Application of Project-Management Maturity for Indian Defence Construction: A Review of Current Procedures and Preliminary Analysis Towards an Improved Framework

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Abstract: **Indian defence construction works are delivered through detailed procedures for planning, tendering and contract administration by Military Engineer Services (MES). The existence of detailed procedures does not imply that sound project management practices are being applied and continued improvement achieved in performance from project to project. This interim paper reviews project management maturity models, construction-specific maturity studies, research on knowledge-management in organisations, the Defence Works Procedure (DWP) 2020, the IAFW-2249 contract conditions and public United States Army Corps of Engineers (USACE) guidance as a comparator. The paper asks what maturity assessment questions should be applied for MES and examined in detail as an initial step towards framing a workable maturity-based framework for this organisation. The review has focused on research relevant to the particular organisational and working environment of MES. Anonymised selected data keeping in view of the security restrictions which gives general indication towards the maturity dimensions has been collated for purpose of review. These indicators provide starting evidence to be tested in detail during Stage II of research and do not prove organisational immaturity in this Stage. The paper proposes nine identifiable candidate capability dimensions which are to be examined for evolving a final maturity-based framework and outlines proposed steps for next research stage.**

Keywords: *Project-management maturity, defence construction, Military Engineer Services, knowledge management, lessons learned, contractor capability, project readiness*

I. INTRODUCTION

Much of defence infrastructure which includes accommodation, ammunition storage, hospitals, schools, utilities and operational buildings is delivered through a long chain of dependent stages like sanction, survey, design, estimate, tender, contract, construction, inspection and handover. These stages are handled by different departments under the Ministry of Defence amongst which a major role is played by Military Engineer Services (MES) from conception of a work to its completion. Works undertaken by MES are mainly governed by the Defence Works Procedure (DWP) 2020 [1] and the Indian Armed Forces General Conditions of Contract, IAFW-2249 [2], alongside a number of Government policies and regulations issued from time to time.

MES originated in the British period. In 1923 it was brought under the control of the Military Engineer-in-Chief, unifying Royal Corps of Engineers personnel and civilian staff [3]. It is a premier construction agency of the Ministry of Defence and a pillar of the Army Corps of Engineers, providing engineering support to the Armed Forces and associated MoD organisations. Its annual workload was publicly reported in 2021 as approximately ₹30,000 crore, one of the largest construction and maintenance workloads in the country [4]. Over the years, the workload and areas of responsibility of MES have increased due to rising defence expenditure and operational requirements. However, the records examined indicate a serious deficiency of manpower relative to the increased workload. In the records of one MES zone office examined in this paper, about half of the sanctioned civil posts were vacant (Section VI). DWP 2020 and the Regulations for the Military Engineer Services (RMES) lay down the roles of engineer officers and the delegation of powers for technical sanction, acceptance of contracts and financial approval, and permit enhanced powers to be delegated to named officers in exceptional cases [1], [5]. Whether these roles and delegated powers work effectively in practice, together with the capacity to perform, is therefore a possible maturity question this study can test.

Organisational capacity is only one of several factors that influence the successful completion of projects. The quality and timely completion of a work also depend on the contractor selected. Whether that contractor has both the capability and the intent to plan the work, deploy adequate resources and complete it is therefore an important factor for MES works. The difficulty of finding capable contractors is greater in remote areas, where resources are scarce and the terrain is rugged, as at many Army stations. A field note on MES reform raises the same concern, linking delays and cancellations to the selection of contractors and to the limited availability of capable contractors in remote areas [6]. Contractor selection matters most where the work bears on national security. Even stable family circumstances, including the timely availability of family accommodation, are likely to influence a soldier's well-being and satisfaction with service [7]. This can in turn influence the soldier's performance and, ultimately, national security. Policy and contractual frameworks such as DWP 2020 and IAFW-2249 are essential to ensure accountability in defence works. However, they do not show either how they can be reliably and effectively implemented in day-to-day project practice or how quickly the organisation corrects itself when a project deviates from its plan and timeline. A

maturity approach will aid in identifying the gap between laid-down procedures and actual activities followed on ground. Once these gaps are identified, the maturity approach will also aid in reducing this gap.

