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Impact of cash flow variation on project performance: contractors' perspective

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ABSTRACT
This study aims to determine the impact of cash flow variation in Jordanian construction projects from contractors' perspective and its relationship with project performance. An online questionnaire was developed and distributed to a selective sample. The respondents were project managers from contracting companies working in Jordan, around 340 construction companies. The sample frame was a form of non-probability sampling of 181 project managers. The collected data were analysed using the Statistical Package of the Social Sciences (SPSS) version 25. The study results showed a positive statistically significant effect at the significance level ($\alpha \leq 0.05$) of cash flow variation on project performance in Jordanian construction projects. In addition, respondents indicated a high level of agreement on the impact of cash flow variation on projects' performance, with a mean of 4.01 and a standard deviation of .546. However, on the project performance dimensions' level, Quality came first, with a mean of 4.11 and at a high level, followed by Safety, with a mean of 4.01 and at a high level, while Final Cost ranked third with a mean of 3.96 and at a high level. Finally, Project Final Duration ranked fourth with a mean of 3.95. The researchers recommended the necessity of more efforts for a better understanding of the importance of cash flow by contractors to schedule project activities correctly and efficiently to maintain a steady state of the project cash flow.

KEY WORDS
cash flow, project performance, Jordan, construction, cash variation, contractors, quality

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Introduction

The construction industry has direct and oblique links with different industries, extending its effect on economic growth and prosperity past its direct contribution to construction activities (Iyer et al., 2008). The concepts of "success" and "failure" are relative and extraordinarily subjective (Parfitt & Sanvido, 1993). Each stakeholder has their own personal definition of success and failure, which can also differ within the same project as well as from one project to another. One participant's success can be another's failure. Thus, concluding or deciding whether a con-

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struction project is a success or a failure becomes an extremely complicated procedure (Sinesilassie et al., 2017). In general, when a construction project is finished on schedule, without cost overruns, and according to specifications, it is considered a success; these three criteria have been employed by a number of academics to assess project performance (Koelmans, 2004). Cash flow is the backbone of the construction industry, and it is often regarded as the most valuable resource available to a company (Al-Joburi et al., 2012). The movement of money in and out of a company is referred to as cash flow. Cash flow is crucial since it is necessary to satisfy obligations when they are due. A company's operational capital must be adequate to pay its vendors, customers, subcontractors, and employees (Ali et al., 2018).

In this study, four dimensions were selected to measure projects' performance: Time, Quality, Safety, and Cost. These dimensions were chosen as the most influential dimensions in the performance of construction projects according to previous studies (Djatmiko, 2017; Michael, 2018; Mahmoud et al., 2020). In addition, these dimensions are directly and significantly related to cash flow, as any change in cash flow will directly affect these dimensions. So, it is necessary to study these dimensions and reveal the cash flow variation impact on them.

The choice of these dimensions came due to their importance and necessity for the success of any project, as the level of performance of construction projects is greatly affected by the time required to complete the project compared to the cost allocated for this project, with the need to maintain safety for all project workers, in addition to the importance of producing results at a high degree of quality.

All of this is what motivated the researchers to choose these dimensions and study them carefully to determine their relationship with the cash flow and their impact on the performance of construction projects.

Previous studies (Djatmiko, 2017; Sharifi and Bagherpour, 2016; Zayed and Liu, 2014; Al-Joburi et al., 2012) have indicated the importance of examining the impact of cash flow on project performance, as this has an impact on the project ability to continue and to achieve its goals, as exploring the suitable cash flow for a construction project with regard to project needs will help project managers achieve the desires of users and meet their demands efficiently. Despite the multiplicity of these studies, the effect of cash flow variation on project performance still needs more study and examination (Mahmoud et al., 2021; Koopman & Cumberlege, 2021; Al-Subaie et al., 2021).

Also, there is a rarity of studies that deal with the effect of cash flow variation on project performance, especially in Jordanian construction projects, and accordingly, the subject of the study was chosen to reveal the effect of cash flow variation on Jordanian construction project performance from contractors' perspectives. Therefore, the contribution of this study to the body of knowledge is to determine the cash flow variation, the factors that affect it during the construction project, and its effect on the project performance, especially on the project's final duration, quality, safety, and final cost. Since few studies have been found on this subject in Jordan, this study will try to fill the gap in the literature about these concepts.

Furthermore, the significance of this research arises from the fact that it will attempt to investigate the causes and effects of cash flow variance in Jordanian construction projects from contractors' perspective, as well as the relationship between cash flow and project performance. Examining this issue may give contractors the methods they need to manage cash flow variability and, as a result, complete a successful construction project.

