Insolvency of Small Civil Engineering Firms: An Examination of Critical Strategic Factors

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Abstract

Construction industry insolvency studies have failed to stem the industry's high insolvency tide because many focus on big civil engineering firms (CEF) when over 90% firms in the industry are small or micro (S&M). This study thus set out to uncover insolvency criteria of S&M CEFs and the underlying factors using mixed methods. Using convenience sampling,

storytelling method was used to execute interviews of 16 respondents from insolvent firms. Narrative and thematic analysis were used to extract 17 criteria under 2 groups. Criteria were used to formulate questionnaire of which 81 completed copies were received and analysed using Cronbach's alpha coefficient and relevance index score for reliability and ranking respectively. The five most relevant criteria are: economic recession, immigration, too many new firms springing up, collecting receivables and burden of sustainable construction. The 4 underlying factors established through factor analysis are: market forces, competence-based management, operations efficiency and other management issues and information management. The factors were in line with Mintzberg's and Porters' strategy theories. Results demonstrate that insolvency factors affecting big and small CEF can be quite different and sometimes, even opposite. This research will provide a unique resource on the 'beware' factors for potential owners of S&M CEF. The criteria are potential variables for insolvency prediction models for S&M CEFs.

Key words: Civil engineering firms, construction industry, small and micro firms, insolvency, mixed method

1.0 Introduction

While research in construction has focused more on green sustainability in terms of reducing resource consumption and construction waste, the construction industry has been more troubled with economic sustainability in terms of solvency of firms. For instance, over 1500 civil engineering firms became insolvent at the beginning of 2012 alone (Daily Mail Reporter, 2012). To contextualise this better, though the overall insolvency in the UK in the second quarter of 2015 was its lowest since 2007, the construction industry still led the liquidated companies in England and Wales chart at the end of the same period (Wood, 2015), a position

58 it has held over many years (Department for Business Innovation and Skills, 2015). This is so,
59 despite a lot of research into the reason for failure of civil engineering firms.

60 So why have the many studies on civil engineering firms' failure not really helped to stem the
61 insolvency tide? It is partly because most construction industry insolvency studies have
62 focused on big civil engineering firms when the majority of the firms that have become
63 insolvent are small, reflecting not just the highly skewed distribution of firm size in the sector,
64 but also the strong negative correlation of incidence of failure with size. The skewed
65 distribution is clear from the industry statistics: the industry boasted over 950,000 small and
66 medium enterprise (SME) in 2015; the industry represents circa 20% of the UK private sector
67 SMEs, making it the sector with the highest percentage of SME firms (Department for
68 Business Innovation and Skills, 2015); over 96% of UK civil engineering firms as of 2001 are
69 small or micro firms (Jaunzens, 2001); and 86% of employees in the sector work in small
70 civil engineering firms (Stanworth and Purdy, 2008). It is thus nigh on impossible to stem the
71 high rate of insolvency in the industry without doing more research on failure of small civil
72 engineering firms. According to the European Union definition of firm sizes, micro firms are
73 firms with one to nine employees and with a turnover equal to or less than two million Euros;
74 small firms are those with 10 to 49 employees and with a turnover equal to or less than 10
75 million Euros; medium-sized firms are firms with 50 to 249 employees and with a turnover
76 equal to or less than 50 million Euros; large firms are those with over 250 employees and with
77 a turnover of more than 50 million Euros.

78 A major size related problem with research on failure of civil engineering firms is that most
79 studies that attempt to build insolvency prediction models tend to rely mainly on financial
80 statements of the sample firms (e.g. Abidali and Harris, 1995; Chen, 2012; Bal et al., 2013;
81 and more). This method, in more ways than one, does not really help the small or micro firms

(Balcaen and Ooghe, 2006). One way is that the studies normally exclude incomplete accounting data which is a popular feature of small and micro firms (Balcaen and Ooghe, 2006). Another way is that many small and micro firms outsource financial statement production with the main aim of meeting the legal requirement of annual production. This easily breeds misrepresenting statements since they are based solely on the amount of, intentionally or unintentionally but usually, incomplete information provided to the accounting firm producing the statement. This method thus has little implication on helping the solvency situation of small and micro civil engineering firms

Accordingly, the aim of this study is to uncover the main strategic factors that lead to insolvency of small and micro civil engineering firms. The objectives are:

- To inductively identify criteria that lead to the insolvency of small and micro civil engineering firms through qualitative methods

- To deductively establish the relevance of each of the identified criteria and establish the underlying factors through quantitative methods

This study will contribute to knowledge by exposing the key factors that lead to failure of small and micro civil engineering firms. The difficulty of locating and subsequently getting access to owners of failed firms is well acknowledged in the research world (Stokes and Blackburn 2002; Harada 2007) hence the qualitative method in this study, which will be executed using storytelling, provides a unique resource. The scope of this work is limited to factors affecting small and micro civil engineering firms only; medium and large firms will not be considered. The civil engineering firms considered in this study are those classified by the UK Standard industrial classification of economic activities (SIC) 2007 as 41100 Development of building projects; 41201 Construction of commercial buildings; 42110 Construction of roads and motorways; 42120 Construction of railways and underground

106 railways; 41202 Construction of domestic buildings; 42130 Construction of bridges and
107 tunnels; 42210 Construction of utility projects for fluids; 42220 Construction of utility
108 projects for electricity and telecommunications; 42910 Construction of water projects; 42990
109 Construction of other civil engineering projects n.e.c.; 43110 Demolition; and 43120 Site
110 preparation. It does not involve 43130 Test drilling and boring; 43210 Electrical installations;
111 43220 Plumbing, heat and air-conditioning installation; 43290 Other construction installation;
112 43310 Plastering; 43320 Joinery installation etc.

