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PAYMENT PROCESS MODELLING: A PANACEA FOR DELAYED PAYMENT OF CONSTRUCTION PROJECTS

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Abstract : Modelling the construction payment process is a means towards identifying the causation of delayed payment so as to address the root cause of payment problems. Fifty-four (54%) of delayed payment causes are traceable to the payment processes adopted in the construction industry. This paper focused on understanding the causes of delayed payment within construction payment process. Existing Payment problems were modeled vis-a-vis their sources. The findings show that employers are most responsible for delayed payment and that most of the causes of delayed payment are process-related issues. The model provides information to the lack of mechanism to relate the various causes of delayed payments to the payment process.

IndexTerms **– process, payment, requirement, modelling**

INTRODUCTION

Payment processes are chains of events, activities and decisions that are performed within the payment system for payment to happen. The way payment processes are structured and performed affects both the project delivery and the efficiency with which works are being executed. Construction project payment related issues have generated so much interest in research particularly on delayed payment. From existing literature, about 40% of causes of delayed payment were attributable to the payment process. Some of the identified causes are: employer's poor management of cash-flow, failure to implement good governance in business, payers' attitude/local culture and use of pay-if-paid clauses (Ahmadisheykhsarmast & Sonmez, 2020; Abdul-Rahman, Kho & Wang, 2014; Ramachandra, 2013; Emenike, 2010; Abdul-Rahman et al, 2008), however, these are not caused by the execution of payment process. Whereas, other causes such as: valuation of variations and final account, failure to comply with payment provisions, delay in certification, improper supervision and financial control, delays in submitting/responding to claims, underpayment of certified amount and delays in approval of claims (Ahmadisheykhsarmast & Sonmez, 2020; Ramachandra & Rotimi, 2020; Abdul-Rahman et al., 2014, Emenike, 2010) are all payment process-related causes.

Similarly, other causes of delayed payment are either a payment process-related issue or a payment requirement-related issue, or a combination of both issues. Examples of such include: disagreement on valuation of works done, poor communication between parties, pending variation orders approval, poor quality of works, dispute with debtors/creditors, internal conflicts and claims and delay in releasing retention monies to contractor (Ramachandra & Rotimi, 2020; Olusola, 2019; Mohammed, Suman, Harun & Hashim, 2018; Ye & Rahman, 2010; Danuri et al., 2006). However, some causes do not fit into any of the two scenarios but are traceable to payer's behavioural patterns/attitude such as: withholding payments unnecessarily and making arbitrary deductions from certified due amount.

Existing literature equally unveils that the causes of delayed payment occurs frequently during interim/progress payment process. Odenigbo, Odusami, Okolie & Okafor (2021) demonstrated this in the presentation of the major causes of delayed payments in the order of occurrence as: disagreement on valuation of works done, slow processing of variation orders by consultants and client, poor quality of works at both the design and construction stages. It is no surprise that these are interim payment process-related issues. Furthermore, Ibrahim, Wuni & Agyei-wumi (2017) reported top five critical causes of delayed payment for public projects as: delay in certification, poor financial management, withholding of payments by clients, ambiguous contractual provisions and conflict among parties. Three out of these causes are also interim payment process-related issues. Likewise, Ramachandra (2013) disclosed that about 70% of construction court cases are progress payment process-related namely: issues regarding delay in evaluation, certification and approval of payments.

The repetitive and complex activities involved in the payment process are accountable for most causes of delayed payment. More often than not, construction project participants are unable to meet up to their contractual obligations because the structure of the payment process is demanding (Bissoon & Outridge, 2020; Hamledari & Fischer, 2020). This explains why the experts of business process management (BPM) recommend process identification (outlining, prioritizing and performing processes in coordination within a system) as the first step towards realizing a business goal. BPM helps in managing the entire chains of events, activities and decisions that ultimately add value to the organization and its customers (Dumas, La Rosa, Mendling & Reijers, 2013; Weske, 2012).

NEED FOR THE STUDY

Overseeing how construction payment process is performed will ensure consistent outcomes and improvement of the payment system regardless of how cumbersome a process is. For instance, the articles of agreement and conditions of contract for building projects by the Nigerian construction industry standard form building projects (NCI SBC, 2018) and the Joint Contract Tribunal (JCT, 2016) supplies contractual and administrative provisions regarding payment of construction projects. The payment process requires three (3) main tasks which are: application, certification and payment. However, these tasks contain chains of interrelated/dependent activities (sub-processes) which if monitored closely will improve the chances of timely payments. The study provided insights to the challenges of payment with particular reference to payment processes in use in the construction industry.

