

RESEARCH ARTICLE

Exploring the cash flow management strategies of Turkish construction companies

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Abstract

Despite many studies on cash flow management in construction literature, a very limited number of attempts exist focusing on strategies employed by contractors to increase the amount of cash in their hands in the early phases of the project and to improve their cash balance. Based on this gap, this study aims to identify and evaluate cash flow management practices of contractors in Turkey. In this context, a web-based questionnaire survey was conducted with construction company owners and managers involved in the decision process of cash flow management practices. Data obtained from a total of 96 participants show that construction companies commonly hold working capital equivalent to 10% to 20% of the contract sum in their hands at the beginning of the construction. Construction companies frequently recourse to cash flow management strategies to decrease external financing requirements and prevent possible cash shortages during construction. While trade credits followed by overbilling are the most preferred approaches, unbalanced bidding techniques are employed to a limited extent. Furthermore, a clear distinction has been identified between the strategies adopted by companies of different ages and sizes. Trade credits are the first option only for small and young companies and are most widely used by them. Also, the adoption of overbilling techniques increases as company size and age grows. Similarly, unbalanced bidding practices increase with years of experience in the industry. Construction productivity, quality of work, and completion risks come to the fore as common concerns with delaying payments to the suppliers and subcontractors. Also, unbalanced bidding practices are assumed very risky, and accurate estimations are of critical importance at this point.

1. Introduction

Due to its backward and forward linkages with other sectors in the economy and its great potential to generate employment, the construction industry plays a significant role in national economic growth and the socio-economic development of society. However, the industry suffers from a great deal of bankruptcy compared to other sectors of the economy due to its risky and uncertain nature and

its sensitivity to economic cycles [1-4]. As cash is the vital source for construction companies' day-to-day operations, lack of liquidity is the major determinant of financial distress and bankruptcy. Although construction firms can maintain their operations for a while without making any profit or even in a temporary state of loss, they may fail even if they have strong financial statements as a

consequence of a lack of liquidity during construction [5].

Typically, during the construction process, project expenses lag behind interim payments. Considering the self-financing nature of construction projects, contractors could close this gap by using working capital in the initial construction phases. However, in practice, due to the inherently risky nature of the construction process, contractors need to recourse to external financing sources, particularly bank credits, to cover the cash requirements. Repayment of debt and interest payments may also create financial difficulties for contractors and lead to inability to complete the project or even the company liquidation. Besides, lack of liquidity and improper cash flow forecasts makes it difficult for contractors to obtain loans from financing institutions as lenders are more willing to lend to companies that can efficiently perform cash flow management [6,7]. Also, companies may not always be able to obtain debt due to their low credit ratings or inadequate collateral. Thus, effective cash flow management practices should be implemented by construction companies to maximize liquidity while minimizing financing requirements and relevant costs. Kenley [8] stressed so-called “cash farming” opportunities created by cash flow management practices. Through well-managed working capital, surplus cash could be generated, which could be used as working capital for other investments. Therefore, companies could be able to sustain their existence under severe competition.

A considerable amount of studies found that poor financial management, in particular inadequate cash flow management, is the main reason behind the failure of the construction firms (e.g., [9-15]). The importance of the issue has induced scholars to explore various strategies and develop models for effective cash flow management in construction. Cash flow management refers to forecasting, planning, monitoring, controlling the cash receipts and payments, and the arrangement of cash deficits. Accurate cash flow forecasting should be the first step in managing the cash throughout the project

duration. After estimating the expected cash-in and cash-out throughout the construction process, contractors could determine the required amount of working capital and financing until the project generates positive cash flow. Also, cash flow forecasting provides a warning system for contractors to foresee the threat of insolvency and thus enables them to make provisions against possible difficult times [7]. Thereby, the main effort in the vast amount of cash flow research is concerned with the forecasting and planning of contractor cash flow under uncertain conditions - financial and project-specific risks- (e.g., [1,16-21]). Various methods and strategies have been proposed to be implemented from the early construction phases to prevent contractors from running out of cash during construction. In line with the technological advancements in the industry, several recent studies have proposed BIM-based cash flow analysis models and frameworks (e.g., [22-25]). By utilizing the capabilities offered through the BIM-based automated process, contractors may be able to examine several cash flow scenarios quickly. Moreover, a great number of researchers have proposed various solutions so far to develop project schedules under the restrictions of available funds with the aim of minimizing financing costs and project duration (e.g., [26-30]). An accurate cash flow forecasting and efficient management also depend on contractors’ own cash flow management strategies.