Recent work on project-management offices finds limited evidence that higher maturity scores lead to better organisational results [8]. A study of Swedish engineering and construction firms found that formal maturity models were seldom used in practice, and some respondents found them too theoretical for practical use [9]. Hence, whatever framework emerges in Stage II of the project must be practical and aim to enable MES to function effectively within the laid-down guidelines and stipulations. A framework that recommends organisation-level changes may also have wider implications under national rules such as the General Financial Rules (GFR), instructions of the Controller General of Defence Accounts (CGDA) and the Central Civil Services (CCS) rules. Hence, such recommendations will need to be subsequently assessed against them. This paper, prepared at the end of the first stage of an M.E dissertation, has three aims: (i) to compare what standard or construction-specific maturity models can offer for defence works and MES with respect to efficiency in project delivery; (ii) to use anonymised and available figures from official documents to identify the parts of MES where a maturity assessment would be most useful; and (iii) to state clearly what remains unproven until a detailed data-based analysis and expert assessment are completed.

II. LITERATURE REVIEW

The paper uses a focused review of research relevant to the particular organisational and working environment of MES instead of a systematic one. Four basic themes have guided the literature review: project-management and organisational maturity models; maturity of construction firms, including digital and integrated-delivery maturity; knowledge management and lessons learned in construction; and public sector project delivery procedures, contract governance aspects and methodology used for quality management. For the fourth theme, CPWD Works Manual 2022 [10] is used as an Indian public-works reference and USACE project delivery procedures as an international military comparator [11], [12]. The review has been carried out keeping in view that the MES organisation is not a normal construction agency but a full-fledged government department which interacts with other government departments and civilian organisations. Procedural documents like DWP 2020, IAFW-2249, E-in-C's Branch and QMG policies, CPWD Works Manual, and USACE manuals were analysed. Each guideline or laid down action which can significantly influence performance of a work was earmarked as a possible capability question. Because of security considerations in the Armed Forces, only limited ground data of actual works could be analysed at this stage in addition to the procedural documents. Stage II will extend the analysis to additional authorised, anonymised data from other MES offices, together with expert assessment, so that these capability questions can be tested more widely.

III. MATURITY MODELS AND CONSTRUCTION LITERATURE

Maturity models describe how far an organisation's procedures and practices are defined, repeatable, measured and continuously improved from project to project. They provide a guideline or path along which capabilities of an organisation can be assessed and developed for improving efficiency in its work. Maturity models developed by different authors for different requirements vastly differ in approach or methodology, which makes it difficult to equate their levels or stages with each other. An attempt has been made to summarise the main contribution of each approach and its limit for MES defence works in Table I.

TABLE I. Selected maturity approaches and their relevance

Approach	Main contribution	Limit for defence works
CMM / CMMI [13]	Institutionalisation of processes and their repeatability	Indicators must be re-expressed for site conditions, which may vary from place to place
OPM3 [14]	Links practices to capability and outcomes across project, programme and portfolio of projects	Portfolios also change with operational priorities and locational peculiarities from area to area, so specific practices must be developed for each area.
P3M3 [15]	Structured perspectives: governance, control, risk, resources	Must be mapped to local approval paths, many of which lie outside MES control
Kerzner [16]	Common language, common process, benchmarking, improvement	No construction-specific indicators given by the model. MES already has laid down construction specific procedures and practices
Prado-MMGP [17]	Multidimensional competence profile	Competence must be assessed at several organisational levels that influence one another