2.0 LITERATURE REVIEW

This paper begins review of literature from the effects of delayed payment on construction projects as a way to provide a means of mitigating the problem. The factors responsible for delayed payments and contributors to delayed payment equally discussed.

2.1 Effects of Delayed Payment

Delayed payment affects construction projects in many ways such as: financial hardship for the contractor, cash-flow problems, negative chain effect on other parties, abandonment of projects, disputes between parties in the contract, bankruptcy, negative social impact and delays in completing project (Tariq & Gardezi, 2022; Akinola & Awolesi 2019; Niazi & Painting, 2017). In the same way, Ibrahim Wuni & Agyei-wumi (2017) enlisted additional effects of delayed payments in construction projects to include: cost overrun, time overrun, poor quality of work, idleness of equipment and negative impact on contractor's reputation. Furthermore, Bissoon & Outridge (2020) mentioned: reduction of business profitability, increase in late payment to suppliers, difficulty in procuring materials and services and increase in construction cost as impacts of delayed payment on contractor's cash-flow.

These effects can be costly as well as irreparable if ignored. To mitigate this, researchers recommended adopting new innovative payment systems, adopting a clearly-defined contractual provision at the outset of projects, incorporating efficient communication mechanisms, implementation of construction industry payment and adjudication Act, implementation of financial management to improve employer's cash-flow, submission of timely and accurate invoices with complete documentation of payment records, imposing interest penalty on late payer and negotiation of payment terms with employers (Okereke, 2020; Ibrahim et al., 2017; Ansah, 2011). All of these measures have been implemented, yet delayed payment of construction projects persist.

2.2 Factors Responsible for Delayed Payment

Borvorn (2012) classified the factors responsible for delayed payment into four categories: administrative factors, financial factors, technical factors and inspection factors. All, except the financial factor are process-related issues. Likewise, Swai & Arewa (2018) outlined twelve (12) factors, out of which eight were traceable to payment process-related issues as seen in: delay in approval of work done, inadequate supporting documents, contractor's delay in submission of claims and invoices, errors in submission of claims and valuation of works done, disputes over claims and responses, administrative errors, and the cascade payment obligations. Similarly, Okereke, (2020) posits that the twin key factors affecting delayed payment are: time lag between approval and offsetting certified amount and retention percentage applied to the contract sum. Other factors such as: owner financial problems, delay in work approval, major accidents, inaccurate bill of quantities and substandard workmanship were identified (Olusola, 2019; Borvorn, 2012; Mbachu, 2011). These factors cause a deficit on contractor's cash-flow as most contractors rely on interim payments to fund their projects.

2.3 Stakeholders Contribution to Delayed Payment

Stakeholders are important in the payment process and the manner in which they discharge their obligations may mar the entire process. The main stakeholders in construction payment process are the contractor, the consultants (the Architect and Quantity Surveyor) and the employer (JCT, 2016). Causes of delayed payment attributable to the contractor's actions/ inactions are seen in: delays in submission of claims, errors in claims, failure to comply with payment provisions, lack of knowledge and experience in the field, poor quality of work, disputes with debtors and creditors, money used up for other purposes, involvement in many projects at the same time and poor communication. Further examination of the causes reveals some elements of negligence in executing his duties in a contract. A number of causes of delayed payment are equally associated to the consultants actions/ inactions such as: errors in valuations, delay in evaluation and certification of interim and final payments, poor communication and conflicts between parties, delay in submitting contractor's claims, delay in evaluation of payment, poor supervision and financial control, delay in issuance of responses to claims, pending variation orders approval, consultant's working nature, delay in finalizing variations and retentions and poor documentation of written instructions and payments. On the part of the employer being the person who makes the payment, the following causes exist: poor financial management, underpayment of certified amounts, failure to implement good governance in business, underpayment of professional fees, failure to comply with payment provisions, employer's attitude/local culture, delay in approval of claims, disagreement on valuation of work done, making arbitrary deductions from due amount, delay in releasing retention monies to contractors, delay in offsetting certified due amount, money used up for other purposes, ill intention to delay payment when work is completed and unnecessarily withholding payments (Alawi, 2021; Ahmadisheykhsarmast & Sonmez, 2020; Ramachandra & Rotimi, 2020; Olusola, 2019; Ramachandra, 2013; Mbachu, 2011; Emenike, 2010; Ye & Rahman, 2010; Danuri et al., 2006).