Despite many available studies on cash flow management in construction literature, a very limited number of studies address the approaches that contractors implement to increase the amount of cash in their hands in the early stages of the project, improve their cash flows, and even increase their profitability. Cash flow management approaches include unbalanced bidding, overbilling, trade credit, and delaying payments to subcontractors. While they are quite commonly employed by contractors, there have been longstanding debates about the ethics of these strategies. Kenley [8] indicated that the industry’s reticence to being identified with such practices could be the underlying reason for the limited

number of studies. The majority of the previous studies focus solely on unbalanced bidding strategies. While some of them focused on the optimization of unbalanced bidding practices (e.g., [31-33]), others aimed to examine contractors' perspectives on these practices (e.g., [34,35]). However, studies that address the issue with a more holistic approach are even more limited. Among them, Cui et al. [36] introduced a system dynamics model that enables contractors to evaluate the impact of various cash flow management approaches on their cash flow. Odeyinka et al. [37] and Oladimeji and Aina [38] explored cash flow management practices adopted by construction contractors in UK and Nigeria, respectively.

Due to the insufficient number of studies carried out so far, the present research aims to contribute relevant literature by identifying and evaluating cash flow management practices of contractors in Turkey. Moreover, this paper aimed to provide a deeper insight into the risks involved in these practices benefiting from the past experiences and knowledge of the survey respondents.

2. Background and literature review

Cash flow management is critical for contractors since the difference between insolvency and survival can be determined by how they manage money in and out of the company [39]. Contractors need to hold a certain amount of working capital at the beginning of the construction to afford the expenditures in the early months. Then, the project is expected to become self-financing once the owner starts to pay the progress payments. A study conducted by Chiang and Cheng [40] revealed that contractors only need working capital equivalent to 10% and 15% of the contract sum to begin a construction project. However, in practice, contractors have to deal with various critical risk factors that have negative consequences on their cash flow. The most common risk factors are delay in progress payments, project change orders, and cost escalations due to inflation [5,41,42]. Thus, in order to cover the possible financial losses and amplify the impact of the project's self-financing ability, contractors may also need to utilize several

cash flow management strategies. In this respect, strategies to be employed are mainly determined based on the project delivery system and contractual arrangements between the contractor and other stakeholders. Moreover, the optimal strategy also depends on firm-specific characteristics such as size, age, and financing capacity. Even though some of these strategies are considered unethical, the main purpose here is to prevent the cash shortages that construction companies may encounter during the construction and to ensure that they have the optimum level of cash in their hands. Furthermore, effective use of these strategies could also enable contractors to increase their profitability. These strategies include unbalanced bidding, overbilling, trade credit, and delaying payments to subcontractors.

Unbalanced bidding refers to contractors' practices of overpricing or underpricing the unit prices of several line items. Through these practices, which are mainly used in unit price or lump sum contracts, contractors seek to gain benefits with an uneven mark-up distribution among the project's line items [43,44]. Since the total bid price does not change, contractors are able to maintain their competitiveness during the tendering process. However, in some cases, contractors manipulate item prices to decrease the total bid price and to win the contract. Thus, they would also be able to meet short-term cash requirements in their ongoing project with advance payments received from the new tenders. There are three main types of unbalanced bidding, namely front-end loading, back-end loading, and individual rate loading. In front-end loading, contractors overprice the unit prices of the items to be carried out earlier in the project (e.g. mobilization, excavation) while underpricing the items that occur later in the project (e.g. finishing works, landscaping) in order to obtain higher amounts of money from the owners earlier [45]. Thus, contractors are able to meet working capital requirements and provide the opportunity to increase their profitability by gaining a cash flow advantage from the very beginning of the project. If front-end loadings are performed effectively,