113 The next section describes the theoretical background to this work: mainly Mintzberg's five
114 Ps of strategy and Porter's five competitive forces. This is followed by the methodology
115 section which explains the qualitative method executed with storytelling and the quantitative
116 method executed with the survey strategy. Section four explains the thematic and narrative
117 methods used to analyse qualitative data, and the reliability, relevance index score and factor
118 analysis used to analyse quantitative data. Section five provides discussion on the established
119 underlying factors. The paper is then rounded up with the conclusion section.

120 2.0 Theoretical Background

121 Given the multifaceted nature of insolvency and that no individual criteria can answer what
122 determines insolvency of a firm, there are numerous contending theories attempting to reveal
123 what helps to improve solvency (i.e. to avoid insolvency), especial through strategy. Many
124 theories on what strategy to use to aid solvency have been developed over the years. The
125 theories of strategy are quite variant and are not necessarily mutually exclusive; most of them
126 having different emphasis. The diverse and complex nature of strategy was attested to by
127 Mintzberg et al. (1998). After reviewing ten strategy models, they concluded that "strategy
128 formation is judgmental designing, intuitive visioning, and emergent learning; it is

about transformation as well as perpetuation; it must involve individual cognition and social interaction, cooperation as well as conflict; it has to include analysing before and programming after as well as negotiating during; and all of this must be in response to what can be a demanding environment. Just try and leave any of this out and see what happens" (Mintzberg, 1998, pp 372-373). The two most important and relevant strategic theories according to Moore (2011) are Mintzberg's and Porter's.

Mintzberg Perspective: The Mintzberg's perspective is famous as it took a holistic and integrated approach to various strategy theories to develop what is known as the five Ps (plan, ploy, pattern, position and perspective). It has been the basis for some strategy research in construction (e.g. Chinowsky and Meredith, 2000; Dikmen and Birgönül, 2003). A strategy is more or less in itself regarded as a plan. Planning is the most popular and is virtually the default approach by managers. It is usually based on information hence having poor information can lead to poor strategy as plan. Ploy strategy mainly has to do with making a ploy to outwit competitors while pattern is about the decision a firm takes over time which then becomes the firm's way of doing things (Simon, 1957). According to Mintzberg (1998), it is the actions that a firm takes, and not the decisions, that lead to patterns; this is because the interconnection between decision making and actions in a firm is usually unclear. Generally, there is often a great deal of action with little decisions, and sometimes vice versa. Further, the actions and decisions are sometimes uncorrelated. According to Andrews (1971), the essence of strategy is pattern. Strategy as position refers to positioning a firm in such a way that it stands out from others. This is very much about being unique. In the non-product based construction industry, uniqueness is usually about method of execution and this is normally dependent on the resources at the disposal of the firm (Korn and Pine, 2014). Perspective as strategy refers to the fact that the ways of thinking in a firm will largely influence the strategy the firm adopts. For example, a firms that encourages caution in

resource consumption and waste generation is likely to have employees come up with more sustainable solutions.

Porter's perspective: The Porter's perspective is famous for the five competitive forces model: supplier power, buyer power, competitive rivalry, threat of substitution and threat of new entry. According to Rumelt et al. (1991, p.8), "the most influential contribution of the decade from economics was undoubtedly Porter's competitive strategy (1980)". It has been the basis for some strategy research in construction (e.g. Betts and Ofori, 1992, 1993; Budayan et al., 2013; Tansey et al., 2014). The threat of new entrant remains one of the most applicable forces to the construction industry as entrance to the industry has no barrier and sometimes require little investment (Betts and Ofori, 1992). This is unlike some other industries like the computing and engineering industries in Japan where huge investments by larger companies is proving to be a barrier to entrance for potential smaller companies. Supplier power wise, there are usually many suppliers in the construction industry however, keeping a good relationship with a small set of specific suppliers, thereby buying in high volumes from them could give a competitive advantage. This is because being a major buyer allows the firm to drive down prices of the supplier. It also ensures the firm is given priority when there is materials shortage. The threat of substitution refers to how easy it is for a client to replace one firm with the other. This threat is usually high in the construction industry as there are always too many firms competing for one job, hence being unique can give a competitive advantage here. Competitive rivalry, which is the fifth force, is the same as Mintzberg's strategy as position in that it is all about firms vying for a better/unique position to give them competitive advantage. According to Betts and Ofori (1992), vying for position is a strong competitive force among small construction firms despite the low exit barrier of the industry.