Capability-maturity approaches contribute towards discipline in process and shifts from individual efforts to repeatable routines [13]. OPM3 links organisational strategy with project, programme and portfolio practice [14]; P3M3 provides a perspective-based diagnostic [15]; Kerzner proposes five levels, from a common language through benchmarking to continuous improvement [16]; and Prado-MMGP assesses maturity across seven dimensions, reporting an overall level together with a score for each dimension [17]. Nikolaenko and Sidorov, in a critical comparison of widely used models, concluded that the most developed are built on international bodies of knowledge. Most of these models tend to ignore structural and infrastructural enablers such as workplace, tools and regulations, and generally lack processes for assessing whether the practices they promote are effective [18]. Construction-specific literature on the subject reinforces the need to adapt. Machado et al. identified a large set of maturity models and judged OPM3 and Prado-MMGP promising for construction firms, with selection depending on context [19]; their follow-up study on renovation and remodelling firms points the same way [20]. Jäkel et al. place digital transformation within a maturity model for Construction Industry 4.0 [21]. A systematic review by

Bozorg Mehri et al. groups maturity determinants into culture and leadership, project characteristics, external influences, technology and individual competence, and criticises rigid models that give limited attention to human and digital factors [22]. An integrated model for BIM, integrated project delivery and lean construction adds collaborative and improvement attributes [23]. These studies support the idea of adapting specific and relevant concepts of different maturity models to any project-based organisation, especially one that is construction-oriented like MES, instead of applying any single model in full.

IV. KNOWLEDGE MANAGEMENT AND LEARNING

Each construction project generates a great deal of practical knowledge that is seldom documented in academic literature. This knowledge remains with individuals as part of their experience, and much of it is lost when project teams disperse. In defence works the loss is greater because MES personnel are posted out frequently and take their experience and site-specific knowledge with them. Experienced personnel also retire routinely. Owing to the shortage of manpower, no mechanism appears to exist or is possible for newly posted personnel to overlap with them. This is one of the implications that the field note on reform suggests through its discussion of manpower deficiency and institutional memory [6]. Newly posted personnel must therefore rebuild this knowledge from scratch, at the cost of mistakes and valuable project time.

The SECI model explains how knowledge is created: people share it informally, put it into words, combine it with other knowledge, and then absorb it into their own practice [24]. Argote and Ingram show that knowledge moves between teams through people, tasks and tools, and that this transfer gives an organisation its advantage [25]. Abu Adi et al. propose a strategy model for introducing knowledge management in construction firms [26].

Studies of lessons learned from various projects suggest that lessons are often recorded but not effectively reused [27]. The lessons documented rarely reach other teams and mostly remain stored in organisational repositories. A study of large UK contractors, combining a questionnaire survey, interviews and focus groups, found that corporate and site-based staff need lessons in different forms [27]. Eken et al. developed a web-based tool that categorises lessons using a taxonomy and retrieves them by project similarity, and expert testing indicated that it has potential to improve organisational learning [28]. To address the wider question of organisational learning, Sergeeva and Duryan conducted 30 interviews with construction professionals in UK project-based firms. They argued that a more holistic approach to knowledge management and organisational learning is needed to support innovation and continuous improvement [29]. Defence works repeat the same building types and contract situations in every location, and staff are posted out often. A system which documents various lessons of construction projects in MES is useful only if those can be searched or accessed easily and built into routine steps or procedures. This will ensure that these lessons continue to apply even when personnel change.

V. DEFENCE-WORKS PROCEDURES AND THE COMPARATORS

DWP 2020 addresses preparation of work programmes, stipulations for preparatory activities such as survey and soil investigation, approval procedures and progress reporting [1]. IAFW-2249 contains contract related provisions on supervision, time and progress, extension, compensation for delay, cancellation, measurement and payment [2]. Policy documents issued from time to time aim at addressing aspects not covered in the DWP or IAFW-2249. For example, policy issued for pre-qualification criteria for solar power projects stipulates expertise, resources and capabilities required of bidders in that field [30]. A Project Monitoring Group interface has been instituted to support smooth progress during execution [31]. Public procurement rules framed by the Government govern the tender routes and procedures to be followed by all Government departments [32]. A valid question of maturity at this point is not whether a clause or procedure exists in the official documents but whether it has been followed correctly. For example, surveys or geotechnical investigations as stipulated were completed in time to influence the estimate, scope was stable before tender to prevent any post contract variations, the site was available to handover to the contractor for work, and notices and extensions were decided on record and issued in time. A further question is whether gaps in following the laid-down procedures were identified and addressed in succeeding projects.

