**Practical Software and Systems Measurement Continuous Iterative Development**

**Measurement Framework**

**Part 2: Measurement Specifications: Product Value**

Version 2.1

April 15, 2021

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| **Developed and Published by Members of:** | | |
| Practical Software & Systems Measurement | National Defense Industrial Association | International Council on Systems Engineering |
|  | NDIA 100 Year logo |  |
| Product No.  PSM-2021-03-001 |  | Product No.  INCOSE-TP-2020-001-06 |

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| **Editors:** | | |
| **Cheryl L. Jones**  US Army  [cheryl.l.jones128.civ@mail.mil](mailto:cheryl.l.jones128.civ@mail.mil) |  | **Geoff Draper**  L3Harris Technologies  [geoff.draper@l3harris.com](mailto:geoff.draper@l3harris.com) |
| **Bill Golaz**  Lockheed Martin  [willliam.h.golaz@lmco.com](mailto:willliam.h.golaz@lmco.com) |  | **Paul Janusz**  US Army  [paul.e.janusz.civ@mail.mil](mailto:paul.e.janusz.civ@mail.mil) |

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PSM Product Number: PSM-2020-06-001

INCOSE Product Number: INCOSE-TP-2020-001-06

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# Measurement Specifications

## Product Value (Team, Product, or Enterprise Measure)

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| **Measure Introduction** | |
| **Description** | The Practical Software and Systems Measurement (PSM) Product Value Measure (PVM) is a scalable, and flexible approach to measuring product value for a set of stakeholders. The PSM PVM includes product value measurement for three stakeholder groups; User, Acquirer, and Supplier. Product value can have different meanings for different stakeholders and depend on multiple product, or project, attributes. The results can be compared across products, projects, or initiatives if the components used in the measure are kept consistent. This measurement approach can work for software, hardware, systems, or projects.  The defined objective and the related stakeholders will determine and prioritize the product attributes to be evaluated for a particular product or project. A common set of product attributes and common stakeholder groups are included in the baseline PSM PVM. Related sets of attributes are grouped into attribute categories. Additional attributes and stakeholders can be added to the measure as needed to satisfy the objectives of the measurement. Other attributes may include cost of producing value and product value impacts due to release delays.  It is recommended to perform the PSM PVM on capabilities, software releases, or products during the planning stage to identify which options provide the most value to the stakeholders. Then repeat the measure using the same attributes at release to the customer and periodically during initial operation. |
| **Relevant Terminology** | **Cost of Value** is the cost associated with providing product value and satisfying the stakeholder attributes. This would be an estimate of lifetime cost divided by the estimated life span of the product.  **Impact of Delay** is the estimated impact on Product Value based on delaying development and release of a product, system, or capability. This impact is based on estimated cost, or profit, related to the stakeholder group. Example: the impact of delay to a supplier may affect their income or profit.  **Product Attributes** are characteristics of the product, system, or capability that are important to a set of stakeholders. Product Attributes may be important to more than one stakeholder. They describe the right product for the stakeholders and provide criteria for the evaluation. Stakeholders select 1-n attributes from each Product Attribute Category based on the measurement objectives.  **Product Attribute Assessment** is a value calculated by related data, or assigned by one or more SMEs, to indicate satisfaction of the product to the stakeholder’s attribute criteria.  **Product Attribute Categories** are groups, or collections, of related key Product Attributes. The following six Product Attribute Categories are included in the specification of PSM Product Value Measure and cover the 31 product attributes included in this specification.  **Usability and Operability:** Ability of a product, system, or capability, to be easy to use and operate and effectively utilize personnel resources such as manpower and skills. This includes learnability, operability, user error protection, user interface, and accessibility.  **Performance:** The degree to which a system or component meets or exceeds technical requirements or delivery of capability that meet mission objectives with efficient system response and resource utilization measured or estimated under specified testing and / or operational environmental conditions. This includes time behavior, resource utilization, and capacity.  **Functionality:** Ability of a product, system, or capability, to provide or facilitate all the specified tasks and user objectives with the correct results and the needed degree of precision; and meet mission capability needs. This includes completeness, correctness, and appropriateness.  **Dependability:** Ability of a product, system, or capability, to consistently perform its intended functions over time, recover from any failure condition, be available and operable when needed. This includes availability, reliability, recoverability, maintainability, and maintenance support.  **Security:** Ability of a product, system, or capability, to resist cyber and/or physical interruption, intrusion, spoofing, or degradation of its expected operation and functionality.  **Business Value:** Ability of a product, system, or capability, to satisfy customer initial and total cost targets; supplier contract performance, including product delivery when promised; and supplier financial expectations throughout its lifecycle.  **Product Attribute Weight** is a value between 0 and 100 indicating importance of the attribute to the stakeholders. The sum of all attribute weights for a product evaluated by a SME is 100 indicating 100% of possible value.  **Product Value** is an assessment of the degree to which the delivered product, capability, or service satisfies, or will satisfy the needs of its stakeholders including but not limited to mission improvements, efficiencies, risk reduction, and cost.  **Stakeholder** is a group, or individual, that has vested interest in the Product Value, i.e. User, Acquirer, Supplier. An organization may have multiple interests in a product and therefore they may belong to multiple stakeholder groups. For example: a company may be a supplier, acquirer, and user of a product. In this measurement they are considered different stakeholder perspectives.  **User**: perspective of the end user or operator  **Acquirer**: perspective of the purchasing organization, or buyer of the product  **Supplier**: perspective of the company or organization that develops and sells the product to the Acquirer  **Subject Matter Expert** (SME) is a person familiar with the product, capability, or system and is considered an expert by their management or industry. |