3.0 REQUIREMENTS FOR PAYMENT PROCESS

Wieringa, (2014) defined requirements as the properties of a desired treatment. It is a property of the treatment desired by stakeholders who committed time and/or money to realize the property. The following are requirements for construction payment process:

a. People requirement
b. Information requirement
c. Task/function requirement

3.1 People Requirement for Payment Process

According to JCT, (2016), the people involved in payment process are: the employer, the contractor, the Architect/Contract Administrator and the Quantity Surveyor whose roles/duties are clearly provided in the contract conditions (NCI SBC, 2018).

3.2 Information Requirement for Payment Process

In most contracts, certain information is provided for executing the contract. For construction contracts these information are provided in the articles of agreement and conditions of contract. For instance, RICS, (2015) categorised interim payment process information into three levels. Level one also known as the "knowing phase" contains information that relates to the general principles of the contract such as: information on certificates and notices, conditions of contract, legislation, payment mechanism and general information on the breakdown of the contract sum and valuation of works done. Similarly, level two which is considered the "doing phase" has information regarding practical application of the contract as in: general information about the payment process (planning, pre-valuation, valuation, valuation documentation and issuance of certificates), record keeping, final accounts and standard forms and covering letters. The third and last level termed the "advising phase" contains information regarding practical considerations on the contract such as: duty of care, special situations, sale/supply of goods and services, vesting of materials and goods, payment on account, valuation towards completion and VAT.

3.3 Task/Function Requirements for Payment Process

Payment is a contractual process, therefore some obligations which must be performed in accordance with the contract conditions for payment to occur. Specific tasks are required from parties in the contract which are made of sub-process, activities and events.

a. Execution of works: Contractor's task is to provide works in accordance with contract specifications and timelines.
b. Valuation: The Quantity Surveyor is required to conduct interim valuations whenever the Architect considers it necessary to ascertain the due amount. This task is performed especially when fluctuation Option C occurs in the contract (JCT, 2016). Because the process of valuation is specialized, there will be few instances in practice when the wise architect will not require the assistance of the Quantity Surveyor, then valuation may not be needed before certification. Usually, the amount to be included in the architect's certificate is the gross valuation which must have captured the following: retention, total advance payment reimbursement, previously certified amounts/sums and sums paid for interim payment notice given after the issue of the interim certificate (JCT, 2016).
c. Certification: Certification is the Architect's responsibility whether or not a valuation was done by the Quantity Surveyor or a payment application was issued by the contractor. An Architect who disagrees with the Quantity Surveyor's valuation has the duty to change it. The Architect must ensure that the Quantity Surveyor puts no value on defective work. All defective works should be communicated properly in writing every month before valuation is carried out (Chappell, 2014).
d. Payment: Employer's task is to effect payment of certified amount at the specified due dates.

4.0 MODELLING EXISTING PAYMENT PROCESS

Process model is defined as a representation of a collection of inter-related events, activities and decision points that involve a number of actors and objects that collectively lead to an outcome (Dumas, et al., 2013). This study utilized the business process management notation (BPMN) model to represent the existing payment process for construction projects.

First, the process identification of the payment system was done using business process management concept. Secondly, the tasks associated to each process were presented. Lastly, the causes of delay payment were analyzed and mirrored to the specific task/process from which it originated.

4.1 Process Identification of the Payment System

Process identification is a set of activities aimed at systematically defining the set of processes and establishing clear criteria for prioritizing those (Dumas, et al., 2013). The process identification was based on two phases:

a. Designation stage which is concerned with enumerating the major processes within the system as well as determining the boundaries between those processes. This phase also answers questions such as: what are the process tasks/activities? How are they related and how do they rank in order of priority? Priority here, being the timeline within which a task/set of tasks must be executed. According to the JCT (2016), the major tasks identified as the payment process are: Applications for payment, Valuations, Certification and Payment.

b. The evaluation phase on the other hand prioritizes the process analysis and re-designs efforts. Priorities here are based on the importance, potential dysfunction and feasibility of improvements of the process. This stage answers questions such as: what is the relevance of each process? Which processes are in deepest trouble and how profitable are the processes? RICS (2015) reveals that valuation and payment are two formal contractual processes that must be processed strictly in accordance with contract conditions. Similarly, existing literature explains the importance of valuation as one of the truest means of ascertaining due amount for progress payment (Odenigbo et al., 2021; Hamledari & Fischer, 2020). After valuation is done, the certifier issues the certificate to the contractor who then presents it to the employer for payment. The RICS guidance note (2015) also elaborated the relevance of valuation in the payment process as both the contractor's QS and employer's QS have to perform valuation for payment to happen. Therefore, in re-designing payment process in the order of relevance, valuation takes topmost priority before certification and then payment. Applications for payment ranked least in the payment process because the contract conditions made provision for payment to be made even if an application was not issued (JCT, 2016). However, all payments are allowed for by certification.

