

Rethinking Resilience: Review of the Impact of Capability Maturity Models (CMM) on selected South African Category B4 Municipalities

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Abstract:

Category B4 municipalities in South Africa perform poorly in managing their infrastructure prompting a probe on the utilization of capability maturity models (CMM). The mismanagement is due to skills deficiencies occasioned by their inability to retain capable, and matured engineers and related construction professionals. CMM are structured improvement levels previously used in software engineering to develop employee skills in executing daily responsibilities, from impulsive and inconsistent, to mature and seasoned. This ongoing study seeks a rethinking of resilience on the skills programmes and explore the use of CMM in developing resilient employee infrastructure (IM) skills. Seemingly the current municipal engineering skills (ES) improvement programmes undermine the resilience component and ultimately service provision outcomes. The study aims at reviewing current infrastructure management capability maturity levels in selected category B4 municipalities. The study methodology will assume a qualitative case study approach involving the use of interviews and thematic analysis of data obtained. Conclusions will be drawn based on the selected case study municipalities. Interim finding is that, current capability maturity models (CMM) are devoid of the resilience element and are inappropriate for the category B4 municipalities. The study recommends a radical rethinking of resilience and how ES improvement programmes in the the local government sector are conceptualised. Founded on the existing 5-stage Organizational Project Management Maturity Model (OPM3) maturity model, the study seeks to review and to promote resilience in CMM for infrastructure management in category B4 municipalities.

Keywords: Category B4 Municipalities, Capability Maturity levels, Rethinking, Resilience, Skills programmes

Introduction

In South Africa there are 257 municipalities set out in various categories (A, B, and Cs) (RSA, 1996). Municipalities are allocated powers and service provision functions in terms of Section 155 of the Constitution, as well as the Municipal Structures Act No. 117 (MSA, 1998). Primarily, the constitutional powers and functions of municipalities are related to the provision and maintenance of services to their communities, which include water services, municipal roads and stormwater, solid waste collection, electricity, and firefighting services.

Table 1. Descriptions of municipal categories in South Africa

Classification of Municipalities	Number of Municipalities	Description of the Municipal Categories
A	8	Metropolitan municipality with select executive and legislative authority
B1	19	Local municipality with largest budget and secondary cities
B2	26	A municipality with a central large town
B3	101	A municipality with a relatively small population, mainly urban, and having no large town as a core. Rural areas in this category are characterized by the presence of commercial farms
B4	59	Mainly rural municipality with at most, one or two small towns
C1	23	District municipality with few service delivery functions, not a water service authority
C2	21	District municipality that is a water services authority and often with sizeable obligations

(Source: MDB, 2018)

The National Treasury (2018) framework for infrastructure delivery and procurement management (IDPM) revealed that category B4 municipalities are the worst-performing municipalities on service delivery indicators. Likewise, the Municipal Demarcation Board (MDB) demonstrates that category B4 municipalities are devoid of infrastructure management resilience to address service provision challenges (MDB, 2018). According to Khatleli (2017) despite the government investment in the construction of new infrastructure, obsolescence is a major challenge in South Africa. Category B4 municipalities perform poorly in managing their infrastructure prompting a probe on the utilization of Capability maturity models (CMM) which are structured improvement levels previously used in software engineering to develop employee skills in executing daily responsibilities.

Engineering organizations with the quest to promote systematic processes for employee skills and knowledge improvement, used CMM to respond to the dynamics of technological innovations (Nenni, et al., 2014). Employee adaptable maturity levels are therefore key in assessing organizational resilience and the resilience of the employees upon which the organization is dependent. Joseph (2013) avers that in order to maintain resilient competitive advantage, organizations must aim to cultivate specific employee capabilities in the medium to long-term. This ongoing study advocates for a continuous capability improvement pathway, to address the non-resilient, impromptu, incoherently executed practices. Wendler (2012) advocates for a mature, methodical improvement process of employee's infrastructure management skills and capabilities.

