COLLABORATIVE BEHAVIOR IN THE SPANISH BUILDING INDUSTRY: A PRELIMINARY ANALYSIS OF THE DATASET

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The objective of this study is to: (1) evaluate the team behavior in the Spanish building industry; (2) investigate the barriers in adopting more integrated delivery methods; and (3) suggest practices to enhance team integration in the Spanish building industry. To achieve these objectives, project managers (owners and contractors) were interviewed following a questionnaire, which was composed of five parts: characterization, procurement, payment provisions, team characteristics, and team behavior. According to the responses, lump-sum is the main payment approach used. The two-stage RFP and the sole source procurement methods are employed most often. No incentives or partnering (formal or informal) is used by Spanish owners, and communication is considered quite formal. However, owners tend to repeat with project teams, and appreciate the team's prior experience as a unit. Moreover, team's commitment to project's goals is high as well as the team's compromise on project issues. Owners more often favor the timeliness of communications, whereas team chemistry is rated higher by contractors.

Keywords: *Collaborative; Construction Project; Spain; Team Behavior; Team Integration*

COMPORTAMIENTO COLABORATIVO EN EL SECTOR DE LA EDIFICACIÓN ESPAÑOL: ANÁLISIS PRELIMINAR DE LOS DATOS

El objetivo de este estudio es: (1) evaluar el comportamiento de las partes involucradas en la obra en el sector de la edificación español; (2) investigar las barreras para adoptar métodos de contratación más integrados; y (3) sugerir prácticas que mejoren la integración de las partes en el sector de la edificación español. Con la finalidad de conseguir estos objetivos, se entrevistó a gestores (promotores y constructores) según un cuestionario, compuesto de cinco partes: caracterización, licitación, condiciones de pago, caracterización de las partes, y comportamiento de las partes. Según las respuestas, el precio cerrado es el principal método de pago utilizado. El concurso restringido y el candidato único son los métodos de licitación más empleados. Los promotores españoles no incentivan ni se asocian (formal o informalmente), y la comunicación la califican como formal. No obstante, los promotores tienden a repetir con las partes, y aprecian la experiencia anterior como equipo. Además, el compromiso de las partes con los objetivos de la obra es también alto, así como el compromiso con los aspectos de la obra. Los promotores suelen favorecen la puntualidad de las comunicaciones, mientras que la química entre las partes es altamente valorada por los constructores.

Palabras clave: *Colaborativo; Obra, España; Comportamiento del Equipo; Integración del Equipo*

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1. Introduction

The construction industry is characterized by the adversarial relations among different stakeholders that lead to cost overrun, schedule overrun, or low quality of finished facilities. These antagonist relationships are attributed to contradictory objectives of different parties as well as the disintegration and fragmentation of the construction industry (e.g.: Nam & Tatum, 1992; Koskela, 1992; Latham, 1994). One of the factors that influence the behavior of the parties and defines their roles and responsibilities in a project is the delivery method. The traditional project delivery method (design-bid-build) and selection of parties based on the lowest price are often criticized to discourage collaboration among team members (Nam & Tatum, 1992; Latham, 1994; Pocock et al., 1996).

To address this challenge, different type of delivery methods are introduced into the construction industry providing various levels of team integration: construction management at risk (Barrie & Paulson, 1978), design-build (Beard et al., 2001), partnering (Baker, 1990), or integrated project delivery (Ballard, 2000). There is an emerging approach to more integration and collaboration among parties (El Asmar et al., 2013). For example, in the case of the integrated project delivery, the legal framework is provided by the multiparty relational contract (Macneil, 1980; El Ballard, 2000; Asmar et al., 2013). The basis of this contract is a relationship of trust between the contractual parties. Macneil (1980) also suggested including integrity, reciprocity, flexibility and solidarity in the contract to enhance performance. Some authors (Kumaraswamy et al., 2005; Rahman & Kumaraswamy, 2008) indicated that cooperative team-working is improved by moving from classical to relational contracting; the main barrier to collaborative team-working is mainly the lack of trust. According to these authors there are four factors that encourage cooperative team-working: owner's competencies, prior interactions, compatible organizational culture, and better selection of project partners.