3.0 Methodology

3.1 Qualitative Method

One issue common with investigation of failures is the use of financial statements which most small firms either do not have, or do not possess accurate ones. In fact, some firms go into insolvency in their first two years before the UK legally required time to produce their first statement. Another issue is that when a subjective approach is taken, the subjects are usually asked for their views when some of them cannot judge best what some key problems were and have repeatedly failed with subsequently established firms. Those unidentified key problems are referred to as the deeper truths which are unattainable with direct observation; a viewpoint rejected by positivism and empiricism but well accepted by structuralism, hermeneutics and psychoanalysis (Gabriel and Griffiths 2004). On using the subjective approach to search for the deeper truth, it is usually onerous to detach the more or less important insolvency criteria by respondents in research. Ordinarily, the owner, manager, employee etc. of a failed firm is more tilted to blaming other stakeholders although, such blames are sometimes true. This study will hence elucidate the complex process of failure of small and micro civil engineering firms by analysing the 'stories' of mainly owners, and sometimes managers and employees of such firms. This is done by listening to their accounts of the life of the civil engineering firm from establishment (or stage of involvement) to insolvency. By using the story telling method, the researchers prevent any form of priori assumptions about the criteria that lead to insolvency but can conduct a narrative analysis of the stories to identify what events, actions, or occasions contributed to insolvency. Storytelling can be of unstructured interview as in this study, and/or semi structured in other cases (Gabriel and Griffiths 2004).

201 The owners/employees of insolvent civil engineering firms were contacted in two major
202 ways. First was to use the FAME (Forecasting Analysis and Modelling Environment) Bureau
203 Van Dijk UK financial database to identify failed civil engineering firms' directors, and
204 subsequently identify existing firms where those directors currently work. Fifty identified
205 directors were subsequently contacted and a request for an interview was made. Most of the
206 directors unsurprisingly turned out to be the owner of the firms, a common feature of small
207 and micro firms. The second was to use the position of one of the authors as a college lecturer
208 that taught on construction apprentice programmes. The apprentices were persuaded to talk to
209 colleagues and/or bosses at work in order to identify those that have worked in, managed or
210 owned a now defunct construction firm. Some apprentices were, by themselves, suitable
211 respondents as they once owned firms and most agreed to respond positively to the request of
212 talking to colleagues and/or bosses. This method of sampling is known as convenience
213 sampling and has been used in a number of construction studies (e.g. Li et al., 2005; Oyedele,
214 2013). This sampling method became necessary because of the inherent difficulty in finding
215 stakeholders of insolvent construction firms. A total of 18 respondents agreed to take the
216 interview. Table 1 presents the demographics of the respondents and the firms. Since
217 insolvent firms are virtually impossible to trace because of their non-functioning-anymore
218 contacts (Everett and Watson 1998; Stokes and Blackburn 2002; Harada 2007), the
219 interviews/stories from this research will supply a unique resource.

220 **Table 1: Demographics of the respondents and the firms**

221 The questions used in the interviews were designed such that they were unrestricting in order
222 to avoid pre-determined responses, and to evoke stories about how the firm's failure came
223 about. Although it was referred to as being in its infancy stage in 2004 (Gabriel and Griffiths,
224 2004), the storytelling method is now a widely accepted and used method (see for example

225 Steyaert and Bouwen 1997; Hill and McGowan 1999; Rae 2000; Marcella and Illingworth,
226 2012 among others). In fact, Denning (2005) emphasized that research that does not value
227 storytelling as a way of understanding firm performance cannot give a complete account of
228 that firm.

229 Storytelling or narratives are taken to be especially valuable and appropriate when researching
230 sensitive topics such as insolvency of firms (Marcella and Illingworth, 2012). Insolvency can
231 be a bad experience for some owners which they do not want to recall or discuss it. Extra
232 effort was thus made to make the questions as non-judgemental as possible.

233 More time was spent with respondents that delivered many/longer stories as required when
234 the stories, as against the story tellers, are the unit of analysis (Gabriel and Griffiths 2004) as
235 is the case in this study. Incidents that related to insolvency or firm problems were explored
236 further after the stories by seeking elicit accounts of the incidents through direct or indirect
237 tactic; this is appropriate for the storytelling method according to Gabriel and Griffiths
238 (2004).

239 The stories elicited from the respondents can be categorized as tragic considering the four
240 categories of stories (comic, epic, tragic and romantic) presented by Gabriel and Griffiths
241 (2004). This is not too surprising as many of the respondents were owners of insolvent
242 construction firms and were not happy about the insolvency. Some stories however sounded
243 epic, or a combination of tragedy and epic, as the respondents tried more to show how they
244 made mistakes and learned from them and then defiantly started (or are willing to start)
245 another firm which is now (will be) a success

3.2 Quantitative Method

The themes that resulted from analysing the qualitative data were used to develop a preliminary questionnaire to determine how relevant each identified criteria is to determining solvency/insolvency of small civil engineering firms. A Likert scale of one to five was used where five represents 'most relevant' and one represents 'least relevant'. This preliminary questionnaire was used as a pilot study with the aim of evaluating its relevance/correctness, complexity, length and layout before being sent out to a wider set of target respondents.