The CPWD Works Manual 2022 is an Indian public-works reference [10]. It provides for quality assurance built into the contract, makes the Engineer-in-Charge responsible for the overall quality of the work, provides for third-party quality assurance on larger works, and screens contractors through an eligibility bid and an enlistment system by class and category [10]. These provisions relate directly to the contractor capability and quality dimensions in Table IV. Comparable provisions exist for MES in DWP 2020 and IAFW-2249 [1], [2]. A relevant question is whether CPWD also faces quality and timeline problems similar to those seen in MES despite its detailed manual and procedures. If it does, the existence of procedures alone would not indicate maturity.

USACE offers an international military comparator. Its Project Delivery Business Process manual describes a project management plan, workload analysis, change management and after-action lessons learned [11], and its quality regulation treats quality assurance as starting well before construction [12]. The legal, financial and organisational environments differ, so the comparison will be more about functional aspects. While comparing MES with CPWD and USACE, the question one should ask is whether equivalent management functions exist in MES and whether CPWD or USACE project delivery is efficient and mature by implementing these procedures while compared to MES.

VI. PRELIMINARY GROUND EVIDENCE

A. Data and handling

As an initial test of the relevance of the capability questions raised in the previous sections, aggregate figures were

extracted from two works-status returns obtained from two higher MES offices that monitor large projects [33]. Two case documents of projects from different regions within the same zone, which appeared to show contrasting project-management practice, were also analysed [34], [35]. Locations and project identities are removed for security, and only counts, ratios and durations are used. The two returns refer to different dates and different scopes. The zone return (January 2025) covers manpower, budget and work status for the zone as a whole. The Command return (October 2026) lists only projects above ₹20 crore value. Works above ₹20 crore were selected for the Command analysis because they have a major impact and a long time-span. This makes identification of various actions, delays and their effects easier. The indicators were mapped to the candidate dimensions that can influence the maturity of an organisation like MES, and are summarised in Tables II and III.

B. Indicators

TABLE II. Anonymised zone-level indicators (January 2025)

Indicator	Value	Dimension	Remarks
Civil subordinate staff, held vs ceiling	413 of 837 held (49%); deficiency 424 (51%)	Resources	Held strength by sub-formation ranges from 39% to 65% of ceiling
Military subordinate staff, held vs ceiling	382 of 408 held (94%); deficiency 26 (6%)	Resources	The shortfall critical in the civil cadre
Expenditure, FY 2022-23 to 2024-25	Capital +75%; maintenance +23%; revenue +16%; total +39%	Capacity	Capital works grew fastest while civil staff held stayed at 49%
Capital liability untendered	₹570 of ₹1,215 cr (47%)	Procurement/ Contracting	Two of five areas under zone hold 86% of the untendered value
Works listed for completion in the next four quarters (37): completed in time / within PDC / expired or not expected within PDC	2 / 26 / 9	Planning /Execution	Late tendering major reason in 4 of the 9 works
Carry-forward works (28): within PDC / expired or not expected within PDC / conditional or not stated	18 / 8 / 2	Execution	Contract cancelled in 6 of the 8. 3 out of the 8 were first sanctioned in 2015 or earlier (old works)
Tendering-hindrance cases after sanction (5)	Original PDC expired in all 5	Planning/ Readiness	Site or soil problems in 4. Revised sanction/ extra funds needed in all 5

Table III. Anonymised Command-level indicators, works above ₹20 crore (October 2026)