However, the studies analyzed in the previous paragraphs were developed in English-speaking countries. In the Spanish construction industry, the most popular delivery methods among public agencies are the traditional design-bid-build (75%) and concession-like contracts (25%) (Asociación de Empresas Constructoras de Ámbito Nacional [SEOPAN], 2012). The design-bid-build is also the most common delivery method used by private developers. The reason stems from the fact that the Spanish Building Act 38/1999 shields the architect and prevents the implementation of other delivery methods (Pellicer & Victory, 2006). In addition, in Spain, integrated project delivery is virtually unknown in the industry, construction management at risk is seldom used (and only by industrial or commercial developers), and design-build was used in the past (staring in the 1970s) but abandoned twenty years ago maybe because of its misuse by some public agencies. Table 1 displays a historical comparison between the United States and Spain regarding alternative project delivery methods.

Table 1: Comparative historical analysis of project delivery methods between the United States and Spain

	United States		Spain	
	Starts	**Current Use**	**Starts**	**Current Use**
Construction Mngmt. at Risk (CMR)	1960s	Used	1970s	Seldom used (by private only)
Design-Build (DB)	1990s	Frequently used	1970s	Seldom used
Integrated Project Delivery (IPD)	2000s	Seldom used	---	Unknown

Considering the procurement procedures, open bid and one-stage request of proposals (RFP

henceforth) are mainly used in Spanish public contracting. Open bid takes into account the price, whereas the one-stage RFP also considers the technical proposal, the schedule, the team experience, and quality and safety control procedures. For one-stage RFP, the price is weighted 50% or more in public contracts because of the regulations imposed by European Directive 2004/18/EC on the coordination of procedures for the award of public works, supply, and service contracts. The two-stage RFP is seldom implemented by public owners; however, it is used by private owners (Pellicer & Victory, 2006). For two-stage RFP, the technical proposals are received first and pre-qualified bidders are short-listed; then, these qualified bidders submit the economic offer (Molenaar et al., 1999). Private developers sometimes implement other strategies like the qualifications-based or the sole source.

Concerning payment provisions, only unit-price (in accordance with a bill of quantities) and lump-sum are allowed by the Spanish Public Procurement Act 3/2011. The first one is used most of the time in civil engineering works for public owners, whereas lump-sum is seldom used (de la Cruz et al., 2006). As a result, contractors are chosen based on the bid price (Oviedo-Haito et al., 2014). This circumstance incites adversarial relationships among the different agents of the construction process (de la Cruz et al., 2006; Oviedo-Haito et al., 2014). Even though private owners do not have these regulatory constraints, most of the time they use lump sum –in building construction– and unit-price –in civil engineering works– (Pellicer & Victory, 2006). Private developers may use other payment provisions from time to time, such as guaranteed maximum price or cost plus fee.

While alternative project delivery methods to design-bid-build, along with the procurement and payment methods, continue to enjoy greater use in the United States, United Kingdom and other culturally-related countries, the Spanish construction industry is falling behind this trend (de la Cruz et al., 2006; Pellicer & Victory, 2006). Therefore, following Nam and Tatum's (1992) scheme, this paper departs from the literature by analyzing the level of integration and team behavior in the Spanish building industry.

2. Motivation behind the Study

The research developed and explained in this paper is part of the overall research project "Owner's Guide to Maximizing Success in Integrated Projects" conducted by the University of Colorado and Penn State University. The purpose of this project, funded by the Pankow Foundation and the Construction Industry Institute, is: (1) to identify key project success factors from the owner's point of view, and (2) to determine appropriate metrics for measuring performance results; this purpose is to be accomplished by considering innovative concepts such as project integration and team behavior. Within this research we analyze the Spanish building industry and compare it to the United States industry. However, since the Spanish construction industry tends not to use integrated delivery methods due to the specific characteristics of the Spanish scenario (explained previously), the focus of the research is narrowed to include only the design-bid-build delivery method applied to the residential housing sub-sector.

The overall research has two main phases. First, a comprehensive literature review was developed to produce dependent variables (performance metrics) and independent variables (predictors). To execute this, a rigorous content analysis was performed on papers relating to the measurement of project performance. Secondly, a research workshop was held to refine, improve and rank these variables according to their significance and availability; the most important goal of the workshop was to make sure that no variable was missed from the analysis. Experts from the industry and the academia participated in a two-day workshop, structured as a "charrette", to combine techniques used in surveys, interviews and focus groups in an accelerated time frame (Griffith & Gibson, 2001; Gibson & Whittington, 2010).

After analysis and refinement of the results, 11 dependent variables (performance metrics)

and 45 independent variables (predictors) were chosen. A broad survey of owners and contractors was designed to gather the data. The questionnaire was composed of 12 parts: characterization, project costs, project schedule, project quality, project safety, sustainability, procurement, payment provisions, team characteristics, team behavior, process and technology, and lesson learned. A detailed explanation of the steps carried out to design this questionnaire survey can be found in Esmaeili et al. (2013).