financing requirements will be reduced for contractors having more working capital, and even the project could be financed entirely with progress payments [40]. Contrary to front-end loading, back-end loading practices involve overpricing the items expected to have a high inflation rate and to be performed later in the project. Thus, contractors will have the advantage of price escalation clauses in contracts [35,43]. Unbalancing the bid with back-end loading strategies is mainly employed by contractors for projects with long duration and undertaken in countries with high inflation [46,47]. The third strategy is individual rate loading, also known as quantity error exploitation. Unlike the two aforementioned bidding strategies, the individual rate loading strategy is an opportunity created for the contractor by the project owner himself. The contractor tries to provide a cash flow advantage and increase its profitability by exploiting errors in the estimated quantities and possible design changes in the future. In this context, contractors overprice the items whose quantities are expected to increase and underprice the items whose quantities are expected to decrease during the construction [45,48]. Hyari and Alamayreh [35] conducted a survey of Jordanian contractors to reveal their perspectives on unbalanced bidding practices. Findings show that front-end loading is the most commonly used form of unbalanced bidding, followed by quantity error exploitation. The main motives for contractors adopting these practices appeared to be; the lack of restrictive bidding regulations, increasing the chance of winning the contract, and improving the profitability.

There have been long-standing debates in academia and industry about the ethics of unbalanced bidding practices. Even if front-end and back-end loading practices are somewhat considered legal due to their significant role in contractor companies' survival, individual rate loadings are commonly prevented and rejected by owners [47]. A testing conducted by Cattell et al. [33] on a hypothetical project showed that an increase of 150% profit could be captured by contractors with optimized unbalanced pricing.

However, the study carried out by Hyari [45] concluded that unbalanced bidding practices are undesirable from the owners' point of view and whether the practices are acceptable bidding strategies or unacceptable manipulation depends on the extent of the imbalance. Nevertheless, all of these strategies have the potential to increase the owners' financial risks. For instance, considering the time value of money, front-end loadings lead the owners to overpay, and back-end loading practices cause inflation risks to be assumed by the owners. Divergence in views is reflected in the studies carried out so far. Relevant literature focuses on either assisting contractors in optimizing unbalanced biddings (e.g., [31-33,47]) or assisting owners in detecting and preventing these strategies (e.g., [46,49-51]).

On the other hand, overbilling practices, which can also be considered a type of front-end loading, are implemented by contractors within the owners' knowledge. These practices refer to billing the materials brought to the construction site but have not been installed yet. Thus, contractors could improve their cash flow and increase liquidity through overbilling practices reflected in the early progress payments. Accordingly, they have to underbill later to compensate for the extra amount they obtained [36]. From the contractors' viewpoint, overbilling method is less risky than other front-end loading methods as they could protect themselves from the negative impact of inflation on construction material prices. Moreover, unlike other cash flow strategies, the possibility of conflict or contract termination is almost non-existent due to the mutual agreement between the owner and the contractor.

Another cash flow management strategy is to take advantage of trade credits. Trade credits are commonly used as a financing source by contractors, especially by those that cannot obtain loans from banks or other financial institutions [52]. Trade credit is a deferred payment granted by the supplier. That is to say, the payments of the materials purchased by the contractor are delayed depending on the agreement terms. Thus, contractors could meet their short-term cash

requirements and improve their cash balance. Kapkiyai and Mugo [53] explored the impact of trade credit on small and medium Kenyan companies' financial performance. Results of the documentary analysis show that companies' liquidity and profit margins are found to be positively affected by trade credits. One of the advantages of this type of practice is that the suppliers are more understanding than financial institutions in terms of any overrun of the payment due date [54]. Moreover, Chluddek [55] estimated that the average interest rates of trade credit are about 4 – 6% and revealed that the cost of trade credit is less than the cost of other financing sources. On the other hand, using trade credit, a contractor cannot benefit from the early payment discounts that can positively affect the project cost. It should also be noted that the predominance of trade credit could lead to the insolvency of contractors. Thus, contractors should carefully plan and manage this process, as there is also a risk of losing the trust of suppliers [56].

