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Information feedback in construction contract bidding: Perceptions of Hong Kong contractors

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ABSTRACT

Contractors learn from their experiences in which feedback information plays a key role to enable experiential learning in recurrent bidding. However, little is known about how contractors perceive and act in response to varying levels of bidding feedback information from construction clients. Focussing on construction procurement in Hong Kong, this exploratory study examines: (i) the level of bidding information feedback from public, private and quasi-government client groups, and (ii) the sources, types, uses and adequacy of bidding feedback information from these client groups from contractors' perspective. Data was collected using online questionnaire. The results provide strong evidence that the respondents perceive bidding feedback information from the three client groups are inadequate. They have heavily relied on multiple and/or 'unofficial' sources for obtaining bidding feedback information. Nonetheless, there is suggestive evidence of different possible uses of bidding feedback information among the contractors, which could substantially affect bidding outcomes. This study provides a much-needed insight into clients' information feedback conditions and how feedback information might be used by contractors in competitive bidding. The research implication for clients is that they should take into consideration contractors' need for feedback information in their procurement design so as to enhance efficiency in their procurement practices.

KEYWORDS

Bidding; construction; feedback; information; tendering

Introduction

Clients need a strategic approach in their procurement design to meet their increasing demands for improved building performance, and for improved value within construction contracting services (Marinelli and Antoniou 2019). Aliakbarlou et al. (2018) found that construction clients define values for construction services from multiple perspectives including health and safety, environmental impact, creativity, value for money and contractors' professionalism, which are far beyond the conventional values associated with project time, cost and quality. The selection of contractors is thus crucial in achieving clients' values, and indeed the selection of right contractor is of paramount importance to the success of any construction project (Watt et al. 2010, El-Sayegh et al. 2019). Researchers have advocated the use of multi-criteria for contractor selection for better value for money, but not selecting contractors solely based on bid price – the lowest bidder (e.g., Wong et al. 2001, Yu and Wang 2012, Kog and Yaman 2016). Indeed, the use of multi-criteria contractor selection is well-documented in public procurement of construction services, of which the guidelines are accessible on government websites. In the procurement process, the formation of a contract between clients and contractors via competitive tendering (or bidding) continues to be the most common procedure for job allocation in the construction industry, especially for public sector works (Marinelli and Antoniou 2019).

Although competitive tendering mechanism is well-established, an important procurement design variable that varies across construction clients is the level of information feedback in bidding competitions (Oo et al. 2011). Drew and Fellows (1996) opined that the contributory factors for the varying levels of bidding feedback information among construction clients include: (i) the differing perceptions on the usefulness and actual use of the feedback information provided; (ii) the lack of use of bidding models developed from feedback information provided as reported in the literature; and (iii) the differing perceptions on confidentiality where many contractors do not like to have their bid prices being disclosed to competitors. In many cases, clients do not provide feedback or provide insufficient feedback to contractors (Drew and Fellows 1996). Contractors are facing foreseeable difficulties in obtaining past bidding data records, and there is concern about the accuracy of the information with possibilities of erroneous bids (Drew and Fellows 1996, Lowe and Skitmore 2006). Nonetheless, there is strong empirical evidence of systematic variations in bids over time (e.g., De Neufville et al. 1977, Oo et al. 2012), suggesting that contractors learn from their experiences in which feedback information plays a key role to enable the experiential learning process (Fu et al. 2002, Kagel and Levin 2002). While it has been documented in the literature that contractors do make use of historic bidding data records for their own purpose wherever it seems fit (Drew and Fellows 1996, Lo et al. 2000, Fu et al. 2002), little has been written on how contractors perceive and act in response to varying levels of bidding feedback information among construction clients. Focussing on procurement of construction services in Hong Kong (HK), this exploratory study aims to shed light on these aspects by examining (i) the level of bidding information feedback from different client groups, and (ii) the sources, types, uses and adequacy of bidding feedback information from contractors' perspective. The research findings have implications for

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construction clients and/or contracting authorities in reviewing their procurement design in terms of information feedback condition in the competitive bidding process for contractor selection.