3. Research Method

This paper aims to present a preliminary analysis of the collaborative behavior in the Spanish building industry. Therefore it only studies the results concerning five of the sections of the overall questionnaire: (a) characterization, (b) procurement, (c) payment provisions, (d) team characteristics, and (e) team behavior. The characterization of the respondents (section #1 of the questionnaire) includes data regarding company type (owner or contractor), square footage, and number of floors (above and below grade). The procurement section (#7) asks about how proposals were solicited and which factors were considered. The payment provisions section (#8) finds out about payment terms, incentivized work, and inclusion of operation and maintenance, and partnering in the contract provisions. The team characteristics section (#9) inquires on owner's type of relationship with the project team, team's prior experience as a unit, project team chemistry, timeliness of owner decisions, owner´s ability to make a decision, staff turnover, involvement of end users, and co-location (yes/no). Finally, the team behavior section (#10) requests information on: formal or informal communication, compromise on project issues, timeliness of communication, contingency, setting goals, and commitment to the project goals. The specific questions for each of these sections are displayed in the Results section.

This research can be considered exploratory. In case where the goal of the research is not to generalize but to approach a phenomenon, it could be suitable to purposefully choose individuals that get the most out of the underlying phenomenon (Onwuegbuzie & Collins, 2007). The 60 respondents are Spanish project managers working for private developers (owners) or construction companies (contractors) with, at least, 10 years of experience. There is a pair of respondents (owner and contractor) for every residential building project chosen, being 30 the total number of analyzed projects; all of them were finished after 2006.

With the aim of calibrating the survey properly: (1) the questionnaire was handed out to 10 experts with more than 15 years of experience in the Spanish construction industry to get feedback from them; and (2) a pilot interview with one owner and one contractor was performed to check that questions were properly understood. The process to get in touch with the respondents started with a telephone call explaining the basics of the research and inquiring about the potential respondent's willingness to participate. Then, the research team sent an email asking for the hard data of the project. Finally, it was decided to obtain the answers using face-to-face interviews so any doubts or inconsistencies could be clarified by the interviewer in real time; every interview took around two hours as average.

4. Results

4.1. Scales of Measurement

Several kinds of questions were used in the questionnaire requiring the use of multiple levels of measurement according to the type of variable (Cohen et al., 2000). These include continuous, categorical (e.g. binary response scales), and interval (e.g. 6-point Likert scales) levels of measurement. For the categorical variables relative frequency was calculated. The continuous variables (building gross square footage, and number of floors above and below grade), maximum, minimum and mean values were computed too (displayed in Table 2).

Tables 3 (procurement), 4 (payment provisions), 5 (team characteristics), and 6 (team behavior) present the results for the categorical and interval data collected. Table 7 shows the results from Likert scale questions as well as the cumulated percentages of “low” (grouping 1 to 3) and “high” (grouping 4 to 6) choices.

4.2. Demography

The sample consists of 30 Spanish building residential projects ranging from two-floor single houses (518 m^2) to 43-floor tall buildings (25.284 m^2), as displayed in Table 2. Two different roles were interviewed per each project (question 1.1 of the survey): owners and contractors.

Table 2: Extreme and mean values for continuous variables

Question	Max.	Min.	Mean
1.2 Building gross square footage (in m^2)	25.284	517	10.068
1.3 No. of floors above grade	43	2	9,7
1.4 No. of floors below grade	5	0	1,6

4.3. Procurement Methods

Regarding the procurement method (see Table 3), sole source and two-stage RFP were the methods implemented by owners. The sole source procurement method was more common in order to hire the architect/designer (85%), whereas the two-stage method was more often used to hire the general contractor (62%). In the case of the 2-stage RFP, the most important factor considered for the selection of the architect was similar project experience (69%); other factors considered were: qualifications (41%), design and functionality (38%), technical proposal (31%), price (21%), and interview performance (7%). Regarding the general contractor, project experience (90%) was the most popular factor too. Qualifications and price were highly considered as well (55% and 62% respectively), whereas technical performance and interview performance were not so commonly used (10% both).