Main contractors benefit from the subcontractors' workforce and equipment either as a management strategy or to make use of their expertise. As a management strategy, contractors could delay the payment to subcontractors to generate a positive cash flow. For instance, under a 'pay-when-paid' clause, payments to be made to the main contractor can be deferred until the main contractor secures payments from the owner [36]. This type of clause does not involve a commitment as to when the payment of the subcontractor is to be made. In such a situation where the payment schedule is uncertain and entirely at the discretion of the contractor, the contractor can use the money received from the employer to meet his short-term financing needs. While providing substantial advantages for contractors, delaying payments could either create significant problems in the construction process. Delay in payments may negatively affect the productivity and quality of the construction works undertaken by subcontractors due to financial difficulties. Moreover, conflicts may arise, and the construction may be left incomplete. Thus, such a cash management strategy

for contractors could be more effective when subcontractors are financially sound.

All the previously mentioned management strategies are peculiar to the construction industry except trade credits. Since trade credits are also commonly adopted by the other sectors in the economy as a funding source, numerous studies exist on the use of trade credits in the finance literature. When the construction industry is considered, even though the literature on unbalanced bidding practices is abundant, only a few studies have attempted to explore and evaluate the cash flow management practices adopted by construction contractors. Among them, Cui et al. [36] developed a system dynamics model that has the ability to evaluate the impact of various cash management approaches on contractors' cash flow. The proposed model also allows contractors to customize the key parameters according to various negotiation scenarios with other project stakeholders. In this respect, a warehouse project was considered as a case to demonstrate how cash flow management practices used by contractor companies affect their financing requirements and profitability. Authors carried out scenario analysis with different cash flow management strategies and their combinations, namely overbilling, trade credits, early payment material discounts, and subcontracting. The analysis showed that by using an overbilling approach, financing requirements of the contractor could be reduced by 11,4%. Accordingly, project profitability will be increased due to the reduction in interest payments. On the other hand, delaying payments to suppliers for six weeks could improve the cash balance by 30%, which will lead to a decrease in overdraft financing requirements at the same rate. They further stressed that if the contractor takes advantage of material discounts with early payment instead of trade credits, the overdraft financing will increase by 26%. Meanwhile, the contractor could gain substantial savings in construction costs with discounts and increase his profitability. Considering the case project used for the analysis, the authors suggested the integration of front-end

loading and early payment discounts as the most appropriate strategy.

Odeyinka et al. [37] examined cash flow management approaches adopted by UK contractors in resolving deficit cash flow. Overbilling is found to be the primary approach followed by the company's cash reserves and tender unbalancing. Further analysis revealed that firm size has direct implications for the choice of strategies. While micro-scale firms are inclined to use their cash reserve primarily, large and medium-scale firms give higher priority to unbalanced bidding practices compared to their smaller counterparts. This finding can be attributed to the greater ability of larger firms to make price manipulations. In a similar attempt, Oladimeji and Aina [38] surveyed construction firms in Nigeria, the majority of which were micro and small firms (86%). Results showed that "reduction of profit margins to win contracts as far as they could" is the primary strategy adopted for increasing their construction volume and working capital. In addition, to improve the project-level cash flow, nearly half of the surveyed firms regularly take advantage of delaying payments to suppliers. Front-end loading and delaying payments to subcontractors are less frequently practices employed by contractors.

It should be noted that when it comes to unbalanced bidding, only the front-end loading practices are mentioned as a cash flow management technique in the relevant literature. While front-end loading and other techniques are performed to maximize project cash flow for the entire construction process, back-end loading practices contribute to contractors' profitability and improve their cash flows in the later stages of construction. However, back-end loading techniques are also included in the present survey in order to broaden the scope of the present research. On the other hand, quantity error exploitation is left out of the scope due to ethical concerns and the assumption that accurate information on actual practices cannot be obtained from contractors.

