Explaining the Capability Maturity Model Integration (CMMI) Framework and All Its Constellations (DEV, ACQ, SRV).

Analysis:

The Capability Maturity Model Integration (CMMI) framework is a process improvement methodology that was created to help assess and improve the quality of software for the U.S. Department of Defense, but now is used to evaluate/improve processes across a wide range of industries (CMMI Institute, n.d.; UMGC, 2022). This is possible because the CMMI framework is applicable regardless of industry or domain, as it merely outlines the universal features that all productive processes possess, which allows the CMMI framework to be applied in conjunction with industry-specific methodologies to enhance those processes (Carnegie Mellon University, 2006). The Information Systems Audit and Control Association (ISACA), regulates the use of the CMMI by requiring training in CMMI principles to become certified (CMMI Institute, n.d.; WGU, n.d.). Once certified individuals can be hired in-house or as consultants to provide CMMI services (CMMI Institute, n.d.). Those services include conducting CMMI training for an organization's workforce and/or performing appraisals of an organization (CMMI Institute, n.d.). The most consequential CMMI appraisal is its "Benchmark Appraisal" (ISACA, n.d.-b), which first involves evaluating an organization's Capability Level across a range of individual practice areas, on a zero to three scale (ISACA, n.d.-a).

To that point, capability level zero is termed Incomplete, meaning the practice area is not consistently effective due to a lack of process methodology to guide practice area activities (ISACA, n.d.-a). Capability level one is termed Initial, meaning some basic steps have been taken to leverage a process methodology to guide practice area activities to have a consistently effective process (ISACA, n.d.-a). Capability level two is termed managed, meaning a basic effective process methodology has been implemented for the practice area in question, but the practice area is not as efficient as it could be as it does not leverage organizational assets (ISACA, n.d.-a). Lastly, capability level three is defined, meaning a fully formed consistently effective process methodology has been implemented for the practice area that both leverages and produces organizational assets (ISACA, n.d.-a).

Furthermore, the second part of a "Benchmark Appraisal" (ISACA, n.d.-b) occurs after the evaluation of all an organization's relevant practice areas' capability levels have been completed, so that a maturity level, on a scale of zero to five, of an organization can be determined (ISACA, n.d.-a). To that point, maturity level zero is termed Incomplete, meaning it cannot be assured that work will be accomplished within the organization (ISACA, n.d.-a). Moreover, maturity level one is termed initial, meaning work will be completed but unreliably, i.e., not on schedule or at its projected cost (ISACA, n.d.-a). Maturity level two is termed managed, meaning all organizational projects follow a basic process methodology (ISACA, n.d.-a). Maturity level three is termed defined, meaning there is a holistic process methodology steering all organizational activities (ISACA, n.d.-a). Maturity level four is termed "Quantitatively Managed" (ISACA, n.d.-a), meaning there is a holistic process framework steering all organizational activities and that methodology is determined and improved based on data-driven metrics, which lead to consistently effective outcomes (ISACA, n.d.-a). Lastly, maturity level five is termed optimizing, meaning there is a data-driven holistic process framework steering all organizational activities and that methodology is so strongly rooted into the organizational structure that the business can quickly evolve to take

advantage of market fluctuations without degrading its underlying process methodology (ISACA, n.d.-a).

Furthermore, CMMI has several appraisal types beyond just benchmark (ISACA, n.d.-b). Another type of appraisal is an "Evaluation Appraisal" (ISACA, n.d.-b) which is a pre-appraisal in preparation for a benchmark appraisal (ISACA, n.d.-b). Additionally, a "Sustainment Appraisal" (ISACA, n.d.-b), follows up and confirms that the benchmark appraisal's findings are still valid (ISACA, n.d.-b). Lastly, an "Action Plan Reappraisal" (ISACA, n.d.-b), seeks to meet a rating level that was barely missed by a recent benchmark/sustainment appraisal (ISACA, n.d.-b).

Additionally, there are three distinct models that the CMMI framework produces, i.e. "CMMI for Development (CMMI-DEV)" (Software Engineering Institute, 2010b), "CMMI for Acquisition (CMMI-ACQ)" (Software Engineering Institute, 2010a), and "CMMI for Services (CMMI-SVC)" (Software Engineering Institute, 2010c) (Software Engineering Institute, 2010b). Moreover, each of the three model variations uses the same "16 core process areas" (Software Engineering Institute, 2010b) of the CMMI framework, which is separated into three process area domains (FHWA CA Division, 2016). Those three universal process domains (across CMMI constellation models) are support, process management, and project management process domains (FHWA CA Division, 2016; Software Engineering Institute, 2010a; Software Engineering Institute, 2010b; Software Engineering Institute, 2010c). Additionally, while these core processes are found in all three (DEV, ACQ, SVC) CMMI constellations the exact content for each process area may be altered slightly "to address a specific area of interest" (Software Engineering Institute, 2010b). Furthermore, an example of a support process area is "Causal Analysis and Resolution" (FHWA CA Division, 2016), which involves investigating what led to a certain outcome, and how to adjust/correct a given process based on that information, which applies to all types of CMMI models (FHWA CA Division, 2016; Software Engineering Institute, 2010a; Software Engineering Institute, 2010b; Software Engineering Institute, 2010c). Furthermore, an example of a "Process Management" (FHWA CA Division, 2016) process area is "Organizational Training" (Software Engineering Institute, 2010c), which involves preparing team members for their roles so they can execute them effectively, which applies to all CMMI models (FHWA CA Division, 2016; Software Engineering Institute, 2010a; Software Engineering Institute, 2010b; Software Engineering Institute, 2010c). Moreover, an example of a project management process area is "Risk Management" (FHWA CA Division, 2016), which involves proactively identifying potential threats to a project and developing strategies to eliminate/minimize those threats; a practice that applies to all CMMI models (FHWA CA Division, 2016; Software Engineering Institute, 2010a; Software Engineering Institute, 2010b; Software Engineering Institute, 2010c).

Lastly, the three CMMI models (constellations DEV, ACQ, SVC) differ in their fourth process area domains, each of which has process areas that are specific to the model employed (FHWA CA Division, 2016). For CMMI-DEV this domain is *engineering* which covers process areas such as *verification* which involves technical activities (FHWA CA Division, 2016; Software Engineering Institute, 2010b). For CMMI-ACQ this unique domain is *acquisition* which covers process areas such as *agreement management* which involves activities to ensure transactions are conducted appropriately. (FHWA CA Division, 2016; Software Engineering Institute, 2010a). Finally, for CMMI-SVC this domain is *services* that cover process areas such as *service delivery* which involves service delivery conditions/specifications that do not apply to CMMI-DEV or CMMI-ACQ models (FHWA CA Division, 2016; Software Engineering Institute, 2010c).

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