Figure 1: Process Identification of the Payment System

4.2 Associated Tasks to Payment Process

For each of the payment process, there are associated tasks; and in each of these tasks are activities which were outlined to enable the process perform effectively. However, to facilitate the modeling of each process using the Business Process Management Notation (BPMN 2.0), the process requirement for each task was classified as either as an (information, people, or task) which will be used in modeling the payment process.

Table 1 Components of Payment Process: Valuation

Process	Tasks/Activities	Requirement
Valuation	Planning:	People (QS)
	Understand contract requirement	
	Understand employer's requirement	
	Review pricing documents	
	Liaise with contractor	
	Liaise with consultants	
	Liaise with clerk of works	
	Pre valuation:	People (QS)
	Receives interim application for payment	
	Complete initial desk check on interim application	
	Valuation:	Task (QS)
	Fair assessment by inspection	
	Production of photographic records of inspection	
	Ascertain valuation amount	
	Collect information	
	Valuation documentation:	Task (QS)
	Check valuation	
	Perform arithmetic checks	
	Prepare statement of retention	
	Record valuation and payment	
	Issue valuation:	People (QS)
	Assemble valuation documents	
	Review valuation	
	Sign valuation	
	Issue valuation	
	Post valuation:	Information (QS)
	Maintain records	
	Manage discrepancies	
	Record payments	

Table 1 shows six (6) main tasks undertaken in the valuation process. Each task has a number of activities to be performed sequentially. Although the JCT (2016) was silent on some of the tasks itemized, the experts consider them to exist in practice (RICS, 2015).

Table 2: Components of the Payment Process: Certification

Process	Tasks/Activities	Requirement
Payment	Planning:	People (Architect/ Contract Administrator)
	Reviews contract specification	
	Checks quality of work	
	Approves works to be valued	
	Pre certification:	Task
	Receives valuation	
	Complete necessary checks on valuation	
	Collect information	
	Certification:	People (Architect/ Contract Administrator)
	Approves due amount	
	States due amount	
	Collect information	
	Certification documentation:	Task
	Prepares certificate	
	Records certified payment	
	Issue certification:	People (Architect/ Contract Administrator)
	Review certificate	
	Sign certificate	
	Issue certificate	
	Post certification:	Information
	Maintain records	
	Record payments	

Table 2 shows six (6) main tasks undertaken in the certification process. For each task, the architect or contract administrator performs about three (3) other activities sequentially. In summary, the certification process has six tasks and eighteen activities which are all time-bound JCT (2016).

Table 3: Components of the Payment Process: Payment

Process	Tasks/Activities	Requirement
Payment	Advance payment:	People (Employer)
	Reviews bond	
	Approves bond's surety	
	Agrees on terms for reimbursement	
	Makes payment at agreed date	
	Interim payment:	Task
	Confirms monthly due date for payment	
	Receives interim certificate/ payment notice	
	Agrees with certified due amount	
	Pays certified sum or issues a pay-less notice	
	Final payment:	People (Employer)
	Ascertains final date for payment	
	Issues a pay-less notice where applicable	
	Pays certified sum or amount	
	Pays all debts accrued	
	Post payment:	Information
	Record payment	
	Maintain records of all payment made	

Table 3 shows four (4) major tasks and fourteen activities to be performed in order for payment to be issued for work done.