Indicator	Value	Dimension	Remarks
Works at 0% progress	8 of 24 (₹545 of ₹2,814 cr)	Readiness	Sanctioned 26 to 44 months earlier
Of the 8, awaiting revised sanction or foreclosure	5 of 8 (₹353 cr)	Readiness	Revised sanction for 4 (₹317 cr); foreclosure for 1 (₹36 cr) because the site not available
Of the 8, still under tender action	3 of 8 (₹192 cr)	Procurement/ Contracting	26 to 31 months after sanction
Incomplete works with PDC expired, or assessed as exceeding PDC	15 of 22 (68% by number; ₹951 of ₹2,747 cr, 35% by value)	Planning	7 already expired (₹477 cr); 8 assessed as certain to exceed (₹474 cr)
Incomplete works on track	5 of 22 (₹1,691 cr, 62% by value)	Planning	Two very large works account for most of this value
Works sanctioned in the last week of March (2023 and 2024)	10 of 24	Planning	None has passed 36% progress.5 of 8 sanctioned in March 2024 still at 0%

Four main observations can be identified from this data. First, workload has increased faster than the available capacity to handle it. The capital expenditure in the zone rose about 75% in two years but the civil subordinate posts were held at 49% of the ceiling and military posts at 94%. Even though the ceiling allows adequate manpower, the zone at the time of sampling was 51% deficient in civilian manpower who may be directly or indirectly involved in planning and execution of the work. Second, there is a large backlog of works which were yet to be tendered after issue of sanction. Nearly half (47%) of the capital liability was untendered which indicates large amount of work yet to physically commence on ground. Third, in the Command projects list, 8 of 24 works above ₹20 crore had no physical progress even 26 to 44 months after sanction. Out of these 8, three were still under tender action after more than two years, four works awaited revised sanction because of variations in scope, budget or site. Remaining one project was being foreclosed because the site was not available after sanction of the work. Fourth, out of the 22 incomplete works in the Command list, 15 of the works had either crossed their planned completion date or were assessed to certainly exceed it (68% by number and 35% by value, since the largest works are on track) as per the current state of progress on ground. The process for obtaining revised sanction for works taken up due to change in site or scope, increase in budget requirements etc is reported to be slow because such proposals draw intense scrutiny and receive

lower priority than new proposals which are awaiting sanction in a financial year.

The works data of zone also indicates similar trends. Of the 37 works planned for completion in FY 2025-26, 9 had either passed their planned completion date or were not expected to meet it. The same trend showed for 8 of the 28 carry-forward works. Late tendering was cited in four of the nine, and a tender or contract had been cancelled in six of the eight. Five cases held up at tender stage showed site, land, tree-felling and soil conditions recurring, and all five needed revised sanction or additional funds. In one of them, poor soil found during investigation after sanction raised the estimate from about ₹55 crore to ₹106 crore (+92%) for want of expensive foundation design. A smaller group of long-running works adds a time dimension. Three works first sanctioned between 2005 and 2015 were still open in January 2025, each with its planned completion date revised at least once (two of them twice). Completion in these cases was being sought 6.5 to 17 years beyond the original date of completion thereby denying useful infrastructure to the user for a long period since the necessity was raised. In most of the poorly managed works, a similar sequence repeats: a hindrance occurs, estimate is revised either due to delay or re-siting etc, process for revised sanction taken up and obtained, re-tender carried out and a new baseline is set. In one proposal, tendering had been hindered since 2016 because part of the planned land was forest land forcing reduction in scope to fit within the available land. A revised estimate for a reduced scope was submitted in 2024 indicating gaps in initial planning and delay in decision making. DWP already stipulates a certificate of availability of defence land and statutory clearances before sanction, and permits go-ahead sanction for preparatory works such as survey and soil investigation [1]. The gap noticed in these cases is a maturity question and not a procedural gap. Verification of site and land, conduct of survey and assessing of soil conditions before sanction may have avoided such a prolonged delay. The zone analysis makes the same point in its recommendations [33].

