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Construction project management through building contracts, a South African perspective

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Abstract

This article reviews construction project management and building contracts in South Africa. It introduces general information and findings on the topic, forming part of a broader in-depth study, which proves difficult to encapsulate in one single article. The novice might perceive contract management, project management, and construction management to be the same concept. To clarify these concepts, the evolution of construction contracts and project management was studied to identify possible similarities between these concepts. This article commences with a brief history prior to a schematic analysis of the general characteristics of construction contracts and project management. It investigates the application of these concepts within South Africa and compares the general structure of the main contracts used within South Africa. This general investigation clearly shows that the standard conditions of contracts used in South Africa have similar structures to the main construction project management knowledge areas recognised by the Project Management Institute (PMI). The article also reviews the four general conditions of contracts endorsed by the Construction Industry Development Board (CIDB) in South Africa and investigates the general clauses and themes of these contracts. The Construction Contract should consider all the Project Life-Cycle (PLC) stages. The Construction Contract should further be regarded as the Project Implementation Plan (PIP), on which the control procedures during construction are based. With the understanding of the evolution of the two streams (contracts and management), their relevance, goal, dependencies and responsibilities may be understood better. This may enhance the

professional manner in which the management of the entire Project Life-Cycle (PLC) is implemented and approached.

Keywords: Agreement, construction, contract(s), general conditions, project management, project life cycle

Abstrak

Die artikel beskou konstruksieprojekbestuur en boukontrakte in Suid-Afrika. Dit stel algemene inligting en resultate voor oor die onderwerp, wat deel uitmaak van 'n wyer indiepte studie, wat moeilik is om in een enkele artikel te vervat. Die beginner kan soms kontrakbestuur, projekbestuur en konstruksiebestuur as dieselfde konsep beskou. Om hierdie konsepte te verduidelik, is die evolusie van konstruksiekontrakte projekbestuur bestudeer om moontlike ooreenkomste te identifiseer. Hierdie artikel begin met 'n kort geskiedenis voor 'n skematiese analise van die algemene kenmerke van konstruksiekontrakte en projekbestuur. Die artikel ondersoek die toepassing van hierdie begrippe binne Suid-Afrika en vergelyk die algemene struktuur van die hoofkontrakte wat in Suid-Afrika gebruik is met mekaar. Uit hierdie algemene ondersoek is dit duidelik dat die standaardvoorwaardes van kontrakte wat in Suid-Afrika gebruik word, baie soortgelyke strukture het in vergelyking met die belangrikste konstruksieprojekbestuursareas soos erken deur die Projekbestuursinstituut (PMI). Die artikel beskou die vier kontrakte wat deur die Konstruksiebedryf-ontwikkelingsraad (CIDB) in Suid-Afrika onderskryf is en ondersoek die algemene klousules en temas van hierdie kontrakte. Die konstruksie kontrak moet al die Projek Lewensiklus (PLC) stadiums in ag neem. Die Konstruksie Kontrak moet verder gesien word as die Projek Implementeringsplan (PIP), waarmee beheer tydens konstruksie toegepas moet word. Met dié begrip van die evolusie van die twee strome (kontrakte en bestuur), kan hul relevansie, doel en afhanklikhede beter verstaan word. Dit kan die professionele manier waarop die totale Projek Lewensiklus (PLC) geïmplementeer en benader word, verbeter.

Sleutelwoorde: Algemene voorwaardes, konstruksie, kontrakte, ooreenkoms, projekbestuur, projek lewensiklus

1. Introduction

The subsequent literature review focuses on the four main construction conditions of contracts currently utilised in South Africa and their relationship with respect to the Project Management Knowledge Areas (PMKA), as recognised by the Project Management Institute (PMI). It is anticipated that this may be the first in a series of articles on the relationship between project and construction management towards construction agreements.

Many different building contracts could be identified within the construction industry, and they are continuously being adjusted and revised to stay relevant in an ever-changing built environment (Putlitz, 2013). The authors of the majority of standard conditions of contracts related to construction projects suggest that their contract conditions allow for the best project management principles and practices for certain projects (NEC, 2015: online; JBCC, 2014: 1).

This article is limited to a general overview of building conditions of contracts (hereafter referred to as contracts or construction contracts) and project management principles for building projects in South Africa.

Each construction project will dictate the type of agreement that is needed for the specific project (CIDB, 2005: 1-2). It is generally agreed in the construction environment that a successfully completed construction project will comply with the specified quality and will be completed within the allowed time and budget (Cooke & Williams, 2009: 23; Knipe, Van der Waldt, Van Niekerk, Burger & Nell, 2002: 18; Winch, 2010: 71), as agreed upon prior to the commencement of the project.

Loots (1995: 13) highlights that construction law focuses on establishing and administering the contract. The relationships between engineer (agent) and the employer; the contractor and the employer; the contractor and the subcontractors are all intricate and influential towards the success of the project. Managing a building project requires project management knowledge and a diverse range of skills and abilities such as technical, general, leadership and entrepreneurial management skills (Burke & Barron 2007: 25). During the project life cycle (PLC), the implementation phase of a construction project, has a larger time, cost and scope implication, with the result of a higher risk factor than the other phases of the project (Burke, 2010: 88; PMI, 2013: 40). It was observed that, in some cases, the professional team might be blamed for not complying with the conditions of the contract, resulting in unsuccessful completion of projects (Finsen, 2005: 215; Emmitt & Gorse, 2003: 165).

To determine the potential of the construction contract as a means to manage the construction project, it was necessary to find a relationship between the construction contracts most commonly used in South Africa and the project management knowledge areas as defined by the PMI. The general structure of these main contracts was analysed and grouped based on defined main themes and clauses. To place the construction contract's position within the PLC, a comparison was made between the whole PLC of a construction project and the contract life cycle (construction contract requirements). Finding similarities will highlight the construction contract's ability to act as a management tool in an experienced manager's hands. The construction contract's ability to assist in the management of the project could be a valuable realisation for all parties involved with the construction contract and could, therefore, make an important contribution to the construction industry.