To guide this research and achieve the goals mentioned above, it is important to set the main questions which must be answered during and after the research:

- What are the causes of cash flow variation in Jordanian construction projects from the perspectives of contractors?
- What is the impact of cash flow variation on construction projects' performance in terms of the project's final duration, quality, safety and final cost?

1. Research background

Construction project management concerns the context and attributes of projects to ensure that events adhere to plans and standards. Nonetheless, performance dissatisfaction is a widespread issue in the construction industry. A typical project may face a number of challenges that impair its performance in areas such as poor productivity (Makulwasaatudom et al., 2003). Other construction difficulties stem from the chronic twin issues of time and cost overruns. Despite the creation of new alternatives and less combative contractual structures, Yisa and Edwards

(2002) agree that project time and expense overruns continue to plague the business, resulting in client discontent.

For analysing management performance and formulating business strategies, performance evaluation is an important instrument. The desire to increase performance in the construction business has become a hot topic all around the world. For example, the UK construction industry launched a number of investigations in this regard. Rework of defects contributes significantly to cost performance issues in the US construction industry, accounting for an average of 5 % of total construction costs (Tunji et al., 2016).

In developing countries, a lack of necessary resources and structures to handle performance difficulties exacerbates the problem. According to studies, time overruns cause failures in 40 per cent of building projects in India. Many challenges plague Ghana's construction business, including contract administration, complicated and time-consuming payment procedures, and late payments (Tunji-Olayeni et al., 2016).

The most critical stage in performance improvement is a diagnosis, not intervention, because an accurate diagnosis of performance demands and shortcomings is what leads to improvement success (Ankrah & Proverbs, 2005). It is impossible to increase performance unless it is measured (evaluated).

Performance measurement is the process of determining how successful organisations or individuals have been in reaching their set goals. It is a mechanism for identifying sources of unnecessary waste so that the company can focus its resources where they are most needed. It shows the state of play and, more importantly, the direction of further developments. Also, measurement can promote steady progress toward specified targets while also identifying inadequacies or stagnation. Measurement of performance is important because it indicates the status and direction of a project (Egwunatum, 2017). Performance measurement's purpose is to offer quick and accurate feedback on operational efficiency and effectiveness and to keep the focus on continual development (Bassioni, 2004).

Performance measures are crucial criteria of an institution aiding in determining whether the practices of a method or the results of the project achieve the targeted objectives. They could be used to translate an organisation's strategy into a group of aims and goals, and the results achieved through the measures represent the strategy's achievement. Performance measures reflect the institution's priority elements and how workers must act in order to achieve the best possible results (Neely et al., 2002).

It is widely agreed that, at the very least, project performance measures rely on time, cost, and quality. The three aspects of project performance are known as the iron triangle. A number of criteria are used to evaluate a project, including sticking to the budget and timeline, the quality of the work, stakeholder satisfaction, technology transfer, safety, and health (Tarawneh et al., 2020; Akpituren, 2016).

Similarly, Chan and Tam (2000) found that project performance is measured using a variety of important factors such as health and safety, environmental performance, user expectation/satisfaction, actor satisfaction, and economic value. As a result, they established six elements to examine when evaluating project performance: cost, time, quality, customer satisfaction, health and safety, and functionality.

Clients, users, stakeholders, and the general public often evaluate project performance from a macro viewpoint, with completion time appearing to be the foremost criterion for project success (Lim & Mohamed, 2000). According to Salter and Torbett (2003) and Odeh and Battaineh (2002), time variance is one of the methodologies for factor to evaluate a construction project's performance. The issue of time could alert project managers to the fact that the project was not progressing as planned (Tarawneh et al., 2020). Furthermore, according to the Latham Report from 1994, one of the most important objectives of construction sector clients is to ensure timely project delivery. Construction time refers to the time it takes from the commencement of site work to the completion and handover of a building to the client. Prior to the start of construction, the construction time for a building is usually defined. Construction time can be estimated using information from the client's brief or accessible project data by the construction planner.

The degrees to which general conditions facilitate the execution of a project without serious accidents or injuries are defined as health and safety. Safety is mostly measured during the construction phase, as this is when the majority of accidents occur. The construction sector is regarded as one of the most hazardous industries in the world. Every year, thousands of people are killed or injured in workplace accidents. Construction workers have three times the risk of dying and two times the risk of being wounded than workers in other industries (Sousa & Teixeira, 2004). According to Sarireh and Tarawneh (2014),

building accidents are caused by violations of safety standards and regulations. Other factors include a lack of training programmes, a lack of safety coordination, lectures, and poor building circumstances. Other causes of accidents were deemed to be poor equipment quality and the absence of testing by a specialised safety team on the project site.

