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A process reference model for claims management in construction supply chains: the contractors' perspective

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ABSTRACT

Claims are an unavoidable burden for every construction project. They stem from risks that have unfortunately been realized in a project and how they will be pursued is up to company strategy, operational particularities and managers' skills and experience. Claims, in general, have an adverse effect on a project's supply chain by compromising actors' relationships, project implementation and project outcomes. It is imperative that all contractors follow a well-designed claims management strategy that is guided by well-defined and accurately documented operational processes outlined in detail. Process models related to claims management are scarcely found in the literature. These models are evaluated and a new process reference model, that attempts to improve the claims management process and rectify the identified shortcomings of existing models, such as a lack of transactions between the contractor and other supply chain actors, is proposed. In doing so, a number of process models are created. The objective of this paper is to prescribe the claims management process as an integral process to the supply chain of a construction project in an effort to raise awareness of this relationship and provide a holistic view to claims management through a supply chain management lens.

KEYWORDS

Claims management; supply chain management; construction; process modelling; reference model

Introduction

The construction industry is project based and characterized by complex activities, tight schedules and a tuple of actors. This is an environment where risks are abundant. It is common practice for every company to attempt to mitigate as many risks as possible. Furthermore, the industry faces new types of risks that stem from the fact that projects are becoming more complex due to new regulations, standards, technologies and owner-desired additions or variations (Abdul-Malak et al. 2002). As the size and complexity of projects increases, so does the frequency of claims (Mishmish and El-Sayegh 2016). These factors have an extremely strong reflection upon projects' supply chains.

Cox and Thompson (1998) as cited in Ribeiro and Lopes (2001) define the construction supply chain as follows: 'A supply chain in construction can be considered as a process of series of activities transforming raw materials into finish products (e.g. roads or buildings) and services (e.g. design or budget) for use by a client irrespective of organization boundaries'. Relationships between actors of construction supply chains are mainly determined and guided by contracts. Contracts describe the obligations of each party, the reimbursement method and risk allocation. These contracts have clauses that provide for specific events but, due to different limitations they cannot be exhaustive. As risks arise, they guide to project cost escalation and time overruns, which can lead to claims that can divert resources in form of both finances and staff time from on-going projects (Sibanyama et al. 2012). According to Revay (1993: 'The larger and more complex the project, the greater the likelihood of several major claim'. Claims are, thus, inevitable. Due to conflicts and differences over claims, the construction industry is plagued by an antagonistic atmosphere between clients and contractors (Harmon 2003). Although successful completion of projects depends mainly on cooperation between the main actors of a project, namely the contractor, the consultant and the owner, problems and disputes have always erupted due to conflicting opinions on various aspects of the project (Abdul-Malak et al. 2002). The root of these problems is misalignment of interests between the contracting parties (Jensen and Meckling 2001). In cases of back-to-back contracts, which are used broadly in the construction industry, claims tend to propagate along the supply chain. Things are not made easier by the actors that behave opportunistically. As a fact, the idea

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that the industry has an opportunistic culture leads to conflict and resistance to change which is a byword in construction (Rooke et al. 2003). This opportunistic behaviour does not allow construction companies to develop relationships that support efficient collaboration at the supply chain level. The degree of collaboration and coordination between supply chain actors affects the success of a project (Ronchi 2006). There are many process models that attempt to improve different organizational aspects available in the general literature, most of them based on best practices.

The existing claims management literature contains a few process models that illustrate a rather basic process. None of the existing process models makes a connection of claims to the implications for the management of a project's supply chain. The relationship with other actors of the supply chain (clients or suppliers) is highly affected by claims. Contractors that want to improve their relationships with key-clients and key-suppliers could benefit from the use of documented best practices and standardized sets of processes that allow for easier monitoring. It is the aim of this paper to introduce a holistic claims management process reference model that enlightens how the contractor should handle claims in a project-based supply chain. The rest of this paper is organized as follows. An analysis of claims in construction and their effects on project supply chains is performed, followed by a brief review of process models related to claims management. The proposed reference model is presented and analysed thoroughly. A brief discussion on the model and its characteristics, compared to the existing models in the literature, is performed and finally, the conclusions are presented.

Claims and construction supply chain

Construction supply chain

Supply chain management is a relatively new concept in construction, originating from manufacturing. It is a subject of intense research in the manufacturing discipline since the 1960s. It was introduced to construction through the 'rethinking construction' report (Egan 1998) and research on the subject is on the rise. Despite the amount of research in manufacturing, the results do not readily translate to the construction supply chains. Aloini et al. (2012) define construction supply chain management as:

> It is the coordination and the integration of key construction business, both processes and members involved in construction supply chain, extending traditional intra-enterprise activities in a management philosophy by bringing together partners who have the common goals of optimization and efficiency so establishing long-term, win/win, and cooperative relationships between stakeholders in a systemic perspective.

The construction industry is characterized by temporary supply chains with fragmentation and instability as a result (Persson et al. 2010). Construction markets are often closed to international antagonism due to government subsidies, regulations and culture (Segerstedt and Olofsson 2010). Despite the locality of the construction markets, they are still highly fragmented with many SMEs (small–medium enterprises) (Briscoe and Dainty 2005) performing unique activities (Ribeiro and Lopes 2001). Matthews et al. (2000) find that the increase in complexity, the over-supply of specialist firms and the declining construction output (maturity of the market) has aided the cultivation of an adversarial atmosphere that has had a negative effect on main contractor–subcontractor relationships. According to Rooke et al. (2003), 'Competition results in a fragmented system of economically independent units, each attempting to maximize its benefit, to the detriment of the co-operation required of a technically interdependent system, if collective benefit is to be achieved'.

Buyer–supplier relationships in the construction industry can be characterized as a market exchange relationship, where, according to Bensaou (1999): 'information exchange between two firms takes place mainly during bidding and contract negotiations'. The client–supplier relationship is portrayed by Saad et al. (2002) and Fernie and Thorpe (2007) as critical in construction supply chain management. A problem faced by the construction industry is the tendency of contractors to focus explicitly on their clients' needs (Saad et al. 2002) and neglect their relationships with their suppliers. This leads to low productivity, cost and time overruns, conflicts caused by bad communication (Aloini et al. 2012) and required reworks. Many subcontractors do not have the expertise to undertake work reasonably which impacts their ability to give their clients the service they require, while, further up the supply chain, many of the undesirable traits common to the main contractor–subcontractor relationship are also common in the subcontractor–sub-subcontractor relationship (Matthews et al. 2000). The client–main contractor relationship is regarded as the main relationship in a construction supply chain (Cox and Thompson 1997). As a result, supply chain relationships distinguish one construction supply chain from another (Meng 2012). Supply chain relationships in construction are very diverse, ranging from the traditionally adversarial, to the short-term collaborative, and to the long-term collaborative relationships. The traditional adversarial nature of construction is heavily criticized in the literature and a proposal for collaboration in

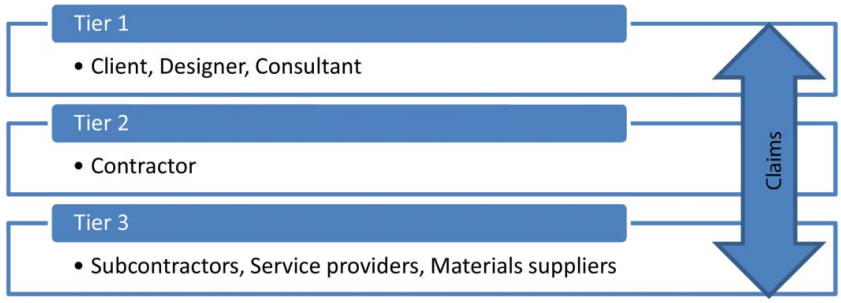

Figure 1. Construction supply chain. Adapted from Pryke 2009, p. 2.

many levels between supply chain actors is promoted. Meng (2012) states that 'deterioration of supply chain relationships is a major reason for the occurrence of poor performance such as time delays, cost overruns and quality defects'. This paper considers the client–contractor–subcontractor tiers (Pryke 2009) as the main construction supply chain under study as all other tiers upstream the subcontractor (e.g. chemicals industry) can be described by other supply chain models. Figure 1 presents this schematically.

