A Framework for Improving Capabilities of Tanzanian Contracting Parties Practices through Adopting Three Philosophies: Lean, BPR and the Capability Maturity Model

Author: Yazidi H. B. Mwishwa, Mbeya University of Science and Technology, Tanzania
mwishwa@gmail.com

In Tanzania, construction industry is very slow in adapting technologies as well as the management philosophy. As such, it is plagued with problems associated with poor process management. It is normal for projects in the country to register huge time overrun, budget overrun that are associated with dissatisfaction quality and safety standards. More search of information suggests that the poor performance of these projects is due to incapability of the parties involved. This situation has prompted a number of researches with the aim of improving performance of individual party as well as the whole industry. This paper presents yet another effort towards improving performances of individual contracting party within the industry. Literature review about three emerged management techniques, namely: Lean, Business process reengineering (BPR) and the Capability Maturity Model (CMM) are reviewed and mapped into the Tanzanian construction industry context with the aim of synthesizing their potentials and fitment to typical local contracting parties’ problems. Concepts of lean and BPR have been embedded together to form L-BPR framework. In order for a developed L-BPR framework to be adequately adopted by the parties to improve performance, the CMM concepts were introduced making it a full framework with four elements, namely: (i) map process to understand it (ii) analyse processes to identify weaknesses (iii) establish the redesigned process and (iv) exercise CMM to enable unique party to change from a low to a high level of performance. As for this, local contracting parties should adapt a developed framework to improve own performance. The study is further, denoting that, its’ overall outputs have implications of use by majority contracting parties within the country, and, from developing countries.

Keywords: construction industry; contracting parties; BPR; lean; CMM

Introduction

Performance problems of the Tanzanian construction industry persist for a long time. In the post colonial period (i.e. from 1961 – 1980), construction projects were mainly executed by public institutions, notably, MECCO and NEDCO indicating the industry to be characterized by uncertainty availability of required resources, low productivity levels etc. (Blorklof, 1992). Compounding these results, in twenty years period i.e. from 1978 - 1998, one hundred thirty two [132] construction projects were completed at an average time overrun of 2.42 times the original planned duration and at cost overrun of 1.55 times the original project budget (Baradyana, 2000). Until recently (2013), projects’ execution yet perform below expectations (Mamiro and Kasuwi, 2005; Mawenya, 2011).

Since projects are accomplished by the contracting parties; thus, their poor performances are due to the characteristics of the parties involved, they are outlined as follow:

- Parties, especially SMEs lack formal organization structures; they adopt short term plans;
- Parties do not afford, or they adopt partial documentation processes;
- Projects occur geographically; thus, is difficult to collaborate due to low IT bases that exist;
Design and construction are separated causing fragmented services between parties;
- Parties have low financial bases enabling them to advance or run projects;
- Parties lack visions to innovate products; they fail to give customers what they need rapidly and in efficient way.

Due to these problems the construction industry’s regulators and other stakeholders initiated improvement efforts, such as: splitting projects into lots capable of been met by the local firms, establishing (CAF) contractors assistance fund to enable contractors advance and run projects and conducting routine training to practitioners, to mention but a few. Despite these efforts, performance problems still persist. Other initiatives are needed.

This paper proposes new ideas of incorporating three emerged management techniques – the Lean, BPR and CMM into the contracting parties’ operational practices to improve own performance capabilities. Before explaining this improvement methodology, it is necessary to define the three basic/useful terminologies (i) contracting parties’ capability – ability of a party to engage with the project’s roles (ii) L-BPR – lean concepts embedded with the BPR concepts to improve process of a project and (iii) CMM – a tool for enabling parties to accomplish L-BPR model.

Thus, the current study explores and identifies the contracting parties’ projects operative problems; denoting that, if performance problems and their sources of weaknesses can be identified/known by a firm at own sake, this knowledge would guide him in the redesign process. For each party to redesign the process, it would need to learn and adopt a CMM enabling in understanding of own processes’ characteristics, barriers, and motivations to change. This paper contributes into the knowledge by offering practitioners with a framework with four elements: (i) map processes to understand them (ii) analyze processes to identify weaknesses (iii) redesign the processes to set new direction and (iv) learn and adopt CMM to guide efforts towards a path to the new direction.