Table 3: Percentage values for categorical variables regarding procurement

7.1 Indicate how proposals were solicited from each project participant:		
Architect/Designer: Sole Source (85%) / 2-Stage RFP (15%)		
General Contractor: Sole Source (38%) / 2-Stage RFP (62%)		
7.2 Which of these factors were considered in the selection of each participant? (check all that apply):		
	Architect/Designer	General Contractor
Price	21%	55%
Qualifications	41%	62%
Design, Aesthetics and Funcionality	38%	0%
Technical Proposal	31%	10%
Project Experience	69%	90%
Interview Performance	7%	10%

The first and second choices made by the owner for both groups (architects and contractors) are project experience and qualifications (see Table 3). Price is important for the selection of the contractor (this factor was chosen 55% of the times), but not the architect (only 21%). The survey also asked about the factors considered to choose, without the inclusion of rank to better ascertain an explanation for why price is not ranked the first for general contractors,

considering the project delivery for all cases is design-bid-build. Moreover, for architects, the technical proposal and design, aesthetics and functionality are important because the owner sometimes asks for alternative designs to the conceptual idea. It is noticeable that performance interviews are seldom used for choosing both agents, relying owners more on facts (past project experience and qualifications) than words (interview).

4.4. Payment Provisions

Regarding the payment provisions (see Table 4), lump sum was the most applied by owners (89% for paying the architect and 76% for the general contractor). This finding seems logical when considering that owners tend to use the same payment provisions for every party involved, and that lump sum is the most commonly chosen. This approach generally simplifies the supervision and control task on the side of the owner, allowing a more in-depth focus on quality and time issues. Guaranteed maximum price was seldom used for both parties (4% for architects and 14% for contractors), whereas unit prices and cost plus fee were only implemented from time to time. A surprising result is that no performance-based incentives or partnering agreements (formal or informal) were used in any of the projects, whether for architects or for contractors (Table 4). The operation and maintenance of the facility was sometimes included in the contract scope of the general contractor (42%).

Table 4: Percentage values for categorical variables regarding payment conditions

8.1 Select the commercial terms used for the following project participants:		
	Architect/Designer	General Contractor
Lump Sum	89%	76%
Unit Prices	0%	14%
Guaranteed Maximum Price	4%	14%
Cost Plus Fee (Fixed)	4%	3%
Cost Plus Fee (%)	4%	0%
8.2 Were performance-based incentives used in any contracts?:		
No: 100%		
Yes: 0%		
8.4 Did the project team use a formal or informal partnering agreement?:		
No: 100%		
Yes: 0%		
8.3 Was the operation and maintenance of the facility included in the contract scope of any team member or members?:		
No: 58%		
Yes: 42%		

4.5. Team Characteristics and Behavior

Most commonly the owner repeated work with both the design and construction agents as is indicated in Table 5 (architect 55% and contractor 72%). This finding is only slightly corroborated by question 9.2 in Table 7 by both parties (the owner and the contractor); even though they have worked together previously, it looks like they do not consider their relationship mature enough. End users provided feedback to the project in the pre-construction (10%), construction (38%), and operation phases (13%). Feedback during the construction phase comes mostly from end users that have already bought a unit and want to customize it; whereas during the operation phase is mainly due to complaints regarding the

quality of the work. Anyway, useful feedback, provided during the pre-construction phase, is not abundant. Furthermore, some respondents (21%) considered that there was co-location during the construction phase of the project. The chemistry among the team members was considered good (mean of 4.3 and 4.7 for owners and contractors respectively, in Table 8), whereas the staff turnover was considered low (1.6 and 1.8 in Table 7).

Table 5: Percentage values for categorical variables regarding team characteristics

9.1 Indicate the owner's type of relationship with the project team:
Architect/Designer: First Time (45%) / Repeat (55%)
General Contractor: First Time (28%) / Repeat (72%)
9.5 When was end-user feedback provided to the project? (check all that apply):
Pre-Construction: 10%
Construction: 38%
Operation: 13%
None: 55%
9.6 Was there any co-location (team in shared workspace for extended period) of teams in the project?:
No: 79%
Yes: 21%

Contingency was generally shared, even though some respondents indicated that it was owner-controlled or contractor-controlled (5% each), as displayed in Table 6. Having into consideration that the project delivery approach is very constrained (design-bid-build) as well as the type of product (residential units), it is possible that some of the respondents may have misunderstood the question. The participants in the survey also indicated that almost always (98%) the owner set the goals of the projects; the general contractor (22%) and the architect (27%) participated sometimes too.

Table 6: Percentage values for categorical variables regarding team behavior

10.4 How was contingency managed?:
Owner-Controlled: 5%
Contractor-Controlled: 5%
Shared: 80%
Other: 10%
10.5 Who participated in setting goals for the project (check all that apply)?:
Owner: 98%
Architect/Designer: 27%
General contractor: 22%

Table 7 displays the results of the Likert scale questions from 60 questionnaires gathering the perspective of two groups: owners and contractors. The results show percentages grouped as "low" (from 1 to 3) and "high" (4 to 6). The median and mean also allows for a preliminary comparison of the groups. First, the results show that some of the group responses are quite similar. For example, both groups rate the team's prior experience as a unit (mean of 3.2 vs. 3.2), the frequency of staff turnover (1.6 vs. 1.8) and the team's commitment to the project's goals (4.9 vs. 4.8) in a similar fashion.

