Why Do They Acquire Each Other? Nexus between International Contracting and Construction Professional Service Businesses

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ABSTRACT
In recent years, the international construction market has witnessed the growing eminence of construction professional services (CPS) while the traditional contracting sector remains strong. Nowadays, it is not uncommon to see a design firm taking over the work of a traditional main contractor, or vice versa, of overseeing the delivery of a project. Much has been said about the nexus between the two business sectors in the international market but little has been done to articulate it using empirical evidence. This study examined the nexus between contracting and CPS businesses by offering and testing lead-lag effects between the two in the international market. A longitudinal panel data composed of 23 top international contractors and CPS firms from the Engineering News-Record’s top lists over the past 12 years was adopted. Surprisingly, it is found that CPS business does not have a significant positive causal effect on contracting, and vice versa. CPS and contracting subsidiaries in the same company do not necessarily form a consortium to undertake the same project; rather, they often collaborate with other CPS or contracting counterparts to undertake projects. The research provides fresh insights to the diversification strategies adopted by international contracting and CPS firms.

INTRODUCTION
The international construction market in recent years has seen an increasing amount of integration between contracting and construction professional services (CPS). For example, to gain advantage from pooling design and construction strengths, Balfour Beatty who, as a UK construction company, took over the US design giant Parsons Brinckerhoff in 2009 (Rubin and Reina, 2009). Many companies such as Fluor Corp, Bechtel, Jacobs, McDermott International Inc. often appear on both the top 225 international contractors list (TIC 225) and the top 200 international design firms list (TID 200) compiled by Engineering News-Record (ENR).

There are several factors driving this contracting and CPS integration. Firstly, CPS business is an economic agent in its own right with higher profitability than its contracting counterpart (Lu et al., 2013b). Contracting companies are interested in expanding to CPS as a high-end upstream business (Lu et al., 2009). In addition, CPS
are suitable for market penetration. The construction sector, in particular the international market, is subject to many different resisting measures (WTO Secretariat’s Note, 1998). These measures, however, may be found to be less onerous for CPS. Hence, CPS firms and contractors working in tandem can be a competitive strategy for penetrating the international market (Flanagan et al., 2007). This is particularly true that clients nowadays are increasingly demanding integral design and build services (Jewell et al., 2010). Under these circumstances, top companies tend to entail both CPS and contracting within their business lines to sharpen their competitive advantages.

Much has been said about the nexus between the two sectors but less has been done to articulate their relationships using empirical evidence. For example, it may help to determine whether a company should encompass both CPS and contracting, or just focus on a certain area, which is a typical “focus” strategy advocated by Porter (1980), and the diversification strategies remarked by Mintzberg and Quinn (1992). From an organizational structure perspective, understanding the nexus can help explain whether one should internalize CPS and contracting using a hierarchy, or let the market mechanism drive the coordination of the two business sectors. This is a typical scenario for investigating the dichotomous view of markets and hierarchies in Neoclassical Economic Theory (Coase, 1937; Williamson, 1991). Practically, the research will help gain insights into the operations of CPS and contracting companies, in particular the ever booming mergers and acquisitions (M&A) in the international construction market.

The aim of this study was to test the nexus between contracting and CPS by situating it in the international market. This first introductory section is followed by the second section elaborating the relevant constructs of contracting and CPS. The third section develops the hypotheses with relation to the nexus between contracting and CPS; the fourth section discusses the sample, measures, data, and procedures for testing the hypotheses; the fifth section presents the analyses, discussions, and research findings; and the final section provides a conclusion to the study.

**CONTRACTING AND CPS**

For the purposes of this study, contracting means general contracting, construction management at-risk, the construction portion of design-build activities, and equipment procurement and installation services as part of an overall construction contract. CPS can be considered as including a wide range of knowledge-intensive realms such as architecture, engineering, environmental, geotechnical engineering, landscape architecture, urban planning, surveying, and their combinations, as well as construction-related accountancy, legal, and information and communication technology services (Jewell et al., 2010; ONS, 2007). CPS should also include construction-related accountancy, legal, or ICT services, which are often provided by firms outside the construction industry. Figure 1 illustrates the working definitions of CPS and contracting adopted by this study and their relationships with other related service sectors. Researchers (e.g. Lu et al., 2013b) may also treat CPS as design, and contracting as construction. This is evident in ENR’s practice to rank its top international design firms and top international construction firms. At the risk of over
simplification, this paper equates ENR’s “design” to CPS, and ENR’s “construction” to contracting.