The paper is organized into five sections. Whereas section one presents background information, section two describes research methodology. Section three presents relevant literature review. Section four describes study finding and discussions that incorporate ideas for framework’s development. Finally, section five presents the concluding remarks.

**Methodology**

This research is based mainly on the critical review and synthesizes of the relevant literature. The performance problems of the local contracting parties are outlined to help parties understand traditional process performance. Since the traditional process afforded an ad-hoc process, then, lean concepts are chosen and used because of their offering systematic process focus (University of Kentucky, 1997). Lean emphasizes the scanning of the current process against the preceding and the succeeding ones to eliminate wastes. However, within lean ideas, a gap exists of limited systematic procedure for managing wastes (Hirano, 2009). As for this, BPR is built-in, to add on, the understanding of the process’s problem and, then, redesign the process making a L-BPR framework. Finally, the concepts of CMM are synthesized and proposed to help parties understand unique characteristics, barriers and motivations to adopt L-BPR framework.

**Reviewing of the literature**

Review work is divided into four parts, describing the: (i) unique problems of the contracting parties (ii) lean concepts (iii) BPR philosophy and (iv) CMM’s concepts. They are described as follow:

**Unique performance problems of the contracting parties**

Researchers for example Salewi (2003), Mamiro and Kasuwi (2005) and Mawenya (2011) outline
reasons that, generally, hinder the local construction industry’s performance improvement, they include:

- Some management of the construction firms prioritize and devote more efforts into social issues rather than capitalizing on project-support-capability issues;
- Some parties rely on the influential relationship businesses; rather than factual capability;
- Some project’s involvement parties give little avoidance to corruption related issues;
- When someone is a leader, no delegation, everything is attached to him/her;
- Parties afford ad-hoc processes, they do not: outline all inputs, outline the targeted outputs, standardize the method(s), and afford partial documentation, amongst others;
- Reactants to learn and benchmark process, they are overcome with a fear to try;
- Parties do not realize that improvement is not straight forward; rather, it deserves own efforts, targets, measurements and a worked feedback.

These problems can be summarized as parties inheriting the ad-hoc process; they have slow pace of changing own culture, and, put little efforts to adapt to the emerged technologies.

This study has views that understanding and fitting solutions to the aforementioned problems by a person other than the concerned contracting party, would resemble as the lost efforts. Importance is for own local party’s involved, to recognize and accept own performance weaknesses. The realization of own weaknesses would help them appreciate potentials of lean and BPR that analyze problems and fit them into feasible solutions. Lean principles are firstly, presented as follow.

**Lean concepts**

Lean philosophy originates from the so called Toyota Production System, focusing attention into making a process to be ‘leaner’. A lean process affords the use of less material, less human efforts, less capital/budget, less space, little/no defect, and avoids unnecessary movements and waiting. The ‘leaner’ aspects of a process place attention into adopting any technique possible to address, and, eliminate wastes (Stapleton et al., 2009; Hirano, 2009). Lean has a thrust of ‘do it right the first time’ focused on one to one confirmation, which concentrates on two levels of a process, namely: (i) at the macro process level that focuses on a complex scope of the company and (ii) at a micro process’s level that enables to evaluate tasks to their details levels (University of Kentucky, 1997). Within these two levels of process understanding, effort is to be focused to scan each process and link it with the preceding and the succeeding ones to understand and identify wastes. As for this an overall process/the organization would improve. Contracting parties may learn to benefit from two learn concepts; summarized as: (i) systematic scanning of processes and (ii) making a process learner by eliminating the wastes. Despite these two views, Hirano (2009) denoted a gap within lean philosophy of lacking appropriate procedure possible to eliminate wastes. The current study fills this gap by embedding BPR ideas into it; giving a full procedure to eliminate wastes. BPR tenets are described as follow.