In the construction industry, quality is defined as the total of traits that a product or service must have to meet a specific demand or fitness for purpose. To put it another way, quality in the construction sector is determined by the ability to achieve predetermined requirements. A characteristic is any standard or quality that specifies the nature of those items, processes, or services that are initially determined by the client, whereas requirements are the established characteristics of a product, process, or service as described in the contractual agreement. To complete a project that meets the owner's quality requirements, all project participants must have a thorough awareness of the owner's expectations, factor them into the contract price and other contract agreements as much as possible, and commit to carrying them out in good faith (Ganaway, 2006).

Cost describes the extent to which general conditions support the completion of a project within the anticipated budget. Cost variance is the most common method for evaluating design performance, according to Salter and Torbett (2003). It includes any costs paid as a consequence of revisions, modifications made during construction, and expenditures incurred as a result of legal claims, such as litigation and arbitration, in addition to the tender value. It can be calculated in terms of unit cost, net variance over final cost, and other variables (Chan & Tam, 2000).

Cost variation is a critical metric for assessing project performance since it tells whether the project is on budget or not. In Japan's construction business, cost variance was utilised by Andi and Minato (2003) to quantify project performance caused by poor design. Similarly, Georgy et al. (2005) proposed using cost as a metric for evaluating engineering project performance; they defined cost variance is defined as the difference between a project's actual and projected costs.

The most difficult and crucial challenge facing contractors is obtaining sufficient cash flow at all stages of construction project implementation. Sufficient cash flow is required to meet three goals: paying for overheads, labour, and material costs; completing building activities on time; and reducing financial liabilities. In other words, effective management of cash flow is critical to running a profitable construction company. Successful contractors avoid carrying out work that exceeds available cash or credit at any point throughout the project, regardless of schedule requirements. In other words, contractors want to ensure that they have enough cash on hand at all times. Furthermore, the lack of appropriate construction finance planning can result in considerable cost and time increases, as well as the financial failure of the construction project (Michael, 2018).

Cash flow is the lifeblood of the construction business, and cash is usually regarded as the most valuable of a construction firm's assets (Hyung et al., 2005, Arditi & Polat, 2010). Cui et al. (2010) discussed project cash flow management solutions using a systems analysis methodology. In view of these perspectives, it is found that it is now necessary to investigate the relationship between cash flow and construction sector performance.

2. Literature review

All components of the building project implementation process are influenced by cash flow. A lack of cash can result in project and business failure. Researchers have looked at cash flow in the context of project scheduling, delays, failure, and forecasting. Negative cash flow trends and patterns, on the other hand, have not been thoroughly investigated (Al-Joburi et al., 2012). Contractors that do not manage their cash flow effectively will not be able to compete in the construction market. According to studies and investigations, a shortage of cash is a major factor in construction project failure (Zayed & Liu, 2014). In construction management literature, cash flow is regarded in two ways. The first defines cash flow as the difference between the net receipt (cash in) and the net disbursement (cash out) of receipts and disbursements that occur within the same interest period (Liang et al., 2021). A positive cash flow, according to this school of thought, shows a net receipt in a certain period or year, whereas a negative cash flow suggests a net disbursement in the same period (Liang et al., 2021). In the construction industry, receipts (cash in) are mostly generated from monies received in the form of monthly payments, stage of work payments, the release of retention funds, and final account settlements. Disbursements (cash out) refer to the money spent on a contract to pay workers and subcontractors, purchase materials and blueprints, and so on (Liang et al., 2021). The

second definition of cash flow in construction management is the actual movement or transfer of money into or out of a corporation. Money going into a business is referred to as positive cash flow (+ve) and is credited as cash received by this school. Negative cash flow (-ve) refers to money that has been paid out and is debited to the firm. The net cash flow is the difference between positive and negative cash flows. The first definition of cash flow is utilised in this study because it is broadly recognised by most contractors, widely used in the construction industry, and supported by numerous recent studies (Purnusa & Bodea, 2016).

Also, due to the critical necessity of cash flow, researchers have developed numerous cash flow forecasting and prediction methodologies for both owners and contractors, as well as for both short and long-term building projects. Chen (2007) suggested simple technologies that will make cash flow forecasting easier. McInnis and Collins (2011) looked into the impact of cash flow forecasting on project accounting. The reviewed research emphasised the critical significance of cash flow forecasting in predicting financial shortages and avoiding or at least decreasing negative cash flow situations.

Purnus and Bodea (2015) presented a viable cash flow analysis model that may be used by construction businesses when making decisions on project portfolio structure. Their suggested model allows construction companies to anticipate not only when but also how much money should be borrowed or received from internal or external sources and when and how much money should be returned. Construction project management concerns the context and attributes of projects to ensure that events adhere to plans and standards. Nonetheless, performance dissatisfaction is a widespread issue in the construction industry. A typical project may face a number of challenges that impair its performance in areas such as poor productivity (Makulwasaatudom et al., 2003).