Claims management

Claims are present and ever increasing in every construction project, regardless of scale, and they are recognized as a burden for the industry. There is no uniform definition for claims although they may be best described by Kululanga et al. (2001) as 'an assertion of and a demand for compensation by way of evidence produced and arguments advanced by a party in support of its case'. Ho and Liu (2004) point out that many project participants consider them as the most disruptive and unpleasant events of a project. Claims may start against one party but end up affecting multiple contractors (Chester and Hendrickson 2005) even at different phases of the project, especially in cases of back-to-back contracting. Research conducted by Zaneldin (2006) shows that the completion of projects is hindered by claims that cause delays in project delivery. In fact, many partnership attempts in the construction industry have failed due to claims. According to Mbachu (2011), 'The critically risky aspects of the owners' acts or omissions were associated with their contractual role, especially in relation to disagreement over payment claims and on what constituted variations'. Avoiding such situations is not easy as it requires careful study of contract terms, a cooperative spirit and a good understanding of the causes of claims (Semple et al. 1994). Demirel et al. (2016) state that 'one way to achieve this is through clever contracting, by proactively anticipating potential change in the planning phase and providing flexible contract mechanisms that enable an effective response'. Claims are highly affected by the intention and goodwill of the interpreter (the actor considering himself exposed to a realized risk) of the contractual terms. As Fenn et al. (1997) state, 'it is worth noting that conflict can be managed, possibly to the point of preventing it from leading to dispute'. Carmichael (2009) noticed that contractors kept claim rates low when clients behaved similarly. It is typical for contractors to submit claims for cost or time. Not all claims submitted by contractors are accepted by the other parties. Vidogah and Ndekugri (1998) identified eight reasons for refusal of part or all of contractor's claims, namely (in descending importance): 'non-entitlement in principle, inadequate information, quantification of claim, lack of breakdown of claim by causes, non-compliance with contractual procedures, inadequate effort at mitigation, validity of architect/engineer's instructions, and other grounds'. Different controls in various stages of the process for handling claims could influence perceived lack of fairness and the potential for dispute (Aibinu 2006). Third parties are rarely addressed in order to participate in the claims process and boost the feeling of fairness due to the very small profit margins in construction projects.

According to Banwo et al. (2015), events that cause claims can be split into three categories, these being, excusable, non-excusable and external. This categorization allows for an examination of the validity of a claim by the contractor. Non-excusable events are attributed to the other party and do not present a basis for claims, so they are certain to be declined by the contractor and vice versa in the case the contractor submits such a claim. It is common practice for project owners to transfer as many risks as possible to other actors although that does not mean that their exposure to them is necessarily eliminated (Revay 1993). In the case of supply chains, it is impossible to provide an exhaustive description of the rights and obligations of all contracting parties for every possible contingency (Coltman et al. 2009).

Despite the category the claim falls in, the way contractors treat claims is different. Two main trends can be observed in the literature regarding claims management. On the one hand, researchers propose that claims should be pursued in order to increase contractors' profitability. For example, Yang and Xu (2011) investigate the situation where contractors bid at low, even beneath cost, and aim at making a profit through claims. Zhou and Tan (2012) go one step further exploring whether taking advantage of claims could also benefit project management efficiency. He and Chen (2010) support that opportunities for claims exist throughout the life cycle of a project. This is due to the contract-based nature of projects. Opportunism stems from contractual incompleteness (Yates 2002). As Aibinu et al. (2011) concluded in their study, 'when contingencies occur which are not fully, or only ambiguously, covered by the contract provisions, one or both of the parties to the transaction may behave opportunistically by taking actions that increase the transaction cost'. Minimizing claim causal factors during earlier phases would therefore reduce claims during the construction phase (Sibanyama et al. 2012). Opportunistic behaviour could either be attributed to cultural and/or financial factors. Ho and Liu (2004) find that economic slowdowns and recessions encourage opportunistic behaviour. On the contrary, Zaneldin (2006) identified that, in the UAE, construction claims are direct results of the on-going growth in the construction industry in the country. Opportunistic behaviour may include a contractor's intentional ignorance of possible risks involved that may significantly increase costs or decrease profitability (Ho and Liu 2004). This kind of opportunism is criticized when there is talk of changing culture for the better, but it bespeaks a perfectly rational and legal adaptation according to Rooke et al. (2003). Opportunistic behaviour creates adversarial relationships, a problem that plagues the construction industry worldwide, from a local level to an international one.

On the other hand, authors propose claims as a last resort and only if this is really necessary, as conflicts caused by claims can have a damaging effect on intercompany relations. Claims are sought by these authors as a burden that must be avoided. In their work, Semple et al. (1994) advocate against the use of claims in construction projects because of the adverse effects they have on the industry. Aibinu et al. (2011) propose that prior to initiating the claim process actors should consider the financial costs of pursuing claims that may lead to disputes and the impacts of the claims on future business prospects with existing or potential clients. Zaneldin (2006) stresses out that it is imperative for the construction industry to develop methodologies and techniques in order to reduce or prevent claims. The wealth generating action of production makes it possible to conceive of efficient solutions for all participants (Rooke et al. 2003).

During a project, claims may be submitted by any party. Project stakeholders view claims management from different angles. Opportunistic bidding behaviour, as Mohamed et al. (2011) defined it, was analysed extensively in the current section. Banwo et al. (2015) state that claims management, from the contractors' perspective, may be viewed through another lens, that of profit maximization from a supply-chain perspective. This distinguishes claims management as being principally driven by the need to reduce the company's overheads in an attempt to maximize profit and is analysed in the following section.

Claims management process models

In order to better understand the relationship of claims with supply chain management, a non-exhaustive analysis of the types of claims in construction was performed. Table 1 presents the types of claims recorded in the literature.

Most of the types mentioned are in direct relationship with the supply chain of a project. For example, the increase of scope was the main cause of dispute that Semple et al. (1994) identified and almost all other works presented in Table 1 seem to ratify their find. Increase in scope highly affects the supply chain of a project since new parameters are being added, schedules are shifted and in some cases new subcontractors need to be contracted. Banawi and Bilec (2014) analysed waste levels through the amount of claims submitted and identified design changes during construction as the largest source of both claims and waste. Delays which can be directly related to the supply chain, according to Braimah and Ndekugri (2009), are the most often and involve many actors which make it hard to justify and quantify the effect of each individual item of delay. Contractors must keep in mind that in some cases one type of claim may lead to other types in a later phase of the project (Chester and Hendrickson 2005). Claims management is not easy and therefore best practices need to be documented and adopted by companies in the sector in order to avoid long-term effects of bad claim management practices such as late claim identification, ineffective claim management processes and financial losses. Many best practices are documented in the literature in the form of process models.

Process models are widespread in the general literature. Usually they are based on state-of-the-art research but, unfortunately, their adoption by industries is less

Table 1. Claim typology in construction projects.

Types	(Revay 1993)	(Zack 1993)	(Semple et al. 1994)	(Chester and Hendrickson 2005)	(Zaneldin 2006)	(Moura and Teixeira 2007)	(Hassanein and El Nemr 2008)	(Banwo et al. 2015)
Acceleration	X	X	X	X	X	X		
Restricted access			X		X			
Force majeure	X		X	X		X		
Increase in scope		X	X	X	X	X	X	X
Loss of productivity	X	X						
Problematic bid documents	X							
Delays		X		X	X	X		X
Measurements and payments				X		X		
Suspension of works						X		
Beginning and ending acts		X				X		
Contract termination						X		
Contract ambiguity					X			
Fluctuation								X
Extension of time		X						X
Ex gratia								X
Different site conditions					X			
Resequencing of work				X				
Defective work				X				
Total cost		X						

common. This is also the truth in the case of the construction industry where the effective and widespread adoption and use of process models has been limited, and the benefits span from ambiguous at best to non-existent at worst according to Tzortzopoulos et al. (2005). Numerous reports, for example, Egan (1998) and Fairclough (2002), have found that there is a lack of innovation and change in process management practices throughout the industry. This could be due to the fact that there is a lack of effective knowledge management tools and the one-off nature of construction projects. A way to overcome these complex problems is the development and implementation of process reference models, which would allow for a consistent and integrated design and construction process (Kagioglou et al. 2000). Cheung and Yiu (2006) state that an efficient claims management approach is essential to prevent disputes from occurring.