3. Research method

The target population of the research was company owners and middle or senior-level managers in the Turkish construction industry who take part in the decision process of cash flow management practices. A questionnaire survey was employed to gather the required information. As commonly used in the construction management research area, questionnaires are favorable instruments as a manner of time and cost to collect information on knowledge, attitudes, and behavior of people in different locations [57]. Accordingly, a self-administered web-based survey was designed through an online survey tool called SurveyMonkey. The survey includes two sections; the first section requires respondents to provide general information about their firms, such as age, size, and place of operation. The second section focuses on the evaluation of cash flow management practices employed by contractor companies. Results obtained from these sections will be used for further comparisons to examine whether firm-specific factors have an impact on the use of cash flow management strategies. Moreover, the respondents were invited to share their experiences and opinions regarding the risks involved in cash flow management strategies with an open-ended question.

The participants were randomly selected, and an invitation email containing the survey link was sent to 218 potential participants from the member companies of the Turkish Contractors Association (TMB). As the response rate was low, 65 professionals were also contacted via an online networking site (LinkedIn) to increase the number of responses. All these efforts resulted in responses from a total of 109 individuals, of which 13 were discarded due to incomplete data, leaving 96 valid responses. The data obtained from the survey were analyzed using descriptive statistics in the form of frequencies and percentages.

4. Survey results and discussion

4.1. Descriptive statistics

Table 1 shows general information about the 96 samples. The majority of the respondents (40.63%) are finance managers, followed by project managers (20.83%), company owners (14.58%), and other senior or medium-level managers (e.g., tender managers and contract managers) involved in cash flow management decisions (23.96%). Among the sample companies, 67.71% had an experience of more than 20 years in the industry, while 19.79% had an experience of 10 to 20 years, and 12.50% had less than 10 years of experience. The respondents also represent companies of various sizes, most of which were classified as large-scale (69.79%). The remaining 10.42% and 19.79% were medium and small-scale companies, respectively.

The project types carried out by companies were almost evenly distributed and covered all buildings except housing, energy/industrial facilities, transportation, and housing projects. In addition, while more than half of the companies (61.5%) perform their operations both in domestic and international markets, 25% of them operate only in domestic and 13.54% only in international markets.

4.2. Cash flow management strategies employed by construction companies

First, the participants were asked to indicate the working capital they need to begin a construction project as a percentage of the total contract value. As shown in Table 2, an overwhelming majority of the companies (59.38%) indicated that working capital equivalent to 10% to 20% of the contract sum is sufficient to cover their expenses in the early months. This amount is used to cover mobilization costs by 90% of the companies. Moreover, responses reveal that insurance payments, performance bond premiums, and construction expenses in the first three months are also met with the working capital.

Table 1. Descriptive statistics of the sample

General Information	No. of samples	% of total respondents
Occupation of respondents		
Finance manager	39	40.63
Project manager	20	20.83
Company owner	14	14.58
Other managers	23	23.96
Experience of firms		
More than 20 years	65	67.71
10 - 20 years	19	19.79
1 - 9 years	12	12.50
Number of employees		
250 or more	67	69.79
50 - 249	10	10.42
1 - 49	19	19.79
Project type		
All buildings except housing	62	64.58
Energy / Industrial facilities	57	59.38
Housing	47	48.96
Transportation	52	54.17
Place of operation		
Domestic and international	59	61.46
Domestic markets	24	25.00
International markets	13	13.54

Table 2. The percentage of required working capital to total contract value

% of required working capital to total contract value	No of samples (%)
less than 10%	8 (8.33%)
10% - 20%	57 (59.38%)
21% - 30%	20 (20.83%)
31% - 50%	6 (6.25%)
more than 50%	5 (5.20%)

Table 3 shows the use of various cash flow management techniques by participants. Looking at the whole picture, one can see that trade credits (59.37%) followed by overbilling (57.29%) and delaying payments to subcontractors (34.37%) are the most preferred three approaches used by sample companies. Results also reveal that unbalanced bidding strategies are less preferred options for professionals in the Turkish construction industry. A closer look at the two alternative unbalanced bidding techniques, namely front-end loading and back-end loading, it can be observed that front-end loading techniques are used approximately three times more than back-end loading (30.21% and 11.46%, respectively). The majority of the firms, which employ front-end loading practices, indicated that they price mobilization, concrete and steel works, and earthworks higher. For back-end loading, mechanical and electrical works are priced higher.