Performance measurement is the process of determining how successful organisations or individuals have been in reaching their set goals. It is a mechanism for identifying sources of unnecessary waste so that the company can focus its resources where they are most needed. It shows the current state of play and, more importantly, the further direction of developments. Also, measurement can promote steady progress toward specified targets while also identifying inadequacies or stagnation. Measurement of performance is important because it indicates the status and direction of a project (Egwunatum, 2017). Performance measurement's purpose is to offer quick and accurate feedback on operational efficiency and effectiveness, as well as to keep the focus on continual development (Bassioni, 2004). Accordingly, it is clear that cash flow variation and contractors' financial management have a great effect on project performance, as emphasised by AL-Nassafi (2022).

A cost estimate, often known as a budget plan, is an estimate of a building project's overall cost, which includes materials and labour expenses, among other things. Cost estimation and planning are crucial in project management. The cost estimate must be precise, clear, and full since it is used for feasibility studies, design possibilities, and selecting the optimal design for a project. A time schedule and S-curve may be constructed based on construction planning for a project to be completed within the stipulated time periods after carefully assessing construction expenses (Gurcanli et al., 2017).

Construction project budgeting serves three purposes: (1) evaluating if present assets or finances are sufficient to pay expected building costs, (2) controlling money flow during the construction process, and (3) planning for a competitive construction bidding or negotiating process. The owner's ideas and requirements are used to calculate a building budget, as well as what the contractor understands and agrees to; it is useful in ensuring that construction works are completed properly and that the contractor receives an acceptable profit (Sharifi & Baghepor, 2016).

By regulating the financial situation — positive or negative balance — the Project Cash Flow (PCF) offers a foundation for the contractor to make suitable decisions for project continuity and success. The cash-in comes from current assets (self-funding), loan funds, and down payments. Direct expenses, indirect expenditures, contractor profit, and informal costs are all included in the cash-out (Reyers et al., 2015).

The following six elements have an impact on the PCF: (1) down payments and progress billings for piece work contracts, (2) progress schedules, (3) material schedules, (4) equipment schedules, (5) labour schedules, and (6) subcontractor payment schedules (Djatmiko, 2017). Purnus and Bodea (2016) noted that complete and regulated planning for project cash flow management should be created to deal with increased financial risks, high capital expenditures, market competitiveness, and other competitive concerns that construction businesses face.

According to Sharifi and Baghepor (2016), the PCF conditions are the most significant component of a construction project; hence, the planning and estimating process must be precise, rapid, and successful in dealing with risk factors. Because PCF correctness is critical, a complete and detailed investigation must be performed.

Purnus and Bodea (2016) stated that the length or start and end dates of a project, as well as the DP (Documents against Payment) payment interval and progress billing, are all criteria to consider while monitoring and assessing the PCF. The S-curve is necessary to make PCF deployment and outcomes evaluation easier. According to Lu and Liu (2014), the techniques for successful construction projects are to avoid wasted time, assure quality to get recognition from the owner, resolve conflicts through negotiation, and accelerate progress toward fulfilling work objectives.

One of the most typical issues in the construction sector is project delays. Many researchers have tried to figure out what is causing project delays. According to Abdul-Rahman et al. (2009), there are four main causes of building delays, all of which are tied to money: late payments, inadequate management of cash flow, financial market instability, and limited financial resources are all factors to consider.

From a list of 28 key explanations, Sambasivan & Yau (2007) selected the ten most significant reasons for the delay. They also divided the six primary effects of delay into categories. Four of these underlying elements have been shown as the most significant contributors to construction delays: instability in the contractor's financial foundation, poor financial and commercial management by the client, and issues receiving inflation and loans from financiers.

The construction industry uses the Critical Path Method/Program Evaluation and Review Technique (CPM/PERT) to minimise the overall project length. According to Elazouni and Gab-Allah (2004), many heuristic, optimum, and suboptimal techniques for altering CPM/PERT have been devised, but none of them uses cash flow availability as a variable in balancing project expenditures. Traditional resource allocation approaches, they believe, cannot be utilised to substitute finance-based scheduling since available cash flow is treated as a finite resource. They provide finance-based scheduling for constructing CPM/PERT using integer programming, allowing projects to be funded within certain credit constraints.

Finance-based schedules were also created utilising genetic algorithms to optimise project profit by lowering finance and indirect expenses (Elazouni & Metwally, 2007). Elazouni (2009) used a heuristic technique to apply finance-based scheduling to diverse projects. The Strength Pareto Evolutionary Algorithm is added to the finance-based scheduling, which enhances it even more (Abido & Elazouni, 2010).

