International Journal of Technical Innovation in Modern Engineering & Science (IJTIMES)
Impact Factor: 5.22 (SJIF-2017), e-ISSN: 2455-2585
Volume 5, Issue 05, May-2019

ENHANCING MATURITY MODEL OF PROJECT MANAGEMENT FOR SCALING CONSTRUCTION PROJECTS

Himanshu Pandey[1], Dr. Jayeshkumar R. Pitroda[2], Dr. Vihangraj V. Kulkarni[3]

[1]*Final year M. Tech. Student, Construction Engineering & Management, Civil Engineering Department, BVM Engineering College Vallabh Vidyanagar, Gujarat*
[2]*Associate Professor, PG Coordinator Construction Engineering and Management Civil Engineering Department, BVM Engineering College, Vallabh Vidyanagar, Gujarat*
[3]*Associate Professor, Civil Engineering Department, Government Engineering College, Banswara, Rajasthan*

Abstract - The projects are delayed and their budget increases due to the lack of management processes followed by the organization. There are various tools available with the help of which the projects can be completed effectively. Maturity model is one of the tools, by opting that the organization can attain higher project management. Organizations are predicted to be, successful when talk is about project effectiveness and efficiency, having the higher project management maturity level and therefore having a competitive advantage in the marketplace. There are various maturity models established by different authors valid for construction as well as other industries. This research work included the assessment of maturity of the top four smart cities of Gujarat and the maturity of all of them are explained as well as compared with each other using Rank sum method, probability method and a statistical tool. This developed model can be applied to the ongoing construction site from which we will get to know how much mature is the construction site and how the practices are been followed.

Keywords - Project Management Maturity Model (PMMM), Maturity Models (MMs), Construction Projects, Maturity assessment.

I. INTRODUCTION

The construction industry has a great role in the economy of a developing country. The construction industry is compromises of the Real estate as well as the urban development division. The Real estate section includes residential, office, retail, hotels and leisure parks, among others. On the other hand urban development section largely consists of sub-segments such as Water supply, Sanitation, Urban transport, Schools, and Healthcare. Developing countries like India is showing hike in construction work and also the industry is providing a good employment opening, undoubtedly next after agriculture. In spite of the construction industry's substantial contribution to the economy of our country and the crucial role it shows in countries development, the out coming performance of the industry still remains generally low. Many projects in our country come across extensive time and cost overruns, leading to the ultimate failure of the project.

The construction projects need an appropriate way to process in which they are monitored in every step. Despite of the availability of various Project management tools viz. M.S Projects, Primavera etc. the projects re not delivered in estimated time and cost. To overcome all the drawback of the organization it is necessary to adopt the Project management Maturity model (PMMM) for project-based management. It includes the management of projects, programs and portfolios. There are various maturity models (MM) already developed by various researchers, which they have applied and found constructive changes in project handling.

An organization will be able to validate their achievements by describing activities and best practices and classifying these descriptions into progressive levels of maturity. Another benefit of implementing MM is to raise one step up that is to aim for advancement for an anticipated level of maturity. The execution of MM to an organization will focus more on the ineffectiveness of their means of working simply because they know they are being assessed. They will get to know in which areas they are lacking.

Most of researchers identified that use of Project Management Maturity Assessment is related to Project Performance. This thesis work will focus on Enhancing Maturity Model of Project Management for Scaling Construction Projects of Gujarat using project management maturity model concept. The findings of thesis will provide insight to project management practices and recommendations to improve these practices.

II. NEED OF STUDY

1. The maturity assessment evaluation after outcomes of this study can be utilized as starting benchmark statistics in organizing and structuring improvement action.
2. The developed model can be used in assessing maturity of construction Project Management.
3. The finding will let us know the areas lacking in Project Management of the organization.

III. PROPOSED MATURITY MODEL

The proposed Maturity model is of five levels. On the basis of practices followed for construction the model is divided from initial level to optimized level.

- Level 1-Initial
- Level 2-Controlled
- Level 3-Managed
- Level 4-Defined
- Level 5-Optimizing

The 5-Level maturity model was created for the top 4 smart cities of Gujarat. This proposed model will let us know the level of the selected cities and act as a benchmark.