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| **Information Need and Measure Description** | |
| **Information Need** | What value is being provided by the product, capability, or system? What is the Product Value to the stakeholders? Is the user satisfied with the delivered products? Do the products provide the desired functionality when needed? |
| **Base Measures** | |
| **Attribute Category Weight** | **Attribute Category Weight** (Wc) is set for each attribute category being used in the evaluation to represent the portion of the available value assigned to that category of attributes. If Attribute Category Weight is used, it is evenly distributed to all the attributes of the category. If the Attribute Category Weight (Wc) is not used, each attribute will be assigned its own Attribute Weight. |
| **Attribute Weight** | **Attribute Weight (Wa)** represents the portion of available value that is assigned to the specific attribute.The total weight of all attributes for an item being evaluated is 100 representing 100% of the value. Weights may be set to zero for attributes that are not contributing to the Product Value assessment. If Attribute Category Weight (Wc) is used, then the Attribute Weight is calculated as the Attribute Category Weight divided by the number of attributes in that category. A list of common attributes is provided later in this specification. |
| **Product Attribute Raw Score** | **Attribute Raw Score** (RSa) is set for each attribute being evaluated for an item and represent the satisfaction of the item with the attribute criteria. The range for the raw score should be 0-100 for each attribute with 0 representing none of the criteria of the attribute are satisfied and 100 representing all the criteria of the attribute are satisfied. The raw score for an attribute should be calculated based on quantitative data when applicable. A list of common attributes is provided later in this specification. |
| **# SMEs** | **# SMEs** is the number of SMEs involved evaluating the attributes |
| **Derived Measures** | |
| **Stakeholder Attribute Value** | **Stakeholder Attribute Value (SAVs**) is the value achieved by an Item for a specific stakeholder group based on the selected attributes. This is calculated by adding the total attribute points achieved for all attributes related to the stakeholder group and dividing by the sum of the total maximum attribute score available for all attributes related to the stakeholder group. For an Item this represents the % of attribute satisfaction and is calculated for each Stakeholder Group (User, Acquirer, Supplier). Attribute points achieved is calculated as the attribute weight times the attribute raw score. Available score for an attribute is calculated by the attribute weight times 100.  **SAVs =** Score achieved / Score available where  Score Achieved **=** ∑Attribute(∑SME(WAttribute\* RSAttribute)) = ∑Attribute(WAttribute\*∑SME(RSAttribute))and  Score available **=** ∑Attribute(∑SME(WAttribute\* Max Score)) = # SMEs \* 100 \* 100 **= #** SMEs \* 10000  for all attributes selected by a Stakeholder group. This is calculated for each Stakeholder group.  Where:   1. ∑SME(RSAttribute)SME is the sum of raw score across all SMEs and is calculated for each attribute 2. WAttribute\*∑SME(RSAttribute)SME) is the sum from step 1 times the attribute weight and is calculated for each attribute 3. **∑Attribute** (WAttribute\*∑SME(RSAttribute)SME)attribute is the sum of the weighted scores across all attributes 4. ∑Attribute(∑SME(WAttribute\* Max Score))  **=** ∑Attribute WAttribute\* 100 \* # SMEs   **=** 100 \* 100 \* # SMEs = **(#**SMEs \* 10000**)** since Max Score = 100 and sum of  all attribute weights = 100. |
| **Stakeholder Category Value** | **Stakeholder Category Value (SCVs)** is the value achieved by an Item for a specific stakeholder group for each attribute category. This is calculated by adding the total attribute points achieved for all attributes in a category and dividing by the sum of the total attribute score available for all attributes in the category. For an Item this represents the % of attribute category satisfaction and is calculated for each attribute category and each Stakeholder Group (User, Acquirer, Supplier). Attribute points achieved is calculated as the attribute weight times the attribute raw score. Available score for an attribute is calculated by the attribute weight times 100.  **SCVs** = Score achieved / Score available where  Score Achieved = ∑Attribute(WAttribute\*∑SME(RSAttribute)SME) and  Score available = # SMEs \* ( 100 \* 100) = (#SMEs \* 10000) for all attributes selected by a Stakeholder group. This is calculated for each Stakeholder group.  Where:   1. WAttribut= Attribute Category Weight (Wc) / # attributes in the category and is calculated for each attribute 2. ∑SME(RSAttribute)SME is the sum of raw score across all SMEs and is calculated for each attribute 3. WAttribute\*∑SME(RSAttribute)SME) is the sum of step 1 times the attribute weight and is calculated for each attribute 4. **∑Attribute** (WAttribute\*∑SME(RSAttribute)SME)attribute is the sum of the weighted scores across all attributes. |
| **Product Value** | **Product Value (PV)** represents the value achieved by an Item for all attributes. This is calculated by adding the total attribute points achieved for all attributes and dividing by the sum of the total attribute score available for all attributes. For an Item this represents the % of attribute satisfaction. Attribute points achieved is calculated as the attribute weight times the attribute raw score. Available score for an attribute is calculated by the attribute weight times 100.  PV = Score achieved / Score available where  Score achieved =∑Attribute(∑SME(WAttribute\*RSAttribute)SME) and  Score available = # SMES \* (100 \* 100) = (#SMEs \* 10000)  Where:   1. ∑SME(RSAttribute)SME is the sum of raw score for all SMEs and is calculated for each attribute. 2. WAttribute\*∑SME(RSAttribute)SME) is the sum of raw scores from step 1 times the attribute weight and is calculated for each attribute. 3. ∑Attribute(WAttribute\*∑SME(RSAttribute)SME)) is the sum of weighted scores across all attributes. |