1.1 Brief historical overview

In Mesopotamia, unearthed clay tablets show written contracts by the Sumerians, with some set wages for workers and administrative personnel tending to fields, and so on (Phillips, 1999: 3). Between 2284 and 1570 B.C., near the Valley of the Kings in Egypt, painted limestone shards have been found, and show daily work records, administrators, craftsmen, artists and labourers housed in the area to design, excavate, construct, and decorate the royal tombs (Phillips, 1999: 3). It can be concluded from this, especially the presence of daily work records and administrators, that there were also project management principles at that time. Knipe *et al.* (2002: 3) established that the origins of project management can be traced back to the construction of the Pyramids as well as the Great Wall of China.

Standard contract conditions have been in use in South Africa since 1904, but it was only in the late 1920s that an assertive effort was made to enforce such conditions for the building industry (Malherbe & Lipshitz, 1979: 1). At that time, prominence was given to a document published in Britain in 1928 named *Agreement and schedule of conditions of building contracts* (Malherbe & Lipshitz, 1979: 1). This ultimately led to a system of building in South Africa that closely followed the system in Great Britain at the time. Currently, this basic system has hardly changed; where it has changed, it has been done so to accommodate itself to those factors influenced by the South African economy that do not manifest themselves in the British economy (Mills, 1982: 30).

Project management, on the other hand, only started to formalise in the 1930s in the United States of America, with risk analysis and scheduling in the 1950s (Knipe *et al.*, 2002: 3-4). It is interesting to note that the Empire State Building was completed in 1931 (the tallest building in the world at the time) in the early days of formalising what we refer to nowadays as 'project management'. That amounts to a construction period of 13 months (Berman, 2003). It was, however, only in the 1990s that project management became popular in the South African public sector (Knipe *et al.*, 2002: 3-4). The traditional system in South Africa fragmented the building industry by separating the design phase from the construction phase. This has, over the years, led to an "arm's length" type of contract that is "ingeniously arranged" between the owner and the contractor with the design team acting as the agent of the owner and the contract is worded in such a way that the contractor is "sure to have to take responsibility for almost any setback" (Mills, 1982: 66). Project management has thus developed to meet the need that has arisen to coordinate this

fragmentation of the design team. A recent development has been the separate appointment of professional project managers by owners (employers), with the object of selecting the best experienced project team, including contractors, architects, quantity surveyors, consulting engineers, principle agents, legal advisers, subcontractors, and so on (McKenzie, 2014: 1-2). In South Africa, this project team is responsible for choosing the contract arrangement (Van der Merwe, Van Huyssteen, Reinecke, Lubbe & Lotz, 1993: 13).

In the year 2000, a series of acts were introduced to govern the built environment. The Council for the Built Environment Act (No. 43 of 2000), in particular, is the overarching council for all the regulating professional councils found in the built environment (Maritz & Siglé, 2016: 4; South Africa, 2000b: 40). As part of this series of acts, the Construction Industry Development Board (CIDB) Act No. 38 of 2000 and its Regulations established the CIDB, which promulgates the standardisation of the construction contracts used in South Africa (South Africa, 2000a: 8).

2. Construction contracts in South Africa

The construction contract, in its simplest form, is an agreement between two parties stipulating the responsibilities of both parties for the execution of a specific activity (Finsen, 2005: 2). For example, a building will be erected by the contractor in exchange for a reasonable compensation by the employer (or client). The construction contract usually takes the form of an offer and acceptance, based on reasonable information available at the time of the tender or bidding (also known as the procurement process) (Finsen 2005: 1; Malherbe & Lipshitz, 1979: 80; McKenzie, 2014: 1).

When considering common law of contracts and Roman-Dutch law (as used in South Africa), the building contract could be categorised as a letting-and-hiring contract (McKenzie, 2014: 1) (in Latin referred to as *locatio conductio operis*). The building contract could be viewed as an essential tool for organising the relationships between the different parties involved in construction companies (Othman & Harinarain, 2009). The relationship between parties may become complex. In order to gain a similar understanding of concepts, an evaluation of the wording used in the signed building contract may assist in analysing the initial intention of the parties involved (Loots, 1995: 38-39).

Building contracts have also evolved over the years to include the clauses necessary to make them work (McKenzie, 2014: 1). Part of the

evolution of standard form contracts is the recognition that different categories of construction contracts have different requirements. Therefore, the different categories of contracts offer different degrees of flexibility, levels of incentive and different levels of risk to the parties (Loots, 1995: 89). Thompson introduces the characteristics of the four different categories of construction contracts used in South Africa, as illustrated in Figure 1 (Loots, 1995: 90).