As far as cash flow management technique preferences by size are concerned, it appears that there is a clear distinction between small-scale firms and the medium-large group. While an overwhelming majority of small firms use trade credits for managing their working capital (78.95%), both medium and large firms prefer overbilling above others (50.0% and 65.67%, respectively). Furthermore, recourse to overbilling is more common among firms operating only in international markets (69.23%) rather than firms operating solely in local markets (29.17%). The common use of trade credits as a funding source among small-scale firms is not surprising since they have limited access to construction loans compared

to their larger counterparts [58,59]. This result is consistent with the findings of previous research in the literature (see [38,54]). The results of the present study also reveal that trade credits are used by three-quarters of young firms, confirming the arguments above. The remaining management techniques are employed only to a very limited extent by young firms, indicating that experience plays an important role in the preferences. Indeed, it appears that older firms tend to benefit from a wide array of cash flow management techniques as their use is not concentrated on a certain approach like young firms. Looking at the unbalanced bidding techniques, it can be observed that they are employed by a limited number of both small-scale and young firms (26.32% and 16.66%, respectively). Also, unbalanced bidding is the last option for both firm types. This may be attributable to the lack of experience of young firms to find the right balance and the limited construction time of small-scale firms in order to engage in price manipulation. Back-end loading techniques are solely used by large-scale firms that usually undertake larger-scale projects with longer durations. Therefore, there is a greater potential to take advantage of price escalation clauses in contracts and a greater vulnerability to the negative effects caused by inflation. The latter explanation could also apply to overbilling. The use of overbilling technique increases as firm size (31.58% for small, 50.00% for medium, and 65.67% for large-scale) and firm age (25.00% for young, 57.89% for middle-age, and 63.08% for old firms) grows.

Table 3. Cash flow management strategies used by construction companies

Cash Flow Management Strategies	%	Size			Age			Place of Operation		
		Overall	Small	Medium	Large	Young	Middle age	Old	Domestic	Intl. Domestic and Intl.
Front-end loading	30.21	26.32	40.00	29.85	16.66	31.58	32.31	16.66	30.77	35.59
Back-end loading	11.46	0.00	0.00	16.42	0.00	5.26	15.38	16.66	0.00	11.86
Overbilling	57.29	31.58	50.00	65.67	25.00	57.89	63.08	29.17	69.23	66.10
Trade credit	59.37	78.95	30.00	58.21	75.00	63.16	55.38	58.33	69.23	57.63
Delaying payments to subcontractors	34.37	36.84	30.00	34.33	25.00	52.63	30.77	29.17	38.46	35.59

The last part of the questionnaire involves open-ended questions asking respondents about their experiences with each of these cash flow management techniques. 43 out of the 69 respondents provided comments about the importance of cash flow management in construction and the risks involved in relevant techniques. Respondents indicated several significant reasons behind the need for managing cash flows in construction. In this regard, delay in progress payment was stressed by several respondents. One respondent argued that high financing costs are the main reason for using such cash flow management techniques. He commented that: *"In today's conditions bank loans from local financial institutions are not easily available. Contractors also have limited access to loans from foreign financial institutions. Therefore, they are exposed to very high-interest rates"*. Two other respondents argued that the need for protecting themselves from the changes in price level of raw materials and other inputs in construction is the main motivation for using cash flow management approaches.

The most emphasized point by respondents regards the risks associated with delaying payments to subcontractors and suppliers. The majority of these comments focused on productivity, quality and completion risks born from financial difficulties experienced by subcontractors and suppliers. For example, one respondent mentioned: *"The additional financial burden put on subcontractors and suppliers by delaying payments may lead to a decrease in the quality of finished works and even to a failure in the completion of works. That is why we prefer to collaborate with financially strong subcontractors and suppliers"*. Another respondent stated that: *"I believe that the productivity and motivation of subcontractors are negatively affected by payment delays. As a consequence, construction delays, which is one of the main reasons for cost overruns and project failures, may occur"*. Several other respondents emphasized profitability concerns by using trade credits. Accordingly, one respondent noted: *"Using trade credits prevents us from benefiting from*

material discounts. Moreover, the interest rate charged by suppliers negatively affects our profitability. Last but not least, when payments are delayed, contractors may not get the best price from the same supplier for the next time". In addition to the quality and the completion risks, many respondents raised concerns over long-term collaboration issues between project parties due to loss of trust. For example, one of them emphasized: *"If payment delays are extended, the prestige of our firm could be negatively affected. Thus, in the long-term, finding appropriate subcontractors and suppliers may become problematic"*.