**BPR philosophy**

BPR issues are widely discussed in literature. Its definitions, implementation steps, organizational elements, radical change issues, industrial use, success and failure factors amongst others are widely discussed (Stoica et al., 2004; Patel et al., 2005; Mansar and Reijers, 2007; Sturd, 2010; Haghhighat and Mohammadi, 2012). The use of the BPR philosophy has been found to be scarce in developing countries; and industry-wise, it is rarely adopted in the construction industries even though there is a high need for reducing cost and improving effectiveness. The requirement of BPR’s adoption in the local Tanzanian contracting practices is well searched in Mwishwa et al. (2012). Moreover, steps for BPR's
A Framework for Improving Capabilities of Tanzanian Contracting Parties Practices through Adopting Three Philosophies: Lean, BPR and the Capability Maturity Model

Implementation within the construction industry context are also presented in Mwishwa et al. (2013a) outlining the four tasks: map process to widen understanding, identify weaknesses, identify the desired process and establish strategies of improvement. This paper further evaluates the first three implementation steps, embedding them with lean concepts; this helps to focus improvement into one set of process: the current-preceding-succeeding processes. Scanning process in this way, all perspectives of the current process are analyzed, preceding process captures the fault's overlooked issues and the succeeding process captures the constructability aspect of a process. Thus, a set of current-preceding-succeeding process is embedded with the BPR implementation steps, see Table 3.1, this forms the L-BPR framework.

### Table 3.1: Embedment of Lean with the BPR concepts

<table>
<thead>
<tr>
<th>Lean</th>
<th>Gap</th>
<th>BPR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scan the current process, &amp; link it with the preceding and the succeeding processes in order to make a process ‘leaner’ (when sets of processes can be arranged in series, they would be improved in stages of three into one process)</td>
<td>No systematic way to eliminate waste, making a process leaner; this is offered by the BPR philosophy</td>
<td>Map process to understand it</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Analyze process to identify weaknesses</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Develop a redesigned process</td>
</tr>
</tbody>
</table>

Both lean and BPR philosophies have generated benefits to the users (Robinson and Ullah, 1996; Brown and Riley, 2000; Sokek and Jimmerson 2003; Forbes and Ahmed, 2011). The benefits range from improving quality, reducing operative-operation time and cost as well as the lead times, to mention but few.

While L-BPR framework is already been developed, it is felt that diverse local contracting parties may become reluctant-face difficulties to adopt it. As such, CMM concepts are introduced to enhance parties to adopt it. Concepts of CMM are described as follow.

### Capability maturity Model (CMM)

**Background to the CMM**

The CMM was developed by Software Engineering Institute (SEI) with the assistance from MITRE Corporation in 1989 to help organizations improve their processes (Humphrey cited in Paulk, 1997). The aim was to provide a method for assessing capability of software contractors to develop projects. Amongst other areas, the CMM is proved useful in the project management (Brooks, 2009) and Business Process Management (Jeston and Nels, 2006). According the Paulk et al. (1995), Kerzner, (2001) and Harmon, (2004), the CMM is performed in five steps, each step defines three issues of the parties, to determine: (i) own inherent characteristics (ii) barriers of shifting to the next level and (iii) opportunities to change. The five levels of the CMM for use by the parties to adopt L-BPR are presented.

**Five steps of CMM and their features**

1. **Level 1: initial (common language) level**

   Characteristics at which a contracting party would be assessing, that, in it:
   - no, or less support of middle management;
   - no attempt is already been made to recognize the benefits of a L-BPR;
   - management are worried about their power and authority;
   - It is difficult to predict performance;
   - decision making is based upon what is best interest of a decision maker than a firm as a whole;
   - successes depend on individual efforts;
   - it is yet to make serious effort to define L-BPR;
company operates in a functional basis approach;
- it is difficult to make commitments, etc.

Obstacles and, or the likely risks to shift to level 2:
Delaying to make shift decision to the second level exist within the party itself: management fear to lose their position; and, may says, it doesn’t apply here, or it won’t work here.