The research aim is to probe the utilization of capability maturity models (CMM) in selected category B4 municipalities. Furthermore, the study aim is to review current infrastructure management capability maturity levels in category B4 municipalities. The 5-stage epistemology will be used to heighten weak infrastructure management capabilities particularly, in this municipal category (PMI, 2013). Founded on the existing 5-stage OPM3 maturity model, the study encourages a radical rethinking of resilience in conceptualizing ES support programmes in the local government sector, particularly in category B4 municipalities. In order to satisfy the research objectives, a case study qualitative research design will be utilized using one-on-one semi-structured interviews. Thematic data analysis will be conducted in this research. Given that a case study will be the basis of this research therefore not representative of the category B4 municipalities in South Africa, and the fact that the study was thus narrowed in scope could be viewed as a delimitation.

Practically, it is anticipated that the identified maturity levels will be useful in refining a systematic improvement path for infrastructure management (IM) capabilities for category B4 municipalities. The expectation is that new emergent qualitative data from the capability maturity assessments will help confirm the maturity levels in the case study municipalities. Anticipated study findings will be a recommended systematic capability maturity framework incorporating resilience element, which will be developed to address IM deficits and maintain service provision normalcy in the category B4 municipalities, that are currently performing poorly in managing their infrastructure. In terms of policy contribution, it is hoped that this study would most probably be useful to the policymakers in changing the ways public infrastructure delivery is implemented.

Literature Review

Previous Engineering Support Programmes

Legoabe & Ngozwana (2012) posit that the Siyenza Manje technical and ES transfer programme aimed at transferring ES to candidate young professionals, has not yielded the desired results. The study findings further cited the downside of significant limited engineering activities in the category B4 municipalities, occasioned by lack of capacity and expertise. (Ibid). These findings are consistent with this study assumption that previous ES support programmes to improve infrastructure management capabilities in category B4 municipalities were not effective.

Lephoto & Khatleli (2019) have also commented on the limited effectiveness of expatriate professionals in transferring ES to candidate engineers in South African mega construction projects (MCPs). Using mixed-method data collection methods, this study found that there is no systematic transfer of ES during the implementation of MCPs. These findings are consistent with study assumptions that previous ES support programmes to improve construction management capabilities lacked the resilience component.

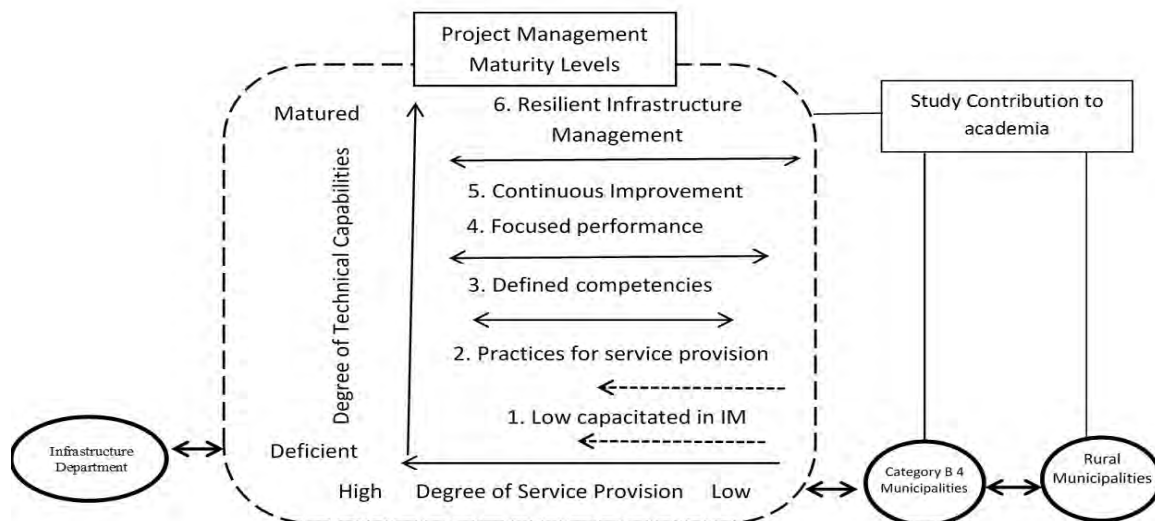
Further studies that employ qualitative approach to assessing the effectiveness of Section 139 of the Constitution as a viable instrument to deal with dysfunctional municipalities, as opposed to Section 154 which advocates for strengthening and supporting municipalities. Njikelana (2016) contends that these regulatory-support instruments were not achieving their objectives. Confirming these study findings is the trend wherein municipalities remain dysfunctional despite provincial interventions invoked through Section 139 or support programmes through Section 154 of the Constitution (COGTA, 2018).