The most prominent models found in the construction claims management literature are those of Kululanga et al. (2001) and Abdul-Malak et al. (2002). The prior proposes a typical, oversimplified sequence of tasks for claim management but introduces total quality management tools in order to prevent the occurrence of new claims. The latter describes a more detailed and complex process for claims management that is also accompanied by a related software. Other notable models include works by Moura and Teixeira (2007), a rather simple approach, and by Banwo et al. (2015), an interesting approach that introduces phases during which certain tasks are performed. Finally, in contrast to the previous authors, He and Chen (2010) present a process model for opportunistic claim management, a tactic that is not adopted in the model presented in this paper. None of the aforementioned process models make a direct connection between claims and construction supply chain management. This is the gap that the following model attempts to fill.

Methodology

The research presented in this paper involves the development and validation of a new model. It is a process reference model which can be adopted by construction companies in order to design or redesign their claims management process and sub-processes, within the whole construction supply chain. The validation of the model is achieved through interviews with experts from the construction industry.

The methodology for the development of the process reference model for claims management in construction supply chain, followed a hybrid top-down and bottom-up approach (Figure 2). This approach is an adoption of the methodology described in ODYSSEUS framework, presented by Ponis et al. (2013) and Gayialis et al. (2013), for the development of generic and partial (industry specific) supply chain reference models. This framework introduces nine main processes divided into management processes, core processes and support processes according to Porter (1985), and claims management is classified as a core process because of the role it has on the contractors' profitability. Elaborating on that, this paper enhances and details the processes related to claims management, enlightening them from the contractors' perspective.

The methodology followed in this paper, includes three phases and it is presented in Figure 2. The *first phase* is the study and critical review of contemporary theories and practices for claims management in construction supply chain. Existing claims management

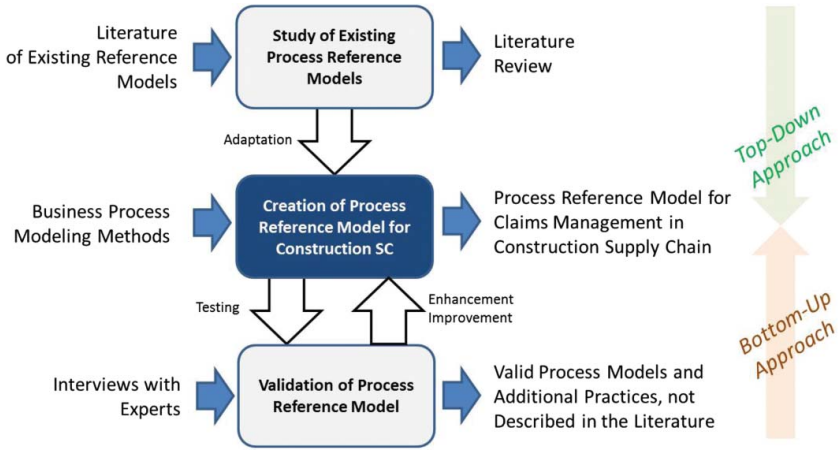

Figure 2. Methodological approach.

process models documented in the literature were analysed. Best practices and IT trends in the construction industry were also studied. This step resulted in the identification of basic directions and requirements for the creation of the reference model (top-down approach). The outcome of this phase is summarized in the literature review section.

The *second phase* includes the creation of the process reference model for construction supply chains. This is achieved through the adaptation and customization of existing models and practices identified in the first phase. Specific business process modelling methods were used, mainly adopting the business process model and notation (BPMN) modelling technique. This step resulted in the creation of the process reference model for claims management in construction supply chains. The process perspective is graphically represented through the use of the value chain diagram, function trees, process charts for processes and (when required) sub-process representation. The outcome of this phase is summarized in the next section of the paper which describes the claims management process model.

The *third phase* of the methodological approach is the validation phase of the reference model through interviews. Semi-structured interviews were performed, one with an expert from a Greek large contractor from the construction industry and one with an expert in dispute resolution in the UK. The interviews aimed to validate the processes created based on the literature and to uncover practices and shortcomings that are not documented in the literature. The outcome of the interviews was embedded in the process reference model leading to the enhanced version presented in this paper (bottom-up approach). The outcome of this phase is also summarized in the next section of the paper which describes the claims management process model.

Claims management process model

According to Hofman et al. (2009), 'construction projects can be seen as temporary organizations between and within organizations, and therefore standardization at the multi-project level is difficult as project teams and product designs change from project to project'. The authors argue that standardization can be achieved through common processes among project participants. The model contains five processes (Figure 3), divided into strategic (long-term) and operational (short-term) based on the classification presented by Croxton et al. (2001) in the Global Supply Chain Framework reference model. On one hand, strategic processes are executed at the beginning of a project and are updated in case of major changes in strategy or legislation. This ensures that there is certain continuity in the way claims and contract terminations are handled. On the other hand, operational processes are executed as often as needed.

The processes of the 'Claims management' function have interfaces with other supply chain model functions but these interfaces are out of the scope of this paper. As seen in the previous sections, literature treats claims as mainly having a negative hue. Interestingly, the interviews conducted corroborate that relationships are damaged by claims and projects may be delayed. Interestingly, the interviews revealed that claims could also have a positive effect on the project, for example, the contractors or subcontractors may identify an opportunity in the plunge of the price of a stock product that may be required at a later stage of the project and submit a claim for its advanced purchase. The model, with its supply chain background, presupposes that behaviours in the construction supply chain are based on mutual cooperation and trust stemming from a partnership environment. It has been proven in cases from the

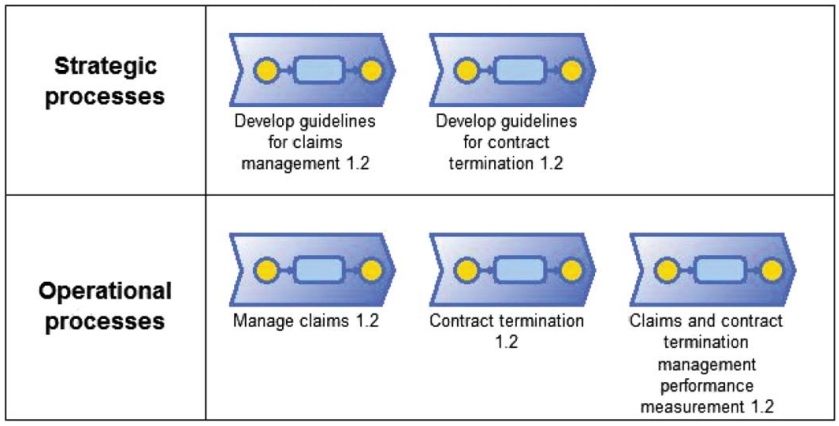

Figure 3. Claims management function tree.

manufacturing industry such as Wal-Mart (Scott et al. 2011) that mutual cooperation is key to successful supply chains. Although construction supply chains are temporary, the interviews conducted revealed that good relationships do exist and in fact claims are less likely to escalate to disputes when contracted parties share previous good experiences. The interviews also supported the literature as far as financial climates are regarded, confirming that in times of economic downturns project participants tend to be more distrustful. It is imperative to maintain trusting relationships with other parties since trust enhances the value of the total service provided by the construction supply chain (Xu and Smyth 2015). Thus, opportunistic behaviour is discredited. The processes presented in this paper were designed using the Adonis Community Edition (BOC-Group 2016) software.

