

Modelling the domino effect of advance payment system on project cash flow and organisational performance

Effect of
advance
payment
system

Emmanuel Dele Omopariola and Abimbola Olukemi Windapo

*Department of Construction Economics and Management,
Faculty of Engineering and the Built Environment, University of Cape Town,
Cape Town, South Africa*

David Jhon Edwards

*School of Engineering and the Built Environment, Birmingham City University,
Birmingham, UK and*

*Faculty of Engineering and the Built Environment,
University of Johannesburg–Doornfontein Campus, Doornfontein, South Africa*

Clinton Ohis Aigbavboa

*Department of Construction Management and Quantity Surveying,
University of Johannesburg–Doornfontein Campus, Doornfontein, South Africa*

Sunday Ukwe-Nya Yakubu

*Department of Architecture, Faculty of Environmental Design and Management,
University of Oye Ekiti, Oye, Ekiti, Nigeria, and*

Onimisi Obari

Department of Building Technology, Kogi State Polytechnic, Lokoja, Nigeria

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Abstract

Purpose – Previous studies have postulated that an advance payment system (APS) positively impacts the contractor's working capital and is paramount to ensuring an efficient and effective project cash flow process. However, scant research has been undertaken to empirically establish the cash flow performance and domino effect of APS on project and organisational performance.

Design/methodology/approach – The epistemological design adopted a positivist philosophical stance augmented by deductive reasoning to explore the phenomena under investigation. Primary quantitative data were collected from 504 Construction Industry Development Board (CIDB) registered contractors (within the grade bandings 1–9) in South Africa. A five-point Likert scale was utilised, and subsequent data accrued were analysed using structural equation modelling (SEM).

Findings – Emergent findings reveal that the mandatory use of an APS does not guarantee a positive project cash flow, an improvement in organisational performance or an improvement in project performance.

Practical implications – The ensuing discussion reveals the contributory influence of APS on positive cash flow and organisational performance, although APS implementation alone will not achieve these objectives. Practically, the research accentuates the need for various measures to be concurrently adopted (including APS) towards ensuring a positive project cash flow and improved organisational and project performance.

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Originality/value – There is limited empirical research on cash flow performance and the domino effect of APS on project and organisational performance in South Africa, nor indeed, the wider geographical location of Africa as a continent. This study addresses this gap in the prevailing body of knowledge.

Keywords Advance payment system, Project cash flow, Organisational performance, Domino effect, Project performance

Paper type Research paper

Introduction

Various studies have reported that failed projects or business operations in the construction industry result from a combination of several factors such as finance, payment systems and cash flow (Abbasnejad and Izadi Moud, 2013). Financial-related factors account for a considerable proportion of project failures and these factors manifest themselves as low returns on investments made, financial losses and in the extreme, liquidations (Abbasnejad and Izadi Moud, 2013). The study by Omopariola *et al.* (2021) describe financial-related factors as financial difficulties in project cash flow that are frustrating the contractors' efforts to ensure that project delivery meets specified goals and objectives. According to Omopariola *et al.* (2017), financial difficulties in project cash flow systems occur because the sources of cash flow to execute contracts are slowed down or cease altogether in the project delivery stages. Consequently, the main contractor becomes heavily indebted to supply chain sub-contractors and suppliers (Chappell *et al.*, 2004).

Research into the financial difficulties associated with project cash flow has been linked to the client's payment system employed for construction projects (Aje *et al.*, 2017). Kenley (2003) explained that payment systems ensure that the contractor is promptly paid for work undertaken to safeguard continuance of future work on site and so guarantee that project funding is not reliant upon the contractor. A plethora of different payments systems are available and these include: interim payment, advance payment, stage payment, milestone payment, payment on completion, lump sum, unit price, front loading, reimbursable cost and percentage fee, reimbursable cost and fixed fee, unit rate and guaranteed maximum price (Oke *et al.*, 2013). However, different payment systems apply to different project environments and expectations given that each construction project is bespoke in terms of the project's specifications and procurement arrangement (the so-called '*project environment*') (Omopariola and Windapo, 2018). Omopariola and Windapo (2018) posit that construction projects fail to deliver as expected due to a mismatch between payments systems used on a project environment. Scott and Mitchell (2017) proffer that when an appropriate payment method or system is used (and in the best-fit project environment), the effectiveness of that project and concomitant organisational performance will improve. As such, litigations may arise from inappropriate payment systems used. Cumulatively, this body of knowledge indicates that the financial performance of construction projects depends upon an appropriate match between the choice of payment system used and the project environment and expectation.

Al-Momani (2000) indicated that to optimise the matching of a payment system to a bespoke project environment, the construction industry must move away from the predominant use of a non-productive payment system and embrace payment systems that can ensure positive cash flows to the contractor. Specifically, Hussin and Omran (2009) maintained that an advance payment system (APS) offers a novel alternative that will ensure: a positive cash flow; improvements in the quality of the construction works; and augmentation of the contractors' efficiency and productivity. Kaka and Lewis (2003) refer to advance payment as an amount of money remunerated to the contractor by the employer at the beginning of work to meet the contractor's mobilisation or other up-front costs. It differs from partial, progress or other payment systems based on performance or partial

performance of a contract. Scholars such as [Kenley \(2003\)](#), are in congruence with [Hussin and Omran \(2009\)](#) and [Kaka and Lewis \(2003\)](#) – specifically, that APS supports small-to-medium construction firms and provides a versatile payment system for contractors, thus enabling industry to operate efficiently, particularly in a developing country context.

[Hussin and Omran \(2009\)](#) identified three beneficial project expectations for the client's advance payment to the main contractor, namely: (1) a decrease in the contractor's financial burden; (2) assistance to the contractor in facing the financial difficulty of commencing the project; and (3) assistance to small-to-medium, financially weak or newer construction firms to compete with large and established firms. [Ashworth \(2012\)](#) extended the prevailing discourse on APS and explained that it is suitable for a project environment where: a loan by a private financial institution is not practicable; and the project start-up costs are excessive and would not normally be recouped quickly by the contractor.