The sampling strategies used for the qualitative study were repeated but extended to reach more potential respondents. After a very onerous search, an extra 250 directors of failed civil engineering firms working in existing firms were identified from FAME Bureau Van Dijk and the questionnaires were sent to them. This was done via post and/or email. In the second strategy the author in the position of a college lecturer successfully contacted some other lecturers, from five different colleges, teaching on civil engineering apprentice programmes (year one and two) and the questionnaires were given to all the students to pass on to potential respondents. This was done mainly by giving the students copies of the questionnaire. The number given to each student was determined by the student, based on how many potential respondents the student thinks he has access to. In all, over 500 questionnaires were sent out.

A total of 84 (16.8%) questionnaires were returned after several reminders. Three out of these 84 were incomplete and unusable, leaving only 81 (16.2%) usable questionnaires for the quantitative analysis. Of the usable questionnaires, circa 88.9% were from former owners of civil engineering firms while the rest were from former managerial level staff of civil engineering firms. The questionnaire data was analysed using Statistical Package for Social Sciences (SPSS) software.

4.0 Analysis of Data and Results

4.1 Qualitative Data Analysis

There are a number of approaches to analysing qualitative data, each approach stemming from different traditions. This study used the narrative and thematic qualitative analyses to analyse the obtained data. The narrative analysis, which is the usually employed technique for story telling was used first, but in a secondary manner (Saunders et al., 2009). In analysing and interpreting each respondent's stories, the transcripts were carefully read and each one was disaggregated into a number of recognizable insolvency episodes (Shotter, 1993).

In order to satisfy one of the objectives of the study of identifying the criteria affecting failure of small construction firms, thematic analysis was subsequently performed on all the episodes (Saunders et al., 2009) using the Nvivo software. Both prior categories and new categories were used and developed respectively during the thematic analysis. Prior categories were taken from the general construction firms' insolvency studies while any issue identified during reading through the episodes were also used to construct conceptual categories which characterised major themes. The Nvivo software word frequency search was also used to create themes. Example of coding from priori and new themes and the respondents' statements they are taken from are presented in Table 2.

Table 2: Example of coding from priori and new themes and the respondents' statements they are taken from

The transcripts were read repeatedly and discussed between the authors in relation to both prior and newly constructed categories. Extra effort was made to maintain awareness of the effect of research process on the stories obtained during the interpretation and analysis of obtained data. It is acknowledged that many components of the research process such as

respondent's talkative ability, command of interview/story language (i.e. English language), level of experience, social class, etc. may have had effect on the eventual output. The findings are thus taken to be a construction process between the researchers and the respondents, as not representing a single truth, but instead as some possible stories of many potential stories. The criteria gotten from the findings are organized into two groups: internal and external related criteria. These criteria are presented in Table 3.

4.2 Quantitative Data Analysis

4.2.1 Reliability analysis

As recommended by many social scientists (Spector, 1992; George and Mallery, 2003; Field, 2005; Nunnally and Bernstein, 2007 among others), this study used the Cronbach's alpha coefficient test to examine the reliability of the questionnaire data. Mathematically, Cronbach's alpha is written as

$$\alpha = \frac{N^2 \overline{COV}}{\sum S^2_{criteria} + \sum COV_{criteria}} \qquad \text{----------(equation 1)}$$

The goal of the test was to check the consistency in the obtained data in order to establish if the criteria and their associated Likert scale are really measuring the construct they were intended to measure (Field, 2005). The construct in this case is the relevance of the identified criteria to determining failure/survival of small civil engineering firms. Cronbach's alpha coefficient value ranges from 0 to 1 and as a thumb rule, 0.7 is suggested as the lowest acceptable score and 0.8 as an indication of good internal consistency, 0.9 and above represent high consistency (George and Mallery, 2003). Table 3 presents the Cronbach's alpha coefficient test results gotten from SPSS. The reliability test was ran and the overall

Cronbach's alpha coefficient gotten was 0.868, depicting good internal consistency of the data.

Table 3: The final 17 insolvency criteria and associated statistical analysis.

To check if all the criteria are contributing to the internal consistency of the data, the 'Cronbach's alpha if item deleted', located in column three of Table 3 is further investigated. A criterion that is not contributing to the overall reliability of the data will normally have a higher associated 'Cronbach's alpha if item deleted' value than the data's overall coefficient (Field 2005). This higher value depicts that if the criteria with the value is deleted, the overall reliability of the data will increase (Field 2005). In this context, only *IC12* (0.870) has a 'Cronbach's alpha if item deleted' value which is greater than the overall coefficient (0.868). This implies that this criteria - 'fluctuation of construction materials cost'- is relatively not a very good measure of the construct hence it was not considered.