![Figure 1. CPS and its relationships with other sectors](image)

The two types of services, namely, contracting and CPS, are often provided by different types of companies. Contracting services are undertaken by companies that are widely known as contractors, who often heavily engage in physical resources such as materials, and machinery. CPS are provided by architecture or engineering design firms, or consultancy firms, which rely more on intensive knowledge, highly skilled human capital, and high investment in technologies (Nguyen-Hong, 2000). There is a clear boundary between the two types of firms, although it is not strictly impermeable. Owing to their different characteristics, they adopt different diversification strategies in geographies, services and markets through either organic or inorganic growth. Of particular interest here is the trend that the two business sectors tend to “cross the boundary” and consolidate with each other in their international operations. The rationales for this contracting and CPS business convergence need to be articulated.

**HYPOTHESES**

As aforementioned, CPS are more suitable for market penetration. According to Lu et al. (2009), designers or engineers tend to nominate their trusted contractors or products, i.e. construction materials and mechanical and electrical systems from their own country. Moreover, an integration of CPS and contracting can lead to procurement innovations in realizing construction projects that are undeliverable using traditional procurement methods (Lu et al., 2013a). These may help explain the increasing trend of contracting and CPS business integration. Intuitively, it is hypothesized that CPS will have a positive causal effect on contracting business within the same firm.
$H_1$: CPS business has a positive causal effect on contracting business in the same firm.

Meanwhile, CPS firms are increasingly interested in allying with contracting companies in undertaking projects. One of the explanations is that a proposed design with proven buildability (in collaboration with the contractor) will be more convincing for clients. This integration is even more advantageous with clients tending to demand integral design-and-build services for their projects (Jewell et al., 2010). It is therefore hypothesized that:

$H_2$: Contracting business has a positive causal effect on CPS business in the same firm.

Four particular aspects are highlighted for better understanding the hypotheses. Firstly, although the nexus between contracting and CPS is multifaceted, this study examine it from a business point of view. Contracting and CPS businesses can be manifested through the turnover of firm size, which can be quantified by the indicator of annual revenue (Ye, et al. 2009). Secondly, the emphasis is on “the same firm”, since CPS and contracting integration can happen within the same single economic unit/firm, where operations are normally governed by hierarchical relations, or in inter-firm consortiums, where the governance is mainly through contracts and other informal institutions such as relations, trust, and culture (Winch, 1989). The former was the focus of this research. Thirdly, a basic premise of the contracting and CPS business integration is that the increase of CPS business (the cause) will lead to the increase of contracting business (the effect), and vice versa. Lastly, the two hypotheses propose bidirectional causality between CPS and contracting businesses. It is posited that the two businesses may mutually enhance with each other. A virtuous cycle between CPS and contracting businesses are hypothesized.

SAMPLE

The hypotheses were tested in the international market. ENR began an annual survey in 1979 to collect data to form a list of top 225 international contractors (TIC 225). From the 1990s, ENR began a similar survey to collect data, such as design-related services, to form a top 200 international design firms (TID 200) list. A handful of companies appear on both lists. Therefore, these companies are considered a good sample for testing the relationships between contracting and CPS in the international market.

DATA COLLECTION

From the two ENR lists a set of panel data was derived. Table 1 is an excerpt of the panel data. There are 23 international companies that have been continuously listed on both ENR’s TIC 225 and TID 200 between 2000 and 2011. The longitudinal data set contains 276 firm-year observations. The panel data in Table 1 is considered a valuable data set for testing the hypothetical causal effects between contracting and CPS firms in the international AEC market.
Table 1. A Sample of Revenues of Construction and CPS business of the 23 International Companies Listed on both TIC 225 and TID 200 (unit: m$)