Strategic processes

There are two strategic processes in the model, namely 'Develop guidelines for claims management' and 'Develop guidelines for contract termination'. These processes can be executed simultaneously or not and the outcome of each process is independent of the other. Each process describes the tasks to be executed in order to develop guidelines that will allow for seamless claim management and contract termination respectively. Strategic processes are of a proactive nature since claims/disputes are unavoidable as Cheung and Yiu (2006) proved in their work using a probabilistic model. The possibility that all potential risks will be foreseen or even mitigated to another party is practically nought. The interviews conducted revealed that there are always claims in construction projects. External factors such as regulations and client requirements (expressed in the contracts) interfere with strategic processes. Since one cannot exclude the human factor from the organizational operations, it is imperative that organizational justice is enhanced through project processes and a cooperative attitude is promoted in order to reduce contracting inefficiencies (Aibinu et al. 2011). Finally, contractors must keep in mind that contract cancellations may irreversibly harm relationships between supply chain parties.

The 'Develop guidelines for claims management' process (Figure 4) should, in an ideal scenario, start before the tendering phase of a new project. As the interviews revealed, some construction companies have strategic guidelines in place for managing claims but they are usually not described in a clear process fashion. As mentioned in Stamatiou et al. (2016), the clients and suppliers of a contractor should be categorized according to the sort of relationship the contractor wants to maintain with each one of them. Based on this categorization and relative to the specifics of a certain project, the contractor should 'Set claim strategy for different groups of supply chain parties'. The signed contracts with those parties provide most of the input related to this task. Other participants of the project should be evaluated and decisions on how claims against them or from them should be handled. The interviews revealed that supply chain parties are indeed treated differently, depending on the expectations the contractor has for future collaboration. Next, the contractor should 'Identify possible claims in each phase of the project'. The major phases of a project are: pre-tender, contract formulation, construction and post-construction. According to Sibanyama et al. (2012), claims result from omissions and actions during the former two phases but manifest during the latter two phases. It would be easier to identify possible claims if the contractor consulted a database of claims that have appeared in previous projects, although an exhaustive list would be impossible to be created. At this

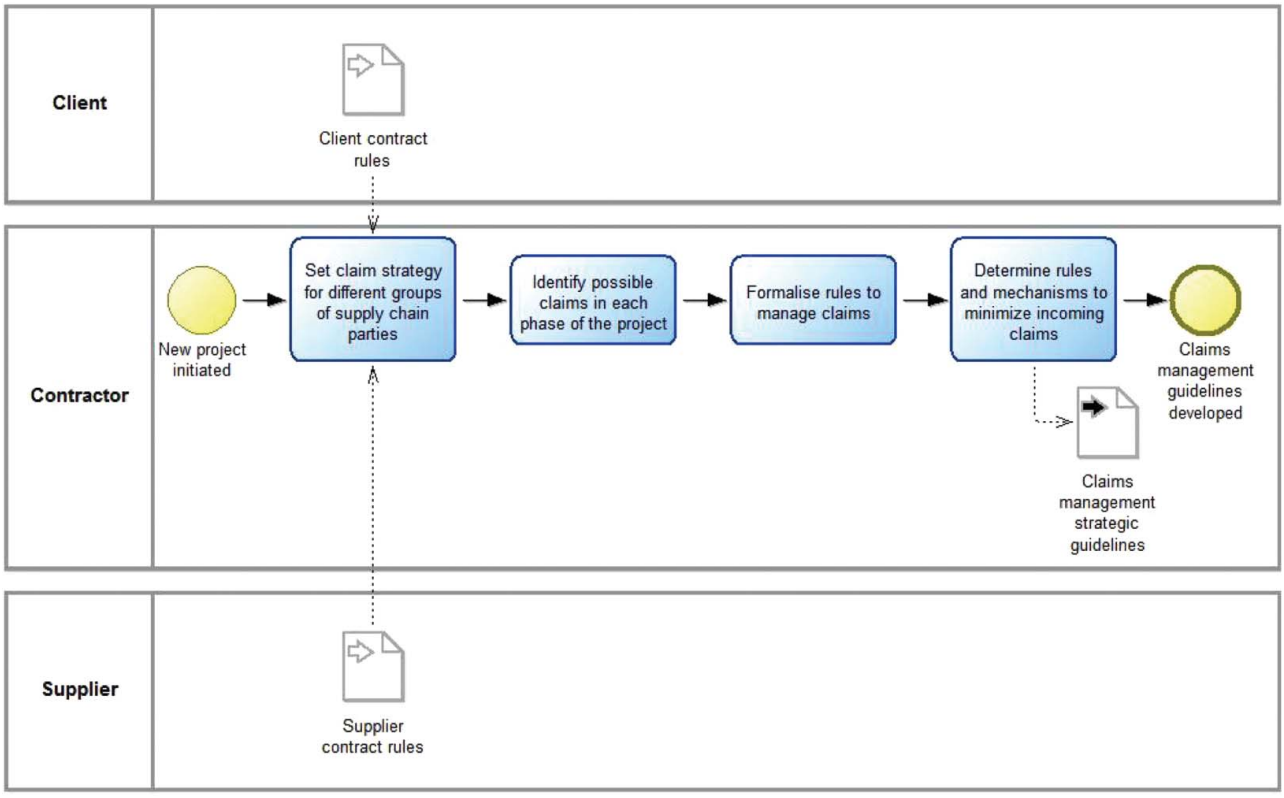

Figure 4. Develop guidelines for claims management.

strategic level, it is advisable to 'Formalize rules to manage claims' during the project life span based on the results of the previous tasks. This task, according to the interviews, involves the decision to submit each claim as a standalone claim or to bundle the claims in order to resolve them collectively in the final phase of the project. Finally, through the 'Determine rules and mechanisms to minimize incoming claims' task, the contractor prepares a strategy to defend itself from incoming claims. This could include contract provisions that allow only for a short time frame since an event occurs till the other party submits a claim or mitigating risks upstream the supply chain. The way people are treated (quality of treatment) and the way claims are administered (quality of decision-making) have a large impact on the amount of claims that escalate to disputes (Aibinu et al. 2011).

The 'Develop guidelines for contract termination' process (Figure 5) starts when a new project is initiated. The first task is to 'Determine guidelines for assessing contracts'. Each contract is unique and, although there may be standard contract types, the contracting parties may add clauses to their suiting (as long as they are lawful). There are plenty of factors that should be considered during the assessment of a candidate contract for termination. Sizes of contract, existence of substitutes, contract termination penalties and relationship with the other contracting parties are just some of these. Contracts may be terminated halfway through execution or even before they start. The 'Determine guidelines for credit/debit approval' task describes how credit/debit for services or products that have been partially offered or remunerated by/to the contractor should be handled depending on the factors mentioned previously. The 'Determine guidelines for contract termination management' task aims at providing an outline of duties that staff in specific organizational positions need to perform in order to have a smooth termination on the contractors side. In addition, these guidelines may be shared with other supply chain parties. 'Determine rules and mechanisms to diminish contract terminations' is a proactive task that aims to provide a toolbox in order to minimize costly contract terminations at the expense of the contractor. Finally, 'Determine rules that will be included in product/service agreements' is a task that is based on the lessons learned from previous contract terminations. It aims to provide clauses that should be proposed for inclusion by the contractor during the negotiation phase.