4.2.2 Insolvency Criteria Relevance Index and Ranking

To estimate the respondents' perception of the relevance of each of the criteria, an insolvency criteria relevance index score was calculated using the equation below. The equation was derived from comparable formula deduced by authors of previous construction studies (e.g. Kometa et al., 1994; Oyedele, 2013). Insolvency criteria relevance index (ICFI) is

$$ICRI = \left[\frac{\sum_{n=1}^{N} (R_n)}{NG} \right] \times 100\% \qquad \text{----------(equation 2)}$$

where R is the relevance rating given by the (ith) respondent ranging from 1 to 5; i=1, 2, 3, 4.....N; N is the total number of respondents for that particular criteria; and G is the highest relevance point i.e. 5. The last three columns of Table 3 present the IRFI scores, the in-group

339 rankings and the overall rankings of the criteria. Excluding the criteria with unreliable data
340 (i.e. *IC12*: fluctuation of construction materials cost), the top five relevant criteria are: *IC11* –
341 'economic recession', *IC13* – 'immigration', *IC14* – 'too many new firms springing up', *IC1*
342 – 'collecting receivables' and *IC15* – 'burden of sustainable construction practice', in that
343 order.

344 It is not surprising that economic recession was voted to be the most relevant as there was one
345 in as recent as between 2007 and 2009; and it would have been a major contributing factor to
346 the insolvency of some respondents' firms. The main challenge a recession brings is the
347 reduced number of projects/contracts available in the market, leading to a much higher
348 contractor/project ratio. The results are discussed further in the next section.

349 *4.2.3 Factor Analysis*

350 To achieve another objective of this study, there is need to establish the main underlying
351 factors that form the basis of the identified criteria. This will cause the numerous identified
352 criteria to be replaced with few, more concise and uncorrelated principal factors. For the
353 explorative factor analysis using the SPSS software, principal component analysis and
354 varimax were used as methods of factor extraction and rotation respectively. During the
355 process, Bartlett tests of sphericity and Kaiser-Meyer-Olkin (KMO) measure of sampling
356 adequacy were also conducted to check the appropriateness of the data for factor analysis.
357 Values of 0.76 (above 0.5) and 0.0001136 (less than 0.05) were gotten respectively,
358 demonstrating that the data set is suitable for factor analysis (Pallant, 2005). In interpreting
359 the results, all factors with Eigen value of one and above were retained, while criteria with
360 factor loading of +0.3 and above or -0.3 and below were taken as part of the offspring of their
361 principal factor (Child, 2006). The output of the analysis was of four factors which
362 represented 73.349% of total variance as presented in Table 4. The factors were named
363 according to the offspring criteria as follows:

- Market forces
- Competence-based management
- Operations efficiency and other management issues
- Information management

From the factor analysis result in Table 4, although IC12 was categorized under the market forces factor, it was not considered as it did not satisfy the reliability test from section 4.2.1. Under operations efficiency and other management issues and information management factors, the IC5- outsourcing account management (0.201) and IC9-over reliance on account statement (0.273) respectively have factor loadings below 0.3 hence cannot be strongly considered as offspring of their principal factors. They are thus not considered under the affected factors.

Table 4: Exploratory factor analysis.

5.0 Discussion

This section discusses the identified underlying factors from factor analysis in terms of the constituting criteria. The interest is mainly in the top ranked criteria, according to the ICRI score, under each factor. Note that in Table 4, the criteria are arranged under each factor according to their position from the ICRI score. Because the market forces factor contains four of the five overall most relevant criteria in terms of ranking, it is widely discussed with an attempt to capture most criteria under it. Only the top two criteria are discussed in the other three factors.

Market forces: A major problem small civil engineering firms have with market forces is that they have absolutely no control over them. This forces the strategic conflict theory into play where firms turn to outwitting other firms in order to survive (Shapiro, 1989). The theory

assumes common interest between adversaries (civil engineering firms in this case) and that every party's best choice of action is completely dependent on what is expected of other players (Schelling, 1963). Small civil engineering firms hence focus more on threats or potential threats of losing bids to other similar firms for example. They will want to deter competitors or outdo them.

Of all the highlighted market forces, 'economic recession' is probably the most severe as identified by respondents and in other studies (e.g. Kangari, 1988; Arditi, et al., 2000; Kapliński, 2008; Thomas et al., 2011; Sang et al., 2013). Although it does not happen too frequently its effect, when it does, can be devastating. Virtually everyone in the country is hit somehow and plans for new build, renovations, expansions etc. are widely cancelled if they are not absolutely necessary. The result is a higher contractor/projects ratio. Bigger civil engineering firms that lose out on the few bids available in their class suddenly become hawkish and encroach on the projects small civil engineering firms would normally take, putting them in more danger of shutting down. This makes firms focus a lot on their competitors as a means of survival as in strategic conflict theory. A small firm for example will do anything to know how much its competitor has put in for a bid and will want to beat it all cost, even if it is at a minor loss, with the hope of repeat business and starving the competitor to death. One potential major solution is to continuously seek proper information (Marcella and Illingworth, 2012) as there are usually hints about such events (economic recession), then create a strategic plan. With this, owners can proactively take decisive actions e.g. closing firm down early before any losses in the worst case.