The access and use of bidding feedback information

The information feedback condition adopted by construction clients in competitive bidding can be broadly classified into full, partial and no information (Oo et al. 2011). In the full information feedback condition, bidders are provided with information about all bids and the identity of the bidder making each bid. In the partial information feedback condition, bidders are provided only with the winning bid and the identity of the winning bidder. These two information feedback conditions are more common among public sector clients that must maintain public accountability. For example, the public sector contracting authorities in Singapore provide full bidding feedback information via the GeBIZ government website (www.gebiz.gov.sg). Ballesteros-Pérez et al. (2019) pointed out there are some recent initiatives to make government-related data including historic bids available as open data via different platforms (e.g., the data.gov website, the data.gov.uk website, the European Public Sector Information Platform). However, it is expected that the exercise for retrieving historic bids from these platforms would be both time consuming and expensive to undertake. No information feedback, on the other hand, is prevalent in private sector procurement of construction services due to the high degree of post-bid negotiation (Drew and Fellows 1996). When there was insufficient or no feedback information from clients, contractors have attempted to obtain historic bidding data from a variety of sources, including: competitors, subcontractors, friendly acquaintances, suppliers and newspapers (Park and Chapin 1992, Drew and Fellows 1996). There is also evidence that contractors have kept systematic records of bidding data and performed the relevant analysis in informing their bidding decisions (e.g., Drew and Fellows 1996, Lo et al. 2000, Oo et al. 2010). The data analytical process is of especially importance since contractors have to rely on effective bid pricing strategies in order to translate potential business into reality for long-term survival of their firms (Soo and Oo 2010), especially in highly market environments in HK (Oo et al. 2008). Ballesteros-Pérez et al. (2019) opined that contractors will be able to make much better decisions by making use of past bidding data including making more profits by winning more contracts and/or anticipating the contracts which are likely to have less intense competition. It seems that the potential for more profits among contractors may partly explain why construction clients have not been providing adequate bidding feedback information to contractors.

Fu et al. (2002) suggest that bidders tend to optimize their bids in recurrent construction bidding process with positive reviews of their previous bidding results in which feedback information plays a key role to enable the experiential learning. They found that experienced HK contractors who bid more frequently are more competitive when compared to those who only bid occasionally. According to Park and Chapin (1992), the analysis of historical bids can provide valuable information to contractors in clarifying the relationships among many different competitive factors, these include: (i) the relationship between number of bidders and job characteristics; (ii) the bid-spread – the distribution of the difference between the lowest and second lowest bids; (iii) the distribution of all bids with respect to a contractor's own estimated cost; and (iv) the distribution of lowest bids according to number of bidders. These relationships would facilitate contractors' bid/no-bid and mark-up decisions for future projects; and for them to analyse the market conditions, their bidding performance and the bidding performance of their competitors (Drew and Fellows 1996, Lo et al. 2000). Oo et al. (2010) demonstrated in their competitor analysis model that historic bids could be used to estimate the probable range of competitors' bids, and to differentiate less serious from more serious competitors, thus offering a contractor concerned with bidding strategies targeting on key competitors. In another study, Oo et al. (2015) modelled individual bidders' learning trends (i.e., in terms of bidding competitiveness) using a collection of experimental bidding data. Ballesteros-Pérez et al. (2019), on the other hand, demonstrated a model for predicting the average number of new bidders in construction bidding using historic bidding datasets. While there are many other possible uses of historical bids using different modelling techniques in the literature, it could be expected that contractors would use historical bids for their own purpose using different analytical techniques. It could also be expected that those techniques would not be shared with others since there is nothing to gain and everything to lose for them to disclose the techniques.

The adequacy and importance of information feedback on construction bidding

With reference to the broad classification of full, partial and no information feedback conditions, there are some other variations of information feedback conditions identified in the literature, for example, lowest bid price only and list of all bid prices only (Drew and Fellows 1996). However, there is evidence that contractors generally have different perceptions on the level of adequacy and the appropriate type of feedback information to be provided by clients (Drew and Fellows 1996, Lo et al. 2000). Oo et al. (2014) suggest that clients should provide as much bidding feedback information as possible in the hope that the bids received would be competitive towards better efficiency in their procurement practices. Milgrom and Weber (1982) opined that information never has a negative value to the decision-maker and at worst, irrelevant bidding feedback information can be ignored by the bidders. In examining the importance of information feedback in construction bidding, there experimental studies in the literature aimed at testing the effect of information feedback on bidders' competitiveness and learning (Soo and Oo 2010, Oo et al. 2011, Oo et al. 2014). Using inexperienced student subjects, these experiments provide evidence on variations in bids and learning (i.e., bidding competitiveness) over time for full, partial and no information feedback conditions. The need for more empirical investigations is to be noted, particularly using field data (i.e., bidding data of past projects) in exploring the ideal level of feedback information in optimizing procurement design from clients' perspective (Oo et al. 2015). Oo (2017) opined that field and experimental findings are complementary in construction bidding research, and are important to the progress of knowledge in this field. Indeed, it is surprising to note that little progress has been published on this subject area on bidding feedback information even though competitive bidding is the most common method of job allocation in the construction industry. In contrast, there are a large collection of studies in conventional economics that examined the effects of different bidding information feedback conditions on bidders' bidding behaviour via laboratory economics experiments (e.g., Cason et al. 2011, Saini and Suter 2015, Wooten et al. 2020). These studies

provide a substantial amount of evidence that varying information feedback conditions affect bidders' competitiveness to different degrees, thereby affecting the revenues of those accepting bids to buy or sell.