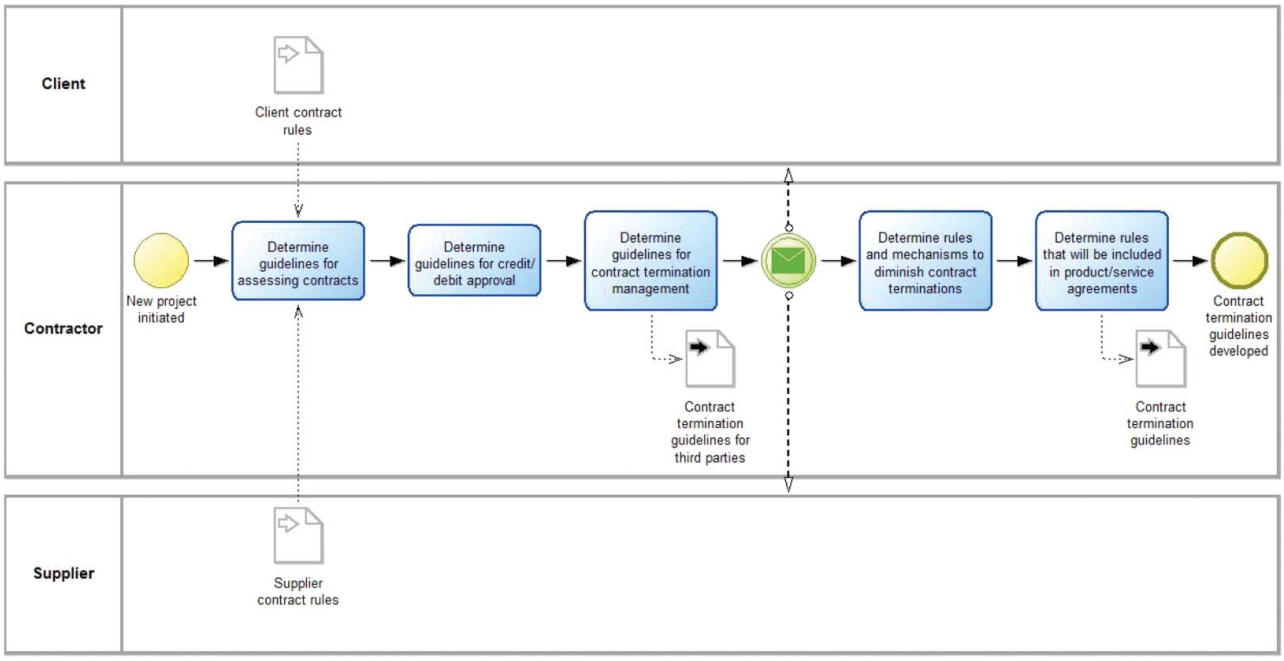

Figure 5. Develop guidelines for contract termination.

Operational processes

There are three operational processes in the model, namely 'Manage claims', 'Contract termination' and 'Analysis of claims and contract termination data and performance measurement'. These processes are not independent of each other and their typical sequence would be the one seen in Figure 6. Each process describes the sequence of steps that are executed reactively to the occurrence of disruptive events. In the 'Manage claims' and 'Contract termination' processes, attention must be paid to exaggerated costs that attempt to bring settlement costs up (Chester and Hendrickson 2005).

The first process, 'Manage claims', as seen in Figures 7 and 8, may be initiated by two different events. Either the contractor initiates a claim against another party in the supply chain, or another party initiates a claim against the contractor. In the first case, the contractor initiates the claim process when it is perceived that a triggering event on the part of the owner has taken place (Abdul-Malak et al. 2002). The first sub-process is to 'Identify the claim'. As the interviews revealed, the contractor executes three tasks simultaneously, namely 'Monitor contract specifications' that includes careful analysis of designs and verbal specifications included in the contract, 'Monitor market conditions' that includes value engineering and 'Monitor project outcome' that includes quantity surveying (based on the bill of quantities) and quality assurance, as seen in Figure 9. Through this continuous monitoring, the contractor may 'Identify claimable deviations'. These deviations may include differences in the project outcome compared to the contract specifications, opportunities for cost reductions, speedier depreciation with the instalment of systems that did not exist during the design phase, or schedule related issues.

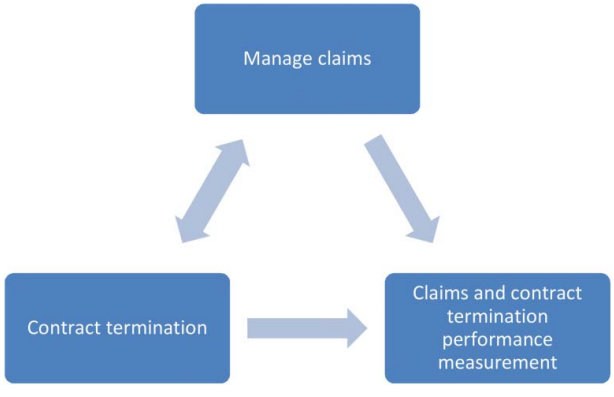

Figure 6. Interdependencies of operational processes.

Next, it is necessary to 'Determine the effect of the claim'. As Abdul-Malak et al. (2002) state:

> ...if the effect on the program and budget can be directly assessed after the occurrence of the cause for a claim, there will then be no continuous effect. On the other hand, if the consequences resulting from the claim are not foreseeable or cannot be measured at the time the contractor notifies the owner, the claim in this case has a continuous effect.

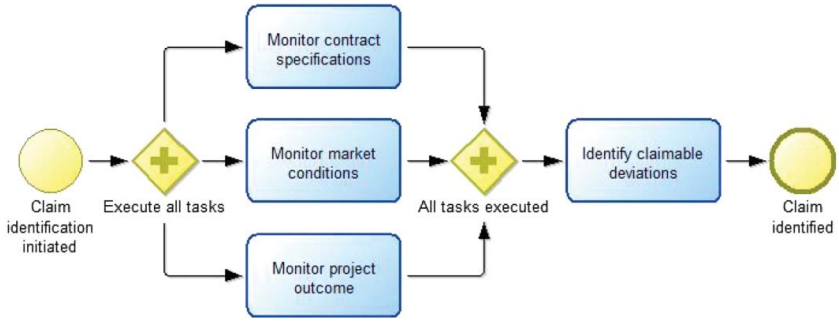

Figure 7. Identify claim sub-process.

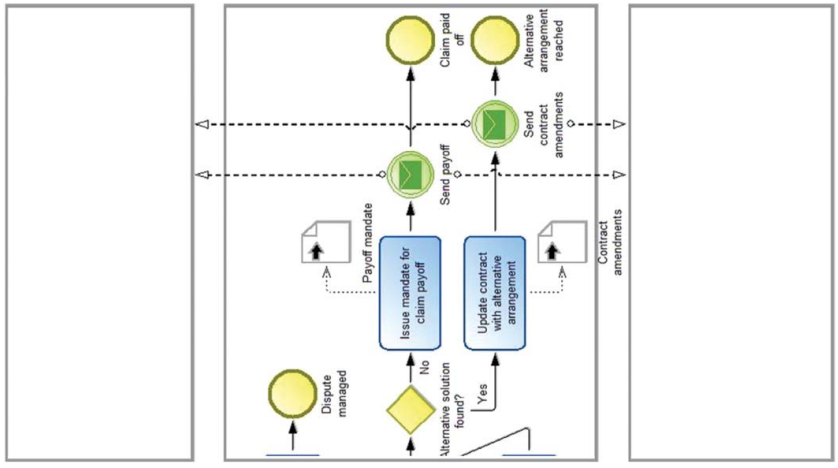

Figure 8. Manage claims (part B).

During this task, the contractor must also estimate the potential recovery. The contractor must 'Notify third party of claim intention', preferably in a non-adversarial manner (Kululanga et al. 2001), in order to abide by the usual contract provisions that require such action. It is to the contractors' benefit, in order to increase the chances of a successful claim, to be thorough during the 'Collect appropriate claim documentation' task. Poor documentation can cause the loss of a favourable position in the claim and lead to legitimate claims being denied. This documentation, according to Yang and Xu (2011), must include general parts, contract citations, calculations of financial claims and time claims, and claim evidence. The interviews revealed that the most important document to support a claim is the worksite diary. The importance of keeping good site records, especially for delay-related claims was highlighted by Scott (1990). The interviews also revealed that dated and signed correspondence between project participants can also provide backup to any claim. Other items that may be used as documentation, such as images, invoices and impacted schedules, may be used by any party to support their claim. Once the claim documentation has been collected and the case has been supported as best as possible, the task 'Present claim to third party' can be executed. The claim file is presented to the other party in order to allow time for study before it is discussed. In an attempt to escape adversarial practices of the past, the contractor should 'Examine alternative solution for claim management'. In the second case, the contractor will 'Receive claim notification' from another party. The contractor has to wait until the other party compiles the claim documentation in order to 'Examine claim documentation' and rule its veritableness. This may be a claim for compensation from the client or a claim for extra time or payment by the subcontractor. The contractor has to ascertain what kind of event, according to the categorization by Banwo et al. (2015), leads to the claim. The rejection may occur due to poor documentation by the other party and in some cases the claim may be resubmitted if the contract conditions allow it. In the case of a non-excusable event, the contractor performs the task 'Reject claim' which includes composing the reasoning of the rejection and the notification of the

