, and (2) the fear of potential clash between the involved parties. Other high ranked challenges include: (3) the industry is renowned for its resistance to change, and therefore would not be willing to accept EDCI concept easily. (4) The creativity of designers might be reduced as demolition contractors would concentrate on simplifying the demolition process, thus resulting in them demanding a simpler design. (5) The expertise of the demolition contractor is undervalued by other construction professionals, as a result, his/her opinion might not be heard by other parties. An interesting challenge brought up by few participants was the fact that engaging a new stakeholder at the design stage will necessitate a change in practice, thus establishing new legislations, standards, and forms of contracts may be required.

Further to the benefits and challenges shown in Figure 1, the respondents were asked to identify key areas where their knowledge could be contributed at the design stage. As a result of the exercise, six areas were highlighted: (1) advice on choices of materials, (2) advice on recycling and reuse, (3) develop a deconstruction methodology, (4) develop a risk assessment plan for the deconstruction process, (5) develop a site access plan for the deconstruction process - which includes best access for machinery, vehicles, skips, and cranes to keep pedestrians and vehicles apart, minimise vehicle movement on site, and to speed up the process of moving materials in and out site - and (6) advice on building design. All participants agreed that through experience, the demolition contractor knows what materials are easily dismantled and what are not, and what materials are easily recycled and what are not. Consequently, demolition contractor's advice to designers concerning choices of materials and recycling and reuse is considered invaluable. See figure 1.

DISCUSSION

Similar to ECI, one of the key motivations for the implementation of EDCI, is the fact that clients and designers intend to make key decisions that have vital impact on the end-of-life phase whilst lacking proper understanding of end-of-life expertise and awareness of demolition knowledge. It is stated under the Construction Design and Management (CDM) 2015 regulations that designers have to propose a deconstruction

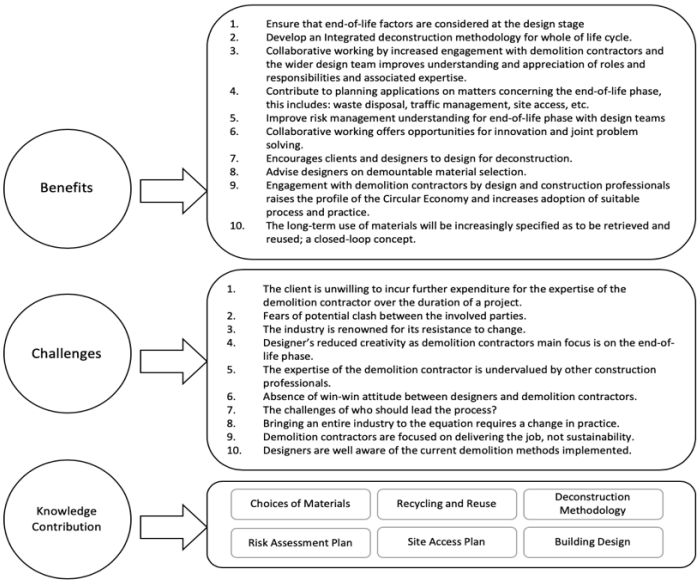

Figure 1: EDCI benefits, challenges, and key areas where a demolition contractor's knowledge could be contributed (benefits and challenges are listed based on their ranking score for the total number of mentions by the participants in their interview).

plan for their designed buildings (Joyce, 2015). However, in a unanimous agreement the participants agreed they never had obtained a deconstruction plan from clients despite the CDM regulations. The majority of the interviewees reflected on this and mentioned that designer decisions are primarily driven by factors such as aesthetics and cost, without having an end in mind. This is also backed up by literature in Song *et al.,* (2009) where the study mentions that designer's decisions are mainly induced by factors such as aesthetics, functionality, and budget. Participant 7 (contracts manager) mentioned in this regard:

> Designers under CDM 2015, there is a pre-requisite that they need to prepare a deconstruction plan for the building. They however don't know how to do it. When a demolition contractor is involved, he will develop the deconstruction methodology. He understands. He could put a footnote at each design element. He could also do a little risk assessment on each design element.