When dealing with restricted cash flow, resource-based scheduling should be addressed, according to Liu and Wang (2008). In conclusion, many scholars have looked at the scheduling issue, but there is still no consensus on the best method for most building projects.

Davis et al. (1989), Abdul-Rahman (1993, 1995), Low and Yeo (1998), Love and Li (2000a), and Barber et al. (2000), among others, have emphasised the need to measure quality costs to enhance the performance of construction organisations and lower project costs. Quality costs are the overall expenses incurred as a result of issues that arise before and after the delivery of a product or service (Love et al., 1999). Internal and external forces contribute to the costs of failure. Internal low-quality expenses, such as rework, material waste, and other unnecessary process losses, raise an organisation's cost of operations.

Quality now stands next to Price as a major factor of differentiation in contractor selection by the client, as well as determining the efficiency of processes that the contractor adopts for site operations. To be competitive and sustain good business prospects, construction companies need a more strategic orientation for the quality systems they deploy. The role of quality management for a construction company is not an isolated activity but intertwined with all the operational and managerial processes of the company. Quality in construction can be achieved only through the direct effort of all stakeholders of the project, which mainly depends on the availability of cash flow.

Human resources and construction operations have not placed enough emphasis on safety provision and practice. Over time, safety concerns have improved as the construction industry has demonstrated investment incentives and favourable consequences for customers and operators. In response to the rise of the construction sector, governments began to implement additional laws and norms for safety measures. Construction businesses began implementing safety action plans on their sites and projects as a result of the enforced laws (Ahmed & Kwan, 2000). Contractors are prepared to implement a qualified safety system for the work environ-

ment since it includes measures that boost their profit and competency by supporting an accident-free work environment. Clients and owners will also be motivated and happy to engage in the construction business since it complies with all environmental and safety laws. A successful qualified safety system for the work environment implementation will result in acceptable quality at a lower cost and more productivity (Koehn & Datta, 2003). Due to the lack of effective safety and building regulations, the construction industry in developed countries still performs poorly in terms of health and safety (Datta, 2000). Okoye (2014) stated that the building industry had made intensive steps to change its health and safety performance.

However, these initiatives have moved away from measuring safety efficiency and toward protective safety initiatives. In its efforts to address the transformative initiatives of several countries, the success of the industry's health and safety remains a glaring concern. Health and safety costs are widely regarded as required and beneficial business expenses (Okoye, 2014). Protection costs are paid to meet regulatory provisions for injury prevention, to enforce policies and avoid injuries during building projects, and to improve health and safety standards in all aspects of the work undertaken to ensure a stable work environment (Bima, 2015). Costs involved with proper safety criteria in developed nations can actually be unjustifiable, and creditors may be unable to pay the safety cost for economic stability if the actual cost of an accident is too low in the market (Smallwood, 2004).

Based on the above scenario, a clear gap is evident in studying the effect of cash flow variation on construction project performance. The importance of this study stemmed from the need to determine the causes and impacts of cash flow variation in Jordanian construction projects from the perspectives of contractors and their relationships with project performance. Examining this relationship may provide practitioners with the means to control cash flow variation and thus have a successful construction project. On the other hand, the current research bridges the gaps in the literature since little research have been found on the research subject in Jordan in the researchers' knowledge.

3. Research design and methodology

Quantitative research refers to the systematic search of social phenomena through statistical methods or mathematics. Quantitative research tries to create and use mathematical models, questions, and theories that are relevant to phenomena. Because it offers an effective link between empirical observation and mathematical articulation of quantitative relationships, the measuring process is the focus of quantitative research (Sekaran, 2010). Moore et al. (2006) argued that the questionnaire is a widely used data collection instrument due to its capability of gathering a large amount of information. This study adopted the descriptive analytical approach to collect data from the study sample, referring to theoretical literature related to the subject of the study and developing a questionnaire as the main tool to collect data from the study sample.

The research community means all the individuals of the phenomenon under consideration and includes the total set of individuals to which the researcher seeks to generalise the results related to the problem studied.

The respondents of the current study are project managers from contractor companies from all classes who operate within Jordan, approximately 340 construction companies in Jordan (Jordanian Construction Contractor Association, 2021). The reason for choosing these respondents is that they are the individuals most affected by this issue. In addition, the researcher considered the valuable data that could be gathered from this group.

According to Cavana et al. (2001), the required sample size for this study was approximately 173 individuals, as defined in the rules provided by Krejcie and Morgan (1970) for sample size decisions, as shown in Equation 1 below. According to Leveugle (2009), the Krejcie and Morgan equation provides a 95 % confidence level and +/-5 % margin of error; therefore, utilising this equation, the study sample consists of 191 individuals in case of the occurrence of unusable data.

$$n = \frac{x^2 * N * P(1-P)}{(ME^2 * (N-1) + (x^2 * P * (1-P))} \quad (1)$$

where:
n = sample size,
X^2 = Chi-square for the specified confidence level at 1 degree of freedom,
N = population size,
P = population proportion (.50 in this method),
ME = desired margin of error (expressed as a proportion).