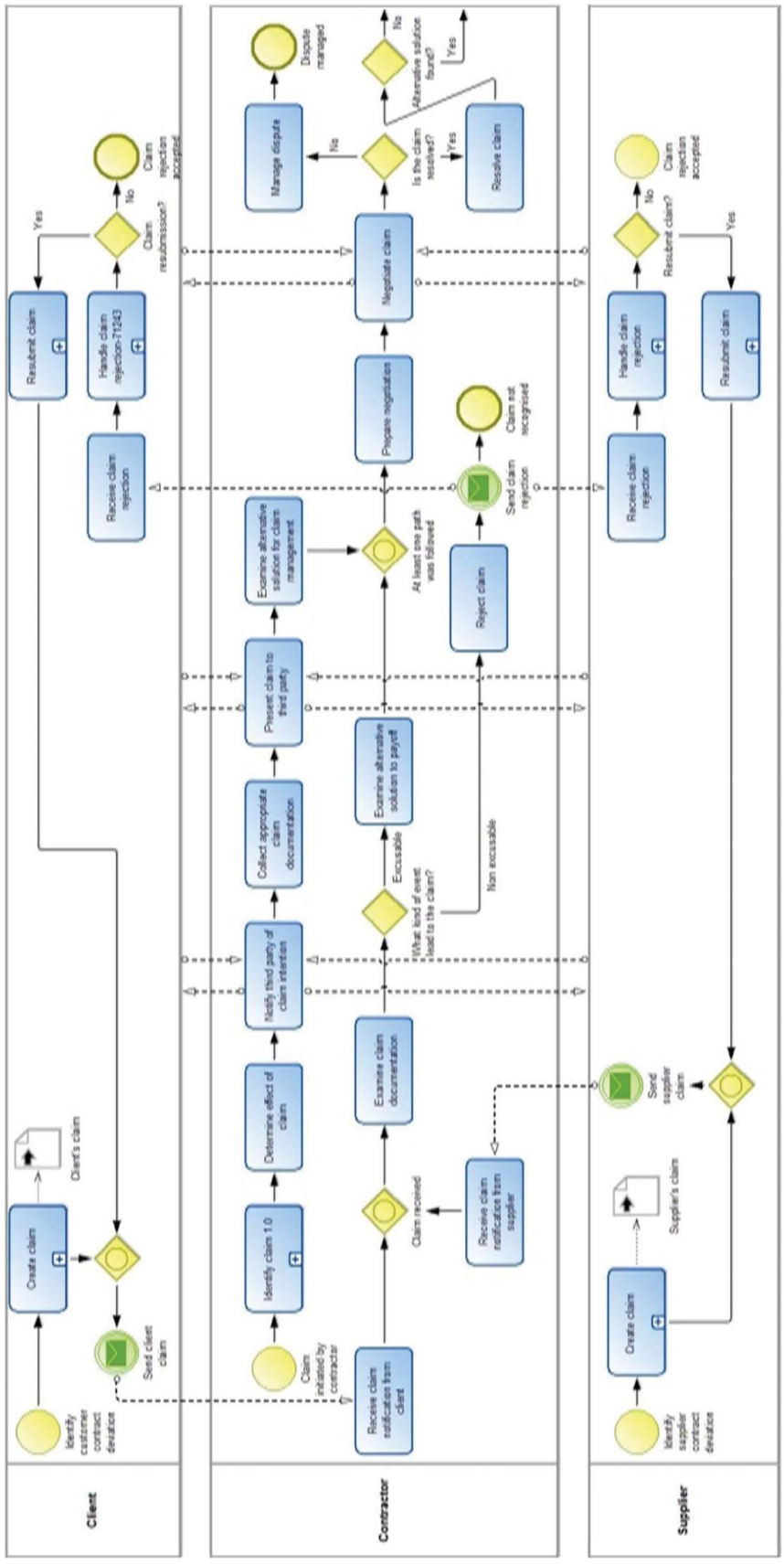

Figure 9. Manage claims (part A).

other party that no compensation will be repaid. In case of an excusable event, the contractor must 'Examine alternative solutions to payoff' in order to maintain his profit margins intact and his relationship with the other parties at a good level. In both previous scenarios, the next steps are common. The contractor must 'Prepare negotiation' in order to:

> (1) ascertain that all information is current and complete; (2) minimize the scope of negotiation beforehand so that insignificant points should not precipitate a violent argument and disrupt progress; (3) know one's weaknesses and try to utilize weak points by conceding them in return from the other party; (4) foresee problems; and (5) anticipate the opposition's next move. (Kululanga et al. 2001)

The next task, 'Negotiate claim', is probably the most important task in the whole process since it is of a make or break nature. During negotiation, there is a tuple of factors that may affect the outcome such as perceptions of the parties about their interactions (Aibinu et al. 2011), the subjective nature of the existence of a claim right (Ho and Liu 2004) and the selection of a resolution channel (negotiation, mediation, arbitration or litigation) (Zaneldin 2006). If negotiation fails, the next task is to 'Manage dispute'. This includes the participation of a third party (e.g. court of law, arbitration), depending on what the contract prescribes. If negotiation leads to a resolution, the following task is 'Resolve claim'. It includes the procedural work to be completed once a negotiation has been concluded. Finally, in the case that an alternative solution has been reached, the two parties must 'Update contract with alternative arrangement'. The interviews revealed that the chances of alternative solutions increase when there is mutual understanding, goodwill and a good relationship between project supply chain parties. In the case where an alternative solution has not been found, the contractor must 'Issue a mandate for claim payoff' that either regards a demand (monetary or time related) from the other party or an obligation for the other party.

The second process, 'Contract termination', as seen in Figure 10, despite not being executed very often since it usually constitutes the last resort of a dispute, can also be initiated by two different events. Either the contractor receives a request from a third party to terminate a contract or, the contractor initiates the contract termination through the 'Issue mandate for contract termination' task. In both cases, there is a single sequence of tasks that follows, the first of which is 'Determine contract termination causes'. Although contract terminations usually occur after a claim that leads to litigation (which means that the cause is already known), in some cases unforeseen reasons may lead to contract terminations even before the physical part of a project is initiated. The next task is to 'Check termination guidelines'. The guidelines have been set in the second strategic process and provide for many different cases. A contract termination affects many departments of a company; it is not solely extra work for the legal department. This makes 'Notify interested departments of termination' the next task. Each department should check the termination guidelines for the parts of the contract that concerns it and estimate the impact of the termination on its operations. A sum of these estimates would give an idea of the real cost (not only monetary) of the contract termination. The 'Check for contract termination clauses' task aims at covering possibilities of remuneration for the lost profits. The interviews revealed that the contractor should then 'Provide "Make good" time' to the other party (or may be provided with 'Make good' time by the other party), in order to rectify misalignments with the schedule or other unresolved major issues. In a spirit of cultivating trust and improving relationships between supply chain actors, it is highly recommended to execute the 'Check for need for settlement' task. This may lead to new claims and the activation of specific contract clauses. The need to maintain good relationships with specific parties could depend on the availability of adequate competitors in the specific sub-market (Stamatiou et al. 2016). The final task, 'Check course of termination' is procedural and is intended to create intermediate reports on the progress of the contract termination.