It is for these reasons that this study aims to review current infrastructure capability maturity levels and, rethink resilience on the skills programmes that currently have little consideration of capability maturity, ultimately undermining resilience and therefore service provision outcomes. Likewise, Lephoto & Khatleli (2019) argue that the improvement of the engineering skills throughput in South Africa remains a national priority, which is essential for long-term socio-economic transformation. This study situates resilience as a context within which the design parameters of the capability maturity framework should be considered to model the capability improvement process, for application in under-capacitated municipalities.

Theoretical Framework

The theoretical framework for this study originated from the Organizational Project Management Maturity Model (OPM3) maturity model. The OPM3 model is defined by Project Management Institute (PMI) as the organizational project maturity model based on managing portfolios, programmes, and projects methodically towards achieving service provision objectives (PMI, 2013). The central notion of CMM is the continuous improvement process of key capacities at different levels (PMI, 2013). The conceptual thought is that actors will interactively produce their reality by assessing the level of IM capability maturity in category B4 municipalities using the OPM3 model. Maturity levels are accomplished when specified key capacities progression levels are concluded. The conceptual framework design process will assume the 5-stage epistemology underlying the OPM3 maturity model as depicted in figure 2.2 (PMI, 2013).

Figure 2. Suggested study Conceptual Framework



Source: Adapted from (PMI,2013)

The study will first review the current infrastructure capability maturity levels in the selected municipalities using the existing Project Management Maturity Model (OPM3). Project maturity assessments would be conducted to review the current levels of maturity in the implementation and management of infrastructure in the case study municipalities. It is anticipated that accomplishing the optimal level–5 would help category B4 municipalities to eventually move closer to addressing the resilience gap in infrastructure management capabilities. By introducing the six-level of resilience, this on-going study posits that resilience can only be built where there has been an appreciable investment in employee capabilities. In a nutshell, the study seeks to close the resilience gap in infrastructure management in category B4 municipalities. Interviews would be conducted with the technical employees in the infrastructure department. The OPM3 project management capability model entails charting key capability areas to maturity levels. The capability maturity assessment will assume the 5-stage principles underlying the OPM3 maturity model, using a pre- set excel worksheet (PMI,2013).

Level 1- Measuring the IM capabilities against the Project Management Body of Knowledge (PMBOK) knowledge Areas

The PMBOK project management knowledge areas will be used to benchmark and measure the current infrastructure management capabilities in category B4 municipalities against maturity levels. These requisite capabilities for resilient IM capabilities in the case study municipalities would be measured covering all 3-project management domains PMI (2013) project, programmes and portfolios.

Level 2: The Repeatable level of the CMM

Thus, the primary focus of this level “Repeatable level” is to instil discipline, deploying common processes to monitor project budgets, schedules and quality (SEI, 2009). Discipline on this level is about avoiding impulsive construction decisions, circumventing construction slipups due to hasty work, and firefighting, but building resilient capabilities to perform regular and repeatable basic project management practices.

Level 3: Defined level

This is the level where the experts are invited to help standardise the critical practices, infrastructure management processes, developing effective contingency approach for category B4 municipalities; define and collect and analysis to determine best practice.

Level 4: Managed level

Workforce competencies are integrated through mentoring, workgroups. documented combination of knowledge, skills, and process abilities to be imparted. At Maturity Level 4, mentoring activities are organized around the knowledge, skills, and process abilities to be imparted.