The domino effect of advance payment on project and organisational performance has also been postulated by [Mutti and Hughes \(2002\)](#) and [Oke et al. \(2013\)](#). [Oke et al. \(2013\)](#) maintained that advance payment offers the contractor an interest-free loan at the outset of the contract where the greatest strain is placed on a contractor's cash flow. [Mutti and Hughes \(2002\)](#) explained that advance payment has a positive impact on the working capital of the contractor and is paramount to the project's cash flow process. Recently, attention has focussed on the various topics of: payment bond and mechanisms of APS ([Oke et al., 2013](#)); cash flow analysis of construction projects ([Purnus and Bodeab, 2016](#)) and profitability performance and distribution of different types of construction projects ([Bilal et al., 2019](#)). This body of knowledge illustrates that scant attention has been paid to empirically establishing the cash flow performance and domino effect of APS on project and organisational performance. Only, the study by [Omopariola and Windapo \(2019\)](#) explored this phenomenon but such work represented a preliminary investigation only and focussed more upon a review of extant literature review. The study's conclusion ([Omopariola and Windapo, 2019](#)) was tentative and indicated that APS has no effect on project cash flow and the performance of organisations and projects. Also, [Omopariola et al. \(2022\)](#) investigated the impact of attributes of an APS on cash flow, project and organisational performance. The study ([Omopariola et al., 2022](#)) concluded that APS serves as an effective payment system that can catalyse the performance of organisations and projects towards construction operations success. What is not yet established is the effect of APS on contractors' cash flow problems and insolvency ([Omopariola et al., 2021](#); [Su and Lucko, 2015](#)).

However, scant research has been undertaken to empirically establish the cash flow performance and domino effect of APS on project and organisational performance. To address the prevailing knowledge gap and build upon past research undertaken in this area, this current study seeks to use structural equation modelling (SEM) to model the domino effect of APS on project cash flow and performance of organisations and projects using a comprehensive primary data set and inferential statistics. A primary objective of the research is to elucidate upon the connections between dependent and independent variables measured and so ensure a deeper and richer understanding of the phenomenon under investigation. Such detailed empirical analysis has hitherto not been available in extant literature.

Advance payment system (APS)

APS is a payment system where a monetary value is released to the contractor by the client (as a percentage of the contract sum paid in one instalment or multiple instalments) in anticipation of project works to be carried out ([Abubakar, 2004](#)). Such works may include: site mobilisation and a fair proportion of job overheads or preliminaries such as payment for

equipment, material and plant mobilisation expenses [Rameezdeen et al. \(2006\)](#). Sometimes, contractors are required to submit copies of invoices or other proof of expenses to the client's representative ([Omopariola et al., 2021](#)). Depending on the nature of work, advance payment is typically between 15 and 20% of the contract sum ([CIDB, 2008](#)). There are different payment mechanisms for making advance payment – each tailored for certain conditions of a project and client circumstance ([Motawa and Kaka, 2009](#)). Advance payment is considered as an interest-free loan and could be a bank guarantee or any other acceptable guarantee by the client ([Rameezdeen et al., 2006](#)). Advance payment is repaid by the contractor when a proportionate amount from payments due to the contractor is deducted. This is usually done when total certified value of work reaches 90% of the initial contract price ([Rameezdeen et al., 2006](#)).

Studies such [Motawa and Kaka \(2012\)](#), [Oke et al. \(2013\)](#) and [Aje and Adedokun \(2018\)](#) have investigated the usage of APS in the construction industry. For example, [Oke et al. \(2013\)](#) assessed the usage and benefits of advance payment bond in the Nigerian construction industry. The study's findings ([Oke et al., 2013](#)) showed that contractual method (which prompts the decision to provide advance payment bond) often adopt target cost contract; whilst procurement methods (which prompts the decision to provide advance payment bond) are mainly collaboration-based methods. [Oke et al. \(2013\)](#) concluded that a proper understanding of the concept of advance payment bond by both the contractors, consultants and the clients is essential. [Aje and Adedokun \(2018\)](#) investigated the sustainability of APS to Nigerian construction projects based on a survey of 127 respondents. The study ([Aje and Adedokun, 2018](#)) found that most of the participating contractors have cash surplus at an average of 28% of the contract sum due to the current government policy of 30% of the contract sum as advance payment. [Aje and Adedokun \(2018\)](#) concluded that advance repayment deduction should span throughout the contract duration or when the actual performance on site reaches 85% as against the contractual provision for four equal instalment repayments of 25%. An emergent recommendation was that contractors should be made to stock-pile materials that are susceptible to price fluctuation immediately after the contract is signed and advance payment (AP) granted. Cumulatively, these past findings and conclusions suggest that APS usage will impact the performance of contractors and projects. However, the studies failed to demonstrate the effect of APS usage on the performance of projects and organisations hence, justifying this present investigation.

Cash flow performance of contractors

Project cash flow represents the actual movement of funds in and out of a construction company (between client and contractor) and are vital for the project delivery process ([Odeyinka et al., 2013](#)). To underscore its importance, [Omopariola et al. \(2017\)](#) stated that cash flow is the life-blood of a business whereas [Park et al. \(2005\)](#) states that cash is the contractor's most important resource. Cash flow is key throughout the project execution period, and it is used in assessing the working capital requirements, since the difference between project outflows and payments determines the required capital reserves ([Omopariola et al., 2017](#)). Payment made to suppliers, sub-contractors and direct costs is dependent on cash inflows from the client ([Omopariola et al., 2017](#)). These payments vary in size and frequency depending upon the contract(s) agreement(s) made between the contractor and client, sub-contractors and suppliers ([Kenley, 2003](#)). [Omopariola et al. \(2021\)](#), noted that most contractors working on construction projects suffer serious liquidity and cash flow problems. Also, many contractors have become insolvent not because their work was not profitable but due to a short run lack of cash ([Omopariola et al., 2021](#)). A prominent example includes: Carillion Plc, a former company with a substantial portfolio of public private partnership projects and a sector leading ability to deliver sustainable solutions

(Carillion, 2016). For each project executed by a firm, it is expected that the estimates of amounts, timing and uncertainty of the cash flow resulting from the investment would be carefully analysed on an incremental basis throughout the project (Pandey, 2002). The uncertainty surrounding cash flow, has led many researchers to review existing approaches for cash flow prediction based on advance tools such as: algebraic formulations (Kenley, 2003); regression models (Lucko and Cooper, 2010); and fuzzy theory (Su and Lucko, 2015). Yet, despite this research momentum, contractors continue to suffer cash flow problems and insolvency (Omopariola *et al.*, 2021).