On 'immigration', the challenge highlighted by interview respondents was the open EU border that allows people from other EU countries to work unrestrictedly in the UK. The major complaint was that some probably unregistered skilled workers were able to take

411 especially small renovation and refurbishment jobs for unrealistically low prices. On the
412 other hand, cheap construction labour immigrants favour big civil engineering firms as
413 employing or contracting them helps reduce their cost/wages (Beaverstock and Hall, 2012;
414 Rolfe et al., 2013). The immigration problem is somewhat similar to that of 'too many new
415 firms springing up' as they both represent threat of new entrants. When there is no barrier to
416 entry, as is the case in the construction industry, and anyone or any firm can just decide to
417 start or stop construction works, then the market can easily be over flooded with firms,
418 leading to tipped balances, fierce competition and insolvencies (BurtonShaw-Gunn, 2009; De
419 Valence, 2012; Research and Markets, 2015). Using strategy as ploy to distract or deter
420 competitors, for example reporting unregistered workers who avoid tax might increase
421 likelihood of survival.

422 'Burden of sustainable construction practice', seem to be a controversial criterion because it
423 was highlighted according to the analysis here and some other studies (e.g. Carmichael and
424 Balatbat, 2009) as being a major insolvency driver while many other studies (Orlitzky et
425 al., 2003; Dorfleitner and Utz, 2012; Siew et al., 2013) have claimed that sustainability
426 increases profitability. The claims that green buildings do pay for themselves in the long run
427 in itself is a testament to them being more expensive initially. The sustainability issue might
428 even be more challenging with smaller firms when clients seek a more environment friendly
429 way of execution and want to pay less, as experienced by most respondents that spoke about
430 this criterion. The issue is because there are many desperate construction firms who are
431 starved of jobs, the threat of substitution is critically high hence the client can make ridiculous
432 offers. Also because the jobs on offer can be executed by many firms as most firms do not
433 offer anything unique, then extreme competitive rivalry sets in and firms put in unrealistic
434 deals for requests like more expensive sustainable construction. Further, as firms try to
435 establish special relationship with clients and ensure repeat business in a market with high

436 contractor/client ratio, they go that harmful extra length to please the client, resulting in
437 considerable buyer (client) power (Betts and Ofori, 1992) which allows clients to drive down
438 bid prices.

439 **Competence-based management:** Quality and quantity of available resources is very
440 important to firms. Quality is especially important for the small firms as they always have few
441 resources. The resource quality issue has to do with the organization competency-based
442 management theory which according to Sanchez (2004), the resource competence is a key
443 aspect of (organization competences). The theory is defined by Sanchez (2004) as "the ability
444 to sustain the coordinated deployment of assets in ways that help a firm achieve its goals" (p.
445 521). The two key insolvency criteria (i.e. retention of quality staff and management/owner
446 characteristics) identified under this factor in this study are human resource based criteria.
447 Finding out that quality resource can help avoid insolvency is in line with Barney's (1991)
448 study where he noted that the resources of a firm can be the main cause/driver of continued
449 competitive advantage as the resources empower the firm to apply strategies that boost
450 effectiveness and efficiency.

451 'Retention of quality staff' as a reason for insolvency was linked directly to firm size (Kale
452 and Arditi, 1999) and immigrants by respondents. Quality staff that are immigrants generally
453 do not mind to work with small civil engineering firms when they have visa restrictions but
454 once they get better offers with potential sponsorship from bigger firms, they switch. The
455 challenge is that most small civil engineering firms position themselves strategically (Strategy
456 as Position**)** as low wage payers with little benefit. With bigger firms offering trainings,
457 mentoring to professional membership, golden hello, access to state of the art equipment and
458 software among others benefits, small firms need to position themselves in a way that can
459 offer some kind of present and future benefits beyond just wages if quality staff are to be

460 retained. Though positional strategy is usually decided based on clients, it is equally
461 important to position a firm to keep quality staff if the firm is to gain any competitive
462 advantage, required to avoid insolvency, in terms of services offered. This is the case of
463 resource (a quality staff in this case) leading to position (Korn and Pine, 2014) although, the
464 positional view is always seen in contrast to the resource based view strategy (Barney, 1991).