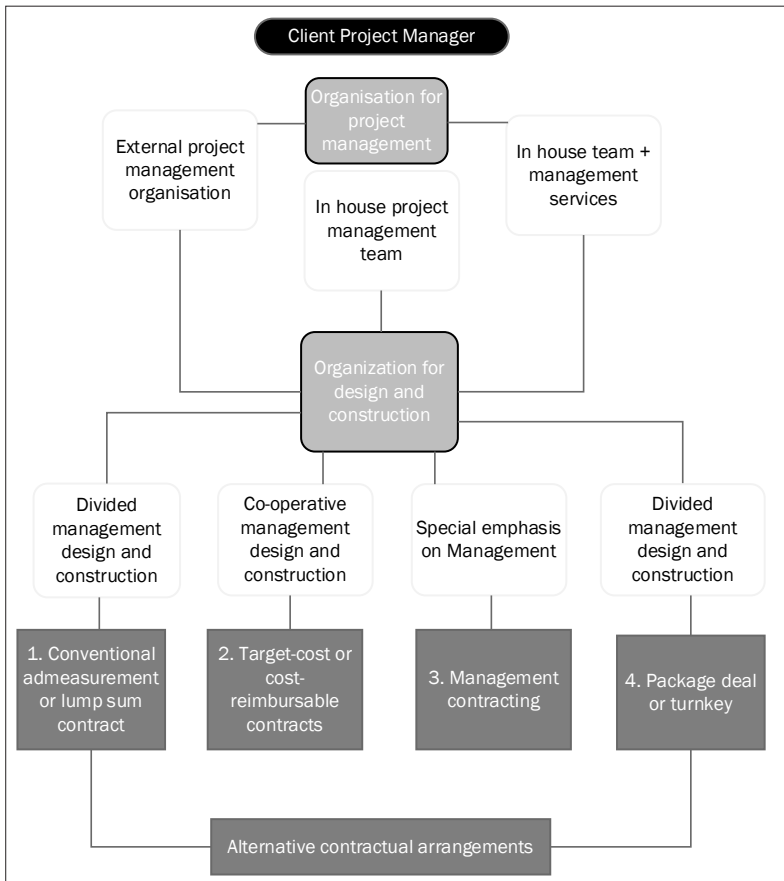


Figure 1: Characteristics of different categories of construction contracts
Source: Loots, 1995: 90

Conventional admeasurement or lump sum contracts (1) include admeasure contracts, such as contracts with bills of quantities, contracts with provisional bills of quantities, and so on. Thus,

contracts with some kind of quantifiable costs, on which the contracts are based, and usually with an offer and acceptance (Loots, 1995: 91-149). Target-cost or cost-reimbursable contracts (2): Loots (1995: 142) divides this type of contract into three separate contracts, distinguishing between the incentives and cost limitation. With these type of contracts, the cost is uncertain when the contract is signed. The management of contracting (3) is an arrangement where the employer appoints an external organisation to manage and co-ordinate the design and construction of a project. The management contractor becomes part of the employer's team as a consultant to the employer on the construction processes. The contractor advises the employer on the construction processes and the employer is, therefore, more involved through his/her project manager (Loots, 1995: 147,148). Package deal or turnkey contracts (4) provide a one-stop service to the client. The appointed contractor/consultant is responsible for the design and construction of the project. The term 'package' usually refers to commercial projects, design-and-build to the construction/renovation industries, and the turnkey project usually refers to engineering projects (Maritz & Siglé, 2010: 11).

For the purpose of this study, the search will be limited to conventional admeasurement or lump sum contracts only and the specific conditions of contract used for the study.

In South Africa, the project team remains responsible for choosing the contract arrangement (Van der Merwe *et al.*, 1993: 13). It is important to follow a contract strategy where the project team knows the differences and characteristics of the main contracts to choose from. Loots (1995: 143) lists the main differences between the characteristics in the four main contract categories as follows:

- roles of the parties;
- emphasis on management;
- method of payment;
- allocation of risk, and
- nature of the work.

"Whilst the ideal of standardisation on one system of standard forms of contract for all engineering and construction works in South Africa is, probably, just as illogical as it is for each employer to have its own form of contract; a balance has to be found between these two extremes" (CIDB, 2005: 1). To find a balance, the number of forms of contract in use in South Africa should be reduced based on standardisation and documents capable of catering for a wide range of client

requirements (CIDB, 2005: 2). Therefore, the Best Practice Guideline #C2, set out by the CIDB (2005: 2), recommends and supports four standard conditions of contract for the built environment in South Africa, which are privately owned by independent organisations. These suites of conditions of contract suites are:

- JBCC – Joint Building Contracts Committee;
- GCC – General Conditions of Contract for Construction Works;
- NEC – New Engineering Contract, and
- FIDIC – The Fédération Internationale des Ingénieurs-Conseils (CIDB, 2015: 3-4; Vosloo & Maritz, 2005: 48-54).

FIDIC, NEC and GCC are forms of contract that are generally used on all types of engineering and construction contracts. The JBCC is, however, mostly confined to building works. The FIDIC, NEC and JBCC series of documents contain short versions of engineering and construction works contracts. The four series of documents collectively cover the commonly encountered contracting strategies that are currently being pursued internationally (CIDB, 2005: 2).

Table 1 illustrates the latest research done by the CIDB on the construction industry and shows the percentage usage of the four standard conditions of contract for different project types.

Table 1: Type of contract used for different project types 2014

Project type	% Contract document type usage for each project type					Total (%)
	GCC	NEC	JBCC	FIDIC	Other	
Residential building	20	-	68	8	4	100
Non-residential building	13	1	83	0	3	100
Civil works	76	4	6	10	4	100
Mechanical works	27	13	10	23	27	100
Electrical works	27	20	29	18	6	100
Special works	31	6	44	13	6	100
% Projects with contract document significantly amended	31	36	24	33	18	

Source: Marx, 2014: 16

Overall, the JBCC suite of contracts was utilised the most, but it was specifically popular to use for residential and non-residential building projects. The GCC suite of contracts was the most preferred to use for

civil work contracts. Although the NEC and FIDIC suites of contracts were less preferred, all these document types have been used on building projects previously.

Considering that the NEC, JBCC and FIDIC conditions of contracts comprise different individual contracts, the research narrowed the specific suite of contracts down (CIDB, 2005: 2-11) to Conventional Admeasurement or Lump Sum contracts (category 1) in Figure 1, which, together with the Best Practice Guideline #C2, determined the following specific contracts to be used further in the study (CIDB, 2005: 14):

- General Conditions of Contract for Construction Works (GCC);
- NEC Engineering and Construction Contract (ECC) (hereafter referred to as NEC);
- JBCC Principal Building Agreement (PBA); (hereafter referred to as JBCC), and
- Conditions of Contract for Construction (Red Book) (hereafter referred to as FIDIC).