Procurement of construction services in Hong Kong

This section provides an overview of the construction procurement practices of the two HK major client groups – the public and private sectors. Each client group contributes about half of the total construction output in HK in 2020 (Census and Statistics Department 2020). For public sector, it consists of two groups of government and quasi-government clients. Government clients include various works departments under the Development Bureau, for example, the departments of Architectural Services, Buildings, and Civil Engineering Development. In general, the construction services procured by works departments follow the broad procurement principles and practices of the Stores and Procurement Regulations (SPR), under the overall supervision of the Development Bureau (Financial Services and the Treasury Bureau 2020a). Under the SPR, HK government procurement for services for construction and engineering works exceeding HKD 7 million is normally done using open and competitive tendering procedures so as to obtain the best value for money. It should be also noted that HK acceded to the Agreement on Government Procurement of the World Trade Organization (WTO GPA) in 1997 that aims is to provide for open and fair competition amongst domestic and foreign suppliers and service providers. The WTO GPA applies to the HK Government procurement of construction services contracts of a value of not less than 5,000,000 Special Drawing Rights (SDR) (Development Bureau 2014). SDR is an international currency unit set up by the International Monetary Fund (www.imf.org), the current US dollar equivalent to 1 SDR is about US$1.42 at the time of writing (Nov 2020). In addition, the Development Bureau (www.devb.gov.hk) maintains a list of approved contractors for public works, and only listed contractors can tender for public sector contracts in the works categories and groups for which they are approved. There are five works categories (i.e., buildings, port works, roads and drainage, site formation, and waterworks) and contractors are grouped into Groups A, B and C with set tendering limits (i.e., Group A $\leq$ HKD 100 million, Group B $\leq$ HKD 300 million, Group C $>$ HKD 300 million). In terms of information feedback condition to competing bidders, the feedback information to unsuccessful tenderers should not include tender information provided by other competing tenderers (Financial Services and the Treasury Bureau 2020a). Essentially, unsuccessful tenderers will be provided with information on awarded contract sum and the technical score elements if a marking scheme (i.e., a multi-criteria contractor selection scheme) is applied in tender evaluation (Environment, Transport and Works Bureau 2002). Upon the execution of contract with the successful tenderer, the number of tenders received for a particular contract, the name of the successful tenderer, the accepted tender sum and the date of the award of the contract will be released to the public using the government gazette on a periodic basis (Financial Services and the Treasury Bureau 2020a).

For quasi-government clients such as the Mass Transit Railway Corporation Limited, the Housing Authority, the Airport Authority, and the Kowloon-Canton Railway Corporation procure a large volume of construction services in HK, and have their own established procurement policies and procedures. For example, 'although Housing Authority is not required to follow the requirements of SPR of the HK government, Housing Authority will make reference to and generally follow the broad procurement principles and practices of the SPR, where applicable' (Housing Authority 2019). Despite of their different procurement procedures, the WTO GPA is applicable to HK quasi-government agencies including the Airport Authority, the Hospital Authority, the Housing Authority, the Kowloon-Canton Railway Corporation and the Mass Transit Railway Corporation Limited for their procurement of construction services contracts of a value of not less than 5 million SDR (Financial Services and the Treasury Bureau 2020b). With the different procurement policies and procedures adopted by this client group, it could be expected that there are variations in their information feedback condition in the competitive tendering process. Next, there are many private sector clients in HK such as property developers. There is no recommended code of tendering procedures for private sector clients, and it has been reported that they do not give feedback information to contractors (Drew and Fellows 1996). Nonetheless, similar to quasi-government clients, there would exist some forms of feedback information among the private sector clients. This study aims to shed light on this aspect by examining the level of bidding information feedback among different client groups.

Research method

This study adopted a survey research design that allows for timely data collection from the targeted population. Data was collected using an online structured survey questionnaire in the last quarter of 2019. While an online survey is an efficient tool to reach the targeted population, it is hoped that the anonymity of responses would encourage participation in this study since the prospective respondents may be reluctant to share bidding-related information of their organizations. In the development of the questionnaire, the HK-based study by Drew and Fellows (1996) using a postal questionnaire was the closest study from which the relevant questions were adapted in this study. The respondents were asked to indicate their perceptions on the subject matter based on a seven-point Likert scale (for e.g., 1 = extremely inadequate and 7 = extremely adequate on their perception on adequacy of bidding feedback information). Also, an 'other, please specify' option was included in the relevant questions so that the respondents could specify additional option if applicable. Prior to the mass data collection, the questionnaire was pre-tested with two professionals with vast experience in construction contract bidding in HK. The outcome of the pilot testing indicated that there was a need to include a third client group as a standalone group – quasi-government agencies – in the questionnaire in addition to public and private client groups. It should be noted that the quasi-government client group had not been captured in Drew and Fellows (1996), and this current study would provide an insight into the feedback information conditions of this respective client group.