IV. METHODOLOGY

From the literature review and as well as referring the PMBOK we selected the 10 knowledge areas of project management. One knowledge area was added later from the expert's advice. For collecting data for the 11 dimensions a questionnaire was drafted with 3 parts to answer in it. The qualitative stakeholder like Project manager (PM), Owner, Contractor and Project management consultancy (PMC) were selected for answering the questionnaire. The questionnaire was divided into 2 parts in which Part I contains the General information of the respondent. The Part IIA contains questions that have been analyzed by rank sum method and Part IIB has been analyzed by Probability method. There is another statistical method that is used to establishing relationship between both the questionnaires. This method of analyzing the questionnaire was adopted from the literature review.
The selected cities of Gujarat are all smart cities and all of them are mentioned under the builders association of India.. According to Companies Act 2013 Section 2 (85) give detailed definition of small company but the main point is as Turnovers should not exceed more than Rs. 2 crore. So the companies/firms having more than 2 crore were selected in this study. The lists of organizations were collected from Real Estate Developers' Associations of India (CREDAI) and PROPTIGER's website. This study is done for the Real Estate developers and contractors in the city of Surat, Ahmedabad, Vadodara and Rajkot.

V. ANALYSIS AND RESULTS

a) Surat Maturity Model

Table 1 Surat's Maturity Model

SURAT MATURITY MODEL					
DIMENSIONS	**Level-5**	**Level-4 (Surat)**	**Level-3**	**Level-2**	**Level-1**
COMMUNICATION	4.4722	3.2711	1.9678	0.8944	0.4174
COST	4.4167	3.1944	2.6500	1.5143	0.5048
HR	4.2500	3.1581	3.1682	1.0818	0.4636
INTEGRATION	4.3611	3.1901	2.4825	1.2748	0.4697
PROCUREMENT	4.2778	2.9808	3.0800	1.5400	0.5133
QUALITY	4.5000	3.3659	2.8200	1.2000	0.4800
RISK	4.3333	3.1183	2.1922	0.8157	0.4078
SCOPE	4.5833	3.1888	2.8722	1.2222	0.4889
STAKEHOLDER	4.0556	3.0621	2.1630	0.9463	0.4056
TIME	4.4444	3.1294	2.6667	0.9524	0.4444
WASTE	4.0833	2.9753	1.4449	0.8795	0.3769
Overall	**4.3434**	**3.1486**	**2.5007**	**1.1201**	**0.4520**