A selective sample was adopted, which is a form of non-probability sampling. Researchers employ this

strategy in investigations where random chance sampling is impractical to draw due to time or expense constraints, according to Zikmund, Babin, Carr, and Griffin (2013). Furthermore, with the selective sampling method, researchers choose samples solely based on their own knowledge and reputation. In other words, researchers select only those individuals whom they believe are suitable for participation in the study and have the right information.

191 questionnaires were distributed to the respondents through Google Drive. The online method was used because of and in accordance with COVID-19 government-mandated restrictions. A total of 181 valid questionnaires were retrieved for statistical analysis, accounting for (94.76 %) of all disseminated questionnaires, which is an acceptable percentage for scientific research.

The questionnaire utilised in this study was based on the Likert scale, with five options ranging from (strongly agree) to (strongly disagree). Each option was given a relative weight of 5-1. The following are the three key sections of the questionnaire: the First Section, concerned with the personal data of the respondents and their companies; the Second Section, concerned with the independent variable (cash flow variation); literature was used to develop this instrument (Al-Joburi et al., 2012; Djatmiko, 2017; Liang et al., 2021); and the Third Section, concerned with the dependent variable (project performance) with all its dimensions (Project Final Duration, Quality, Safety, and Final Cost); literature was used to develop this instrument (Guracanli et al., 2017; Lu & Liu, 2014; Oke et al., 2016).

The current study followed certain phases to achieve its objectives, wherein the design method of this study was derived from the literature to determine the suitable approach and instrument for this type of study. This study employed a questionnaire for data collection because it is a valid instrument, according to Moore et al. (2006), who argued that the questionnaire is a widely used data collection instrument due to its capability to gather a large amount of information. The following procedures were followed: to determine the study problem, define the study terms, pick the relevant tools for the research, and evaluate the theoretical literature and existing research relating to the subject of the current study.

The study population comprised individuals who deal with the Jordanian Construction Contractor Association, 2021. From that population, a selective sample was chosen. To collect data from the study sample, a questionnaire was developed, and the questionnaire's validity and reliability were confirmed, after which the researcher distributed 191 questionnaires to the respondents. A total of 181 valid questionnaires were retrieved for statistical analysis, which represents 94.76 % of the total distributed questionnaires. Data was collected from the distributed questionnaire and then analysed using the Statistical Analysis of Social Sciences program (SPSS 25.0) to achieve the study results. The study results were discussed, clarified, and compared with the results of previous studies, and some recommendations were proposed.

4. Data analysis and results

This section summarised the findings of the data analysis that was carried out to answer the research questions and achieve the research objectives through hypothesis testing.

Content validation and internal construction validation were employed to confirm the study tools' validity:

The research instrument was presented to a panel of six experienced and specialised arbitrators drawn from Mutah University's department heads and faculty members. The arbitrators were requested to comment on the comprehensiveness of the paragraphs, their area relevance, the suitable language construction, and the clarity of the paragraphs and to add, delete, or alter anything they thought was necessary. The arbitrators recommended that no para-

Tab. 1. Correlation coefficients between the individual's score on the paragraph and the overall score on the instrument

Item No.	Correlation coefficient	Item No.	Correlation coefficient	Item No.	Correlation coefficient
1.	.476**	15.	.413*	29.	.399*
2.	.434*	16.	.449*	30.	.462*
3.	.542**	17.	.544**	31.	.348*
4.	.465*	18.	.602**	32.	.568**
5.	.604**	19.	.379*	33.	.593**
6.	.375*	20.	.443*	34.	.611**
7.	.456*	21.	.374*	35.	.436*
8.	.567**	22.	.432*	36.	.387*
9.	.423*	23.	.572**	37.	.349*
10.	.385*	24.	.365*	38.	.465*
11.	.376*	25.	.493*	39.	.579**
12.	.542**	26.	.449**	40.	.564**
13.	.501*	27.	.610**	41.	.456*
14.	.571**	28.	.434*	42.	.604**

* means significant at the level (α≤0.05)

** means significant at the level (α≤0.01)

graphs be deleted and that some paragraphs in the study tool be rewritten.

The validity of the study tool was confirmed using the validity of the internal construction, in which the tool was applied to a 40-person exploratory sample, randomly selected from both within the study community and outside the study sample, and the correlation coefficient calculated between the individual's degree on the paragraph and its overall score on the tool. Table 1 shows that suitable scale indicators have been achieved for the study instrument, as correlation coefficients ranged between .611- .348, all of which are statistically significant at the level $\alpha \leq 0.05$ (Sekaran, 2010).