Project and organisational performance in the construction industry

Performance is related to the prescribed goals and objectives which form the project parameters (Chitkara, 2005). From a construction perspective, performance entails meeting or exceeding clients' needs and expectations from a project and ensuring the smooth and successful completion of the construction project. Consequently, there is need to develop criteria for performance measurement. Hence, numerous parameters for measuring project performance have been developed (cf. Ling, 2004; Josephson and Lindstrom, 2007). Josephson and Lindstrom (2007) identified 250 parameters; whilst Ling (2004) evaluated 70 potential factors for measuring project performance and can be classified as subjective and objective parameters. Pinto and Slevin (1998) classified project performance parameters into internal (e.g., schedule, time, cost and quality) and external factors (e.g., client's satisfaction). Ilori and Omopariola (2018) found that project time and cost performances are influenced by project characteristics, procurement system, project team performance, client representation's characteristics, contractor characteristics, design team characteristics and external conditions. Bilal *et al.* (2019) proposed a project analytics approach where Big Data is harnessed to understand the profitability performance and distribution of different types of construction projects. The study (Bilal *et al.*, 2019) revealed that profit margins evolve and that the profitability performance varies across several project attributes. Moreover, the research (Bilal *et al.*, 2019) claimed that the proposed project analytics approach enabled the fast exploration of data to understand the underlying pattern in the profitability performance for different types of construction projects. The findings and conclusions of these aforementioned studies reveal that performance dimensions for projects may have several indicators and could be influenced by various project characteristics.

Thus, construction organisations are the fundamental units of the construction industry that undertakes a contract (often management contracts) to execute construction projects using supply chain organisations (Tripathi and Jha, 2019). As with any business, financial success is the ultimate goal, and achieving success is a highly critical issue for construction businesses due to tough national and international competition (Arslan and Kivrak, 2008). However, project success or performance does not always ensure the success of the construction organisation (Ilori and Omopariola, 2018). Hence, it must be measured separately. According to Jha (2015), the construction organisation can even become insolvent despite the success of its projects due to the inherently high risk involved in construction business. Every year, an increasing number of construction organisations enter the market only to, after a few years, go bankrupt due to various reasons (Jha, 2015). Examples include: negligence in planning out some vital elements (such as financial performance and risk management) (cf. Omopariola *et al.*, 2021). Therefore, due diligence is required to ensure that important and crucial elements (such as financial performance) are carefully planned out (Ilori and Omopariola, 2018).

Influence of APS on project cash flow

One of the persistent issues with contractors in developing countries is cash flow difficulties (Omopariola *et al.*, 2017). Alkilani and Loosemore (2022) and Aje *et al.* (2017) posit that

prompt payment by the employers to contractors in advance (and at the inception stage of a contract) is an important aspect of the relationship between the client and the construction firm. Thus, to ensure that the actualisation of progress with construction activities progress remains uninterrupted, advance funds to the contractor are required (Omopariola and Windapo, 2019). In addition, payment made in advance to the contractor will guarantee the effectiveness of the construction company in meeting the client's imposed final budgetary and programme specifications. This will, reduce the contractor's financial stress and prevent them from seeking external funding from bank loans. Through advance payment clients commits the contractor to appropriate performance through project finance and cash flow (Aje *et al.*, 2017). Thus, this argument naturally leads to the formulation of the first hypothesis (H1) as follows:

H1. The APS has a positive and significant effect on project cash flow.

Effect of APS on organisation and project performance

An APS allows the project owners to pay the contractors some amount of money before the commencement of the work for initial expenditure in respect of preliminaries or job overheads and site mobilisation (Omopariola *et al.*, 2022). Li *et al.* (2005) presented an advance payment as one of the major factors that impact successful project. This is because payment is made to the contractor ahead of the normal schedule concerning statutory and strategic practices that enhance project success. Efficient project completion depends mostly on how the payment dues to the contractors are paid at the right time on diverse construction projects. This is because, the client's obligation to project contractors regard project finance assists the rapid performance of the contractor on construction project tasks (Aje *et al.*, 2017). Also, in the previous research of Oke *et al.* (2013), it was acknowledged that once the final project balance due to the contractor is paid, these finances assist the contractors to be more effective when competing against global market competition. To support the aforementioned research of Oke (Oke *et al.*, 2013), an APS safeguards effective organisation and project performance. Consequently, this argument leads to the formation of the second hypothesis (H2) as follows:

H2. APS has a positive and significant effect on organisational and project performance.

Association between cash flow and project and organisation performance

According to Sliwoski (2018), one of the core financial problems for most contractors is understanding and managing their cash. The ability to have robust and interest-free cash flows to meet the general expenses of a construction organisation is necessity to stimulate performance in construction projects and organisations. Consequently, this allows for non-disruption of project progress (Omopariola *et al.*, 2021). Peer (1992) postulated that a proper cash flow management system (such as prompt payment of sub-contractors, suppliers and payment to workers to cover expenditure of items) is crucial for the survival of a construction firm and organisation efficiency. Thus, liquid cash is one of the most important corporate resources and current asset for the day-to-day activities of a firm. Consequently, a client's commitment to project finance ensures that the project owners obtain value for money in terms of cost, time, performance and sustainability and could mean the difference between success and insolvency for a construction organisation (Lowe and Moroque, 2010). Sufficient cash flow to contractors from project owners improves the contractor's profitability. This argument leads to the third hypothesis (H3) as follows:

H3. There is a positive and significant association between project cash flow, organisational and project performance.