In order to find a relationship between construction contracts and construction project management, the general structure of these main contracts was analysed and tabulated under the categories of main themes and clauses. Table 2 introduces the main themes and clauses.

Table 2: Content comparison between the four main contracts

<i>FIDIC</i>	<i>GCC</i>	<i>NEC</i>	<i>JBCC PBA</i>
<i>20 Main clauses</i>	<i>10 Main themes</i>	<i>9 Core clauses</i>	<i>7 Main themes</i>
1. General provisions	1. General	1. General	1. Interpretation (clauses 1-7)
2. The employer	2. Basis of contract	2. The contractor's main responsibilities	2. Insurance and security - Risks (clauses 8-11)
3. The engineer	3. Engineer	3. Time	3. Execution - Roles and responsibilities (clauses 12-17)
4. The contractor	4. Contractor's general obligations	4. Testing and defects	4. Completion (clauses 18-24)
5. Nominated subcontractors	5. Time-related matters	5. Payment	5. Payment (clauses 25-27)

FIDIC	GCC	NEC	JBCC PBA
20 Main clauses	10 Main themes	9 Core clauses	7 Main themes
6. Staff and Labour	6. Payment and related matters	6. Compensation events	6. Suspension and termination (clauses 28-29)
7. Plant, materials and workmanship	7. Quality and related matters	7. Title – pertaining to material and plant on site (to whom does it belong?)	7. Dispute resolution (clause 30)
8. Commencement, delays and suspension	8. Risks and related matters	8. Risks and insurance	
9. Test on completion	9. Termination of contract	9. Termination	
10. Employers taking over	10. Claims and disputes		
11. Defects liability		Supplementary schedule of option	
12. Measurement and evaluation		Main option clauses, with six options	
13. Variations and adjustments		Dispute resolution	
14. Contract price and payment		Secondary options clauses	
15. Termination by employer			
16. Suspension and termination by contractor			
17. Risk and responsibility			
18. Insurance			
19. Force majeure			
20. Claims, disputes and arbitration			

Source: FIDIC, 1999

Source: SAICE, 2015

Source: NEC, 2013a

Source: JBCC, 2014

McKenzie (2014: 175) highlights specific topics normally found in a construction contract. When these topics are compared to the structures of the identified contracts (Table 2), the following

most general contract themes are derived and will be used in the final comparison:

- general;
- roles and responsibilities;
- time-related items;
- payment (costs);
- quality;
- risks or change;
- termination, and
- claims and disputes.

These topics correspond to the general project management areas, discussed below.

3. Construction project management in South Africa

Project management is regulated by professional bodies. One such body is the Project Management Institute (PMI). The PMI (2013: 3) defines a project as a temporary undertaking to create a unique product, service or result. There is a definite beginning and end, but the impact may last much longer. Every project creates a unique service or result and can create:

- a product that can be either a component of another item or an end in itself – e.g., a building;
- a capability to perform a service – e.g., a business function to support productivity;
- an improvement in the existing product or service line – a Six Sigma project undertaken to reduce defects, or
- a result such as an outcome or document – e.g., a research project.

Lester expands on the definition by defining the purpose and the main differentiating factor to any other business or enterprise. Project management is concerned with the management of change instead of managing a continuum or business as usual. The main objectives of a project are to complete it on time, within budget, and to the required standard or quality (Lester, 2013: 1-2).

The PMI has published a knowledge guide known as the PMBOK guide that stipulates the key terms, concepts, facts, principles, and rules of project management areas. The ten generic Project Management Knowledge areas listed by the PMI (2013: 61) are:

1. Project Integration Management;
2. Project Scope Management;
3. Project Time Management;
4. Project Cost Management;
5. Project Quality Management;
6. Project Human Resources Management;
7. Project Communications Management;
8. Project Risk Management;
9. Project Procurement Management, and
10. Project Stakeholder Management.

In addition to the ten PMBOK knowledge areas that are generic, the PMI have identified four additional areas known as the *Construction Extension to the PMBOK* that are industry specific (PMI, 2003: ix). The purpose of the *Construction Extension* is to improve the efficiency and effectiveness of the management of construction projects. These areas are:

1. Safety Management;
2. Environmental Management;
3. Financial Management, and
4. Claims Management (PMI, 2015).

The Project and Construction Management Professions Act 48 of 2000 defines Construction Project Management as "... the management of projects within the Built Environment from conception to completion, including management of related professional services" (South Africa, 2011: 30). Every new construction project typically consists of a new team. The experience of each individual team player contributes to the success of the project. The project and the management thereof usually take place in an environment larger than the project itself. Kerzner (2003: 69-74) and Burke (2007: 28) state that all construction projects can be divided into phases of development. These phases are collectively known as the project life cycle (PLC) and contribute to better project control for project managers. The PLC can be captured in a methodology with a definite start and end. The items in between can, however, vary considerably (PMI, 2008:15). Burke (2003: 28) divides projects into the following four basic phases: concept, design, implementation, and closing. For the construction industry in South Africa, six phases are identified and set out by the South African Council for the Built Environment (CBE). These phases are inception, concept and

viability, design development, documentation and procurement, construction and close-out (CBE, n.d.: online).

The greatest effort is experienced during the implementation phase (construction phase) of a project. Effort gradually increases as the design of the project starts, and continues to increase steadily until tapering downwards as the projects nears completion (Burke, 2010: 88).

For the purpose of this article, Project Management and Construction Management will be referred to as Construction Project Management (CPM). With the main themes identified for CPM, the process of comparing the CPM and the construction contracts could be conducted.

4. The project life cycle

To understand how the contract fits into the project life cycle, it is important to show the integration between project phases, so that the relationship between the construction life cycle and the project life cycle is clearly understood. The Standard for Uniformity in Construction Procurement divides the procurement document into two distinct sections, namely the Tender Data and the Contract Data. These two sections culminate into an offer (on the Form of Offer and Acceptance) that is either accepted or rejected (CIDB, 2015: 15). Figure 2 is a simplification of the process and does not necessarily illustrate how much information has to be transferred during this process. The objective of Figure 2 is to illustrate how the procurement and contract formation fits into the PLC.