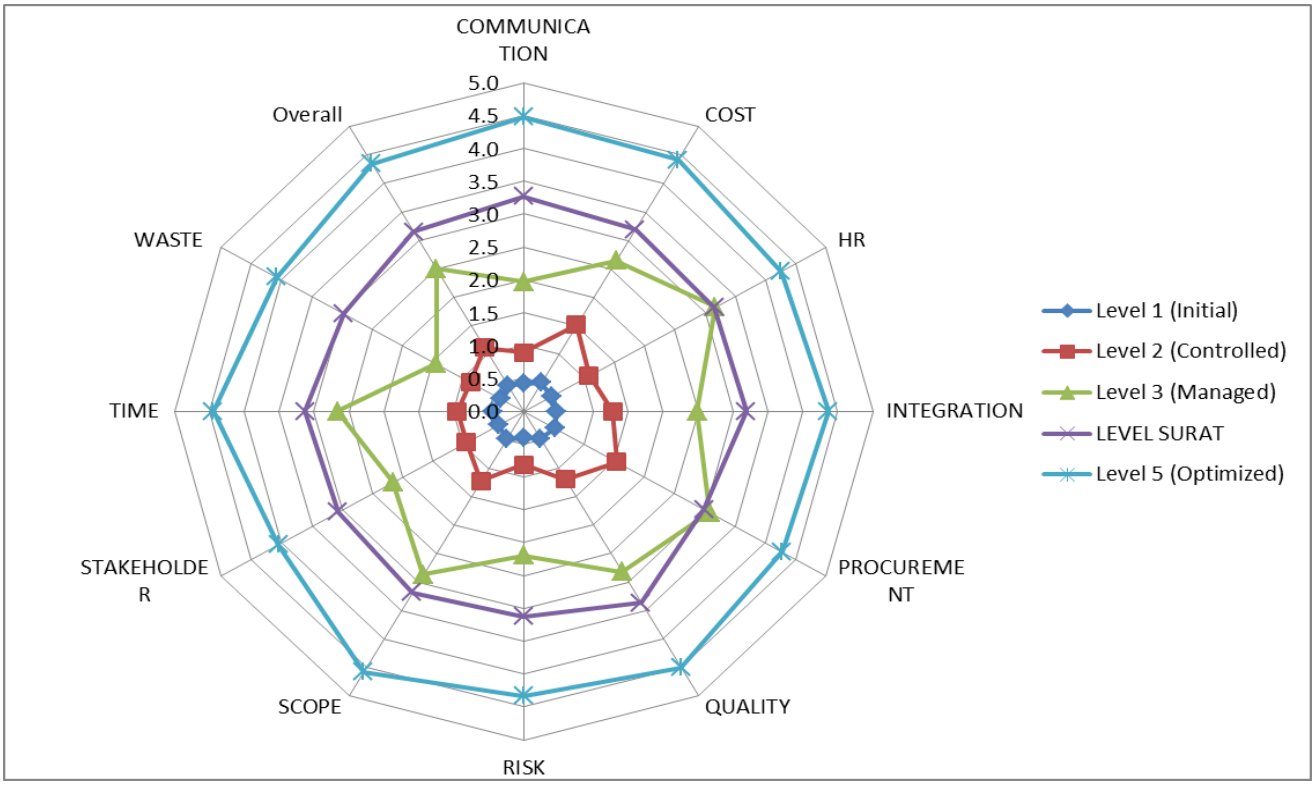

Figure 1 Surat's Maturity Radar Model

Table 2 Surat's Overall Maturity and Name of Maturity

LEVEL	MATURITY ANSWER	NAME OF MATURITY
Level 1	0.4520	Initial
Level 2	1.1201	Controlled
Level 3	2.5007	Defined
Level 4	3.1486	Managed
Level 5	4.3434	Optimized

b) Ahmedabad Maturity Model

Table 3 Ahmedabad's Maturity Model

AHMEDABAD MATURITY MODEL					
DIMENSIONS	**Level-5**	**Level-4 (Ahmedabad)**	**Level-3**	**Level-2**	**Level-1**
COMMUNICATION	4.3611	3.0774	1.9189	0.8722	0.4070
COST	4.4444	3.1218	2.6667	1.5238	0.5079
HR	4.3333	3.1570	3.2303	1.1030	0.4727
INTEGRATION	4.3889	3.0590	2.4983	1.2829	0.4726
PROCUREMENT	4.3889	3.1730	3.1600	1.5800	0.5267
QUALITY	4.4167	3.2689	2.7678	1.1778	0.4711
RISK	4.3056	3.0668	2.1781	0.8105	0.4052
SCOPE	4.6389	3.2872	2.9070	1.2370	0.4948
STAKEHOLDER	4.2500	3.1572	2.2667	0.9917	0.4250
TIME	4.4722	3.1575	2.6833	0.9583	0.4472
WASTE	4.1389	2.8136	1.4645	0.8915	0.3821
Overall	**4.3763**	**3.1217**	**2.5220**	**1.1299**	**0.4557**