C. Contrasting cases

The two cases with contrasting approaches taken by MES of the same zone office again highlight the same themes as identified in above paragraphs repeating at the project level also. In case of a delayed project for 44 residential units, sanctioned for ₹13.57 crore in March 2021, the tender was accepted after prolonged post sanction activities and tender action totalling to about 17 months. The work was physically started by the contractor about two months later. The progress after about 19 months of commencement, i.e. Jul 2024 was about 22%. The first contract was cancelled due to slow progress by contractor and had to be re-contracted [34]. In an artillery gun park planned by the same zone and built with a hybrid pre-engineered and light-gauge steel frame (about 3,600 m², ₹14.80 crore and sanctioned in March 2022), a design-and-build contract was concluded in roughly six months. The work was completed in March 2024, ahead of a May 2024 target. This was attributed to detailed planning, sequencing of work and timely action by all stakeholders [35]. The first case took longer than even the longest benchmark set out in the field note on tendering timelines for a capital work (10–12 months, with consultancy), whereas the second concluded within the benchmark for a work without consultancy (approximately 9 months) [6]. Neither case proves a cause, and the technology alone cannot explain the second outcome. Both the projects were sanctioned a year apart in different parts of a MES zone which covers a very large area of responsibility. The projects are likely to have been influenced by the planning teams who handled each project, the locations and accessibility, the interest and actions by stakeholders, capability and intentions of the contractors who have been awarded the particular contract etc. However, both cases reveal how small actions at each stage of a project lifecycle can positively or negatively impact its course.

VII. CANDIDATE DIMENSIONS

The review and the indicators point to four points to look for before calling a procedure or process mature: (a) a procedure is laid down; (b) it is followed consistently across all current projects; (c) its use is recorded on time and any lapse in following the laid-down procedure or any gap in procedure itself leads to corrective action; and (d) the lessons are documented and applied to improve the procedure and its application in later projects. At this preliminary stage of research, the stages are only a basic framework for further detailed research and not a validated scale due to small sample of data and inputs. Table IV links nine candidate dimensions to the evidence reviewed. The final candidate set, wording and level descriptions will be fixed in Stage II of the research after analysis of more data and assessment by experts who have handled various stages of project management in MES.

The zone analysis and the MES field note also record improvement measures proposed by field staff. The measures suggested include coordinated safety clearances, especially for fire safety, before sanction; need of prior go-ahead sanction for survey, soil investigation and preparatory works so that estimates are accurate and revised sanctions are avoided; clearer accountability of Integrated Financial Advisers for timely clearance of project files during financial-advice stage; hindrance removal with active station and formation support; timely action on slow-progressing works, and a fully project-aware and involved monitoring-group interface from start to close [33], [6]. Some of these are already provided for. DWP 2020 provides for go-ahead sanction for preparatory works [1], and a policy of the Engineer-in-Chief's Branch (Policy 01/2021) lays down the procedure for using it [36]. Such provisions exist, so the issue is in their application and not absence of such a rule. The same holds for contractor selection. The field note questions selection of contractor based on lowest bid price alone. The delays and cancellations that follow when contractors without the required capability are engaged are a recurring theme in the works assessed [33], [6]. Policies have been issued for EPC contracting, with pre-qualification requiring prior EPC experience (Policy 03/2021), and for quality and cost-based selection (QCBS) of consultants (Policy 14/2021) [36]. In the policies reviewed, however, works contractors are still selected on the lowest eligible bid, so how far these

provisions are used and whether they are adequate is a question for Stage II.