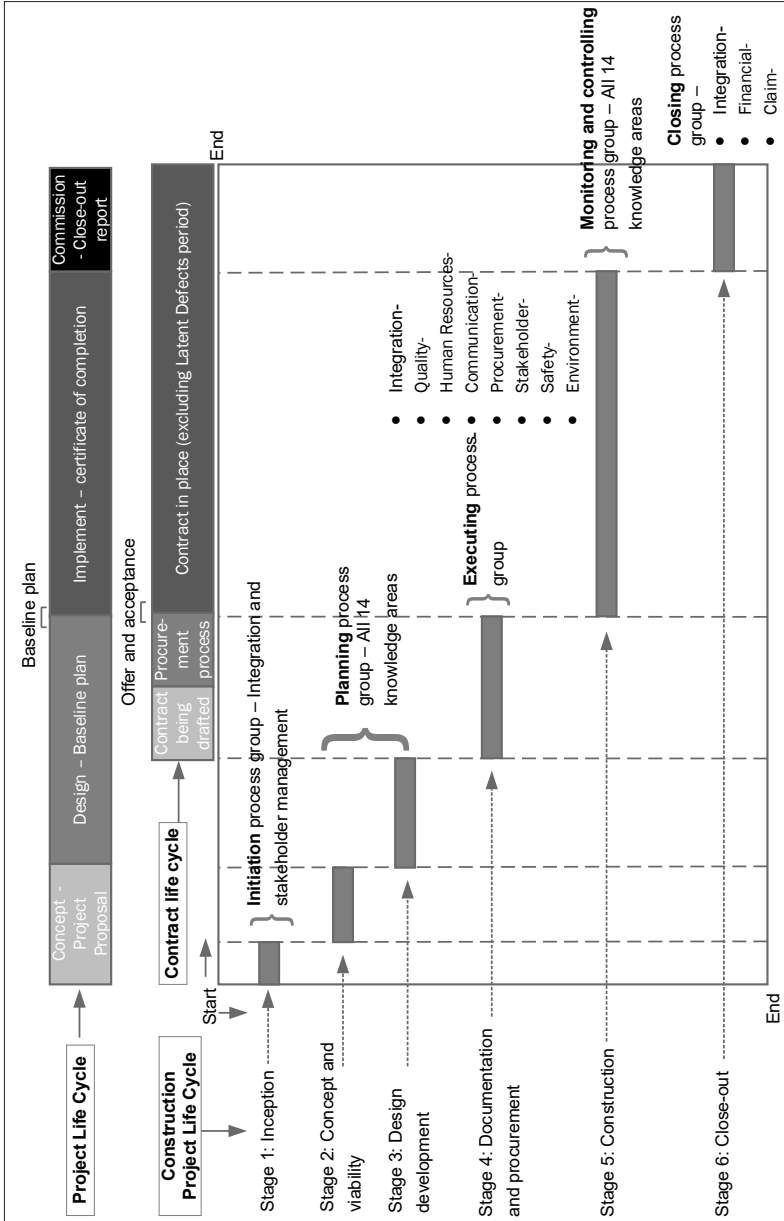


Figure 2: Integration between project phases (own diagram)

Sources: Adapted from CBE, n.d.: 4; Cooke & Williams, 2009: 81, 132; PMI, 2017: 25; PMI, 2007: 21; Burke, 2007: 48

Figure 2 illustrates the construction project life cycle, as described by the CBE on the left with the contract life cycle at the top (stages 1 to 6). The Project Management Processes and the applicable knowledge areas are illustrated adjacent the PLC stages and subsequently linked to the CPM life cycle (PMI, 2017: 25; PMI, 2007: 21). Taking this into account, the South African Council for the Construction Profession defined the six stages of the PLC (South Africa, 2011: 4-10).

Stage 1 (Inception) includes the procedure of agreement of the requirements and preferences of the client, assessing user needs and options, appointment of necessary consultants in establishing project brief, objectives, priorities, constraints, assumptions and strategies in consultation with the client. The PMI lists the Integration and stakeholder management knowledge area used during the ignition process.

Stages 2 and 3 (Concept and viability through to Design development) relate to planning process and to all 14 knowledge areas. Stage 2 is defined as the finalisation of the project concept and feasibility, and stage 3 as the management, co-ordination and integration of the detail design development process within the project scope, time, cost and quality parameters.

Stage 4 (Documentation and procurement) mostly involves the integration, quality, human resources, communication, procurement, stakeholder, safety and environment management planning processes. Even though the decision on the type of contract to use may be decided in the earlier stage, the documentation for the tender process is finalised during stage 4. The SACPCMP defines this stage as the process of establishing and implementing procurement strategies and procedures, including the preparation of necessary documentation, for effective and timeous execution of the project.

Stage 5 (Construction or implementation) may involve the finalisation of the contract and the appointment of the contractor. The main objectives of this stage include the management and administration of the construction contracts and processes, including the preparation and co-ordination of the necessary documentation to facilitate effective execution of the works. It further entails the monitoring and control of the project through the processes of all 14 knowledge areas.

Stage 6 (Close-out) involves the process groups of integration and financial claim management. Practically, this involves managing and administrating the project closeout, including preparation and co-ordination of the necessary documentation, in order to facilitate

the effective operation of the project. The specific outcomes of this stage may include Works Completion Certificate, Certificate of Final Completion, Record of all Meetings, and a Project Close-out Report depending on the contract used.