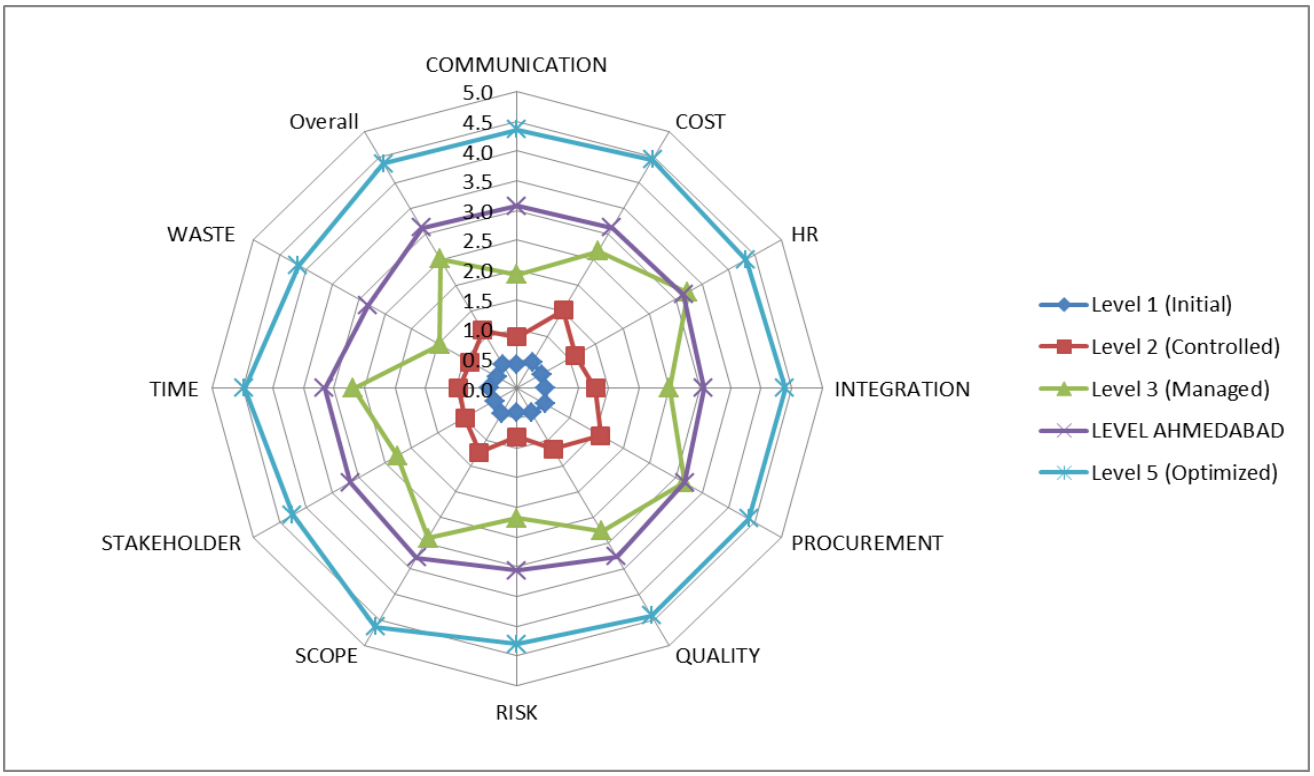

Figure 2 Ahmedabad Maturity Radar Model

Table 4 Ahmedabad's Overall Maturity and Name of Maturity

LEVEL	MATURITY ANSWER	NAME OF MATURITY
Level 1	0.4557	Initial
Level 2	1.1299	Controlled
Level 3	2.5220	Defined
Level 4	3.1217	Managed
Level 5	4.3763	Optimized

c) Vadodara Maturity Model

Table 5 Vadodara's Maturity Model

VADODARA MATURITY MODEL					
DIMENSIONS	**Level-5**	**Level-4 (Vadodara)**	**Level-3**	**Level-2**	**Level-1**
COMMUNICATION	4.2105	2.5032	1.8526	0.8421	0.3930
COST	4.5263	3.0304	2.7158	1.5519	0.5173
HR	4.3158	3.1693	3.2172	1.0986	0.4708
INTEGRATION	4.2632	2.9671	2.4267	1.2462	0.4591
PROCUREMENT	4.1579	2.5673	2.9937	1.4968	0.4989
QUALITY	4.6842	3.2689	2.9354	1.2491	0.4996
RISK	4.3684	2.9308	2.2099	0.8223	0.4111
SCOPE	4.4211	2.7725	2.7705	1.1789	0.4716
STAKEHOLDER	4.1053	2.6267	2.1895	0.9579	0.4105
TIME	4.4737	2.8148	2.6842	0.9586	0.4474
WASTE	4.0000	2.6904	1.4154	0.8615	0.3692
Overall	**4.3206**	**2.8326**	**2.4919**	**1.1149**	**0.4499**