The demolition contractor, therefore, with profound experience could develop a deconstruction plan for any designed building. Additionally, participant 1 (environmental manager) added regarding the decisions made by designers and clients at early stages:

> You see all these buildings that are being built right now? It is all composite structures. So, in terms of recycling the materials it is going to become very difficult. How do you expect the circular economy to work in the upcoming years?

This is also the opinion of the majority of the participants. They expect demolition to become more complicated in the upcoming years in terms of recycling and reusing of materials. Currently, buildings which are being demolished were built in 1940's to 1960's which predominantly consist of simple materials that are easily retrieved, recycled, and reused (Guy and Shell, 2002). However, newly built buildings are generally formed of composite structures where many mastics and adhesives are used. Such materials have less value or no value at all. It would be extremely difficult to separate the materials and extract any value from them in the future. One of the core concepts of the circular economy is to fulfil a closed-loop concept, but how would this be achieved, if in the upcoming years, the industry expects to produce more waste?

Therefore, it is critical to begin designing with an end in mind, and the implementation of EDCI would encourage designers to design for deconstruction.

Another key motive for EDCI implementation is the current calls for the movement towards the circular economy. Such movement will not prosper without involving the entire construction cycle in the process (Leising *et al.,* 2018). Extant literature calls for the need for a radical change in the current methods implemented to design buildings (Lemmens and Luebkeman, 2016; Cheshire, 2016). Such reports display the need to innovate the way buildings are designed through following circular economy principles and to begin designing out of waste. Whilst a change in design is vital, such movement however, is aspiring to change the whole construction cycle through centring their focus on one perspective without involving other key parties within the cycle, such as the demolition engineer. Participant 9 (CEO at NFDC) stated:

> In what way would this work? The role of the demolition industry is always neglected when it comes to discussing the circular economy. We are never involved. Designers are leading this process without consulting us. We are the experts in our field, and we inherently know what things are recycled, how they are recycled, and how to reuse them again. Transitioning towards circular built environment will never thrive without involving all parties in the construction cycle.

Few participants elaborated on the fact that the role of the demolition industry is often neglected, and two factors were elicited. Firstly, demolition is considered to be separated from other phases of the construction cycle. There is minimal engagement between demolition contractors and other construction professionals. Thus, many practitioners outside demolition do not have sufficient understanding of what demolition is, what it involves, and what demolition contractors are capable of. One of the participants mentioned as a result, that a demolition contractor is not perceived as a true engineer by other construction professionals, and therefore his role is belittled. And secondly, one of the major reasons why demolition input is minimal in the movement towards the circular economy is due to lack of researchers and lack of academic qualifications in the industry. Participant 11 (client) mentioned:

> Demolition is generally formed of rough builders and research and development is not a priority for many. And, due to the harsh nature of demolition, researchers tend to keep away and would rather contribute their research input to different sectors.

This study however shows that the demolition industry with its profound experience is able to contribute to the movement towards the circular economy. EDCI implementation entails many benefits to the movement towards the circular economy. Firstly, the demolition contractor through experience, knows what is difficult to deconstruct and what is not. Their advice to designers on the choices of materials is invaluable. This will therefore stimulate clients and designers to begin designing buildings for deconstruction; ensuring that the long-term use of materials will be increasingly specified as to be retrieved and reused, thus engendering a closed-loop concept. Subsequently, the demolition contractor will help developing a deconstruction methodology with details containing the best method to deconstruct the building, what materials are reusable, what requires recycling, best access to site, and what risks are involved. This process will reduce the uncertainty a demolition contractor usually encounters on site, as all details about the project are highlighted within the deconstruction methodology. Finally, collaborative working by increased engagement with demolition contractors and the wider design team improves understanding and appreciation of roles and responsibilities and associated expertise. This would result in a growing mutual respect between construction parties.