Relationship between APS, cash flow and performance of projects and organisations

Past study such as [Robinson and Lavers \(1998\)](#) have drawn conclusions and given explanations that provide support for the relationship between APS, cash flow, project performance and organisational performance. [Robinson and Lavers \(1998\)](#) stated that advance payment decreases the financial burden of the contractor, assists small-to-medium size organisations to compete with the large firms and assists contractors to face the difficulties associated with mobilisation to project sites, thus having effect on the project and organisation performance. Postulations and conclusions are found in an extensive range of extant literature (cf. [Rameezdeen et al., 2006](#); [Motawa and Kaka, 2009](#); [Oke et al., 2013](#); [Omopariola and Windapo, 2018](#); [Adjeil et al., 2018](#); [Omopariola and Windapo, 2019](#)). [Rameezdeen et al. \(2006\)](#) explained that advance payment supports the contractors in initiating and sustaining robust cash flows for project execution and management of organisational activities. [Omopariola et al. \(2021\)](#) concurred with the earlier work of [Oke et al. \(2013\)](#) by arguing that any interruption of the payment will affect cash flow and cause the contractor problems in financing the project.

These aforementioned postulations have also explained the dimensions of time and cost performance of projects, as well as profitability of contractors in relation to advance payment. For instance, [Motawa and Kaka \(2009\)](#) explained that the domino effect of advance payment on cash flow, organisation and project performance influence the timely completion of a project, non-disruption of project progress, organisational efficiency and improved profitability. [Omopariola and Windapo \(2019\)](#) emphasised that providing advance payment to the contractor augments construction company effectiveness in meeting the final project cost, as well as the duration required by the client; this helps prevent contractors delaying the project by trying to obtain a loan externally. [Omopariola and Windapo \(2018\)](#) explained that advance payment guarantees efficiency and profitability of project and organisation performance. Empirical studies by [Lancaster et al. \(1998\)](#) and [Adjeil et al. \(2018\)](#) attempted to establish the relationship between profitability, cash flow and advance payment. [Lancaster et al. \(1998\)](#) examined the relationship between profitability, dynamic liquidity, static liquidity and cash flow. The study ([Lancaster et al., 1998](#)) found that cash flow from operations had incremental explanatory power for liquidity measures that are used to assess a company's state of being unstable. However, it was highlighted in the study that the relationship cannot be generalised across firms. [Adjeil et al. \(2018\)](#) explored significant quantifiable cash flow factors influencing building projects profitability in Ghana. The study concluded that the use of an APS aids construction managers to effectively manage the significant cash flow factors towards maximising profit.

A common theme that runs throughout literature is that APS invariably affects the overall performance of construction projects and organisations. This means that advance payment enables contractors to establish the client's commitment to project finance and cash flow. It also means that the client's strategic goal in paying contractors in advance is to enable contractors pay for scarce resources before the prices rise and avoid the accruable costs that could ultimately add to the project costs. Thus, it becomes clear that advance payment is a strategy that supports the minimising of cost overrun, speeding up of work progress, prevention of project delay, improved work quality, organisational efficiency and profitability.

Underpinning theory and hypothesis

This present research draws from domino theory which states that if a particular variable is influenced by another variable, then the associated variables would be affected by the domino effect ([Chi and Han, 2013](#)). Specifically, the domino effect implies that the use of advance payment by clients for construction projects is likely to cause contractors, suppliers,

sub-contractors, construction projects and construction organisations to perform effectively (cf. Choi and Kim, 2014). These assumptions of domino theory are in line with the postulations of related studies (cf. Nicholas and Edwards, 2003; Oke *et al.*, 2013; Aje *et al.*, 2017). Nicholas and Edwards (2003) posited that the domino effect of sub-optimum working capital management results in financial hitches of a lone supplier in the supply chain and even liquidation. Oke *et al.* (2013) theorised that construction projects demand a high quantity of capital for their actualisation which will make it financially beneficial if the client pays contractors in advance at least once, preferably at the commencement of a contract. Aje *et al.* (2017) concurred that advance payment will facilitate the payment to sub-contractors, suppliers and labour which will help to: evade the price fluctuation that usually serves as a reason for cost overrun in construction projects; aid prompt performance of the contractor on construction project operations; and enable contractors to compete more efficiently in the global market.

Based on this understanding, this study developed a theoretical framework of the domino effect of advance payment on project cash flow and organisational performance (see Figure 1). The framework shows that the domino effects of APS on cash flow, project performance and organisational performance are robust and interest-free cash flows, non-disruption of project progress, prompt payment of sub-contractors and suppliers. It also leads to client's commitment to project finance, timely completion of the project, organisational efficiency and improved profitability of organisations. The following hypotheses are formulated from the framework:

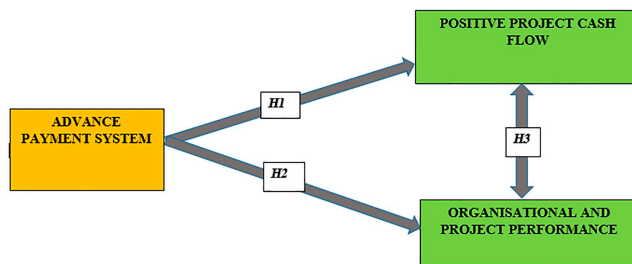
H1: The APS has a positive and significant effect on project cash flow.

H2: The APS has a positive and significant effect on organisational and project performance.

H3: There is a positive and significant association between project cash flow, organisational performance and project performance.