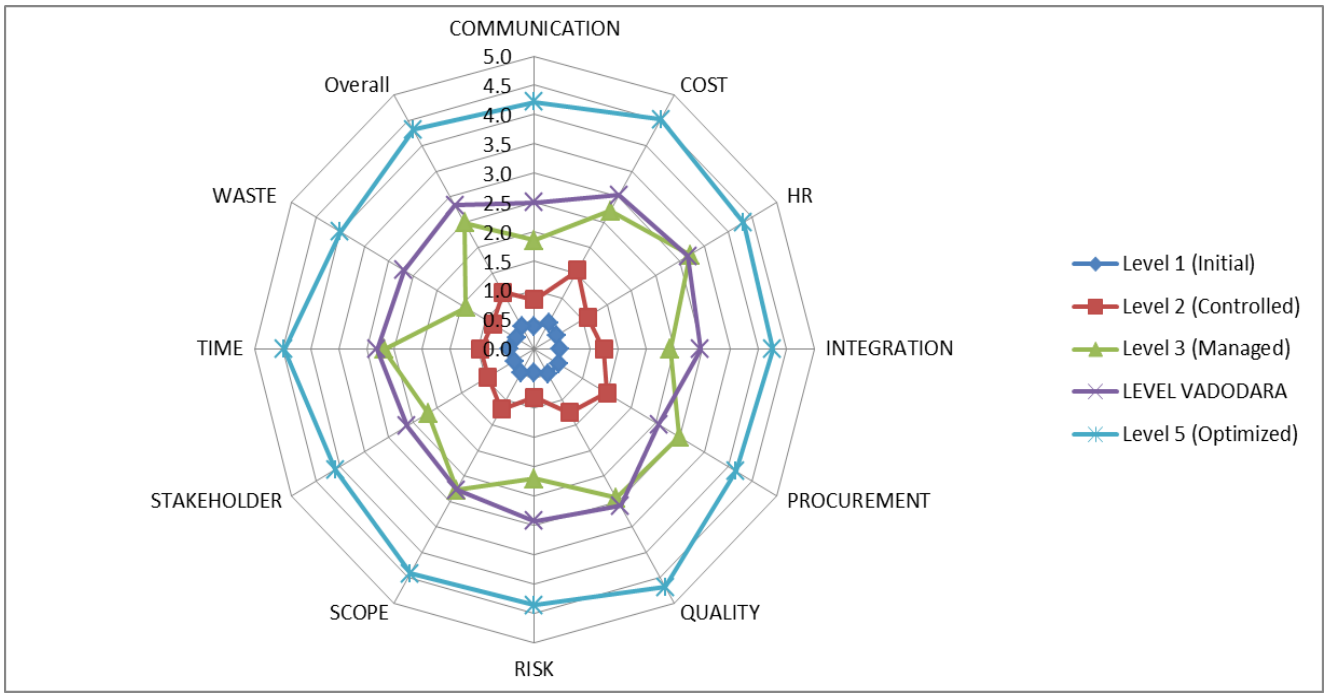

Figure 3 Vadodara Maturity Radar Model

Table 6 Vadodara's Overall Maturity and Name of Maturity

LEVEL	MATURITY ANSWER	NAME OF MATURITY
Level 1	0.4499	Initial
Level 2	1.1149	Controlled
Level 3	2.4919	Defined
Level 4	2.8326	Managed
Level 5	4.3206	Optimized

d) Rajkot Maturity Model

Table 7 Rajkot's Maturity Model

RAJKOT MATURITY MODEL					
DIMENSIONS	**Level-5**	**Level-4 (Rajkot)**	**Level-3**	**Level-2**	**Level-1**
COMMUNICATION	4.3889	2.7817	1.9311	0.8778	0.4096
COST	4.3333	2.9877	2.6000	1.4857	0.4952
HR	4.2778	3.1677	3.1889	1.0889	0.4667
INTEGRATION	4.1667	2.8322	2.3718	1.2179	0.4487
PROCUREMENT	4.1667	2.5430	3.0000	1.5000	0.5000
QUALITY	4.6667	2.6353	2.9244	1.2444	0.4978
RISK	4.3889	2.9056	2.2203	0.8261	0.4131
SCOPE	4.4444	2.8624	2.7852	1.1852	0.4741
STAKEHOLDER	3.8333	2.2726	2.0444	0.8944	0.3833
TIME	4.3889	2.8917	2.6333	0.9405	0.4389
WASTE	4.0556	2.3833	1.4350	0.8735	0.3744
Overall	**4.2828**	**2.7512**	**2.4668**	**1.1031**	**0.4456**