For the recruitment of respondents, the selection criteria for the targeted respondents were industry practitioners who were: (i) proficient, experienced and actively involved in construction bidding activities, and (ii) working for construction firms listed on the HK Development Bureau's Groups B and C list of approved contractors for public works. The respective numbers of Groups B and C contractors were 144 and 119 at the time of survey. The justification for the selection criterion to include only larger contractors is because they are more likely to be

active in bidding competition and would be working with different client groups, and have the resources to maintain and manage feedback information on their business operations. In the recruitment of targeted respondents, an attempt was first made to approach the targeted groups of contractors via phone calls to obtain the contact details of the tendering team. However, the majority contacted have refused to provide the details. Thus, snowball sampling, a convenience sampling method, was adopted to reach the targeted respondents who would otherwise be very difficult to reach. This sampling method was considered efficient and essential in dealing with the typical low response rates for online surveys, not forgetting that HK was experiencing political unrest at the time of survey. The data collection continued until no new contacts were obtained. For data analysis, One-sample Kolmogorov-Smirnov test was first performed to test on the normality of the dataset for selection of parametric and non-parametric statistical tests. The test results show that the observed variables failed the normality assumption, and thus non-parametric statistical tests were used for subsequent data analysis. The non-parametric tests include: (i) One-sample Wilcoxon Signed Rank test for examining whether the sample median is equal to a test-value of four (i.e., the mid-point of the seven-point Likert scale) in evaluating the respondents' perceived usefulness and adequacy of bidding feedback information, and (ii) Friedman test for testing the difference in the respondents' perceived adequacy of bidding feedback information across three client groups.

Results and discussion

In total, there were 32 complete set responses for the data analysis based on the assumption that there was only one single response set from each individual firms, representing a response rate of 12% (i.e., 32 out of 263). While it was not possible to verify this assumption since all the responses are anonymous, it is noted that the response rate is lower than the 20% in Drew and Fellows (1996). The difference can be partly explained because of the use different sampling and data collection methods, i.e., they adopted a total population sampling method where a postal questionnaire was sent to all Groups A to C contractors. The low number of responses in the present study was nonetheless considered satisfactory and adequate, particularly when taking into consideration the various research limitations including the difficulty to reach the targeted respondents who met the selection criteria, the political unrest situation in HK at the time of survey, and the nature of bidding-related information which may be considered as sensitive information. Table 1 shows a crosstabulation of the respondents' profile according to their years of experience in the industry and involvement in construction bidding activities in their working organization in terms of percentage of total number of bidding attempts. Almost all respondents (31 out of 32) were with above 10 years of experience in the construction industry and the majority of them were actively involved in the construction bidding activities of their organization. It is worth noting that about 40% of the respondents have had over 25 years of experience in the industry. Twenty respondents (over 60%) were involved in above 50% of total number of bidding attempts of their firm and of these, fourteen were involved in over 80% of their organizations' bidding attempts. In examining whether there is a relationship between their years of experience in the industry and involvement in construction bidding activities, a Spearman correlation test shows that there is no statistically significant relationship between these two variables ($r = -0.291$; $p = 0.106$). This indicates that their involvement in construction bidding activities would be largely based on their job position. Among the 32 respondents, four were directors of their firms, the majority (21) of them were at managerial level (e.g., contract manager, quantity surveying manager, and commercial manager) and the remaining respondents were quantity surveyors (including senior quantity surveyors).

Table 2 shows the respondents' company profile in terms of company annual turnover, type of work, client group and the competitive bidding activities. Based on the self-reported company annual turnover in 2018, most firms (66%) had an annual turnover below HKD 1,000 million. There is also another 22% of the firms with an annual turnover above HKD 2,000 million, signifying these firms are large contractors with significant market share. In terms of types of work, the main type of work is buildings for 69% of the firms, while some firms (28%) are major in both buildings and civil engineering works. While there is a small number of firms worked with both public and private sector clients, the number of firms with private sector as major client group is slightly above half of the total number of firms (i.e., 17 out of 32), this is followed by ten firms which mainly worked with public sector clients. Notwithstanding the firms' type of work and major client group, most firms (84%) obtained above 80% of their job via competitive bidding. Indeed, close to half of the firms obtained 100% of their job via competitive bidding, providing evidence that competitive bidding remains a common method for job allocation in the highly competitive market environments in HK as reported in Oo et al. (2008). Further evidence on the highly competitive market environments in HK include the rather high number of bids submitted by the respondents' firms, and their bidding success rates which are considerably low. Of these, 75% of the firms have an average of at least three bidding attempts in a calendar month. In addition, most firms (84%) have indicated a bidding success rate that is below 20% (less than one in every five bidding attempts). Indeed, it has been reported that the average bidding success rate is as low as around 4% in Oo et al. (2012) which examined the bidding trends of 67 HK contractors who submitted an average of 26.5 bids with only a winning bid recorded in their bidding attempts.

Table 1. The respondents' profile according to years of experience and involvement in construction bidding activities.