Research methodology

The epistemological design adopted positivism augmented by deductive reasoning to quantitatively explore the phenomena under investigation (cf. Edwards *et al.*, 2020; Quaigrain *et al.*, 2022; Kukah *et al.*, 2022). Primary data were collected using an on-line questionnaire survey (via Survey Monkey) from grade 1–9 contractors contained within the South African Construction Industry Development Board (CIDB) list of members with experience of APS. Electronic administration was adopted to ensure the lead researcher was safe during the coronavirus disease 2019 (COVID-19) pandemic but this method also had other incident benefits such as reduced administration costs and an ability to cover a larger



Source(s): Authors own work

Figure 1.
Theoretical framework of the domino effect of APS on project cash flow, construction organisational and project performance

geographical region (Israel, 2011; Ameyaw *et al.*, 2017). The survey contained three core sections. Section one sought informed consent and gave participants assurances that robust ethical processes governed this research (e.g., strict confidentiality, data protection and security and future access to the results) (cf. Fisher *et al.*, 2018; Law *et al.*, 2021). Section two was designed to collect demographic information, such as the validity of the respondents' opinions (such as their educational background, designation and professional experience, year of experience and establishment etc.) – refer to Tables 1 and 2. Section three collected

Answer choices	Responses	
<i>Educational background of the respondent</i>		
Bachelor's degree	21.69%	90
Higher National Diploma (Technikon/University of Tech)	21.69%	90
Certificate – Diploma with Grade 12	43.37%	180
N4-6/NTC 4–6/Certificate – Diploma with less than grade 12	13.25%	55
<i>Designation of Respondent</i>		
Director cadre	67.37%	287
Management cadre	12.68%	54
Technical officer	5.16%	22
Others (please specify)	14.79%	63
<i>Profession of respondents</i>		
Architect	1.90%	8
Quantity surveyor	4.74%	20
Engineer	14.45%	61
Others (please specify)	78.91%	333
<i>Province where company head office is located</i>		
Eastern Cape	13.62%	61
Western Cape	9.38%	42
Free State	5.58%	25
Gauteng	17.63%	79
Limpopo	8.04%	36
Mpumalanga	7.14%	32
Northern Cape	7.37%	33
North – West	7.59%	34
KwaZulu Natal	35.27%	158
Source(s): Authors' own work		

Table 1.
Respondents'
background details

Type of company	Percentage grading (%)								
	1	2	3	4	5	6	7	8	9
General building construction (GB)	68.96	11.45	7.38	4.33	4.07	1.53	0.51	1.02	0.76
Civil engineering construction (CE)	69.03	11.29	9.45	2.36	3.94	1.57	0.52	0.79	1.05
Electrical engineering work- building (EB)	68.25	4.76	7.94	6.35	3.17	3.17	1.59	1.59	3.17
Electrical engineering works- infrastructure (EP)	74.07	7.41	4.94	7.41	1.23	0.00	1.23	1.23	2.47
Mechanical engineering works (ME)	75.96	13.46	3.85	0.96	0.00	0.96	1.92	0.96	1.92
Specialist works (SW)	61.90	12.70	3.17	6.35	3.17	1.59	0.00	4.76	6.35
Source(s): Authors' own work									

Table 2.
CIDB grading of
company

data on the respondents and were probed using a five-point Likert item scale (where 1 = never and 5 = always) and (where 1 = strongly disagree and 5 = strongly agree) to rate: the frequent means of clients using APS to pay construction organisation for construction services rendered by their company; and level of agreement on how often advance payment is made by clients to contractors on construction projects, impact of advance payment on project cash flow and organisation performance respectively. Prior to the main study, a pilot study was conducted to assess the data collection instrument's clarity of expression, completeness and ease of use. This consisted of all registered contractors listed in Grades 1 to 9 on the CIDB database register of contractors in South Africa. The CIDB grades are a reflection of the maximum level at which the contractor is permitted to conduct projects as well as the class of works for which the contractor has been certified competent for executing on projects. For instance, a grade 2 contractor is unable to carry out projects that are valued at more than R650,000. For grade 1, there are no eligibility criteria; however, for grades 2 through 9, contractors are required to meet criteria regarding their finances and their track record. This comprehensive database contains all contact details of registered members and so represents the most comprehensive source of professionals within the construction industry. Moreover, the database arguably includes all reputable contractors who will have sufficient skills, knowledge and expertise to offer an insight view on the phenomenon under investigation. Contractors outside of membership are largely unknown entities and hence, caution was exercised by not including them in this present study. The sample size for this research was 504 contractors who are familiar with the use of APS in the South African construction industry. The study applied a non-probability purposive sampling technique to collect data from the relevant persons by using the e-mail contacts of registered contractors on the CIDB database. With 426 responses received, a high response rate of 85% was observed perhaps due to the support of the CIDB for this study (given its importance to the members of this professional body). A sample size of 200 has been indicated as the bare minimum for SEM (Deng *et al.*, 2018).

Variance-based maximum likelihood estimation, SEM was employed to examine the measurement and structural model of the domino effect of an APS on project cash flow, construction organisational and project performance. SEM is a multivariate statistical method found in systematic research, to progressively test, appraise and validate multivariate networks of outcomes concomitantly in causal model relationships and has been used extensively in previous research in the field of construction economics and management (Adediran, 2018). SEM differs from other modelling methods because it examines the direct and indirect outcomes or the assumed causal associations; developed for the inference of causal modelling using path analysis, to include factor analysis, in its functional development of the structural causal model and the incorporation of modelling (cf. Adediran, 2018; Fan *et al.*, 2016). The decision to employ SEM over traditional statistical techniques was primarily driven by its capacity to effectively evaluate measurement error, estimate latent variables based on observed variables and conduct model testing to assess the fit of the data whilst imposing and evaluating a specific structure (cf. Adabre *et al.*, 2021; Olanrewaju *et al.*, 2021). In this research, the utilisation of SEM was employed to analyse intricate networks of causal relationships. The primary objective was to elucidate upon the logical and methodological connections between correlation and causation.