The need for a tool for auditing construction contractors' claim process for the purpose of reducing time and cost increases cannot be overemphasized (Kululanga et al. 2001). The 'Claims and contract termination management performance measurement' process (Figure 11) is the last operational process of the claims management function. It is in line with the directory for the construction industry composed by Egan (1998) that moves companies to the development of management measuring tools as a means towards modernizing the industry. The interviews revealed that the majority of construction companies do not use Key Performance Indicators (KPIs) to monitor the claims-related processes. Effective monitoring and registering of claims enables managers to identify opportunities for productivity improvement. The process can take place once either or both of the previous operational processes have been completed. The first task is to 'Record and classify data from claims and terminated contracts'. A unified grouping system across projects will allow for knowledge generated in any project to be concentrated and used whenever required. In an ideal case, this could be an international system (Moura and Teixeira 2007). Next, the 'Monitor claims and contract termination management

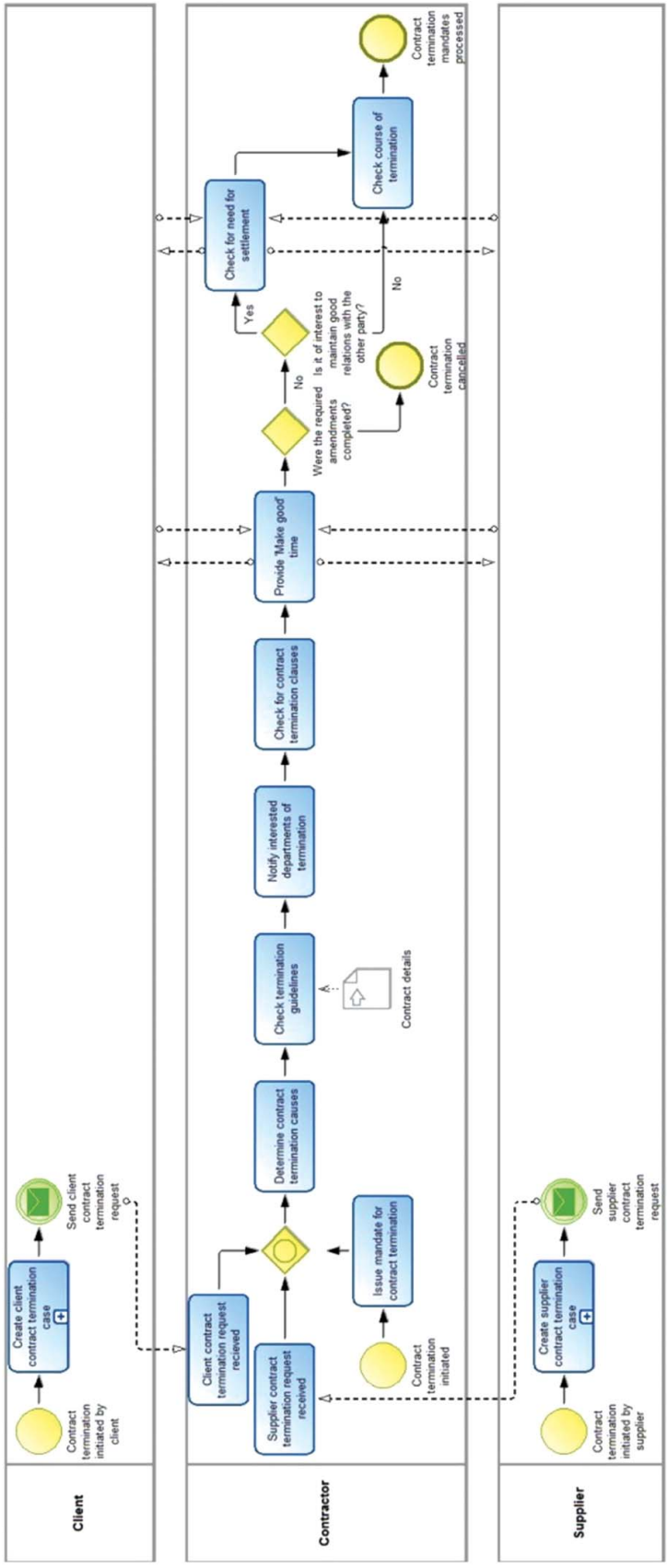

Figure 10. Contract termination.

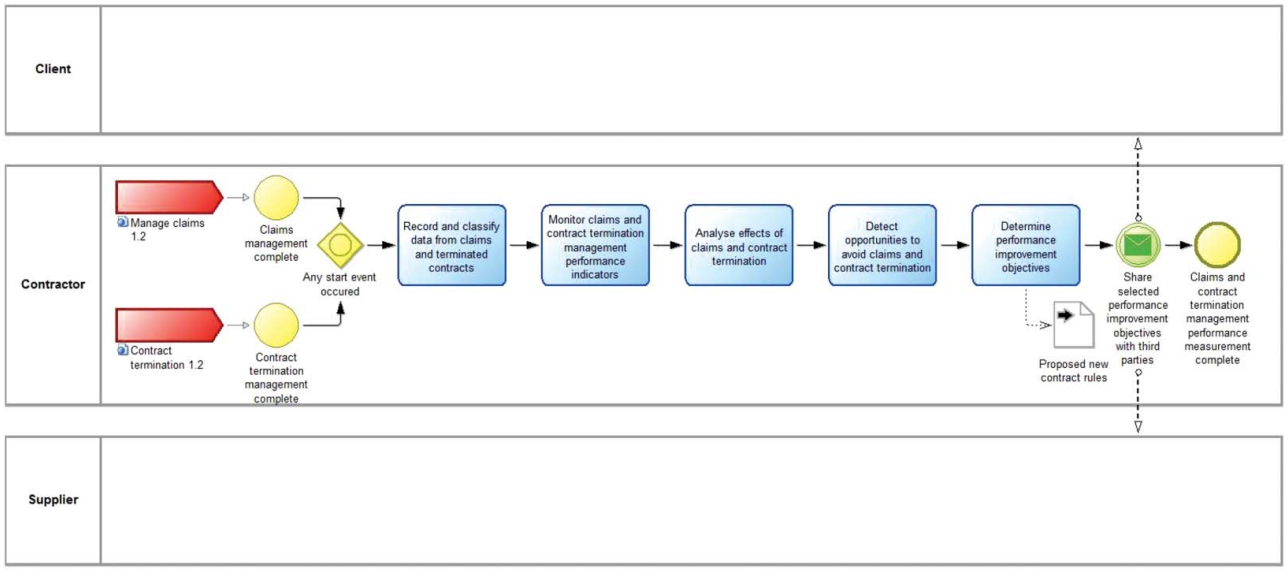

Figure 11. Claims and termination management performance measurement.

performance indicators' task is executed where strategically selected performance indicators are calculated. These indicators are part of either a robust but concise measuring system that the company designs to meet their exact needs, or is an adaptation of a verbose system available by consulting firms. This measuring system could, for example, contain indicators such as claim cost to earnings, claims successful to claims submitted and other useful ratios. As part of a knowledge management strategy, the 'Analyse effects of claims and contract termination' task is critical in order to support future claim decisions. The effect of a specific claim and claims in total on intercompany relationships and transactions, project performance and intra-company performance should be examined. As Kululanga et al. (2001) propose, a total quality management system could be implemented in order to support such an analysis. The task 'Detect opportunities to avoid claims and contract termination' aims at two things: primarily to use the knowledge base in order for the contractor to minimize claims against him or precarious contract terminations and, secondarily, in the spirit of a cooperative and goodwill stance towards other actors of the supply chain, to avoid making small-scale claims that only harm relationships and do not necessarily add towards profitability. Finally, the last task to be executed is 'Determine performance improvement objectives'. In this task, managers compare performance indicators against strategically set targets in order to examine performance shortfalls, their causes and areas for improvement. In some cases (e.g. partnerships), the relationship with the third party may lead to the sharing of KPI data in order to satisfy jointly set goals.

Results

Claims management is a critical process for all organizations in the construction industry. It is important for all construction organizations to record, model and formalize claims related processes in order to achieve effective and efficient claims management. The development and application of process reference models can assist organizations in the development of effective processes in all functions, including claims management, but there is no such reference model available in the concurrent literature. This paper describes the development of such a model as well as the model's building blocks in an attempt to cover the literature gap identified. The work conducted was based on the methodology developed through a research program related to the development of reference models in supply chains, after that methodology was adapted appropriately. The process reference model developed was validated through a semi-structured interview process with industry experts. The main characteristics of the reference model can be summarized as:

- It is the only available process reference model describing the claims management processes for contracting organizations in the construction industry.
- The reference model provides a process for contract termination management that is innovative as there are no such processes described in the literature.
- The reference model provides a process describing the performance measurement process through the use of KPIs.