<table>
<thead>
<tr>
<th>Firm</th>
<th>Contracting/CPS</th>
<th>2000</th>
<th>2001</th>
<th>...</th>
<th>2010</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMEC plc, London, U.K.</td>
<td>Con.</td>
<td>2472.3</td>
<td>2835.6</td>
<td></td>
<td>255.3</td>
<td>276</td>
</tr>
<tr>
<td></td>
<td>CPS</td>
<td>974.9</td>
<td>802.2</td>
<td></td>
<td>2456</td>
<td>2291.1</td>
</tr>
<tr>
<td>Balfour Beatty, London, U.K</td>
<td>Con.</td>
<td>937</td>
<td>1183</td>
<td></td>
<td>5161.1</td>
<td>5805</td>
</tr>
<tr>
<td></td>
<td>CPS</td>
<td>140</td>
<td>155</td>
<td></td>
<td>1461.8</td>
<td>2485.4</td>
</tr>
<tr>
<td>Bechtel, San Francisco, Calif., U.S.A.</td>
<td>Con.</td>
<td>6811</td>
<td>3993</td>
<td></td>
<td>12500</td>
<td>16700</td>
</tr>
<tr>
<td></td>
<td>CPS</td>
<td>758</td>
<td>761</td>
<td></td>
<td>1220</td>
<td>1599</td>
</tr>
<tr>
<td>Black &amp; Veatch, Overland Park, Kan., U.S.A.</td>
<td>Con.</td>
<td>471.9</td>
<td>268.8</td>
<td></td>
<td>465</td>
<td>573.7</td>
</tr>
<tr>
<td></td>
<td>CPS</td>
<td>234.7</td>
<td>198.2</td>
<td></td>
<td>322.1</td>
<td>369.4</td>
</tr>
<tr>
<td>CH2M HILL, Englewood, Colo., U.S.A.</td>
<td>Con.</td>
<td>91.5</td>
<td>30.2</td>
<td></td>
<td>320.6</td>
<td>238.1</td>
</tr>
<tr>
<td></td>
<td>CPS</td>
<td>170.9</td>
<td>207.5</td>
<td></td>
<td>891.3</td>
<td>1563.6</td>
</tr>
</tbody>
</table>

PROCEDURE AND EMPIRICAL RESULTS

Step 1: Basic procedures for conducting panel data analysis

First, revenues of contracting and CPS are presented as \{X_{it}\} and \{Y_{it}\}, where \(i=(1,2,\ldots,23)\) and \(t=(1,2,\ldots,12)\). Given the time-series nature of the data, the second step in the analysis is to determine the stationarity of panel data. This is tested by a unit root test (Levin and Lin, 1992; Maddala and Wu, 1999). If the panel data fails the stationarity test, a time series needs to be adapted by certain levels of differential until the rest requirement is fulfilled. Third, the basic equation for the panel data analysis, as a regression model, is developed and shown below:

\[
y_{it} = x_{it}'\beta + z_{it}'\alpha + \varepsilon_{it}
\]  
Eq. (1)

Where \(y_{it}\) is the dependent variable, \(x_{it}\) the independent variable, \(z_{it}'\alpha\) the individual effect or heterogeneity term, and \(\varepsilon_{it}\) the error term. The subscript \(i\) indicates individual firm and \(t\) represents the time. \(z_{i}\) contains a constant term and a set of individual or group specific variables, all of which are taken to be constant over time \(t\). The main objective of the panel data analysis is to test the consistent and efficient estimation of \(\beta\) (Greene, 2003), which indicates the correlation between contracting revenues (\(x_{it}\)) and CPS revenues (\(y_{it}\)).

Next, the balanced panel data of the 23 firms is analyzed by R, which is an open source statistical analytical software program. Through the significance test (implied by \(Pr(>|t|)\)) and the regression, it is found that the coefficient \(\beta\) is significantly positive (See Table 2). The positive correlation between CPS and contracting revenue is therefore confirmed.
### Table 2. Results of the Correlation Analyses between Contracting and CPS Businesses (significance codes: ‘****’ 0.001; ‘**’ 0.01; ‘*’ 0.05)

<table>
<thead>
<tr>
<th></th>
<th>Balanced Panel: n=23, T=12, N=276</th>
<th>Dependent: Y (CPS) &amp; Independent: X (contracting)</th>
<th>Dependent: X (CPS) &amp; Independent: Y (Contracting)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Effects</td>
<td>Effects</td>
</tr>
<tr>
<td></td>
<td></td>
<td>var     std.dev share</td>
<td>var     std.dev share</td>
</tr>
<tr>
<td>idiosyncratic</td>
<td></td>
<td>2575869 1605 0.184</td>
<td>69415 264 0.297</td>
</tr>
<tr>
<td>Individual</td>
<td></td>
<td>11424879 3380 0.816</td>
<td>164399 406 0.703</td>
</tr>
<tr>
<td>theta:</td>
<td></td>
<td>0.864</td>
<td>0.816</td>
</tr>
<tr>
<td>Coefficients</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Estimate  Std. Error  Pr(&gt;</td>
<td>t</td>
<td>)</td>
</tr>
<tr>
<td>(Intercept)</td>
<td>1894.933  722.950 2.621 **</td>
<td>254.380  89.095 2.855 **</td>
<td></td>
</tr>
<tr>
<td>β</td>
<td>1.827  0.358 5.103 ***</td>
<td>0.047  0.009 5.107 ***</td>
<td></td>
</tr>
<tr>
<td>R2:0.0868</td>
<td>Adj. R2:0.0861</td>
<td>R2:0.0870 Adj. R2:0.0863</td>
<td></td>
</tr>
</tbody>
</table>