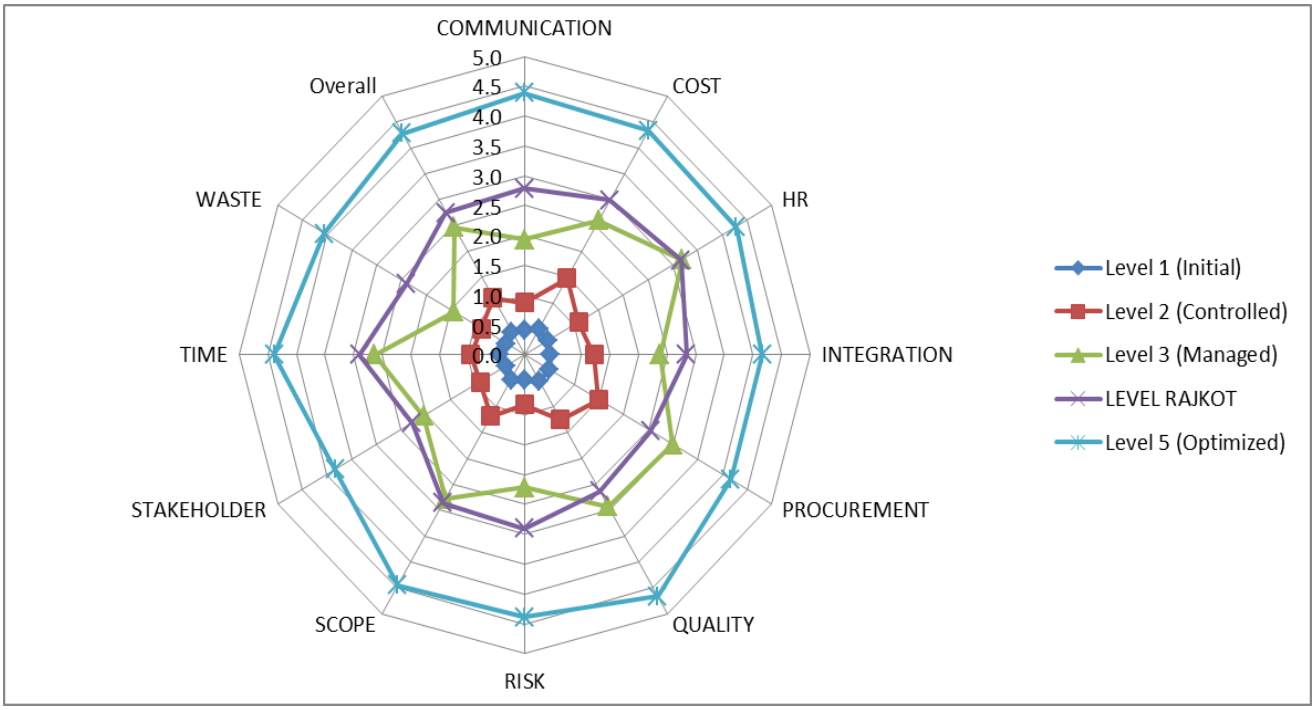

Figure 4 Rajkot Maturity Radar Model

Table 8 Rajkot's Overall Maturity and Name of Maturity

LEVEL	MATURITY ANSWER	NAME OF MATURITY
Level 1	0.4456	Initial
Level 2	1.1031	Controlled
Level 3	2.4668	Defined
Level 4	2.7512	Managed
Level 5	4.2828	Optimized