Analysis results

Table 1 presents the demographic information of respondents, stratified in terms of: *educational background; designation (job title); professional status; and head office location (province)*; and reveals that: 43.37% (frequency (f) = 180) of the respondents have a Diploma with Grade 12; 21.69% (f = 90) have Higher National Diploma; 21.69% (f = 90) have a

Bachelor's Degree; and 13.25% ($f = 55$) have Diploma with < Grade 12. Table 1 shows that 67.37% ($f = 287$) of the respondents are a Company Director; 12.68% ($f = 54$) are Managers; and 5.16% ($f = 22$) are Technical Managers. From a professional background perspective, Table 1 revealed that 1.90% ($f = 8$) are Architects; 4.74% ($f = 20$) are Quantity Surveyors; and 14.45% ($f = 61$) are Engineers. Table 2 reports upon CIDB grading and shows that most respondents (68.96%) work for grade 1 construction companies. 68.96% of these companies are general building construction; 69.03% are civil engineering companies; 68.25% specialise in electrical engineering work-building; 74.07% specialise in electrical engineering works-infrastructure; 75.96% specialise in mechanical engineering works; and 61.90% undertake specialist works. As shown in Table 1, circa one-third (35.27% or $f = 158$) of the companies where the respondents works are located in Kwazulu Natal. Other notable locations are Eastern Cape (13.62% or $f = 61$), Western Cape (9.38% or $f = 42$) and Gauteng (17.63% or $f = 79$). Although 2.58% (or $f = 11$) responses received from the study participants failed to respond to the demographic questions, the demographic information elicited suggests that the participants possess reasonable experience in project development and therefore, have sufficient knowledge of issues relating to project and organisational performance. This enhances the validity of the survey data.

Analysis of the measurement model

The interpretation of the study's outcomes was based on the hypotheses, which were informed by the framework that is provided in Figure 1. An interpretation aid was offered by the framework in the form of the hypothesised relationships that existed inside it. In accordance with what is posited in the framework, if the advance payment method has a positive and significant effect on the cash flow of the project, the findings will indicate that the advance payment mechanism has an impact on project cash flow. If it is discovered that the system of advance payments has a positive and significant effect on the performance of the organisation as a whole (as well as the project itself), a conclusion that might be drawn from this would be that the performance of both the organisation and the project is strongly impacted by the advance payment mechanism. In the event that the third hypothesis is shown to be correct, the findings will be taken as indicating that there is a positive and significant correlation between project cash flow, organisational performance and project performance.

Table 3 shows the internal consistency of the measured variables for the constructs of APS, extent of positive cash flow on a project and extent of organisational performance. Thirteen (13) variables were obtained from extant literature to measure these three constructs. Five (5) variables were used for the "advance payment system" (S), six (6) variables for the construct cash flow I and two (2) variables for the construct organisational performance (E) – refer to Table 4. The respondents were asked, using a Likert scale, to

Constructs and sub-constructs	Number of variables	Internal consistency	Cronbach's alpha	Average variance explained	Bartlett's test
Features of advance payment system (S)	5	0.784	0.68	59.52	Chi-square: 114.49 Significance: 0.000
Extent of positive cash flow on project (C)	6	0.821	0.79	65.18	Chi-square: 154.35 Significance: 0.00
Extent of organisational performance (E)	2	0.713	0.87	57.17	Chi-square: 142.57 Significance: 0.000

Source(s): Authors' own work

Table 3. Internal consistency of the measured variables for features of advance payment systems, extent of positive cash flow on project and extent of organisational performance

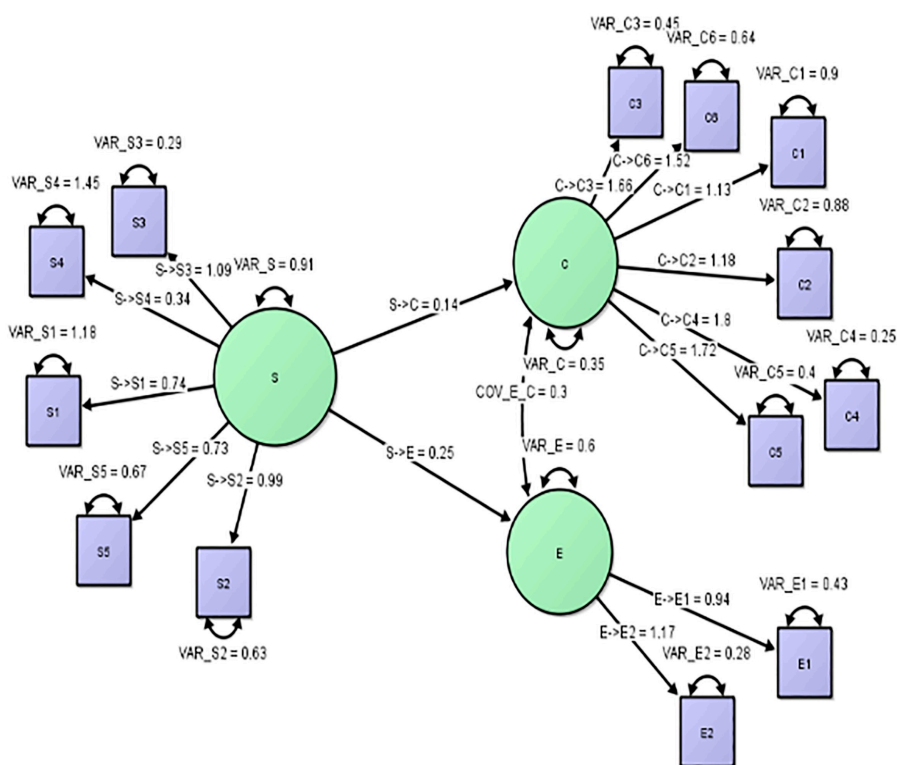
Variable	Description	References
<i>Domino effect of APS (S)</i>		
S1	All the payments due to the contractor are paid at the right time	Abubakar (2004) and Rameezdeen <i>et al.</i> (2006)
S2	The contractor is paid some amount of money before the commencement of the work	Rameezdeen <i>et al.</i> (2006)
S3	Payment is made to the contractor ahead of the normal schedule	Omopariola <i>et al.</i> (2018) and Rameezdeen <i>et al.</i> (2006)
S4	The balance due to the contractor is paid once the project is delivered	Motawa and Kaka (2012) and Oke <i>et al.</i> (2013)
S5	All the payments due to the contractor are paid before the commencement of the work	Kaka and Lewis (2003) and Oke <i>et al.</i> (2013)
<i>Project cash flow (C)</i>		
C1	Robust and interest-free cash flows	Rameezdeen <i>et al.</i> (2006) and Oke <i>et al.</i> (2013)
C2	Non-disruption of project progress	Oke <i>et al.</i> (2013)
C3	Prompt payment of sub-contractors	Mutti and Hughes (2002) and Omopariola <i>et al.</i> (2017)
C4	Prompt payment of suppliers	Odeyinka <i>et al.</i> (2013)
C5	Prompt payment of workers	Kenley (2003)
C6	Client's commitment to the project finance	Aje <i>et al.</i> (2017)
<i>Organisational performance (E)</i>		
E1	Organisational efficiency	Kaka and Lewis (2003) and Hussin and Omran (2009)
E2	Improved profitability	Kaka and Lewis (2003) and Bilal <i>et al.</i> (2019)
Source(s): Authors' own work		