### Step 2: Lead-lag relationship between \{X_{it}\} and \{Y_{it}\}

However, correlation does not imply causation (Aldrich, 1995). Researchers tend to use correlation as a valuable type of scientific evidence but true causal relationship must be systematically explored. To find out the likelihood of a true causal relationship, or in other words, the bidirectional causality between contracting and CPS businesses as hypothesized in \(H_1\) and \(H_2\), this study further tested the lead-lag relationship between the two business sectors. A lead-lag effect, especially in economics, describes the situation where one leading variable is correlated with the values of another lagging variable at later times. It is hoped that through this proven statistical analysis, the causal relationship between CPS and contracting businesses, if there is any, will be discovered not only on the current term, but also at later times.

Lagged models were adopted in this research. Eq.(2) and Eq.(3) are the models to test the bidirectional lead-lag relationships between contracting and CPS businesses:

\[
\begin{align*}
    y_{it} &= \sum_{j=1}^{p} \gamma_j y_{i(t-j)} + \sum_{j=1}^{q} \gamma_j' y_{i(t-j)} + \alpha + \epsilon_{it} \quad \text{Eq. (2)}
    \\
    x_{it} &= \sum_{j=1}^{p} \beta_j' x_{i(t-j)} + \sum_{j=1}^{q} \beta_j x_{i(t-j)} + \alpha' + \epsilon_{it}' \quad \text{Eq. (3)}
\end{align*}
\]

Where \(y_{it}\) is the dependent variable; \(x_{it}\) the independent variable; \(p, q, p',\) and \(q'\) the maximum levels of lag in the analyses; \(y_{i(t-j)}\) is the CPS revenue of firm \(i\) in \((t-j)\)th year, \(x_{i(t-j)}\) is the contracting revenue of firm \(i\) in \((t-j)\)th year, \(\gamma_j, \gamma_j', \beta_j, \beta_j'\) coefficients of lagged terms; \(\alpha\) and \(\alpha'\) constant terms, \(\epsilon_{it}\) and \(\epsilon_{it}'\) error terms. Eq. (2) is to test whether \(X\) has a lead-lag effect on \(Y\), and Eq. (3) is to test whether \(Y\) has a lead-lag effect on \(X\). If one or more significant coefficient(s) of \(x_{i(t-j)}\) in Eq. (2) exists, it means the hypothesized lead-lag relationship of \(x_{it}\) on \(y_{it}\) is supported. Similarly in Eq. (3), the existence of significant coefficient(s) of \(y_{i(t-j)}\) confirms the lead-lag effect.
relationship of \( y_{it} \) on \( x_{it} \). The effects of any lead-lag relationship depend on the estimated coefficient(s) and statistical tests of the lagged models.

Surprisingly, the analyses show that no lead-lag relationship between contracting \( \{x_{it}\} \) and CPS \( \{y_{it}\} \) business is discovered from the panel data analyses (See Table 3). Both hypotheses \( H_1 \) and \( H_2 \) are not supported. Neither the hypothetical virtuous cycle between CPS and contracting businesses is supported. These contradict our orthodox wisdom.

**Table 3. Results of the Lagged Models (significance code: ‘***’ 0.001)**

<table>
<thead>
<tr>
<th></th>
<th>( x_{t-1} )</th>
<th>( x_{t-2} )</th>
<th>( x_{t-3} )</th>
<th>( y_{t-1} )</th>
<th>( y_{t-2} )</th>
<th>( y_{t-3} )</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>( H_1 ) (contracting)</td>
<td>Estimate</td>
<td>0.77</td>
<td>2</td>
<td>0.898</td>
<td>Nil</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Significance</td>
<td>***</td>
<td>***</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( H_2 ) (CPS)</td>
<td>Estimate</td>
<td>0.50</td>
<td>8</td>
<td>0.298</td>
<td>Nil</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Significance</td>
<td>***</td>
<td>***</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**EXPLANATION**

In-depth analyses of the business operations in the above listed companies were conducted to understand the no strong lead-lag relationship between contracting and CPS businesses. Research efforts have been made to collect annual reports of the companies over the past five years from 2008 to 2012, with the hope that they will give their business operation models and explain the “no strong relationship”.

Beyond the standard self-promoting information, there were some interesting findings.

Companies seem well aware of the business opportunities brought about by clients’ increasing preference for EPC or D&B. Meanwhile, the top international companies are often involved in more than one business. It gives an impression that today’s top international firms try to entail CPS and contracting businesses to provide a one-stop service to clients, in particular those who demand EPC or D&B.