In project management, considering Burke (2007: 75), the "Baseline Plan" or "Project Plan" is a portfolio of documents and policies that outlines how to achieve the objectives of the project. Figure 2 illustrates when the contract comes into effect. By this time, a substantial portion of planning and design have been done. The construction contract thus has a very similar position within the PLC to the Project Plan or the Project Implementation Plan (PIP).

5. Similarities between construction contracts and project management

Figure 2 clarified the relationship between the PLC towards the construction contract and the CPM knowledge areas. To consider the similarities between construction contracts and construction project management, in general, this article first considers the entire PLC of a construction project compared to the contract life cycle (construction contract requirements). Secondly, a comparison is made between the project management knowledge areas and the construction contract themes.

Table 3 shows the similarities between the general themes of the construction contracts compared to the knowledge areas of both project management and construction management knowledge areas. It also displays the applicable construction life cycle stages in rectangular blocks next to each theme and knowledge area. This serves as a link between Figure 2, the PLC, contract themes and construction project management themes.

Table 3: Construction contract themes compared to project- and construction knowledge management areas

Contract themes		Project management knowledge areas		Construction management knowledge areas	
Contract themes	Basic requirements to address in the contract	Knowledge area	Basic aspects of area	Knowledge area	Basic aspects of area
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	An offer by the contractor		Collecting the requirements		
	Acceptance of the offer		Defining and documenting the stakeholder's needs		
			Subdividing project deliverables		
			Formalising the acceptance of the deliverables		
	Access to the works - who does the site belong to etc.		Monitoring the status of the project and the scope and managing changes.		
		<div style="display: flex; flex-direction: column; align-items: center;"> <div style="border: 1px solid black; width: 20px; height: 20px; margin-bottom: 2px;">1</div> <div style="border: 1px solid black; width: 20px; height: 20px; margin-bottom: 2px;">2</div> <div style="border: 1px solid black; width: 20px; height: 20px; margin-bottom: 2px;">3</div> <div style="border: 1px solid black; width: 20px; height: 20px; margin-bottom: 2px;">4</div> <div style="border: 1px solid black; width: 20px; height: 20px; margin-bottom: 2px;">5</div> <div style="border: 1px solid black; width: 20px; height: 20px; margin-bottom: 2px;">6</div> <p>Integration management</p> </div>	Ensure that the various elements of the project are properly identified, defined, combined, united and coordinated.		

Table 3 continued ...

Contract themes		Project management knowledge areas		Construction management knowledge areas	
Contract themes	Basic requirements to address in the contract	Knowledge area	Basic aspects of area	Knowledge area	Basic aspects of area
<div style="display: flex; flex-direction: column; align-items: center;"> <div style="border: 1px solid black; width: 20px; height: 20px; margin-bottom: 2px;">4</div> <div style="border: 1px solid black; width: 20px; height: 20px; margin-bottom: 2px;">5</div> <div style="border: 1px solid black; width: 20px; height: 20px;">6</div> </div> <p>Theme 2: Roles and responsibilities</p>	Who is responsible for the designs	<div style="display: flex; flex-direction: column; align-items: center;"> <div style="border: 1px solid black; width: 20px; height: 20px; margin-bottom: 2px;">2</div> <div style="border: 1px solid black; width: 20px; height: 20px; margin-bottom: 2px;">3</div> <div style="border: 1px solid black; width: 20px; height: 20px; margin-bottom: 2px;">4</div> <div style="border: 1px solid black; width: 20px; height: 20px;">5</div> </div> <p>Resource management</p> <div style="display: flex; flex-direction: column; align-items: center;"> <div style="border: 1px solid black; width: 20px; height: 20px; margin-bottom: 2px;">1</div> <div style="border: 1px solid black; width: 20px; height: 20px; margin-bottom: 2px;">2</div> <div style="border: 1px solid black; width: 20px; height: 20px;">3</div> </div> <p>Stakeholder management</p>	Defining how to estimate, acquire, manage and utilise physical and team resources	<div style="display: flex; flex-direction: column; align-items: center;"> <div style="border: 1px solid black; width: 20px; height: 20px; margin-bottom: 2px;">2</div> <div style="border: 1px solid black; width: 20px; height: 20px; margin-bottom: 2px;">3</div> <div style="border: 1px solid black; width: 20px; height: 20px; margin-bottom: 2px;">4</div> <div style="border: 1px solid black; width: 20px; height: 20px;">5</div> </div> <p>Time or Schedule (as per 2017 PMI) management</p>	<div style="display: flex; flex-direction: column; align-items: center;"> <div style="border: 1px solid black; width: 20px; height: 20px; margin-bottom: 2px;">2</div> <div style="border: 1px solid black; width: 20px; height: 20px; margin-bottom: 2px;">3</div> <div style="border: 1px solid black; width: 20px; height: 20px;">5</div> </div>
	Who is the employer/client's agents and what is their obligations?		The process of estimating team resources and the type and quantities of materials, equipment and supplies required		
	Site representation requirements of parties		Acquisition of the resources		
	Assignment		Putting the project team in place		
	Setting out of the works		Manage project team		
Assignment	Managing the team				
Sub-contractor arrangements	Identify stakeholders				
	Plan stakeholder management				
	Manage and control stakeholder engagement				
<div style="display: flex; flex-direction: column; align-items: center;"> <div style="border: 1px solid black; width: 20px; height: 20px; margin-bottom: 2px;">4</div> <div style="border: 1px solid black; width: 20px; height: 20px; margin-bottom: 2px;">5</div> <div style="border: 1px solid black; width: 20px; height: 20px;">6</div> </div> <p>Theme 3: Time related items</p>	Practical, works and final completion - wording dependant on contract	Plan, develop and control the project schedule	<div style="display: flex; flex-direction: column; align-items: center;"> <div style="border: 1px solid black; width: 20px; height: 20px; margin-bottom: 2px;">2</div> <div style="border: 1px solid black; width: 20px; height: 20px; margin-bottom: 2px;">3</div> <div style="border: 1px solid black; width: 20px; height: 20px;">5</div> </div>		
	Defects liability periods	Identify and documenting relationships among activities			
	Sectional completion of the works	Sequence Activities			
	Revision of contract periods/dates	Estimate Activity Durations			
		Analysing activity sequences, durations, resource requirements and schedule constraints			
	Controlling the schedule				



Table 3 continued ...