		Number of respondents and their involvement in bidding activities in terms of % of total number of bidding attempts of their organization				Total freq. (relative freq. in % in bracket)
		< 50%	50 to 80%	> 80%	All bids	
Years of experience in the construction industry	6 to 10	0	0	0	1	1 (3.1%)
	11 to 15	1	0	1	2	4 (12.5%)
	16 to 20	4	1	2	1	8 (25.5%)
	21 to 25	2	3	0	1	6 (18.8%)
	26 and over	5	2	2	4	13 (40.6%)
Total freq. (relative freq. in % in bracket)		12 (37.5%)	6 (18.8%)	5 (15.6%)	9 (28.1%)	32 (100.0%)

Given that tendering procedures do vary among clients in practice, the respondents were asked to select the more common type of tendering and tender evaluation method adopted by the three client groups (see Table 3). Consistent with findings in Drew and Fellows (1996), open and selective tendering have been identified as the most common types of tendering methods for public and private sector clients, respectively. An open tendering for public sector works occurs among contractors who are on the list of approved contractors for public works administrated by the HK Development Bureau. For quasi-government agencies, most respondents (69%) indicated that the common type of tendering method is selective tendering. The popularity of selective tendering method among private sector and quasi-government client groups could be associated with the potential efficiency benefits of having bidders who are capable of providing the required services on the tenderer list. For tender evaluation, over 90% of the respondents indicated that the use of marking scheme – a form of multiple-criteria contractor selection – is very common for public sector projects. This can be explained by the fact that all HK government departments are encouraged to adopt marking scheme in tender evaluation process to ensure there is adequate room to assess innovative suggestions from the competing bidders (Financial Services and the Treasury Bureau 2020a). The common marking schemes identified here are price to technical weighting of 50:50 and 70:30, in which competing contractors are required to submit two envelopes with their price and technical submissions. Under normal circumstances, the tender evaluation panels should not open the envelopes containing the tender price documents until the evaluation of the technical submissions have been completed (Financial Services and the Treasury Bureau 2020a). For public sector construction works, the standard marking scheme for tender evaluation emphasizes on the contract specific attributes with a view to enhancing competition on the technical quality of tenders, particularly on safety, innovation and creativity, productivity and constructability (Development Bureau 2014). Next, as expected, the tender evaluation method that based on price-only is most common for the profit-driven private sector client group. For quasi-government agencies, on the other hand, the use of price-only and marking scheme in tender evaluation is mixed with about half of the respondents indicated the use of marking schemes of different price to technical weightings. The trend can partly be explained by the fact that the WTO GPA are applicable to some HK quasi-government agencies' procurement of construction services, and these agencies may have referred to public sector tender evaluation marking schemes in formulating their procurement procedures.

Table 2. The respondents' company profile.

Profile	Freq. (no. of respondents)	Relative freq. in %
Company annual turnover (HK$, mil) in 2018		
Below 1,000	21	65.6
1,001 to 1,500	1	3.1
1,501 to 2,000	2	6.3
Above 2,000	7	21.9
Type of work		
Buildings only	22	68.8
Buildings and civil engineering works	9	28.1
Civil engineering works only	1	3.1
Major client group		
Public	10	31.3
Private	17	53.1
Quasi-government	1	3.1
Both public and private	4	12.5
Percentage of job obtained via competitive bidding annually		
Below 80%	5	15.6
80 to 99%	12	37.5
100%	15	46.9
Average number of bidding attempts per month		
1 to 2	8	25.0
3 to 4	4	12.5
5 to 6	8	25.0
7 to 8	3	9.4
9 to 10	5	15.6
more than 10	4	12.5
Average bidding success rate annually		
Less than 20% (less than one in five)	27	84.4
Between 20 and 40% (one to two in five bids)	4	12.5
Between 40 to 60% (two to three in five bids)	1	3.1

Sources and types of bidding feedback information

Table 4 shows the multiple sources of bidding feedback information according to the three client groups, with the additional sources specified by the respondents under the 'other' option in italic font. Similar to that of Drew and Fellows (1996), they obtained the data from multiple sources including 'unofficial' sources (competitors, subcontractors, suppliers and friendly acquaintances, insurance broker) for all three client groups, signifying that there is little change in the clients' information feedback conditions in the last few decades. For public sector works, it can be seen that all respondents accessed the data via the government publications as it is a requirement for public sector construction works that are subject to WTO GPA to publish tender information on the government gazette (Financial Services and the Treasury Bureau 2020a). However, they do also obtain bidding feedback data from other main sources including clients' representatives (consultants), subcontractors and suppliers. This can partly be explained by the possible time delay in getting the information from official sources and the inadequacy of feedback information. For example, bidding feedback information on the government gazette is only available after the contract has been executed with the winning bidder under a partial information feedback condition (i.e., the winning bid and identity of winning

Table 3. Tendering procedures of the three client groups.

	Freq. (no. of respondents) and relative freq. in %					
Tendering procedures	Public sector	%	Private sector	%	Quasi-government	%
Type of tendering						
Open tendering	24	75.0	7	21.9	10	31.3
Selective tendering	8	25.0	25	78.1	22	68.8
Tender evaluation						
Price only	2	6.3	21	65.6	14	48.3
Price and technical (50/50)	12	37.5	3	9.4	5	17.2
Price and technical (70/30)	12	37.5	7	21.9	9	31.0
Price and technical (60/40)	6	18.8	1	3.1	1	3.4

Table 4. Sources of bidding feedback information.