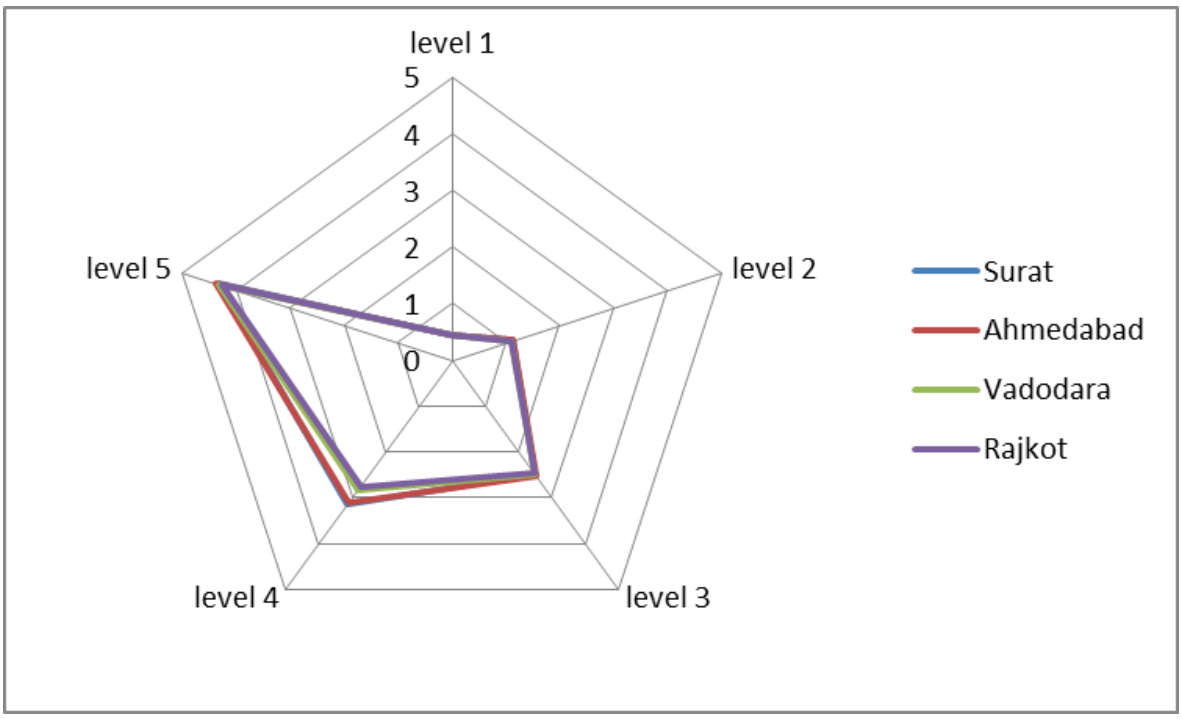

Figure 5 Maturity Radar Model of four cities

VI. CONCLUSION

This research work tried to evaluate the degree of use (maturity) of project management processes and practices in the Real Estate construction industry of Surat, Ahmedabad, Vadodara and Rajkot the top 4 smart cities of Gujarat, based on the views of Project Manager, Project Management Consultant, Contractors and Owners. 11 dimensions reserved under considerations for Maturity assessment as stated in literature and from PMBOK.

The different construction sites were analysed and with reviewing the practices of project management of these sites we found that all the four cities are not properly applying the advanced practice and tools as the Maturity is below Optimized Level which is (the Highest Level of Maturity) represented as Level 5. All the four smart cities Gujarat are falling in the Managed level (4th level).

Therefore with this research work an effort has been made to develop a baseline maturity framework with the help of which we can evaluate the ongoing construction projects and their progress. This may also provide scope of rectification for coming/future projects.

Acknowledgment

I thankful to Prof. (Dr.) I. N. Patel, Principal, BVM Engineering College, Vallabh Vidyanagar, Gujarat, Dr. Jayeshkumar R. Pitroda, Associate Professor, PG Coordinator Construction Engineering and Management, Civil Engineering Department, BVM Engineering College Vallabh Vidyanagar, Gujarat, Dr. Vihangraj V. Kulkarni, Associate Professor, Civil Engineering Department, Government Engineering College, Banswara, Rajasthan for their motivation and support for the research work.

REFERENCES

[1] Abadir, Y. 2011. Project Management Maturity in the Construction Industry of Developing Countries (The Case of Ethiopian Contractors).

[2] Andrej, M. 2015. Improving project management performance through capability maturity measurement. Procedia Economics and Finance Elsevier, (30): 522 – 530.

[3] Backlund, F. Chronéer, D. and Sundqvist, E. 2014. Project Management Maturity Models-A Critical Review-A case study within Swedish engineering and construction Organizations. Procedia - Social and Behavioral Sciences Elsevier, 119: 837-846.

[4] Cheng, G. and Steve, R. 2013. Conceptual Maturity Model for Sustainable Construction. Journal of Legal Affairs and Dispute Resolution in Engineering and Construction (ASCE), 5(4): 191-195.

[5] Gholamreza, H. and Gholami, A. 2018. The Influence of Project Risk Management Maturity and Organizational learning on the success of power plant construction projects. Project Management Journal, 49(5): 1–16.

[6] Hulya, Y. 2009. The Role of Project Management Maturity and organizational Culture in Perceived Performance. Project Management Journal, 40(3): 14–33.

[7] Ibbs, C. and Kwak, Y. 2000. Assessing Project Management Maturity. Project Management Institute, 31(1): 32-43, ISSN 8756–9728.

[8] Jana, K. and Libena, T. 2018. Proposal and Verification of Project Management Methods and Tools Oriented Maturity Model. Journal of Management and Projects, 9(1).