Contract themes		Project management knowledge areas		Construction management knowledge areas	
Contract themes	Basic requirements to address in the contract	Knowledge area	Basic aspects of area	Knowledge area	Basic aspects of area
<div style="display: flex; justify-content: space-between;"> 4 5 6 </div> Theme 4: Payment	Interim payments (payment during project period)	<div style="display: flex; justify-content: space-between;"> 2 3 5 </div> Cost management	Defining how the project costs will be estimated, budgeted, managed monitored and controlled	<div style="display: flex; justify-content: space-between;"> 5 6 </div> Financial management	It includes the processes to acquire and manage financial resources on the project
	Adjustments and variation orders		Estimating the costs		In contracts to cost management - it is more concerned with revenue sources and mentoring nest cash flows for the construction project
	Recovery of expenses by either parties		Establishing the cost baseline		Management of day-to-day costs
	Final Account		Controlling the cost against the baseline		
	Within supplementary documentation to the contract				
<div style="display: flex; justify-content: space-between;"> 4 5 6 </div> Theme 5: Quality	Testing and commissioning	<div style="display: flex; justify-content: space-between;"> 2 3 4 5 </div> Quality management	Development and implementation of a quality management system with regard to planning, managing and controlling		
	Specifications				

Table 3 continued ...

Contract themes		Project management knowledge areas		Construction management knowledge areas	
Contract themes	Basic requirements to address in the contract	Knowledge area	Basic aspects of area	Knowledge area	Basic aspects of area
4 5 6 Theme 6: Risks	Work, Risk	2 3 5 Risk management	Planning, identification, analysis, response planning, response implementation and monitoring risk on the project are all processes involved in risk management	4 5 Safety management	Develop, executive and administer a safety plan to improve health and increase the safety on the project
	Indemnities				
	Insurances				
	Securities, guarantees etc.				Determine what impact the project will have on the environment.
5 6 Theme 7: Termination	By the employer or contractor and the rights related to default and disaster			4 5 Environmental management	Assure and control that the plan stays in the environmental standards
	Litigation, arbitration, adjudication, mediation etc.				
5 6 Theme 8: Claims and disputes	Cancellation by the Employer or contractor and the rights related to default and disaster			5 6 Claims management	Identify and quantify claims Set the correct input to prevent claims Set the correct claims resolution steps

Table 3 continued ...

Contract themes		Project management knowledge areas		Construction management knowledge areas	
Contract themes	Basic requirements to address in the contract	Knowledge area	Basic aspects of area	Knowledge area	Basic aspects of area
		 <p>Communication management</p>	<p>Presents the formal communication plan within the project management plan</p> <p>Plan, management and control communications during the project</p>		
		 <p>Procurement management</p>	<p>The processes necessary to acquire products, services, or results needed from outside</p>		

Sources: Versteir, 2006: 7; FIDIC, 1999; SAICE, 2015; NEC, 2013; JBCC, 2014

Source: PMI 2007: 119-179

When comparing the themes of the four main contracts against the main themes of construction project management, they are found to be very similar in nature. It is apparent that the Construction Agreement and the Construction Project Management knowledge areas have very similar themes or goals. However, a proper comparison proves difficult because of the different structures of each of the four standard conditions. An individual comparison of each of the standard contracts will be included in the anticipated forthcoming research.

On the basis of Table 3, the following general similarities could be highlighted.

Theme 1

The general theme of contracts generally relates to the scope and integration management knowledge areas. The document layout of all four of the standard contracts begins with an introduction, followed by general clauses. The general section of these contracts sets out how the contract should be read and interpreted. This is usually followed by a list of definitions. Communication arrangements are included throughout the contracts, although most of the communication arrangements are contained within the general theme. Procurement can also be linked to the general theme, although as shown above, it is contained outside the actual contract (FIDIC, 1999; SAICE, 2015; NEC, 2013; JBCC, 2014).

Theme 2

Roles and responsibilities relate to human resources and stakeholder management knowledge areas. By its nature, a contract can only be concluded by two people, one on each side of the obligation. More than one person may, however, represent either side or parties. Representation is a legal and not a contractual phenomenon. It occurs when one representative concludes a juristic act in such a manner that the legal consequences of the act belong to the principal (person being represented in the case of a construction contract, the employer, or the client). The basic requirement for representation is that the parties must disclose that they are representing the principal. Representation only occurs when the person or party has the authority to do so (Van der Merwe *et al.*, 1993: 168-178).

Theme 3

Time-related items in the contract correspond to time management as a knowledge area. According to the terms of most of the building contracts, it is the duty of the contractor to complete the building by a specified date. Where no such time has been specified, a reasonable time shall prevail. If the employer wants to claim damages, s/he will first have to place the contractor *in mora* (in delay or default) by means of a contract instruction, stipulating his/her default. The necessity for extension of time on the works can be brought about by the contractor's default, the client's default, or through factors outside the control of the two contracting parties. The employer's consultant/representative can also cause delays such as, for example, the late issue of drawings, and so on (McKenzie, 2014: 161-168).

Theme 4

The payment theme relates to the cost management knowledge area of PM and to the financial management of the CM knowledge area. McKenzie (2014: 201) notes that a building contract, in its purest form, is an "entire contract". This means that only through a contract is the contractor entitled to interim payments. However, the reversed implication of this is that, in the absence of special provisions, payment is due immediately after the work has been completed by the contractor. In like manner, payment for extras is due when completed. To understand the final account specifications in the contract, the construction project manager should clearly define how the project cost is estimated, budgeted, managed, monitored, and controlled.