5. Reliability of the study instrument

The internal consistency of the study instrument was determined using Cronbach's alpha equation and the coefficient of internal consistency. The study instrument's internal consistency coefficient was determined by distributing it to a group of 40 random respondents, as indicated earlier.

Table 2 indicated that the Cronbach's Alpha coefficients for the dimensions of the dependent variable (project performance) ranged between 0.80 – 0.82, while the Cronbach's Alpha coefficient for the independent variable is 0.80; these values are considered acceptable for the purposes of scientific research (Sekaran, 2010).

A descriptive analysis of the construct is addressed in the present study. The mean and standard deviation scores on the 42 items were obtained according to the study variables. After analysing the data to find the result that leads to reaching the first objective (investigate the causes of cash flow variation in Jordanian construction projects from the contractors' perspectives), the results of the descriptive analysis for the cash flow variation variable, the respondents indicate a high level of agreement for cash flow variation with a mean of 4.09 and a standard deviation of .581. The researcher attributes this result to the significance of cash flow for any project, as cash flow allows material procurement, salary payment, new project funding, and financing of other functions of the company's day-to-day operations. Our results have been supported by the finding of AL-Nassafi (2022).

In the construction supply chain, cash flow is also a concern, and it is a major cause of insolvency among contractors and subcontractors. This might be very critical for a project in terms of time and money. Even if a company is moderately successful, if positive cash flow is insufficient, a project may start to collapse owing to a lack of constant money throughout the project's life cycle.

This result may be attributed to the fact that the contractors are fully aware of the seriousness and importance of the issue of cash flow, so they calculate the cash flow accurately and in a scientific way that enables them to continue the project without any negative cash flow effects.

The current research result confirms the study by Djatmiko (2017), indicating that cash flow is related to all project elements and affects all of them. Also, this result agrees with studies by Purnusa and Bodea (2016) and Zayed and Liu (2014), which showed that cash flow could be affected by many factors, including bills of quantities, technical skills, and inadequate budget control, exactly as shown in this current study.

Table 3 shows the results of the descriptive analysis for the project performance variable; respondents indicate a high level of agreement for project performance with a mean of 4.01 and a standard deviation of .546, while at the level of dimensions, Quality came first with a mean 4.11 and at a high level, followed by Safety with a mean of 4.01 and at a high level, while Final Cost came third with a mean of 3.96 and at a high level, and, finally, Project Final Duration came fourth with a mean of 3.95 and at a high level.

This result may be explained by the fact that construction contractors pay great attention to the performance of the projects they undertake, especially with regard to their quality, as they must comply with all specifications accurately in addition to providing comprehensive knowledge about how to implement the quality system for project workers.

This result may also be attributed to the great attention given to the safety and security component in the performance of construction projects in Jordan, implementing procedures that consider the staff safety and security and providing mandatory individual health and safety training in the project, and the presence of a committee primarily responsible for public health and safety measures. This committee works within a set of laws and regulations related to health and safety in the workplace.

Before starting the regression analysis to test the study hypotheses, certain tests were performed to ensure that the data fit the assumptions of the regression analysis. It was confirmed that there was no high correlation between the independent variables (Mul-

ticollinearity) using the Variance Inflation Factor (VIF) test and the Tolerance test for each of the study variables, considering that the VIF did not exceed the value of 10 and the Tolerance value was greater than 0.05. Also, the researcher ensured that the data followed the normal distribution by calculating the Skewness coefficient, bearing in mind that the data follow a normal distribution if the Skewness coefficient is close to 0 (Awang, 2014). Table 4 shows the results of these tests.

The data in Table 4 indicated that the value of the VIF test for the independent variable was less than 10 and achieved 1.000 and that the value of the Tolerance test achieved 0.780, which is greater than 0.05; this is an indication that there is no high correlation between the independent variables (Multicollinearity). It was confirmed that the data followed a normal distribution by calculating the Skewness coefficient; the values were close to the value 0, which is less than 1, so it can be said that there is no real problem related to the normal distribution of the study data.

Table 5 shows that the value of the correlation coefficient for the independent variable (cash flow variation) and the dependent variable (project performance) together amounted to 0.805, and the value of the coefficient of determination (R2) was 0.648, meaning that the model explained 64.8 % of the total variance in project performance.