	Freq. [#]		
Sources	Public sector	Private sector	Quasi-government
Government publications (e.g., gazette)	32	N.A.	16
Your company's competitors	9	14	10
Clients' representatives (consultants)	13	20	15
Subcontractors	12	14	15
Suppliers	11	15	13
Friendly acquaintances (e.g., personal contacts)	9	13	10
Professional journals, magazines and newspaper	5	3	3
Project notice board at the site entrance	1	1	1
Insurance broker	1	1	1

[#]The respondents were asked to select all relevant sources, thus, the total frequency count is greater than 32 (i.e., number of respondents).

Table 5. Types of bidding feedback information from the private sector and quasi-government agencies.

	Freq. (no. of clients) and relative freq. in %			
Types	Private sector	%	Quasi-government	%
No feedback information	14	48.3	11	36.7
Lowest bid only	7	24.1	3	10.0
Contract award value (winning bid) only	3	10.3	9	30.0
Lowest bid and identity of lowest bidder only	1	3.4	0	0.0
Contract award value (winning bid) and identity of winning bidder only (partial)	3	10.3	4	13.3
List of all bid prices only	0	0	1	3.3
List of all competing firms and their corresponding bid prices (full)	0	0	2	6.7
Three lowest bidders and their corresponding bid prices	1	3.4	0	0
Total	29	100	30	100.0

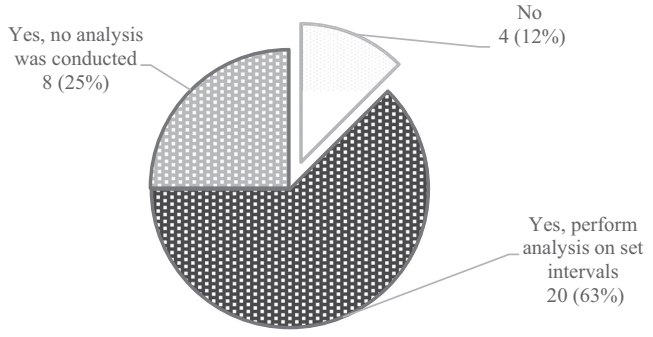


Figure 1. Number of respondents who keep systematic bidding data records and perform analysis.

bidder). There is evidence that the level of bidding feedback information collected by HK contractors for public sector works is beyond partial information feedback condition. A bidding dataset from a large HK contractor in Oo et al. (2010) has indeed included the bids of all competing bidders, the work sector, the work nature, the number of bidders and the lowest bid for a collection of over a hundred of public sector construction projects. While government publications have also been identified as one of key sources for bidding feedback information for quasi-government agencies, it is noted that the main 'unofficial' sources for both private sector and quasi-government are rather comparable. These 'unofficial' sources are subcontractors, suppliers, competitors, and friendly acquaintances. Overall, these findings of a rather heavy reliance on multiple and/or 'unofficial' sources for bidding feedback information provide suggestive evidence on the inadequacy of information feedback conditions among HK construction clients from the contractors' perspective.

In examining the types of bidding feedback information provided by clients, the respondents were asked to first classify the top three clients (based on the highest awarded contract values) into the three client groups, and to indicate the bidding feedback information from the respective clients. With a total of 96 responses (i.e., 32 respondents x 3 top clients), the numbers of public, private and quasi-government clients nominated as the top three clients are 37, 29 and 30, respectively. Table 5 shows the types of bidding feedback information from private sector and quasi-government client groups only. The public sector client group with a formal partial information feedback condition has been excluded from the table. While 'no feedback information' tops the list for both client groups (i.e., 48% for private sector and 37% for quasi-government), the other types of bidding feedback information provided by these client groups do vary. For private sector clients, the most common type (25%) is the provision of information on lowest bid only, which somewhat reflects well on the wide adoption of price-only consideration in their tender evaluation (see Table 3). Correspondingly, contract award value (winning bid) is a common type of feedback information (30%) among the quasi-government agencies. It is also noted that partial information feedback condition (winning bid and identity of winning bidder) has been practiced by both client groups, but not the full information feedback condition. The latter has only been reported for quasi-government agencies. These identified variations suggest that the types of bidding feedback information from clients can be placed logically along the continuum of no, partial and full information feedback conditions.

Use of bidding feedback information

In examining the use of bidding feedback information, Figure 1 shows that as high as 88% (28) of the respondents indicated that their organization have kept systematic bidding data records obtained from the different sources (see Table 4 for sources). Of these, 63% (20) have performed analysis on the bidding data records on a set interval. These percentages are indeed higher than those reported in Drew and Fellows (1996) and Lo et al. (2000). The cited intervals among those who performed the analysis include: an ad-hoc basis ($n = 7$), a quarterly basis ($n = 6$)

Table 6. The respondents' perceived usefulness of the bidding feedback information.

Uses	Mean[#]	Std. dev.	Sig.*
To facilitate bid/no-bid decision for future projects	5.50	1.29	0.000
To facilitate decision making on mark-up level for future projects	5.32	1.36	0.000
To analyse your company's bidding performance	5.37	1.28	0.000
To analyse your competitors' bidding performance	5.25	1.58	0.002
To analyse the market conditions	5.46	1.20	0.000

[#]scale: 1 to 7, extremely useless to extremely useful.
*One-sample Wilcoxon Signed Rank test (test value, median = 4).