Table 4.
Variables and constructs sourced from literature

indicate and rate the features of the APS used by clients, extent of positive cash flow experienced on projects because of the use of APS and extent of organisational performance due to the use of APS. As presented in Table 3, the factor loading is above 0.50 which is acceptable, the Cronbach's alpha values for the constructs are >0.70 which indicates reliability and the average variance explained for the constructs is >0.50 which indicates convergent validity. Also, the discriminant validity test indicated a correlation of 0.534, which is >50%. These results indicate that the constructs and sub-constructs have acceptable validity and internal consistency as shown by the average variance explained and Cronbach's alpha values which were > the 0.5 and 0.7 thresholds respectively (Nandakumar, 2008; Nunnally, 1978).

Analysis of the structural model

A SEM was estimated to confirm the hypothesised model of the domino effect of APS (S) on project cash flow (C) and organisational performance (E). The model describes that the APS has a positive and significant effect on project cash flow (H1), the APS has a positive and significant effect on organisational and project performance (H2), and there is a positive and significant association between project cash flow, organisational performance and project performance (H3). Figure 2 presents the path analysis diagram and illustrates three (3) main constructs (S, C and E) and 13 measured variables (also see Table 5). The model estimation for the model presented in Table 4 and reveal that S has a moderately positive and insignificant effect on C ($r = 0.13, z = 0.00$) and E ($r = 0.25, z = 0.005$). The association between C and E is also moderately positive and insignificant ($r = 0.29, z = 0.00$). These



Source(s): Authors own work

Figure 2. The path analysis diagram for the model of the domino effect of an APS on project cash flow, construction organisational and project performance

results partially validate Hypothesis 1, 2 and 3 in the model. Regarding the association between the main constructs and their variables, Table 5 reveals a moderately positive and insignificant association. Fit indices for the model of the relationship between S, C and E are presented in Table 5 which reveals that the chi-square test statistics is not significant at 0.05 and that root mean square error of approximation index (RMSEA) index is below the recommended 0.08. Moreover, Tucker Lewis index (TLI) and comparative fit index (CFI) are > the recommended limit of 0.97, whilst standardised root mean square residual index (SRMR) index is not up to the recommended limit of 0.10 [chi-square = 206.004, df = 59, RMSEA = 0.074, SRMR = 0.08, CFI = 0.96 and TLI = 0.98].

Discussion of findings

The analysis reveals that the APS has a moderately positive and insignificant effect on project cash flow (H1); and that the APS has a moderately positive and insignificant effect on organisational and project performance (H2). The results also revealed that there is a moderately positive and insignificant association between project cash flow, organisational performance and project performance (H3). These findings suggest that the use of APS will influence a positive project cash flow, but the influence is of little importance. Also, the results suggest that organisational and project performance will improve if APS is employed by the client. However, the improvement in organisational and project performance is not

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Relationships	Estimate	Standard error	Z-value
C → C1	1.12	0.00	0.00
C → C2	1.17	0.00	0.00
C → C3	1.65	0.00	0.00
C → C4	1.80	0.00	0.00
C → C5	1.72	0.00	0.00
C → C6	1.51	0.00	0.00
E → C	0.29	0.00	0.00
E → E1	0.94	112.53	0.008
E → E2	1.16	139.29	0.008
S → C	0.13	0.00	0.00
S → E	0.25	45.89	0.005
S → 1	0.73	92.34	0.008
S → S2	0.98	123.23	0.008
S → S3	1.08	135.67	0.008
S → S4	0.34	43.02	0.008
S → S5	0.72	90.66	0.008
VAR_C	0.35	0.00	0.00
VAR_C1	0.90	0.08	10.83
VAR_C2	0.87	0.08	10.67
VAR_C3	0.44	0.04	9.19
VAR_C4	0.24	0.03	6.70
VAR_C5	0.39	0.04	8.71
VAR_C6	0.63	0.06	9.97
VAR_E	0.60	143.17	0.004
VAR_E1	0.43	0.06	7.12
VAR_E2	0.27	0.07	3.63
VAR_S	0.91	228.06	0.004
VAR_S1	1.17	0.09	12.23
VAR_S2	0.63	0.06	9.67
VAR_S3	0.28	0.05	5.03
VAR_S4	1.45	0.11	13.06
VAR_S5	0.67	0.05	11.59

Table 5. Model estimation for the model of the domino effect of an APS on project cash flow, construction organisational and project performance

Fit indices for the estimated model

Note(s): Estimated parameters = 32; observed statistics = 91; number of observations = 458; restricted degrees of freedom = 59; degrees of freedom (independent) = 78; model chi-square = 1834.331; chi-square from independent = 206.004; RMSEA = 0.074; SRMR = 0.08; CFI = 0.96 and TLI = 0.98

Source(s): Authors' own work

mainly based on the use of APS. Moreover, the results suggest that a positive project cash flow is of little consideration and importance in the performance of organisations and projects. This means that other factors play an important role in organisational and project performance. Previous studies such as [Rameezdeen et al. \(2006\)](#), [Aje and Adedokun \(2018\)](#) have asserted that an APS: assists the contractors to initiate and maintain positive cash flows throughout the project lifecycle; ensures a successful project; enhances the net cash flow of contractors; assists in solving the financial problem associated with construction process; and positively impacts on the working capital of the contractors. From a theoretical perspective, the present findings did not fully corroborate the assertions of previous studies by suggesting that the influence of APS on cash flow is insignificant. Following this finding, the usage of APS amongst the contractors could have positive effects such as timely completion of project, concurrent project progress and improved profitability. Thus, non-availability of APS makes contractors' use overdraft facilities to turn the net cash flow to be negative, thereby resulting in working capital deficiencies ([Rameezdeen et al., 2006](#);

[Omopariola and Windapo, 2019](#)). The insights provided by this study reveal the understanding of APS as one of the factors that must be considered towards achieving successful project completion. Future work is however required to investigate other payment systems as factors that impact on project cash flow and construction organisation performance.