The researchers attribute this result to the circumstances that occurred due to cash flow problems. Construction companies may find it difficult to pay their bills and employees and order equipment, materials, and supplies for construction projects. Cash flow issues can also make it difficult for a corporation to form connections with general contractors and project owners. Construction companies cannot take

Tab. 2. Cronbach's alpha for the variables of the study instrument

Variable	Dimensions	Cronbach's alpha coefficient
Cash flow variation	Cash Flow Variation	0.80
Project performance	Project Final Duration	0.82
	Quality	0.81
	Safety	0.80
	Final Cost	0.82

Tab. 3. Descriptive Analysis for Project Performance

Rank	No.	Dimensions	Mean	SD	Level
4	1	Final Duration	3.95	.623	High
1	2	Quality	4.11	.682	High
2	3	Safety	4.01	.656	High
3	4	Final Cost	3.96	.632	High
		Average mean score of project performance	4.01	.546	High

Tab. 4. Test the VIF, tolerance, and skewness

Independent Variable	VIF	Tolerance	Skewness
Cash flow variation	1.000	.780	-.417

Tab. 5. Model summary of the impact of cash flow variation on project performance

Model	R	R^2	Adjusted R^2	Std. Error
1	.805	.648	.646	.32533

Tab. 6. Matrix of the Pearson correlation coefficient of the relationship between the cash flow variation and project performance with all its dimensions

Dependent variables	Independent variable	
	Cash flow variation	
	Pearson correlation	Sig
Project Final Duration	.742**	.000
Quality	.747**	.000
Safety	.665**	.000
Final Cost	.555**	.000
Project Performance	.805**	.000

** Statistically significant at the level (α≤0.01)

on new work or expand their business if they do not have the money to handle current tasks.

They also are not able to hire new employees or provide benefits or raises because the labour market is so tight. Cash flow affects all elements of construction projects, as it is responsible for determining the future obligations required by the project, determining the expected cost of the project, and anticipating the potential cost of the resources that will be required to complete all project work. This can have an important effect on the company's capacity to succeed. In fact, construction companies that have continuous cash flow issues are more likely to collapse. This result highlights the critical importance of the cash flow issue, which is one of the most significant practices in the management of construction projects, and the importance of calculating it accurately so that the owner and contractor can determine their financial needs and arrange them properly. Therefore, attention must be paid to the cash flow issue, and this is evident in how cash flow variation can impact project performance.

The above results agree with the findings of the studies by AL-Nassafi (2022) and Sharifi and Bagherpour (2016), which indicated the impact of cash flow variation on construction projects performance, and with the study by Al-Joburi et al. (2012), which mentioned that the quantity, time, and distribution of cash flow are all important elements in construction success, according to the report.

To investigate the relationship between project cash flow and individual measures of project performance, the researcher extracted the Pearson correlation coefficient between the cash flow variation and project performance; the results are shown in Table 6.

Table 6 indicates that all correlations are statistically significant and at positive levels between the independent variables represented by the cash flow variation and project performance as a dependent variable, whether at the overall level or at the one-dimensional level, and the total value of the correlation between the cash flow variation and project performance as a whole (0.805), which is a positive value that confirms the impact of the cash flow variation on project performance in Jordanian construction projects.

Also, the result showed that the strongest of these relationships was with the dimension Quality, with a correlation value of 0.747, while the weakest of these relationships was with the dimension Final Cost, with a correlation value of 0.555. This agrees with the results mentioned above in terms of importance, where Quality ranked first, followed by Safety, while Final Cost ranked third, and finally, Project Final Duration ranked fourth. Also, through the results shown, we found consistency, and the results didn't contradict the difference in the examination that was carried out. As stated earlier regarding the testing of the proposed hypothesis, they are examined as follows.

Conclusions

Based on the research results and discussion, the following conclusions can be presented:

- The state of a construction project's cash flow is a good predictor of its financial health, and cash flow issues are a common cause of the failure of construction projects.
- According to the study findings, construction projects are plagued by divergent cash flow with a mean of 4.09 and a standard deviation of .581, emphasising multiple reasons for differing cash flows in construction projects, including the lack of technical skills, different meanings of specifications, incomplete information at the tender stage, inadequate supplier management, and errors in project documents (Bills of Quanti
- Respondents indicated that the difference in cash flow affects all stages of construction projects, such as purchasing inventory and raw materials, and paying wages, causing delays in project completion time, lowering the profit margin, and increasing difficulties in obtaining financial aid.
- Respondents also indicated that they care greatly about the performance of construction projects, with a mean of 4.01 and a standard deviation of .546, as they focus on the success of these projects by adhering to the specified time to complete the project, maintaining the security and safety of all project workers, and implementing construction projects at a high level of quality.

The researchers recommended the necessary efforts to better understand the importance of cash flow by contractors to schedule project activities correctly and efficiently and the need to develop an accurate cash flow model with the aim of helping contractors and academics forecast cash flow before and during construction. In addition, more research is needed to examine the impact of cash flow on contractors, owners, and the industry as a whole, as well as factors that influence cash flow variation in construction projects in Jordan.

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