The implementation of EDCI however, faces challenges. The biggest challenge envisaged to implementing the process is time; as most buildings take many years to be demolished, many things within the industry would have changed by the time the building reaches its end-of-life, thus the deconstruction methodology might not be valid any longer. Additionally, bringing an entire industry to the equation requires a change in practice, and the construction industry inherently resists any change that might occur to its practices (Lines *et al.,* 2015). Furthermore, all the interviewees agreed on two main points, which were similar to ECI challenges: (1) the change begins by clients, and clients unless there are financial incentives involved, will not be willing to incur further expenditure for the expertise of the demolition contractor, and (2) the fear of potential clash between the involved parties. Additionally, the challenge of whether the demolition contractor, if willing to provide advice, would he be listened to? As mentioned before, a demolition contractor is not perceived as an engineer due to lack of academic qualification, and due to lack of understanding from other construction parties of what demolition involve. Thus, many of the interviewees alluded that they will only be overruled by designers, as the expertise of the demolition contractor is undervalued by other construction professionals.

Despite the aforementioned, many of the suggested challenges are similar to ECI challenges, and could be tackled through trust, transparency, and collaboration (Bundgaard *et al.,* 2011). If the involved parties commit towards achieving one desired aim, whilst adhering to mutual respect, most of the specified challenges would not be a threat to the implementation of EDCI. Thus, the benefits of EDCI implementation outweigh the challenges.

The question of how to get EDCI actioned was difficult for the participants to answer. Many suggested stringent legislations to enforce the change; this is seen as the ideal method to convince clients to take on further expenditure (Akinade *et al.,* 2017). However, few participants asserted that the optimum method would be through creating successful case studies for the industry through collaboration. The representative organisations of the demolition industry alongside the representative organisations of design and construction to take the initiative and agree on mutual terms, aims and objectives to invest in developing sustainable solutions for the industry. The outcome of such collaboration will establish successful case studies for the industry and will culminate in lessons learnt that will act as guidelines for major organisations who might be willing to take the initiative to apply processes similar to EDCI.

This paper proposes to begin perceiving demolition as the beginning of life rather than the end of life phase of the construction cycle. This applies specifically for large demolition contractors, as once buildings are demolished, a new construction site is built. Therefore, demolition is considered to be phase 1 of the work, and this would facilitate the engagement of demolition within the construction cycle; thus, facilitating the implementation of EDCI.

CONCLUSIONS

The aim of this paper was to investigate the role of the demolition industry in the movement towards the circular economy through exploring the benefits and challenges of involving a demolition contractor at the design stage of construction. Through conducting 12 in-depth interviews with different construction practitioners who have sufficient understanding of both construction and demolition, a new concept has been introduced which is early demolition contractor involvement (EDCI). The

concept was inspired by early contractor involvement (ECI) contracting method. EDCI seeks to engage a demolition contractor at the design stage to benefit the design process from the expertise and knowledge of demolition with decisions concerning the end-of-life phase. Ten benefits and ten challenges have been identified as a result of the interviews. Findings show that through EDCI, the demolition industry have a vital role in the movement towards the circular economy. Firstly, A demolition contractor through experience, knows what is recyclable and what is not. Their advice to designers on the choices of materials is invaluable. This will stimulate clients and designers to design for deconstruction; ensuring that the long-term use of materials will be increasingly specified as to be retrieved and reused, thus engendering a closed-loop concept. Additionally, the demolition contractor will ensure that end-of-life factors are considered at early phases of design through developing a deconstruction plan for future demolition, improved risk assessment, and contribute to planning applications concerning end-of-life phase. Conversely, findings show that time, extra cost on clients, and adversarial relationships are expected to occur as a result of EDCI implementation. The benefits of implementing EDCI however, outweigh the challenges, because most of the identified challenges are a replica of ECI challenges, which have been dealt with in previous projects that implemented ECI. This study is limited to demolition expert's perspective without involving designers in the process. Future studies regarding this subject should therefore involve designers' perspectives of EDCI implementation and their perceived benefits and challenges of the process.