465 There are various characteristics of a small civil engineering firm's management team, chief
466 executive officer (CEO), president or owner that have adverse effects on its survival. These
467 include unfounded optimism, taking unworthy risks with large construction projects,
468 autocracy, a person holding multiple executive positions, etc. (Pearce and Zahra, 1991;
469 Abidali and Harris, 1995; Daily and Johnson, 1997). The most damaging of all is autocracy as
470 it is a common feature of failed construction firms (Hall 1994; Abidali and Harris, 1995) and
471 was common to some of the respondents as they used the word 'I' frequently. From their
472 stories, most decision were taken just by them without input from other staff members.
473 Unfounded optimism has also been identified as a major cause of insolvency by Ucbasaran et
474 al. (2009). The inertia of a construction company's owner/management leads to not realising
475 the available opportunities and threats to the business (Gilbert, 2005). When business is slow,
476 a construction firm specialized in pile foundation installation, for example, should be able to
477 identify opportunities of excavation projects and use its excavators for executing such
478 projects. Most management/owner characteristics are a case of strategy as perspective as this
479 relies heavily on patterns of thinking. A quality, intelligent and experienced
480 management/owner for example, will be able to consistently think of alternatives when works
481 in the firm's area of specialty are unavailable. This then in turn becomes the pattern and
482 strategy of the firm.

Operations efficiency and other management issues: The problem of 'collecting receivables' is a big one for small civil engineering firms (Arditi, et al., 2000) and leads the line in this factor. From the stories of respondents, it appears collecting payment for work done has been a 'pain in the neck' for small civil engineering firms. A potential solution might be to take the strategy as pattern approach, where the pattern of happenings in a firm is checked, then what is has led to quick collection of receivables in the past is retained and ferocious effort is made to dumping elements that have led otherwise.

Buying unnecessary equipment is usually a case where a small civil engineering firm seeks to improve itself by buying some high level equipment. This leads to increased company overheads which is normally needed during growth. The problem however sets in when the equipment (or software, tool etc.) gets rarely used/needed and consequently does not bring value, yet bring about significant maintenance expenses. This is sometimes as a result of the cyclical construction market or wrong projections where a firm, based on maybe the last three projects executed, wrongly deems a particular expensive equipment (or software, tool etc.) useful as it envisages winning many similar projects (unfounded optimism). Sadly, these expenses are quite hard to remove, forcing a firm to become slave to its overhead, and inevitably leading to losses (Schleifer et al. 2014)

Information management: 'Start-up reason/poor planning' is the most important under this factor. Numerous respondents expressed regret on either seeking information from the wrong sources, or not seeking enough information, before starting the firm. Their poor strategy as plan clearly contributed to their insolvency as also found in other studies (e.g. Hall, 1994; Marcella and Illingworth, 2012). It appeared the unfortunate assumption that as a consumer, it should be easy to make the consumed product had set in in some cases as indicated by one respondent.

507 The case of 'isolation/networking' is that of not having the right information about where to
508 go when there is a problem. Networking from early stage is very vital to the survival to any
509 small firm as already established by Deakins and Freel (1998). The isolation complaint is a
510 testament to the poor information gathering culture of small civil engineering firms as there
511 are many bodies/networks that any small firm or small civil engineering firms can join (e.g.
512 Federation of Small Businesses or Construction Excellence respectively). Isolation would not
513 bode well for competitive rivalry as it becomes hard to compete against other small civil
514 engineering firms that boast proper networking and enjoy various benefits. A firm with
515 Federation of Small Businesses for instance, might get the body's technical, financial,
516 resource, mental and legal support in a legal conflict arising from a contract thereby boosting
517 his chances of winning.

518 # 6.0 Conclusion

519 This study focuses on uncovering the main factors that lead to insolvency of small civil
520 engineering firms using mixed method. Story telling method was used to obtain qualitative
521 data which was analysed with narrative and thematic analysis. The resulting themes were used
522 to create insolvency criteria which were in turn used to form a questionnaire. The
523 questionnaire responses were analysed using reliability analysis, relevance index score and
524 factor analysis. The results showed that the five most relevant criteria include economic
525 recession, immigration, too many new firms springing up, collecting receivables and burden
526 of sustainable construction practice in that order. The four underlying factors established
527 through factor analysis are: market forces, competence-based management, operations
528 efficiency and other management issues and information management.

529 Though predictable, it can be deduced from the results that factors affecting big and small
530 civil engineering firms can be quite different and sometimes, even opposite. More studies
531 should hence focus on small civil engineering firms if the insolvency tide in the construction
532 industry is to be stemmed since over 96% of UK civil engineering firms are small or micro in
533 size. Further, the top three most relevant criteria from the relevance index score are of the
534 market forces factor, showing that the main reasons for insolvency are not usually directly
535 influence-able by the affected small civil engineering firms. The key solution is therefore to
536 be prepared for the worst by always sourcing the right information and using strategy as plan
537 among other strategies. It can be concluded from the discussion section that the
538 implementation of most of the elements of Mintzberg's five Ps of strategy and/or Porter's five
539 competitive forces can help to avert insolvency of small civil engineering firms.