Nevertheless, the CPS and contracting subsidiaries, although within the same company, do not necessarily form a consortium amongst themselves to undertake an EPC or D&B project. Rather, they may collaborate with other companies’ CPS or contracting counterparts in undertaking that project. In fact, the CPS and contracting subsidiaries are largely separated profit centers on their own. They are “freelance” competitors in different projects. This concurs with the observation by Lu et al. (2013a) that companies nowadays adopt a “co-opetition” strategy (e.g., Brandenburger and Nalebuff, 1996; Flanagan, 2009; Eriksson, 2008), which involves collaboration with other companies in one market segment, a region, or even a specific project, while competing fiercely against them in other segments, regions, or projects.

With such a “co-opetition” strategy, it may not be difficult to explain the test results that a contracting business in one particular year is significantly impacted by its earlier terms’ business but not by their CPS counterpart in any term. Likewise, it is not difficult to explain why CPS business in one particular year is significantly impacted by its earlier terms’ business but not by their contracting counterpart in any term. Jointly, the above analyses can explain why there is no significant lead-lag relationship between contracting and CPS businesses.
THEORETICAL CHALLENGES AND FUTURE RESEARCH

In international construction, companies have strived to grow. A clear trend from this study is that a considerable number of top international CPS and contracting firms tend to cross the boundary and enter each other’s territories in terms of geographies, services and markets. The trend seems contradicting Porter’s (1980) theories of competitive strategy, which emphasizes “focus” – a firm can achieve competitive advantage by focusing on “cost leadership” or “differentiation” otherwise it will “stuck in the middle”.

Diversification, as one of the four main growth strategies defined by Ansoff (1957) and remarked by Mintzberg and Quinn (1992), may help explain the contracting and CPS divergence. Diversification is a departure from a firm’s previous experience base (Kim and Reinschmidt, 2011a). Kim and Reinschmidt (2011b) reported that contracting business executives use diversification as a corporate strategy for risk management, for firm growth, or both. Jewell (2011) reported that there are three main drivers for CPS to diversify: 1) increase turnover/profits; 2) minimize the risk of an over-reliance on working in a single domestic market with a cyclical and fluctuating demand, and; 3) to expand overseas having outgrown their domestic market. It is comprehensible that a contracting firm, or a CPS firm, enters a new service business based on its professional knowledge accumulated. However, it is somewhat inexplicable for contracting and CPS firms to diversify into each other, particularly given that there is no significant lead-lag relationship between the two sectors being discovered in this study.

The dichotomous view of markets and hierarchies in Neoclassical Economic Theory needs to be further substantiated in order to better explain the contracting and CPS business divergence in the international market. As evident in the above “co-opetition” strategy, subsidiaries under the same roof of a company are unnecessarily governed by hierarchies, which are supposed to reduce transaction cost in delivering services, and in turn, to increase competitiveness. Researchers have reported that traditional contracting firms tend to adopt hierarchies while for CPS firms, in particular those who are privately owned (e.g. Arup is owned by a Trust and the Ramboll shares are owned by the Ramboll Foundation), the organization structures are much decentralized, and the governance is largely autonomy. The subsidiaries thus often act as “freelance” competitors.

The trend of contracting and CPS business integration in the international market represents a frontier for substantiating theories of competitive strategy, diversification, and the dichotomy of markets and hierarchies. These theoretical challenges cannot be answered in a single paper here, let alone its aim is to merely explore the nexus between contracting and CPS business. The non-significant lead-lag relationship between the two business sectors opens a window through which the intriguing phenomenon of contracting and CPS business convergence can be further investigated.

CONCLUSIONS

This research tests the lead-lag effects between contracting and CPS business, with a view to unlocking the complicated yet intriguing nexus between the two sectors in the international market. Unlike our belief that contracting and CPS within
the same firm will mutually benefit from each other, the study shows that no significant lead-lag relationship was found between the two. In-depth analyses of the business operations in these companies show that CPS and contracting subsidiaries, although under the same company umbrella, do not necessarily form a consortium to meet clients’ increasing demand for integral design and build services. By and large, they remain as individual profit centers, and thus they may collaborate with other companies’ CPS or contracting counterparts in undertaking an EPC or D&B project.

This research has significant academic and practical value. Traditional theories of organizations and competition are frequently challenged by modern contracting and CPS businesses. In practical term, the research provides fresh perspectives on the operations of top construction companies in the international market. By arguing that the growth of contracting and CPS is not by their integration, or for integration, this research may divert researchers’ interest to investigating the rationale and strategies of merger and acquisition, which are increasingly seen in the international construction market.

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