The findings also suggest that effective management of finances to solve or avoid financial problems by the contractor is not entirely due to the use of an APS. As observed by [Hussin and Omran \(2009\)](#), the purpose of an APS is not to eliminate but to decrease the contractor's financial burden that may arise from payment of suppliers, sub-contractors and labour. Likewise, [Rameezdeen et al. \(2006\)](#) observed that an APS only provides motivations for the contractor at different stages of the project lifecycle. The motivations provided by an APS may likely translate into the commencement of work at the earliest possible date, improved quality of work and on-time completion of projects. Overall, APS is not the main factor but rather, is one of the factors leading to a positive project cash flow, improved organisational performance and improved project performance. This finding concurs with [Aje et al. \(2017\)](#) who were unable to find statistical significance between APS and cost performance. Thus, the analysis shown here demonstrates the effect of APS on cash flow and on project and organisation performance – which encourages public clients to continue to consider the successful delivery of construction projects through APS usage.

According to the existing body of knowledge, APS does not have an effect on the cash flow of projects or the performance of organisations or projects, and the use of APS on projects is not common amongst South African contractors ([Omopariola and Windapo, 2019](#)). Furthermore, the use of APS on projects is not common amongst international contractors. According to the findings of the research conducted by [Omopariola et al. \(2021\)](#), the most important aspects of APS in South Africa include the following: payment of the remaining amount to the contractor upon completion of the project; advance payment to contractors prior to the start of work; and payment to contractors in accordance with the terms of the agreement. This current study adds value to the existing body of knowledge by contradicting the earlier findings of [Omopariola and Windapo \(2019\)](#). This is accomplished through the discovery that APS has a positive and significant effect on project cash flow, as well as the discovery that APS moderates the relationship between project cash flow and project performance. Both of these findings are important contributions to the existing body of knowledge. This study also discovered that the client's utilisation of APS may result in an improvement in the performance of both the organisation and the project.

Practical implications of the study

The study's findings have practical implications for the processes that are used to transfer monies between clients and contractors in the construction industry in order to fulfil payment commitments that are the direct result of economic and financial transactions. The study's outcomes suggest that APS, if implemented in the appropriate manner, has the potential to be an effective payment system that is trustworthy, safe and capable of lowering the cost of construction whilst simultaneously improving the likelihood of the project's success. In addition, the study's findings imply that contractors could make use of the benefits that APS have to offer. These benefits include the elimination of the need for physical currency, an increase in financial security, the availability of transaction records and insights and the development of financial inclusion. Contractors can also consider APS as a system that can facilitate the clearing and settlement of monetary and other financial transactions inside their businesses. APS can do this by reducing the amount of time and effort required to complete these tasks.

Limitations and future work

There are several limitations of this research. First, the work is restricted to the geopolitical boundaries of South Africa; albeit, the work may have relevance to similar aligned nations internationally. Second, the study did not model an APS with other payment systems, that are common in project procurement on project cash flow and organisation performance. Future studies must therefore consider the moderating effect of measures such as financial management strategies and cost control techniques on the effect of APS on the performance of projects, cash flow and organisations. Moreover, the findings should be compared and contrasted against international practice within other country settings. It was not possible to determine the effects that the payment systems would have on the outcome of the project by utilising hard data and actual measurements as such information is commercially sensitive and unavailable – this is a common barrier which is commonly experienced in construction management research. Additionally, the use of a purposive sampling technique consisting of members of the CIDB in order to reflect the attitudes of the entire industry in South Africa may be questioned because this demographic does not represent the full population of contractors in the country. That limitation apart, CIDB members gave some assurance that their knowledge was sufficiently informed and appropriate to this study hence, the work is indicative of views with South Africa and not absolutely conclusive. Including businesses outside of CIDB membership could have increased the likelihood of producing a more representative sample but only if their knowledge and competence was sufficient to warrant consideration as participants included in this study.

Another limitation of this study is the reliance on the perceptions of a single group of respondents and the use of statistical correlations to establish causation between APS, cash flow and organisational performance.

Conclusion

This study evaluated the domino effect of an APS on project cash flow and performance of organisations and projects. The study revealed that an APS can influence a positive project cash flow and an improvement in this organisational and project performance. However, the use of an APS is not a guarantee for a positive project cash flow, an improvement in organisational performance and an improvement in project performance. This means that to achieve a positive project cash flow and improved organisational performance, other measures must be taken together with the use of an APS. The findings of this study contribute to the theory on the usefulness of an APS for ensuring a positive cash flow and improved performance of organisations and projects, by revealing that an APS cannot be solely relied upon for positive project cash flow and organisational performance.

Thus, knowing the positive domino effect of an APS (with previous research ascertaining that the reduction of skilled labour, high cost of materials and inaccuracy of estimation of material) serves as the key causatives of time and cost overrun. The use of an APS will enable stakeholders to plan their budgets well and stabilise their flow of cash, which consequently save cost and time on the construction projects. The non-use of an APS may prevent contractors from having the required inflow and outflow of cash, which will lead the contractors to insolvency.

Moreover, working capital denotes near-liquid or liquid assets to facilitate the day-to-day transactions of the construction project. Liquidity also mitigates any discrepancy amid current liabilities and current assets which may affect the continuous flow of construction work on site and preventing contractors from competing effectively in the construction market globally.

The study recommends that industry stakeholders should adopt the use of an APS to reduce (or eliminate) contractors' overdraft requirements in order to turn the net cash flow to positive, thereby resulting in efficient working capital.

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Corresponding author

Emmanuel Dele Omopariola can be contacted at: felixdelly@yahoo.com, ompemm002@myuct.ac.za

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