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| **Indicator Specification** | |
| **Indicator Description and Sample** | **Stakeholder Attribute Value (SAV)** is calculated for each stakeholder group (user, acquirer, and supplier). The results can be represented in a tabular format or using a column graph as depicted below.  The first table and graph represent an example SAV for each stakeholder group.  Table 1: Sample Stakeholder Attribute Values   |  |  |  |  | | --- | --- | --- | --- | | A | B | C |  | | 65.37% | 63.88% | 67.89% | User | | 64.97% | 62.89% | 67.93% | Acquirer | | 65.11% | 61.58% | 66.38% | Supplier | | 64.97% | 62.89% | 67.93% | Total |     Figure 1: Stakeholder Attribute Value  Assessments of Stakeholder Attribute Value and Product Value should be made during planning and in preparation for release, and periodically after deployment. These should be compared to each other to understand any trends in product value. |
| **Analysis**  **Model** | A specified level of Product Value may be set based on historical assessments of similar capabilities or systems. Such a specified level should be agreed to by the stakeholders.  When comparing Product Value across capabilities, products, or systems for prioritizing future work the analysis should identify the item with the highest attribute value.  The Product Value Measure should be performed at a capability, or Epic level and above for software products. Analysis should include sensitivity analysis to assess the robustness of the results of the measure. |
| **Decision Criteria** | Decision criteria and method should be determined by the stakeholder groups before the assessment is made. Decision criteria should be measurable and support decisions on different stakeholder courses of action. For example, the decision criteria may be to select the item with the highest total attribute value. It may also be to select the item with the highest attribute value related to a specific stakeholder or category. |
| **Indicator Interpretation** | Identify the percent of attribute satisfaction. |