REFERENCES

Akinade, O O, Oyedele, L O, Omoteso, K, Ajayi, S O, Bilal, M, Owolabi, H A, Alaka, H A, Ayris, L and Looney, J H (2017) BIM-based deconstruction tool: Towards essential functionalities, *International Journal of Sustainable Built Environment*, 6(**1**), 260-271.

Arditi, D, Elhassan, A and Toklu, Y C (2002) Constructability analysis in the design firm, *Journal of Construction Engineering and Management*, 128(**2**).

Lemmens, C and Luebkeman, C (2016) *The Circular Economy in the Built Environment*. London: Arup.

Boon, K S (2015) Early contractor's involvement a paradigm shift in procurement approach, *In: The 19th Pacific Association of Quantity Surveyors Congress*, 28 May - 1 June, Yokohama, Japan, 1-11.

Braun, V and Clarke, V (2006) Using thematic analysis in psychology qualitative, *Research in Psychology*, 3, 77-101.

Bundgaard, K, Klazinga, D and Visser, M (2011) *Traditional Procurement Methods Are Broken: Can Early Contractor Involvement Be the Cure*? Available from https://www2.iadc-dredging.com/article/traditional-procurement-methods [Accessed 10/07/2019].

Cheshire, D (2016) *Building Revolutions - Applying the Circular Economy to the Built Environment*. London: RIBA Publishing.

Creswell, J W and Clark, V L P (2011) *Designing and Conducting Mixed-Methods Research*. London: Sage Publications.

Guest, G, MacQueen, K and Namey, E (2014) *Applied Thematic Analysis*. London: Sage Publications.

Guy, B and Shell, S (2002) Design for deconstruction and materials reuse *In*:

Proceedings of the CIB Task Group 39 - Deconstruction Meeting, 9 April, Karlsruhe, Germany.

Joyce, R (2015) Construction (Design and Management) regulations 2015. *In: CDM Regulations 2015 Explained*. London: Institution of Civil Engineers.

Laryea, S and Watermeyer, R (2015) Early contractor involvement in framework contracts, *Proceedings of the Institution of Civil Engineers*, *Management, Procurement and Law*, 169(**1**), 4-16.

Leising, E, Quist, J and Bocken, N (2018) Circular economy in the building sector: Three cases and a collaboration tool. *Journal of Cleaner Production*, 176, 976-989.

Lines, B C, Sullivan, K T, Smithwick, J B and Mischung, J (2015) Overcoming resistance to change in engineering and construction: Change management factors for owner organizations, *International Journal of Project Management*, 33(**5**), 1170-1179.

Merriam, S B (1998) *Qualitative Research and Case Study Applications in Education*. Jossey-Bass Publishers: San Francisco.

Mosey, D (2009) *Early Contractor Involvement in Building Procurement: Contracts, Partnering and Project Management*. Chichester, UK: Wiley-Blackwell.

Osaily, Y, Copping, A and Lo, S (2018) Critical success factors: The development of a conceptual framework for demolition projects. *In*: Gorse, C and Neilson, C J (Eds.), *Proceedings 34th Annual ARCOM Conference*, 3-5 September 2018, Queen's University, Belfast, UK. Association of Researchers in Construction Management, 209-218.

Patton, M Q (2002) *Qualitative Research and Evaluation Methods 3rd Edition*. London: Sage Publications, 598.

Rahman, M M and Alhassan, A (2012) A contractor's perception on early contractor involvement, *Built Environment Project and Asset Management*, 2(**2**), 217-233.

Sødal, A H, Laedre, O, Svalestuen, F and Lohne, J (2014) Early contractor involvement: Advantages and disadvantages for the design team. *In*: Proceedings Iglc-22, Oslo, Norway, 519-531.

Song, L, Mohamed, Y and AbouRizk, S M (2009) Early contractor involvement in design and its impact on construction schedule performance, *Journal of Management in Engineering*, 25(**1**), 12-20.