Theme 5

Quality is also addressed by both the contract management themes and the PM knowledge areas. Building quality is attributed to three main components, namely design, materials, and workmanship (Malherbe & Lipshitz, 1979: 102). Design responsibility is defined in the contract and there may be areas where the subcontractor has to design certain specialist portions of the works. The source and supply are the responsibility of the contractor, except where it is supplied by the employer. Workmanship, however, always remains the responsibility of the contractor (Malherbe & Lipshitz, 1979: 106-120). As a project manager, the contractor should develop and implement a quality-management system with regard to planning, managing, and controlling the specifications as set out in the contract.

Theme 6

Risks management is similar to the contractual themes of managing risks and managing health and safety risks. The processes involved in risk management should address time, cost, resources, and environmental management (Loots, 1995: 261-269). Risks must be identified, quantified, and managed through a proper safety plan. The Construction Regulations (South Africa, 2014) emphasise risk identification during the design stage of the project, although these mainly focus on health and safety.

Theme 7

Termination is a theme that is not specifically related to any management knowledge areas (see point 8 below). However, it can be regarded as change, which has to be managed. Cancellation or termination can be caused by the default of one of the parties (employer or contractor) or by "no default" (Finsen, 2005: 195-210). Van der Merwe *et al.* (1993: 359-395) distinguish between three types of termination of obligations of the parties within a contract, namely:

- discharge by performance;
- termination by agreement, and
- termination by operation of the law.

Theme 8

Claims and Disputes, however, specifically relates to the CM knowledge area of Claims management. Construction contracts and their interpretation often lead to misinterpretation by one or both parties. This leads to potential disagreements concerning the rights and obligations of the parties and have been the cause of many claims and disputes. Clear contractual arrangements such as the impact of cancellations, litigation, arbitration, and so on should allow for construction managers not only to set the correct input to prevent claims, but also to set the correct claims resolution steps.

6. Conclusion

The evolution of construction contracts as well as project management in South Africa was studied to identify possible similarities between the general characteristics of construction contracts and project management principles. To determine the potential of the construction contract agreement as a means to manage the construction project, it was necessary to find a relationship between

the construction contracts most commonly used in South Africa and the project management knowledge areas as defined by the PMI.

A comparison between the entire PLC of a construction project and the contract life cycle (construction contract requirements) showed that the contract comes into effect only at the end of Stage 4: Documentation and procurement, and the start of Stage 5: Construction.

The four general conditions of contracts endorsed by the CIDB in South Africa were reviewed and the general clauses and themes of these contracts were investigated, resulting in the following general contract themes: general; roles and responsibilities; time-related items; payment (costs); quality; risks or change, and claims and disputes.

Compared to the main construction project management knowledge areas, these themes show that the controlling parameters of a construction project are identified through the main contracts used in South Africa. These controlling parameters include seven areas with particular similarity.

1. The **general** theme of contracts allows for preparation of the offer, which relates to the scope and integration management knowledge areas. These areas allow for preparing the project scope by ensuring that the various elements of the project are properly identified, defined, combined, unified and coordinated.
2. The **roles and responsibilities** of the project team are set out in the contract and this relates to human resources and stakeholder management knowledge areas, where the stakeholders and roles of the project team are management.
3. **Time**-related items in the contract for practical works and final completion depend on the wording of the contract. Such wording corresponds to time management as a knowledge area, where the project manager plans, develops and controls the project schedule.
4. The **payment** theme in the contract provides for interim payments, recovery of expenses, and the final account. This shows similarity both to Cost management as a knowledge area of PM, which defines how the project costs will be estimated, budgeted, managed, monitored, and controlled, and to Financial management of the CM knowledge area, which includes the processes to acquire and manage

financial resources on the project from a contractor's perspective.

5. **Quality** specifications in the contract provides for testing and commissioning, which shows similarity to the PM knowledge areas that include the development and implementation of a quality management system with regard to planning, managing, and controlling the project.
6. The contract specifies **risks** management do address work, indemnities, insurances, guarantees, and so on. It is similar to the PM area of managing risks, which includes all the processes involved in risk management on the project. It shows similarity both to the CM knowledge area of managing health and safety risks and to environmental risks, which includes a plan to improve health, increase the safety on the project, and limit the influence on the environment.
7. The contract provides for **Claims and Disputes** by setting the legal criteria for the rights related to default and disaster when either the employer or the contractor cancels the project. This shows similarity to the CM knowledge area of Claims management which identifies and quantifies claims, sets the correct steps to prevent claims, and specifies the correct claims resolution steps.

These similarities highlight the building contract's ability to act as a management tool in an experienced manager's hands (PIP). The comparison shows that the construction contract's ability to assist in the management of the project could be a valuable realisation for all parties involved in the construction contract and could, therefore, make an important contribution to the construction industry.

It is obvious that drawing up the building contract is not a simple task. The importance of involving an experienced construction project manager is key towards including the required construction management clauses during the development and selection of the contract agreement. The standard conditions of contract provide a guideline on which the construction project manager can build the contract. The construction contract should, therefore, consider all the Project Life-Cycle (PLC) stages. It should also be viewed as the Project Implementation Plan (PIP), that forms the basis for control procedures during construction. In understanding the evolution of the two streams (contracts and management), their relevance, goal, dependencies and responsibilities may be understood better and may enhance the professional manner in which the management of the entire Project Life-Cycle (PLC) is implemented and approached.

It is subsequently recommended that, in the short term, the four specific building contracts be investigated further, in order to investigate more fully the similarities and objectives of each contract.

In the medium to long term, it is recommended to investigate the need for an additional knowledge area to assist in the management of the amount of information to be transferred during the procurement and implementation stages of a construction project. Furthermore, how can the advent of BIM assist in the transfer of this information from design, through the procurement stage into construction and ultimately to the facilities manager?

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