[9] Jehan, Z, Thomas, F. and Dana, V. 2013. Infrastructure Management Process Maturity Model: Development and Testing. Journal of Sustainable Development, 6(11).

[10] Kam, J. and Janice, T. 2002. Project Management Maturity Models: The Silver Bullets of Competitive Advantage. Project Management Institute, 33(4): 4–14.

[11] Kevin, P. Grant, J. and Pennypacker, S. 2006. Project Management Maturity: An Assessment of Project Management Capabilities among and Between Selected Industries. IEEE Transactions on Engineering Management, 53(1): 59-68.

[12] Kwak, Y. Ibbs. C. 2002. Project Management Process Maturity (PM) 2 Model. Journal of Management in Engineering (ASCE), 18(3): 150–155.

[13] Maria, N. Vincenzo, A. Paolo, B. and Iolanda, N. 2014. How to Increase the Value of the Project Management Maturity Model as a Business-oriented Framework. International Journal of Engineering Business Management, 6(8).

[14] Mitchell, S. Linger, H. and Owen, J. 2008. The benefits of project management maturity assessments: an analysis of OPM3 cases from Australia, New Zealand, and the United States. Project Management Institute.

[15] Naomi, B. and Robin, C. 2009. Using Maturity Models to Improve Project Management Practice. POMS 20th Annual Conference, Orlando, Florida U.S.A.

[16] Patel, D. Sharma, N. and Shah, R. 2016. Development of Project Management Maturity Model for Measuring Success of Construction Projects in Surat City. International Journal of Scientific Development and Research (IJSDR), 1(5): 149-152.

Author's Biography

Himanshu Pandey received his Bachelor of Engineering Degree in Civil Engineering from Government Engineering College Dahod, Gujarat Technological University in 2016. At present he is pursuing his Master's degree in Construction Engineering and Management (Final year) from Birla Vishvakarma Mahavidyalaya Engineering College, Vallabh Vidyanagar, Anand, Gujarat. He has published one review paper in Journal of Building Construction on AHP. He is also working on Project management Maturity Model for construction projects in Gujarat.

Dr. Jayeshkumar Pitroda received his Bachelor of Engineering Degree in Civil Engineering from Birla Vishvakarma Mahavidyalaya Engineering College, Sardar Patel University (Vallabh Vidyanagar, Gujarat-India) in 2000. In 2009 he received his master's degree in Construction Engineering and Management from Birla Vishvakarma Mahavidyalaya Sardar Patel University (Vallabh Vidyanagar, Gujarat-India). In 2015 he received his Doctor of Philosophy (Ph.D.) Degree in Civil Engineering from Sardar Patel University (Vallabh Vidyanagar, Gujarat-India). He has joined Birla Vishvakarma Mahavidyalaya Engineering College as a faculty in 2009, where he is a lecturer of Civil Engineering Department and at present working as Associate Professor from February 2018 having a total experience of 19 years in the field of Research, Designing and Education. At present holding charge of PG Coordinator Construction Engineering and Management. He is guiding M.E. / M. Tech (Construction Engineering and Management/ Construction Project Management/ Environmental Engineering) thesis work in the field of Civil / Construction Engineering/ Environmental Engineering. He is also guiding Ph.D. students (Civil Engineering). He has published many papers in National / International Conferences and Journals. He has published nine Research Books in the field of Civil Engineering, Rural Road Construction, National Highways Construction, Utilization of Industrial Waste, Fly Ash Bricks, Construction Engineering and Management, Eco-friendly Construction.

Dr. Vihangraj V. Kulkarni received his Bachelor of Engineering Degree in Civil Engineering from Government College of Engineering, Aurangabad in 2009. In 2012 he received his master's degree in Environmental Engineering from Indian Institute of Technology Guwahati, India. In 2018 he received his Doctor of Philosophy (Ph.D.) Degree in Civil Engineering from Indian Institute of Technology Guwahati, India. He has joined Civil Engineering Department at Government Engineering College Banswara, Rajasthan. He is guiding M. Tech. thesis work in the field of Civil / Construction Engineering/ Environmental Engineering. He has published 17 papers in National / International Conferences and Journals. He has published one Research Books in the field of Civil Engineering, "Utilization of Fly ash in construction industries: The way forward".