TABLE IV. Candidate dimensions and supporting indicators

Candidate dimension	Supporting indicators
Project readiness and scope	8 of 24 Command works at 0% progress 26–44 months after sanction; revised sanction needed in all 5 hindrance cases; poor soil raised one estimate by 92%
Planning and scheduling	15 of 22 incomplete Command works past, or assessed to exceed, their planned dates; 9 of 37 and 8 of 28 zone works; three works revised by 6.5–17 years
Procurement, contractor capability and intent	47% of capital liability untendered; 3 Command works in tender 26–31 months after sanction; tender or contract cancelled in 6 of 8 overdue carry-forward works; contractor selection for security-sensitive works
Contract and change administration	IAFW-2249 provisions on extension, compensation and cancellation; revised sanction before tender when scope changes
Quality management	USACE three-phase control and CPWD contract-based quality assurance as comparators
Monitoring and governance	PMG interface; early warning of slow works; roles and delegated powers under DWP and RMES
People, workload, continuity and user welfare	Civil posts held at 49% of ceiling (military 94%) while capital expenditure rose about 75%; availability of family accommodation (to be examined)
Digital information and knowledge	A good-practice case is documented, but there is no record of it being shared/disseminated/easily retrievable; field staff propose online submission of board proceedings to reduce voluminous paperwork.
Adaptation and improvement	Lessons are recorded, checked, used in later works and followed up; USACE after-action review as comparator

VIII. LIMITATIONS AND NEXT STAGE

The study has clear limits, especially keeping in view the limited MES data owing to security restrictions. The ground indicators come from two higher offices at two dates and cover different scopes: a zone-wide return and a Command list of works above ₹20 crore. Both returns were prepared for administrative use by respective offices. Progress figures are by value and not by physical effort.The assessments of whether works will meet their planned dates are judgements recorded in these returns and based on the concerned office's understanding of complexities of each work on ground. The delay in revised sanction could not be measured, since it needs dates from a number of such cases to establish a pattern. However, it is safer to assume that in most cases, detailed planning at the beginning of a project may itself have reduced the need for a revised sanction. External causes such as user decisions, market conditions and weather are not covered which also have been seen to affect the smooth progress of some projects. The grouping of hindrances and causes is the author's own coding of a small sample. The two cases were chosen with a purpose. Both come from the same zone and project management activities largely overlapped in the same period. However, the findings from their analysis cannot be generalised. The contractor and welfare factors are raised from a field note and professional observation. No detailed data on these factors have been analysed yet. All indicators should therefore be treated as questions for testing in Stage II.

The next stage will first collect more evidence-based data from several MES offices, as available. Where accessible, work-performance data from other organisations such as CPWD will also be obtained in order to test whether detailed procedures alone can ensure timely delivery. The dimensions will then be converted into practice statements. These statements will be put to rating by experienced MES professionals for relative importance. The field suggestions noted in the previous section will be tested in the same way. A target number of roughly 25–40 respondents is proposed at this stage. Any recommendation involving organisational change will also have to be checked against existing rules such as GFR, CGDA instructions and CCS rules. This check would itself be a separate study given that the expertise and correct interpretation lies specifically with the departments concerned. Only after this assessment will a maturity-based best-practices framework be proposed. An AI-enabled decision-support element is kept as a later design proposal subject to security restrictions and limits of defence projects and is not claimed here.

IX. CONCLUSION

The maturity models reviewed cover different aspects, such as process discipline and its institutionalisation, strategic alignment at organisational level, how governance is set up and how competent the organisation is. However, none of these models can fit defence construction without appropriate adaptation. The controls and regulations in DWP 2020, IAFW-2249 and later policies which have been issued from time to time are extensive. What needs to be seen is how consistently these controls are applied on ground, how well this is documented, and whether the lessons are used later. The anonymised indicators reviewed here suggest that capacity, readiness and the pre-contract period are the areas where a maturity assessment is most likely to help. Contractor capability and intent and the welfare of users are noted as additional influencing factors, which Stage II will examine. No measurement of MES maturity has been attempted here. The paper only has framed relevant questions for testing. Stage II of the research must supply the data, and the dimensions must be scrutinised by experienced MES professionals, before any framework is proposed.

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