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| **Additional Information** | |
| **Additional Analysis Guidance** | Use actual data to assess satisfaction of the attributes whenever possible.  When assessing the same product for trending purposes make sure the attribute weights are kept consistent from one periodic assessment to the next. This forces the changes in value to be driven by changes in how the attributes are satisfied.  When assessing different products for comparison, make sure the attribute weights are kept consistent across the products being assessed. This forces the changes in value to be driven by differences in how the attributes are satisfied. |
| **Implementation Considerations** | All programs/projects should have a strategy for project assessment and control. The product value assessment process should be enabled during planning. Initial assessments are conducted to baseline the assessment. After fielding, periodic assessment should be conducted to identify trends and issues.  Program/projects may choose one or two attributes from each of the six attribute categories for simplification.  Program/projects may use Attribute Category Weights as defined above for simplification.  PSM provides a worksheet to assist implementation of the [PSM PVM](http://www.psmsc.com/CIDMeasurement.asp). |

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| **Additional Specification Information** | |
| **Information Category** | Product Quality and Customer Satisfaction. |
| **Measurable Concept** | Product Value is measured as the satisfaction of specified product attributes. |
| **Relevant Entities** | Capabilities, software products, or systems. |
| **Attributes** | Attributes of Usability and Operability weight and score.  Attributes of Functionality weight and score.  Attributes of Performance weight and score.  Attributes of Dependability weight and score.  Attributes of Security weight and score.  Attributes of Business Value weight and score. |
| **Data Collection and Analysis Procedure** | 1. Prepare for the PV measurement    1. Identify the item being evaluated.    2. Identify the Stakeholders, their applicable Stakeholder groups, and the SMEs performing the measure.    3. Establish the objective or purpose of the evaluation and how the results will be used.    4. Select the attributes to be evaluated for the measure.    5. Establish the weights for each attribute selected. Weight of each attribute will be set by stakeholder agreement. 2. Distribute information to the SMEs performing the evaluation. 3. SMEs will set the raw score for each attribute for each item being evaluated representing how well the item satisfies the attribute criteria. Assessed satisfaction of each attribute will be determined by estimated or actual data, or if data is not available by expert opinion. General criteria for satisfying each attribute is provided in this PSM PV Measurement Specification. 4. Collect the raw scores from the SMEs performing the attribute evaluation. 5. Calculate the Stakeholder Attribute Value and Total Product Value and prepare the results.   The calculations are based on the formulas described in the Derived Data section of this Product Value Measurement Specification.   1. Product Value results are provided to the stakeholders. |
| **Product Value Attributes, Criteria, and Categories** | |
| **Usability and Operability Attributes** | 1. Is the system, product, or capability easy to use and operate? – Degree of ease of operator use. Is additional training needed? Does it reduce amount of work and time required to do the mission or objective? Is it intuitive to use? Does it adapt to user mistakes? Does it include user guidance? Does it reduce the number of user steps to complete the task? Set the value 0-100. Recommended as part of a minimal set of attributes.   Recommended Stakeholders: User; and Acquirer.  0 = Additional training is needed. Increases the amount of work and time required to do the mission or objective. Not intuitive to use. Does not adapt to user mistakes. Does not include user guidance. Increases the number of steps to complete the task.  50 = No training is needed. No increase in amount of work and time to do the mission or objective. Does not improve or diminish intuitive use. Adapts to some user mistakes. Manual user guidance is included. Does not increase or decrease steps to complete task.  100 = Reduces need for training. Reduces the amount of time to complete the mission or objectives. Improves intuitive use. Prevents or adapts to user mistakes. No guidance is needed to use. Decreases steps to complete tasks.   1. Are manpower, skills, and resources available to execute and maintain the system, product, or capability? - Degree the system, or capability, can be operated and maintained with the planned operational and support resources. Does it take more or less effort to use? Set the value 0-100. Recommended as part of a minimal set of attributes.   Recommended stakeholders: User; and Acquirer.  0 = There is an increase in manpower, skills, and other resources to operate and maintain the system, or capability.  50 = There is no increase or decrease in operational or maintenance resources and or skills.  100 = The system, or capability can be operated and maintained with fewer resources than expected.   1. Does the user have appropriate access to the system, product, or capability?  * Degree of access the operator or user needs in order to operate and use the system. Set the Value 0 – 100.   Recommended Stakeholders: User.  0 = Additional user access is needed, or additional admin access is needed, or additional maintenance access is needed.  50 = There is no change in access needed for user, admin, or maintenance.  100 = Reduced access for user, admin, and/or maintenance. |