Table 7. Types of information consolidated from the analysis of bidding feedback information.

Types of information	Freq.[#]
A summary report on your company's past bidding attempts and performance	14
A summary report of the current market bidding trends	12
A summary report on your company's main client group's tender evaluation and awarding trends	10
A summary report on your company's key competitors' past bidding attempts and performance	9
A bidding strategy for the future tenders (especially for contracts such as negotiated contracts where the price is not defined)	8
The cost trends of key building elements	1

[#]The respondents were asked to select all relevant types, thus, the total frequency count is greater than 20 (i.e., number of firms which perform analysis at set intervals).

Table 8. The respondents' perceived adequacy of bidding feedback information from clients.

Client	Mean[#]	Std. dev.	Sig.*
Public sector	3.78	1.979	0.409
Private sector	2.88	1.930	0.002
Quasi-government	3.16	1.936	0.012

[#]scale: 1 to 7, extremely inadequate to extremely adequate.
*One-sample Wilcoxon Signed Rank test (test value, median = 4).

and the remaining did that on monthly, half-yearly and yearly intervals. Despite of these varying intervals, the evidence is suggestive that the respondents' organizations do make use of bidding feedback information in informing their bidding decision-making processes by performing the relevant analysis. However, these potential uses through the relevant forms of analysis could only be applicable to regular construction clients (Fu et al. 2002). Majority of construction clients who are involved in capital work projects build on an occasional basis, especially for some private sector clients where a capital works project could be a once-in-a-lifetime project. This category of clients would normally engage a consultant team in their procurement of construction services, and it is to be expected that little emphasis would be placed on the feedback mechanism of the contractor selection process in the procurement design.

For respondents who indicated that their organizations have kept systematic bidding data records ($n = 28$), Table 6 shows their perceived usefulness of the records in their organization's bidding attempts. The test results from One-sample Wilcoxon Signed Rank test (i.e., test value = 4, the mid-point of the seven-point Likert scale) show that the median values of all the five uses of bidding data records are statistically significantly greater than 4 at $p < 0.05$ level. This provides strong evidence that the respondents perceived bidding feedback information is useful in facilitating the formulations of bidding strategies including bidding decisions on future projects and bidding performance analysis. Nonetheless, as noted in Figure 1, there were firms which neither perform the relevant analysis on their bidding data records ($n = 8$) nor keep systematic records of their bidding attempts ($n = 4$). The reasons cited by these respondents are (i) their clients do not provide adequate bidding feedback information; (ii) most the bidding data records are not obtained via official sources; and (iii) there is a lack of resources to perform the relevant analysis in their organization.

Correspondingly, Table 7 shows the types of information that were consolidated from the analysis of bidding data records among the respective respondents ($n = 20$). While the respondents have consolidated the information into different forms that suit their needs, the most common type of information is a summary report on their organization's past bidding attempts and performance. This is followed by reports on current market bidding trends and main client group's tender evaluation and awarding trends. Lo et al. (2000) claimed that the market trends information about clients is especially useful for contractors who work with private sector clients. They pointed out that contractors may not have information on a larger pool of private sector clients in comparison with public sector clients which tend to be fewer in number. Also, one of the respondents stated the use of bidding data records to examine the cost trends of key building elements under the 'other' option (in italic font). Overall, these findings seemingly suggest that the respondents' organization have placed more emphasis on analyzing the market trends in facilitating their bidding decisions. It is also worth noting that almost half of the respondents have used bidding data records for competitor analysis in analyzing their competitors' bidding performance.

Perceived adequacy of bidding feedback information

Having examined the sources, types and uses of bidding feedback information, the respondents were asked to indicate their perceived level of adequacy of bidding feedback information (Table 8) and the most appropriate type of bidding feedback information they would like to receive from the three client groups (Table 9). In terms of adequacy, the mean scores for all three client groups are below the neutral level (i.e., below 4), signifying their perceived level of inadequacy of information, especially for private sector clients (mean = 2.88). In terms of statistical significance, the One-sample Wilcoxon Signed Rank test results show that the median values for both private sector and quasi-government client groups are significantly below 4 at $p < 0.05$ level. The insignificance of the result for the public sector can partly be explained by the use of well-established standard procedures for government procurement of which the respondents are familiar with the information feedback practices. A further examination using Friedman test shows that there is a statistically significant difference in the respondents' perceptions depending on the client groups, $X^2(2) = 15.217$, $p < 0.05$. A post-hoc analysis with Wilcoxon signed-rank test on pairwise comparisons was conducted with a Bonferroni correction method, and the results show that there is a statistically significant difference in their perceived adequacy between public and private sectors

Table 9. The most appropriate type of bidding feedback information from clients.