Motivations to shift to level 2
- use checklist characteristics mentioned above to assure if your firm dominate at this level or not;
- recognition of relief of moving away from these barriers;

2. Level 2: repetitive (common process) level

Characteristics
- Shows four issues, party (a) needs a L-BPR (b) recognizes those L-BPR's applicability (c) perceives their likely L-BPR's benefits, and (d) recognizes their changes;
- Organizational support: visible management support, management understanding L-BPR concepts, management feelings to incur costs of the changes;
- Management acceptance and commitment to change and affords helpful training;
- Growth: began to create lessons of L-BPR issues;
- Initial maturity phase: develop cost and schedule and their integration as well as control.
- L-BPR issues are defined, documented, practiced, trained, measured and enforced

Obstacles and/or the likely risks to shift to level 3:
Possible obstacles of the changes: resistance to new methodology – they may say; (i) the existing methods work well, (ii) belief that methodology needs rigid policies & procedures.

Motivations to shift to level 3:
Company assesses itself to identify that it falls on the features stated above, and then works contrary to them.

3. Level 3: Defined (singular methodology)

Characteristics
- Integrated processes: streamline multiple processes to encompass all other processes. Immature organizations might engage with multiple processes, e.g. risk management, project management; integrating them with the L-BPR;
- Cultural support: making a L-BPR a company culture;
- use checklists for accomplishments than developing rigid policies and procedures;
- Training and education: accept that realization of financial benefits come from trained workers.
- Behavioural excellence: recognition of behavioural differences
- Processes are documented, standardized and integrated into a set of standard processes.

Obstacles and/or the likely risks to shift to level 4:
Middle management resists accepting accountability; fragmented company culture, overemphasis on documentation.

Motivations to shift to level 4:
Party assess itself on achieving aspects of level three enabling it decide to shift to level four.

4. Level 4: Managed (benchmarking) level

Characteristics
- Establish centre of excellence: party commits to L-BPR across its operational areas.
- Quantitative benchmarking
- Qualitative benchmarking
Obstacles for shifting from level 4 to level 5:
Not involved here syndrome, does not apply to us, wrong industry to benchmark, fearful of what results will be found, resistance to change.

Motivations to shift to level 5:
Company may assess itself to achieve aspects of level four enabling it to shift to level five.

5. Level 5: Optimized (continuous improvement) level

Characteristics
Continuous process improvement is enabled by:
- feedback from the L-BPR’s adoption; and
- Piloting innovative ideas and technologies.

This study concurs with, and adheres with the views of Paulk et al. (1995) who suggest that significant issues for parties at all levels is to gain competencies of maturity by selecting, hiring, developing, and retaining people when implementing L-BPR model.

Findings and discussion (a framework’s development)

For any contracting party to improve performance, four issues are pointed out (i) understanding of generic performance problems of the industry (ii) the efforts an industry is putting to boost specific party’s performances (iii) understanding of own performance problems and (iv) the basics and potentials of management techniques such as lean, BPR and the CMM. To realize these issues, the current study presents a framework that constitutes four elements to guide each party improves own performance capabilities.

The four elements are depicted in Figure 4.1 and are described in sections 4.1 through 4.4.

Figure 4.1: Four use Steps by the contracting parties to improve own performance capabilities

The aim of mapping process is to understand process issues. Since contracting party engages with many processes, but many of them link the project processes, these can be decomposed into series of transformation processes, for example, preliminary design, schematic design, detail design, procurement etc. That is, in any time, if any one process is to be improved, this would be termed as a ‘current process. As such its preceding and the succeeding process would be identified and embedded as one set considered for assessment, Figure 4.2. Thus, all processes of a project would be approached in this way for improvement purposes.