Table 4: Components of Payment Process: Payment Application

Process	Tasks/Activities	Requirement
Application/ Notice	Interim application:	Task (Contractor)
	Understand contract requirement	
	Performs work in accordance to specification	
	Evaluates amount considered to be due	
	Confirms date for interim valuation	
	Issues application for payment to the QS	
	States sum considered to be due	
	Issues payment notice where applicable	
	Provides basis on which sum was calculated	
	Claim application:	People (Contractor)
	Ascertains reasons for claims	
	Checks contract's provisions for claims	
	Issues notice to suspend performance of obligations	
	Suspends performance of obligations	
	Issues application for claims	
	Submits details for ascertaining claims	
	Application documentation:	Task (contractor)
	Checks application	
	Perform arithmetic checks	
	Prepare application	
	Record application	
	Post application:	Information (contractor)
	Maintain records	
	Manage discrepancies	
	Record payments	

Table 4 shows four (4) major tasks undertaken in issuing application for payment. For interim payment application, the contractor performs about eight (8) activities some of which are: an understanding of the contract conditions so as to execute works in accordance with specification. Once work is done, contractor's QS evaluate the value and amount considered to be due to the contractor for his efforts in delivering his roles in the contract. Upon the trigger of the date for interim valuation, the contractor makes his application stating the amount considered due in his application and the basis on which it was calculated. However, if the application was not made, the contract conditions made provisions for the contractor to submit a payment notice after the date of the issue of interim certificate (JCT, 2016).

4.3 Relating Payment Problem to Specific Causes

Table 5 below identified 46 causes of delayed payment of construction projects. 9 out of 46 (19.5%) identified payment problems were caused by contractors, 13 out of 46 (28.2%) were caused by consultants, 14 out of 46 (30.4%) caused by employers while the remaining 10 out of 46 (21.7%) were attributed to other causes within the industry. Analysis of 46 causes shows that 25 causes were attributable to the payment process; making up to 54.3% process-related causes. It is also paramount to note that 12 out of the 25 (48%) of the process-related causes emanated from consultant's roles in payment, 8 out of 25 (32%) from the employer's roles, while the remaining 5 out of 25 (20%) arise from contractor's roles.

Table 5: Relating payment problems to causes

Stakeholders	Payment problem	Cause
Contractor	Delays in submission of claims	Process-related
	Errors in claims	Process-related
	Failure to comply with payment provisions	Process-related
	Lack of knowledge and experience in the field	
	Poor quality of work	Process-related
	Disputes with debtors and creditors	
	Money used up for other purposes	
	Involvement in many projects at the same time	
	Poor communication	Process-related
Consultant	Errors in valuations	Process-related
	Delay in certification of interim and final payments	Process-related
	Poor communication and conflicts between parties	Process-related
	Delay in submitting contractor's claims	Process-related
	Delay in evaluation of payment	Process-related
	Poor supervision and financial control	Process-related
	Delay in issuance of responses to claims	Process-related
	Pending variation orders approval	Process-related
	Consultant's working nature	
	Delay in finalizing variations and retentions	Process-related
	Valuation of variation	Process-related
	Valuation of final account	Process-related
	Poor documentation of written instructions and payments	Process-related
Employer	Poor financial management	
	Underpayment of certified amounts	Process-related
	Failure to implement good governance in business	
	Underpayment of professional fees	
	Failure to comply with payment provisions	Process-related
	Employer's attitude/local culture	
	Delay in approval of claims	Process-related
	Disagreement on valuation of work done	Process-related
	Making arbitrary deductions from due amount	Process-related
	Delay in releasing retention monies to contractors	Process-related
	Delay in offsetting certified due amount	Process-related
	Money used up for other purposes	
	Ill intention to delay payment when work is completed	
	Unnecessarily withholding payments	Process-related
Others	Legislative procedures	
	Use of pay-when-paid clauses	
	Bureaucratic procedures	
	Highly competitive conditions	
	Complication and fragmentation of the construction process	
	Hierarchical structure of the contractual framework	
	Changes in economic conditions	
	Drop in building prices	
	Involvement of many commercial parties	
	Easy entry and exit of players	

CONCLUSION

The finding reveals that most payment problems emanates from employers actions/ inactions, hence employers are most responsible for delayed payment problems of construction projects.

The finding also suggests that a great deal of emphasis should be placed on the payment process as a means of correcting the deficiencies in the payment system. The significance of the analysis performed in this study is in identifying the source of the causes of delayed payment so as to correct the issues with the existing payment system based on the findings of this research. Additionally, it could be deduced that the payment processes could be the reason payment problems prevails.

This finding also provides insights to the survival of construction businesses through the adoption of business process management concepts. In business process management, processes are owned so that accountability can be taken into cognizance such that when there is a problem within the system, the system is able to recognize the source (persons) in order to hold them responsible for their actions or inactions.

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