	Freq. (no. of respondents) and relative freq. in %					
Types	Public sector	%	Private sector	%	Quasi-gov	%
No feedback information	2	6.3	2	6.3	3	9.4
Lowest bid only	4	12.5	5	15.6	4	12.5
Contract award value (winning bid) only	5	15.6	5	15.6	4	12.5
Lowest bid and identity of lowest bidder only	2	6.3	2	6.3	3	9.4
Contract award value (winning bid) and identity of winning bidder only (partial)	2	6.3	3	9.4	2	6.3
List of all bid prices only	1	3.1	1	3.1	1	3.1
List of all competing firms who bid (alphabetical order) and list of all bid prices (ascending order)	2	6.3	2	6.3	2	6.3
List of all competing firms and their corresponding bid prices (full)	5	15.6	5	15.6	4	12.5
Three lowest bidders and their corresponding bid prices	9	28.1	7	21.9	9	28.1
Total	32	100.0	32	100.0	32	100.0

($Z = 0.703$, $p = 0.015$), but not between public sector and quasi-government ($Z = 0.469$, $p = 0.182$) or between private sector and quasi-government ($Z = -0.234$, $p = 1.000$). Nonetheless, these findings are supportive of the phenomenon of inadequacy of bidding feedback information from clients reported above.

For the most appropriate type of bidding feedback information from the three client groups, it is rather surprising to find that the respondents have similar preferences across the three client groups. The top ranked preference is to have information on three lowest bidders and their corresponding bid prices from the clients. One possible explanation is that the market environments in HK is very competitive and often with high number of competing bidders for individual projects, and contractors would therefore be more interested to obtain feedback information on highly competitive bids submitted by all competing bidders. Also, the amount of feedback information may also have implications on their resources to maintain systematic records, and to perform the relevant analysis. The finding is in contrast with Drew and Fellows (1996) where this preference was one the least preferred options among their respondents. The other top ranked preferences among the respondents are: (i) list of all competing firms and their corresponding bid prices; (ii) lowest bid only; and (iii) contract award value (winning bid) only. A comparison between Tables 5 and 9 reveals that only the last two types have been practised to some extent among the respondents' top clients in both private sector and quasi-government client groups, but not the other top ranked preferences identified in the present study. This seemingly suggests that there is a significant gap in perceptions on the appropriate type and amount of bidding feedback information between the clients and contractors.

Conclusion

The research findings provide an insight into current information feedback conditions of three client groups (i.e., public, private and quasi-government) in competitive tendering from the HK contractors' perspective. Most respondents participated in the online questionnaire survey have above 10 years of experience in the construction industry, and they were actively involved in competitive bidding activities of their organization. which obtained above 80% of their job via a competitive bidding process. Competitive bidding remains a common method for job allocation in the highly competitive market environments in HK as evidenced by very high percentage of job (between 80 and 100%) obtained via competitive bidding process for most the respondents' organization. Multiple criteria were reported used by the three client groups to varying degree for contractor selection. The results show that information feedback conditions do vary among the public, private and quasi-government client groups in their construction procurement, which could be placed logically along the continuum of no, partial and full information feedback conditions. The results also provide strong evidence that the respondents perceive bidding feedback information from the three client groups are inadequate. Their top ranked preference across the three client groups is to have feedback information on three lowest bidders and their corresponding bid prices. While they have heavily relied on multiple and/or 'unofficial' sources for obtaining bidding feedback information, the evidence is suggestive that the respondents' organizations do make use of bidding feedback information in informing their bidding decision-making processes by performing the relevant analysis.

It is recognized that the key limitation of this study is the use of snowball sampling method and a rather small sample size. Nonetheless, basing on literature that provide substantial evidence that varying information feedback conditions have an impact on bidders' competitiveness and thereby affecting the revenues of those accepting bids to buy or sell, the research findings have implications for construction clients and/or contracting authorities and future research. In view of the perceived inadequacy and a high reliance on unofficial sources for obtaining bidding feedback information, clients should take into consideration contractors' need for feedback information in competitive tendering process in reviewing their choice of procurement design. Official and timely bidding feedback information from clients could generally enhance the efficiency of the construction industry in its job allocation via competitive bidding. However, it is recognized that it is a challenge for clients to establish an adequate level and appropriate type of feedback information, and thus achieving enhanced efficiency in their procurement practices in the long run. One possible way forward is that regular clients and/or contracting authorities could consider experimenting with different information feedback conditions in their procurement design and measure the impacts on their revenues (and any other performance measures) due to a change in information feedback condition. While the process may be costly and time consuming, regular clients and/or contracting authorities could collaborate with each other and share information. Alternatively, they could also collaborate with academic researchers by providing access to their past bidding data records. It should be noted that academic empirical analyses on contractors' bidding trends and the respective impacts on clients' revenues are very limited due to the difficulties of obtaining field data (i.e., past bidding data records). On the other hand, academic empirical investigations via the use of experimental approaches in exploring the effects of different information feedback conditions are in need for further study if an adequate level and appropriate type of feedback information are to be found. Both experimental and

field studies are important to the progress of knowledge in feedback mechanism in construction competitive bidding process.

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