540 The practical implication of this research is mainly in the unique resource it provides for
541 potential and current owners of small and micro civil engineering firms. They can definitely
542 get some knowledge on what strategies to implement to avoid insolvency from this study. The
543 contribution to knowledge here is the presentation of criteria that can serve as variables for
544 developing insolvency prediction models for small civil engineering firms (IPMCEF). Also,
545 the criteria/factors presented in this study can be used to develop a theory to be tested in
546 future studies. The limitation of this work is that data was not collected from
547 owners/managers of existing firms. Care should thus be taken in implementing the findings
548 because there is no other evidence that relates them to insolvency of small CEFs apart from
549 the fact that they are reported and ranked by owners/managers of failed S&M CEFs. Future
550 studies should carry out more inductive works, and endeavour to include owners/managers of
551 existing S&M CEFs in their study, to establish many more criteria; this will make it possible
552 to correlate the criteria (variables) to insolvency, develop regression models, and develop

553 IPMCEF. Future studies should also make effort to establish factors differentiating good and
554 bad CEFs in good and bad economic environment.

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688

689 Table 1: Demographics of the respondents and the firms

Respondent Type	Number of respondents	No. of years that insolvent firm(s) operated for	No of owner respondents that currently own another firm
Owner	4	1-2	4
	2	3-4	1
	5	5-6	5
	1	7-10	1
	4	10-15	2
Managerial level employee	1	5-6 (5)*	-
	1	7-10 (9)*	-
Total	*18*		

690 *Figures in parenthesis represent the number of years the managerial level employee spent

691 with the firm

692

693 Table 2: Example of coding from priori and new themes and the respondents' statements they
694 are taken from

Prior	New	Statements
New entrants threats (Porters theory)		'The works dried out because people now prefer to give the jobs to some European **immigrants** that will do a shoddy job for a token'
	Collection of receivables	Construction is very interesting. You bring your stuff and workers in, get the job done and get paid. Easy money… But I stopped because **people don't pay up. You make several fruitless efforts that even cost you money**.
Conflict management capability	Legal cost	But I stopped because people don't pay up… **And they take you to court** if you dismantle the job despite you will incur losses on that.
	Over reliance on accounting books to make decision	We made took our time and always consulted our books before making decisions. In fact, we ensured almost **no financial decision was taken without checking our account books**
Sustainability issue		Many people don't know what they want. **They want you to use only environmental friendly stuff for them yet they also want the cheapest price.** They want to get what they don't want to pay for
Strategy as plan (Mintzberg's 5 Ps), Economic recession		I understand property investment and **always buy houses and lands and sell them later.** Brother, this brings more money to do the building [i.e. construction]. The stupid **problem with economy [recession] caused all my property to go down [i.e. devalue]**. Brother, why is America problem our problem (hisses).

695

696

697 Table 3: The final 17 insolvency criteria and associated statistical analysis.

	Insolvency Criteria	Reliability Analysis[a]	Insolvency Criteria Relevance Index (ICRI) and Ranking		
		Cronbach Alpha if Item Deleted	ICRI	In-group Ranking	Overall ranking
	Internal issues related criteria				
IC1	Collecting receivables	0.839	81.1	1	5
IC2	Retention of quality staff	0.823	77.0	2	7
IC3	Management/Owner Characteristics	0.808	74.0	3	8
IC4	Bidding problems	0.863	67.6	4	9
IC5	Outsourcing account management	0.852	67.1	5	10
IC6	Start-up reason/Poor planning	0.846	52.9	6	11
IC7	Conflict management struggles	0.787	52.6	7	12
IC8	Isolation/networking	0.804	50.3	8	13
IC9	Over reliance on account statement	0.860	48.0	9	14
IC10	Buying unnecessary equipment	0.686	44.6	10	15
	External issues related criteria				
IC11	Economic recession	0.836	90.1	1	1
IC12	*Fluctuation of construction materials cost*	*0.870*	89.7	2	2
IC13	Immigration	0.833	88.5	3	3
IC14	Too many new firms springing up	0.811	81.6	4	4
IC15	Burden of sustainable construction practice	0.786	80.0	5	6
IC16	Skill of workforce	0.778	44.4	6	16
IC17	Low attractiveness to quality staff	0.772	43.0	7	17

698 [a] Overall Cronbach's alpha = 0.868

699

700 Table 4: Exploratory factor analysis.

		Eigen Value	Percentage of variance	Factor loadings
	Market forces	5.125	30.149	
IC11	Economic recession			0.909
IC12	*Fluctuation of construction materials cost*			*0.816*
IC13	Immigration			0.806
IC14	Too many new firms springing up			0.618
IC15	Burden of sustainable construction practice			0.436
	Competence-based management	3.465	20.385	
IC2	Retention of quality staff			0.869
IC3	Management/Owner Characteristics			0.864
IC7	Conflict management struggles			0.852
IC16	Skill of workforce			0.662
IC17	Low attractiveness to quality staff			0.479
	Operations efficiency and other management issues	2.506	14.742	
IC1	Collecting receivables			0.889
IC10	Buying unnecessary equipment			0.848
IC4	Bidding problems			0.696
IC5	*Outsourcing account management*			*0.201*
	Information management	1.372	8.073	
IC6	Start-up reason/Poor planning			0.653
IC8	Isolation/networking			0.457
IC9	*Over reliance on account statement*			*0.273*
	Total		**73.349**	

701 Note: Criteria in italics are not considered as explained in this section

702