- The reference model describes the execution of strategic processes related to the long-term planning of claims management.
- The reference model adopts a supply chain management view that does not only describe intra-organizational processes, but describes the interactions of the claims management processes with other parties of the supply chain.
- The software selected for the development of the reference model is free and accessible to anyone, making the adoption of the processes easy for anyone.

Discussion

Claims are mainly a result of human factor influencing the construction process. They have a disruptive effect on projects and are very unpleasant for the implicated parties (Ho and Liu 2004). Even though they may start against a single party, they tend to affect more than one party (Chester and Hendrickson 2005) and spread along the projects' supply chain. Contractors still follow tactics of global claims; they do not plan ahead and expect that through negotiation with clients their inefficiencies will be hidden. The temporary nature of construction supply chains does not allow for these relationships to be treated and future cooperation is rife with prejudice. Techniques of combatting adversities that are used in other project-based industries, such as the one proposed by Mysore et al. (2016) for the information and communications technology (ICT) industry, could prove very helpful. Adopting a holistic strategy for the entire supply chain should improve efficiency of contractors, improve the relationships between supply chain actors and hopefully lead to a less stressful claims process. A good strategy would be to include claim management processes in contracts in order to standardize this function along the supply chain of the project.

As Enshassi et al. (2009) underline, it is important that claim management processes have to be clear and understandable by all parties, especially the contractor. Process models existing in the literature have specific characteristics. Moura and Teixeira (2007) and Kululanga et al. (2001) present a rather simplified process model for claims management with the only difference between the models being that the latter authors include a total quality management related task in order to highlight the importance of improving the claims management process in each company. These processes, however simplistic, provided the backbone to the model presented in this paper. Banwo et al. (2015) added the time parameter to the claims process through the phases in which they are introduced. Additionally, their model includes checks between phases and it is the first to introduce invalid claims to the process. This is adopted in the proposed model with the belief that this feature helps to reduce the load of processing this type of claims from the relative department in a company. Abdul-Malak et al. (2002) describe a process for claims management that is very factual and analytical. It differs from the previous models in another aspect too; it is IT (information technology) oriented. The processes they have described are a guideline to handling the software that they have developed for claims management. This orientation is crucial in order to identify low- and high-level processes, find where gateways are positioned in the processes and detail the company processes related to claims. All models mentioned in the literature have their weaknesses and strengths. The resulting model of this research effort retains as much strength as possible and attempts to resolve as many weaknesses as possible. This results in a process with unique characteristics. The reference model and its particular processes described in this paper provide the reader with a unique holistic tool for claims management. The claims management literature lacks such an approach. In addition to the claims management process, a contract cancellation management process is proposed. Contract cancellations may lead to claims or derive from unresolved claims. Contract cancellations have not been studied previously and the process provided in this model is one of its innovative characteristics. Contract cancellations and their management have to receive their place in the spotlight of the claims management literature as their impact on the project supply chain is too large to ignore. Furthermore, a performance measurement process is proposed – that builds on the identification – by Kululanga et al. (2001), of a need for performance measurement and improvement of intra-organizational processes and their interface with the company's environment. Users may select any measuring method that they feel is best suited to their needs. It is proposed that some of the performance indicators should be common, or at least shared, with selected supply chain parties in order to allow for better cooperation and assist the uniform development of future relationships with these parties. Another innovation of the proposed reference model is the development of strategic processes that describe the planning stages for developing a concise claims and contract cancellation management strategy. The existence of such strategies can provide managers with tools and guidelines that allow faster and more effective decision-making. These processes, based on the literature, were enhanced with information that was not previously documented (to the authors knowledge) and provide a better overview of industry practices. The reference

model builds on the work of the earlier process models but takes a whole new perspective to claims management. It views claims from a supply chain standpoint. Furthermore, it is not a standalone set of processes, but rather it is a part of a set of construction supply chain functions that interact with each other by providing input or other information to each of the other functions. These transactions will ensure that key processes in the company work in harmony, thus enhancing efficiency. What was interesting about the interviews was that both interviewees, despite working in different countries, agreed that the processes described in this paper applied to both markets. This may imply that the reference model can be applied as a reference model, not only in a single company, but along the entire project supply chain. Before the application of such a model along the entire supply chain of a project though, the company has to make sure it has the managerial capacity to implement it successfully. Starting by intra-company processes, it should realize its own level of readiness. Lockamy III and McCormack (2004) present a thorough process discovery guide that will support the adoption of process reference models. Finally, the selection of a software tool that can support the modelling process is a difficult decision as there are many options available in the market and the criteria for each organization differ. The reference model described in this paper is developed using a free modelling tool that can be used by any organization and this is one of its strengths as it is made available to virtually any manager looking to improve the claims management process.

Process reference models offer their users a common roadmap for their process management without dictating how each low-level task should be executed or each detail should be handled. The benefits of such models include the flexibility to adapt low-level processes to existing needs and systems in each company and the provision of a common ground for navigating between inter-company processes. The process reference model presented here has the advantage that it retains a certain level of abstraction, thus allowing it to bind well with any existing enterprise resource planning (ERP) or other IT solutions in any construction company or provide a framework for the adoption of such systems (Pajk et al. 2011).

Conclusions

Claims are highly affected by human behaviour. Omissions and errors in contracts or projects may become the playground for managers with opportunistic behaviour. This behaviour harms the relationships between the two actors, disrupts the supply chain of the project, and in the end, prolongs the image of construction as a problematic industry. Claims will always accompany construction projects, but the way they are handled will make the difference. A win–win culture must be promoted and, as is happening in other industries, the profit margins for the industry as a whole will grow. Competition in the industry will eventually, as in other industries, move from completion between companies to competition between supply chains. The construction industry supply chain boundaries are different to other industries and so is the final product. Process models are only a tool in order to achieve this coveted consensus. There are a few process models in the literature, but none offers a view on how the claims management process interacts with the other parties. The reference model presented in this paper treats claims management in an integrated way regarding the supply chain actors, not only focusing on the convulsive handling of a claim per se, but proposing a reference model that proactively, through the development of strategic processes, and reactively, through the development of operational processes, manages any such disruptive event. This is an innovative reference model that builds on existing models in the literature, enhances these models with previously undocumented practices and connects claims to supply chain management in construction projects.

The reference model presented in this paper builds upon the existing literature and the models available. It avoids a rather simplistic take on the claims process, such as the one adopted by other available models, but at the same time maintains a certain level of abstraction. Unlike other claims management models in the literature, this model examines how contract terminations implicate the claims processes. Total quality management is not only advised in this model but supported fully with an exclusive related process. The innovation present in this reference model is the holistic examination of claims. The processes described on the one hand mainly focus on the contractor, but on the other hand, present a tuple of interactions that take place between the contractor and other supply chain parties.

In practice, the proposed reference model can provide a guideline for handling claims in actual projects. The processes described can be used as contractual obligations that can be asserted on the implicated parties by the contractor. This does not necessarily carry an oppressive hue, but more likely can provide a tool for process standardization across the construction industry. This mainly benefits the contractor because of the amount of parties it comes in contact with during a construction project, but it also provides a knowledge transfer opportunity for small and medium companies that do not have the

internal capacity to manage organization knowledge on their own.

Despite the anticipated benefits of the use of this reference model, there are still steps to be taken in the direction of streamlined claims management in construction. The contractor may be the key player in the construction supply chain, but the clients are the ones generating demand and a similar reference model focusing on their side should be developed. Suppliers, mainly small and medium companies that represent the majority of the construction industry, provide the link between construction contractors and other industries. The effect of claims on the suppliers and the interactions between suppliers and the supply chains of other industries should be modelled in order to provide a complete reference model for the majority of the construction industry. Finally, process reference models can provide guidelines to implementation of IT systems. The effects of the application of the specific reference model on decisions to adopt IT systems that can support the communication of construction supply chain parties have to be examined.

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