Table 7: Percentages, median and mean values for 6-point Likert scale with choices ranging from 1 to 6, differentiating between owner and contractor

QUESTION	OWNER				CONTRACTOR			
	Low (1-3)	High (4-6)	Median	Mean	Low (1-3)	High (4-6)	Median	Mean
9.2 Team's prior experience as a unit	52	48	3	3.2	54	46	3	3.2
9.3 Team chemistry	21	79	4	4.3	12	88	5	4.7
9.4 Relative to your expectations, denote the frequency of staff turnover within the project team	89	11	1	1.6	88	13	1.5	1.8
10.1 Evaluate the formality of communication among the project team	48	52	4	3.7	31	69	4	4.0
10.2 Evaluate the timeliness of communication among the project team	24	76	5	4.6	15	85	4	4.3
10.3 How often did the project team compromise on project issues?	3	97	6	5.4	8	92	5	4.8
10.6 To what extent were all project team members committed to the same project goals?	7	93	5	4.9	4	96	5	4.8

However, other answers show some contrast, like the formality of communication and the team's compromise on project issues. The first variable tested (formality) is perceived as more important by contractors (4.0) than by owners (3.7). This seems reasonable since they are the ones who have to endure most of the paperwork. The second variable tested (compromise) is perceived the opposite way. Owners recognize more compromise (5.4) than contractors (4.8).

Finally, two variables are identified in a different way by each party too. Team chemistry is more appreciated by contractors (4.7) than by owners (4.3). This result is very interesting because it implies that, even though there are no inceptives or partnering agreements between both parties, price plays a very important role in awarding a contract. The general contractor may feel comfortable with this status quo; at least, once the work is done. However, the owner does appear to be less comfortable, perhaps because some owners are not so used to this scenario. Regarding the last question, owners appear to place greater value on the timeliness of communication among the project team (4.6) than the general contractor (4.3). This finding seems logical because delay in communication generally harms the main contractor.

5. Conclusions

This paper presents the partial results of 60 interviews to project managers that have worked in 30 different Spanish residential building projects since 2006; one representative of the owner and one construction site manager were surveyed per project. The results are focused on team characteristics and behavior. Results confirm that lump-sum is the main payment approach used in the Spanish residential industry, with the 2-stage RFP and the sole source the procurement methods most employed. They also confirm that price is the primary variable used to award a contract to a general contractor. No incentives or partnering arrangements (whether formal or informal) are used by Spanish owners, and communication is considered quite formal. However, owners tend to prefer repeat work with project teams, and appreciate the team's prior experience as a unit. In addition, co-location of the contractual agents is sometimes used as well.

Furthermore, it can be concluded that team's commitment to project's goals is high as well as the team's compromise on project issues. Other issues present a difference of appreciation between owner and general contractor: timeliness of communication and team chemistry. Owners value better the timeliness of communication among the project team, because delays in communication generally harm the primary contractor. Team chemistry is more appreciated by contractors (i.e. they rate it higher) perhaps because they feel comfortable with this status quo (at least once the work is done). This happens in spite of the fact that there are no inceptives or partnering agreement between both parties and that price is a key issue in awarding a contract. However, owners do not seem so comfortable in this scenario. Anyway, this result contradicts part of the existing literature on adversarial behavior in the Spanish construction industry (de la Cruz et al., 2006; Pellicer & Victory, 2006; Oviedo-Haito et al., 2014). This result favors dissemination and future use of more collaborative delivery strategies throughout the Spanish construction industry.

Considering that the study is exploratory and that the sample has only 60 project managers, further research is needed. The project is ongoing and the research team is targeting more questionnaires to consider it complete. Because of the small sample size, it is not yet appropriate to apply means tests between groups (owners and contractors) to detect if there are significant differences between them. Once the sample is large enough, additional statistical analyses will provide more robust results and conclusions that can be applied to the Spanish building industry. In addition, other results from the survey will be analyzed in the future as well. Ultimately the goal is to relate performance metrics (cost and schedule basically) to other variables including procurement methods, payment strategies, team characteristics and behavior, sustainability, and technology. Furthermore, comparison with the ongoing study in the United States will allow obtaining additional lessons.

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