Front-end loading techniques were perceived to be very risky among almost all of the respondents. The main concern raised about the technique was the incapability of finding the right balance between the price of work items. Inability to accurately predict the future costs of items, inappropriate and ineffective use of early cash inflows, and the probability of losing client trust are among the most emphasized risk factors. One respondent indicated that: *"While practicing front-end loading, consideration should be given to avoiding potential losses due to possible additional construction works in the future. Increasing the unit price of the earlier work items by 10-20% could be sufficient to tolerate the progress payment delays"*.

Since there are no negative consequences mentioned, overbilling emerges as the least risky option for construction companies using cash flow management techniques. This is also reflected in the overall usage rate, as shown in Table 3. Moreover, even if it is not regarded as a cash flow management technique, several respondents stressed that the amount of the advance payments plays a fundamental role in improving their cash flows and the self-financing ability of the project. One respondent noted: *"We do not undertake projects unless at least 10% advance payment is provided by the owner. This percentage is necessary to protect ourselves against some possible construction risks such as delays in progress payments. Thus, we do not have to take the risks of unbalanced bidding practices"*. Among the respondents representing both large-scale and old

firms, a divergence is showed up regarding the use of these management techniques. While four of these respondents stressed in their comments that they do not approve of or never use these methods, survey results and other comments revealed that large-scale and old firms constitute the majority of the sample employing management practices. One respondent explained: *“Although each technique has its own risks, I find it reasonable to take these risks in order to avoid cash shortages during the construction and the resulting financing costs”*. Findings discussed so far show that although the strategies employed vary according to firm-specific factors, there is a high level of consensus on the risks involved in cash flow management techniques.

5. Conclusions

In the present research, construction companies' approaches to improve their cash balance and prevent cash shortages during construction were explored using Turkey as a case. Furthermore, the experiences and perspectives of contractors were evaluated in terms of the risks involved in these approaches. The results discussed so far reveal that, except for a few large-scale ones, all the sample companies adopt cash flow management approaches. Looking at the overall ranking, trade credits and overbilling techniques come to the forefront as the most employed approaches, and unbalanced bidding techniques appear to be the least preferred options for construction companies. However, there is a clear distinction between the management strategies used by companies of different ages and sizes. Experiences in the industry, accessibility to construction loans, and project duration appear to affect cash flow management approaches of construction companies. Although the majority of the respondents indicated that these management approaches involve various risks, it is seen that they have to undertake these risks in order not to be caught in a cash trap during construction. When contractor companies need to resort to cash flow management techniques, several factors should be considered to determine the optimal approach.

Along with company, project, and country-specific evaluations, the financial conditions of stakeholders and relationships with them also play a crucial role in the successful implementation of these approaches.

The limitations of this research should be kept in mind when interpreting the findings. First, the sample is limited to the Turkish context, where construction companies' approaches and experiences may show discrepancies from other countries. Secondly, cash flow management strategies discussed in the research are limited to previously mentioned ones in the relevant literature. It should be noted that there is a gap in the literature on the benefits that contractors can derive from the adoption of cash flow management techniques. Thus, future research should explore how these techniques affect contractors' external financing requirements and overall profitability through in-depth qualitative case studies of construction projects.

Ethics Committee Permission

The author acquired ethics committee approval for the survey carried out in this research from the Science and Engineering Research and Publication Ethics Committee of Mimar Sinan Fine Arts University (Date: 26.07.2022; No. E-15207191-045.99-68877).

Declaration of conflicting interests

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