Level 5: Optimizing level

In applying the OPM3 organizational project management capability the organization will continue on its improvement path, using the percentage of fully achieved capabilities and capability outcomes, relative to the number that would be assessed for scoring. An alternative scoring provides a more quantitative assessment of maturity by measuring the extent to which capabilities are present in the organization. Results from the first scoring will represent the maturity level, that is, the degree to which the OPM3 methodology is implemented, which is comparable across all organizations. The second scoring, based on capabilities, gives a more detailed picture of the ability of an organization to “do right things well” (PMI, 2013). Reaching the optimal level would hopefully assist in closing the resilience gap in the infrastructure management capabilities.

Research Methodology

A case study qualitative research design will be utilized as an investigation strategy, using one-on-one semi- structured interviews to answer the research problem statement. The nature of this case study design will be both descriptive and exploratory (Creswell,2014). This study assumes the classical pragmatists’ understanding that reality is continually in the making (Schwandt, 2003). The study will adopt a pragmatist approach with more practical outcomes, which is the interest of this ongoing study.

1.9 Case Study Municipalities

According to the MDB (2018), there are precise attributes of category B4 municipalities in the Eastern Cape Province. The Province is among the most burdened province of municipal technical services (MDB, 2019). This has resulted in service provision deficiencies in the category B4 municipalities, which still struggle to attract the requisite mature engineering skills (ES) to perform the municipal functions (National Treasury, 2019). The study resolved to select three municipal cases Nyandeni, Port St Johns and Mhlontlo as the units of exploration. These municipalities are situated within the OR Tambo District of the Eastern Cape. These rural towns remain the centre where goods and services can be accessed by the surrounding rural settlements of the municipality (IDP, 2018).



Figure: 3.1 Map of the Selected Municipalities
(Source: MDB,2018)

Two respondents who is the technical director and one technical employee in the infrastructure department would be selected in each municipality. These municipalities have been chosen due to their strategic geographic location. Subsequent to the data collection phase, the interview data will be thematically analysed and linked to the intended study objectives. Review of performance reports on previous engineering municipal support models including the Development Bank of Southern Africa (DBSA) Siyenza Manje programme will be used as an additional data collection tool to corroborate the results. This will hopefully enhance the credibility of this ongoing study findings. Content analysis will be used to analyse the data coming from the document review. The study scope is limited to the case study municipalities identified.

Findings and Discussion

Despite the on-going research on the ES deficit in local government, there has been no empirical study proffering a Capability Maturity Model (CMM) for resilient infrastructure management in dysfunctional category B4 municipalities. Given that this is an on-going study; data has not yet been collected. It is anticipated that findings from the qualitative interviews will be used to elicit pertinent views that could inform new resilience thoughts and innovations. This study will use a purposive sampling technique, wherein selected cases and research participants with a specific purpose in mind will be identified, as opposed to a random sampling approach which is not suitable for exploring the study's central phenomenon (Guthrie, 2010). The expectation is that new emergent qualitative data from the capability maturity assessments to be conducted will help confirm the maturity levels in the case study municipalities. It is envisaged that the study findings will assist in providing meaningful recommendations on a methodical continuous capability improvement pathway incorporating the resilience component, for infrastructure management resilience in category B4 municipalities. The study

findings will eventually inform the design of a Capability Maturity Framework (CMM) for resilient infrastructure management in category B4 municipalities.

Conclusion and Further Research

The local government sector is in a continual search for research studies that can aid resilient employee capability reclamation endeavours. To date, there has been no recommended systematic capability maturity model developed to address IM deficits and maintain service provision normalcy in dysfunctional category B4 municipalities. The expectation is that the study recommendations would solicit new resilience thoughts and innovations in deploying Capability Maturity Models (CMM). It is anticipated that the study would yield the same results as it was the case with software engineering sector that achieved employee improved capabilities by employing CMM. Inspired by the existing OPM3 capability maturity template, the current identified maturity levels will help structure and develop employee skills improvement pathway. It is further envisaged that the recommendations will help improve technical employee skills in executing daily infrastructure management responsibilities in the case study municipalities. Thus, replicating what the software engineering sector achieved by employing CMM.

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