Figure 4.2: Mapping three processes as one set
Figure 4.2 maps three processes into one set. While each process's decomposition (whether been it current, preceding or the succeeding process) provides the common features of the inputs, methods and outputs, some additional features are to be captured from the preceding and the succeeding processes. Within the preceding process, mapping helps to remind issues that might have been overlooked initially. In addition, within the current process, mapping helps to identify process operative issues likely to impact the succeeding process (constructability) issues. Therefore, when three processes are held as one set of a process, the five aspects can be critically addressed as follow: the inputs, methods, outputs, the likely overlooked operative issues and the impacting issues of the future process. This situation further denotes that, if these five issues are applied onto a chain of project processes, every process would improve, and, the whole organization. Thus, the study scans critically, the five aspects of a process to improve process.

**Analyze process to identify weaknesses**

The aim of process analysis is to extend views of a set of process (Figure 4.2) to broaden understanding, and thereby, identify weaknesses. Thus, process transformation issue is necessary. i.e. any process can be decomposed into sub-process or activities, but the importance is to enhance ability to understand the inputs, methods and outputs together with their boundaries (Figure 4.3). Whether, working at a process or at a sub-process or at an activity’s level, this level should be adequately named and described to provide clarity and the scopes of the works involved. For example, a ‘detail design’ can be described to involve specialized designers that engage with preparing complete sets of construction documents.

Within the inputs’ context; their types, categories, amount in numbers, availability etc. can be conceptualized and outlined. For example, in detail design, designers needed are architects, two in number, three civil engineers, etc. In addition, within the method(s) context, possible methods to conduct an activity are outlined, giving room for standardizing an optimal one. For example, in detail design, designers strike a balance between combinations of the traditional drawing boards with the CAD software because of the local facilities available. The choice of the optimal method is based on how it would be feasible. In addition, the outlining of the outputs allows mechanism to brainstorm about the possible results that is shared by a group involved. For example, within the detail design, expertise members agree about the standard and number of construction documents needed and when.

That been the case, when processes function within a series fashion, any operative issues likely to overlook within the preceding process would be captured within the current process stage, it will be captured by a tool called ‘PREMA’. Likewise, any future operative issues likely to impact the future process’s performance would be foreseen, making it possible to void reworking. This is captured by a tool termed as the PROA. Thus, fives tools named as the (i) inputs (ii) methods (iii) outputs (iv) PREMA and (v) PROA are outlined in Table 4.1 to aid the identification of process’s weaknesses.
Table 4.1: Five Tools of a process for use to identify weaknesses

<table>
<thead>
<tr>
<th>Five tools of a process</th>
<th>Desired aspects of a process</th>
<th>Process weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Naming</strong></td>
<td>Naming process and perceive their levels and the boundaries</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>-Is the process’s scope conceptualized on its clarity? Y/N</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>-If no, decompose it into sub-process or activities</td>
<td>-</td>
</tr>
<tr>
<td><strong>Description</strong></td>
<td>-Is it possible to conceptualize the boundaries of a process or sub-process or activities? Y/N, if no decompose a process</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>-Now, whether a process or sub-process that is well conceptualized, can I list all activities contained? Y/N</td>
<td>N</td>
</tr>
<tr>
<td><strong>Inputs</strong></td>
<td>Can I outline systematically the manpower categories of skills, knowledge, experience and their numbers? Y/N</td>
<td>N</td>
</tr>
<tr>
<td><strong>Manpower</strong></td>
<td>Can I outline equipments in types, operational outputs, sizes etc</td>
<td>N</td>
</tr>
<tr>
<td><strong>Equipment</strong></td>
<td>Can I define the channels of information: to whom, when, how etc? Y/N</td>
<td>N</td>
</tr>
<tr>
<td><strong>Information</strong></td>
<td>Can I outline materials in types, who supply, storage, use, availability, cost, quality? Y/N</td>
<td>N</td>
</tr>
<tr>
<td><strong>Material</strong></td>
<td>Can I outline possible methods available, coming into the standardized one? Y/N</td>
<td>N</td>
</tr>
<tr>
<td><strong>Technique(s)(method(s))</strong></td>
<td>Can I outline possible output and link it with the ability of resources to accomplish it? Y/N</td>
<td>N</td>
</tr>
<tr>
<td><strong>Outputs</strong></td>
<td>Within the current process (see Figure 4.2), do I use a checklist that captures any fault operational/activity of a previous process before it can be repeated? Y/N</td>
<td>N</td>
</tr>
<tr>
<td><strong>Preceding process issues</strong></td>
<td>Within the current process (see Figure 4.2), do I use a checklist that brainstorm and forecast the constructability of the activities/ methods of the succeeding process? Y/N</td>
<td>N</td>
</tr>
</tbody>
</table>

**Process redesign**

Redesign process depends on the results of the identified weaknesses. This phase has the overall aim of providing the management of a contracting party with a tool to improve own processes, and, if possible, initiating large scale improvement. A redesign process phase
provides aspects for tackling and managing process as a whole which is managed through attempting to three tasks, namely: (i) manage and support process (ii) the core process and (iii) the IT as an enable processes. Each perspective is described.

Management and support process involves understanding of all aspects of a management/support that ensures and controls the daily operative tasks appropriately. Such processes may include: firm management process and human management process. While firm management deals with the issues of overall visions of the firm, human resource management deals with manpower operative issues. These thus, the two processes have two tasks, named (i) mapping the processes to understand them and identify weaknesses and (ii) map and control the core processes. Core processes are described.

Core processes are also referred to as the primary processes. They are the daily process operatives of the firm like ‘the construction project’. Mapping of the core project process can be presented in three processes: design, procurement and fieldwork. Each of these processes can be decomposed into sub-processes and, or activities necessary to be improved. Thus, this study intends to use manage and support process to guide the improvement of the core process. When management & support process controls the core processes, they can also use Information Technology (IT) as enabler of the processes to create large scale improvement. IT issues are described as follow.

While using of IT as an enabler of a process is advocated by many researchers, for example Davenport and Short (1990), the current study concurs and adopts this concept. Project processes differ in scope and in geographic location. At the same time, these are managed by different parties or individuals who would want to communicate issues through mobile phones, fax, and emails. Furthermore, the projects’ decomposition tasks and their relationships are mapped, processed, saved and retrieved by the members of the project etc. through a pc, all these functions are played by the IT technology. Thus, IT is wider in scope. The perspectives of use focused in this study is related to the use of mobile phones, faxes, personnel PC that process, retrieve and save information, adopts a database’s functionality and the Internet services.

While parties may adopt L-BPR to improve processes, some challenges may be encountered by the majority contracting parties because of their diverse operative capabilities. For an L-BPR to be adopted CMM may be used as a guidance; its tenets are described as follow.

**Potentials of the CMM to enhance the process’s improvement**

Within the country, while contracting parties suffer from incapability of their own resources’ operative, each party has own features. In the country, contractors for example, are registered in class one to seven. In is noted that the performance capability is related with these ranges of classes, i.e. moving from class three to seven, increases low capability of performance, due to the custody resources amongst other things. Classes one and two are somehow denoted to be at a level of high performance. Regardless of these features, a party needs to assess itself to meet the competitive forces that prevail in the market. CMM is an approach that helps a party to grow from low performance level to the highest stage of the desired performance; its concepts are implemented in five steps as summarized in Figure 4.4. Descriptions of the task issues for each step are well described in section 3.4. Contracting parties should identify own performance characteristics, barriers of change as well as the opportunities of improvement and change.
Usability of the developed framework

Figure 4.4: Five steps of the CMM for adoption by the contracting parties

Conclusions

The Tanzanian construction industry has continued to perform below expectation in terms of its project been delivered at both time and cost overruns and to the dissatisfactory quality and safety standards. Reasons for these inadequacies were due to the incapability’s of the parties involved. This was exacerbated by the tendency of the parties to afford ad-hoc process, and devoting little efforts to learn and practice the emerged management techniques. Two management techniques: lean and BPR when embedded together, they formed a L-BPR model, then the CMM’s concepts appear as a useful tool to guide parties adopt L-BPR. Local contracting parties are advocated to implement this model to improve performance. Since local parties inherent–on a culture of reluctant to learn and adopting new technologies, a further research suggests implementation and validation of a developed framework for future benefits.
References