| **Functionality Attributes** | 1. Does the system, product, or capability work as intended or required? – Degree the system, or capability, operates as expected, or required, in its intended environment. Set the value 0-100. Recommended as part of a minimal set of attributes.   Recommended Stakeholders: User; Acquirer; and Supplier.  0 = There is limited to no execution, no requirements are satisfied, no new or improved functions, and reduced operational performance.  50 = Satisfies some requirements and some operations are as intended. Some mission capabilities are provided.  100 = Provides new or improved mission capabilities, functions, or features and performance which meets or exceeds those requested or required.   1. Does the system, product, or capability satisfy or improve mission needs? - Degree the system, or capability, satisfies the users mission, objective, or purpose. Set the value 0-100. Recommended as part of a minimal set of attributes.   Recommended Stakeholders: User; and Acquirer.  0 = The system, or capability, place mission objective at unacceptable risk. The system, or capability has reduced mission capabilities and performance.  50 = Some mission objectives are satisfied but no improvement to mission capability.  100 = Improved performance and interoperability with improved mission capability and reduced risk.   1. Does the system, product, or capability, meet all contractual requirements or Capability Needs Statement? – Degree the system, product, or capability meets the contractual requirements imposed by the acquirer. Set the value 0-100. Recommended as part of a minimal set of attributes.   Recommended Stakeholders: Acquirer; and Supplier.  0 = The system, product, or capability does not meet most contractual requirements and was not accepted by the acquirer.  50 = Some contractual requirements are met but the system was accepted with workarounds by the acquirer.  100 = The system, product, or capability meets or exceeds all contractual requirements.   1. Does the system, product, or capability, align with the product roadmap or known future needs? – Degree by which the system, product, or capability satisfies or is consistent with the acquirer’s product roadmap. Set the value 0-100.   Recommended Stakeholders: User; Acquirer; and Supplier.  0 = The system, product, or capability is not consistent with acquirer’s roadmap, long and short-term goals.  50 = The system, product, or capability is consistent with short-term goals, but only some long-term roadmap objectives.  100 = The system, product, or capability is consistent with all acquirer’s roadmap objectives.   1. Are there operational or sustainment issues with the system, product, or capability? – Degree by which the system, product, or capability is free from any known operational or sustainment issues. Set the value 0-100.   Recommended Stakeholders: User; and Acquirer.  0= The system, product, or capability increases operational, maintenance, or sustainment issues.  50 = The system, product, or capability does not increase or decrease operational, maintenance, or sustainment issues  100 = The system, product, or capability reduces the known operational, maintenance, and sustainment issues.   1. Is the release cadence to push new capability to the field reasonable and acceptable? – Periodic releases of new capability will meet user needs. Set the value 0-100.   Recommended Stakeholders: User, Acquirer and Supplier  0= The release cadence does not meet user or acquirer needs.  50 = The release cadence meets either user or acquirer needs but not both.  100 = The release cadence meets both user and acquirer needs. |
| **Performance Attributes** | 1. Does the system, product, or capability, perform to expected system measures of performance (MOP) and effectiveness (MOE) within expected, or contractual, system resource limitations? – Degree by which the system, product, or capability performs its intended functions and operations efficiently within target resource constraints. Set the value 0-100. Recommended as part of a minimal set of attributes.   Recommended Stakeholders: User; Acquirer; and Supplier.  0 = The system, product, or capability decreases performance of some capabilities or increases system resource needs.  50 = The system, product, or capability does not improve or degrade performance of any capabilities or system resource needs.  100 = The system, product, or capability improves capability performance within system resource limitations or reduces resource needs.   1. Does the system behave gracefully when approaching resource limits such as large number of users or transactions or increased demand? – Degree by which the system, product, or capability can continue to perform its intended functions as user demands or number of transactions increase. Set the value 0-100.   Recommended Stakeholders: User; and Acquirer.  0= The system, product, or capability has degraded functionality and performance as the user demand increases or the number of transactions increase.  50 = There is some degradation in performance or functionality as user demand increases or the number of transactions increase.  100 = The system, product, or capability continues to perform with no degradation as user demand or number of transactions increase.   1. Does the system, product, or capability provide the results within expected, or needed response time? – Degree by which the system, product, or capability provides the results, actions, or responses within contractual or expected response time. Set the value 0-100. Recommended as part of a minimal set of attributes.   Recommended Stakeholders: User.  0 = The system, product, or capability does not provide any results within expected response time.  50 = The system, product, or capability supports degraded operations within expected response times.  100 = The system, product, or capability provides all results within expected and needed response time.   1. Does the system, product, or capability meet or exceed the most important specified mission technical performance objectives, thresholds, or properties in an operational environment? – Degree by which the system, product, or capability can meet its specified mission technical objectives, thresholds, or properties while in its expected operational environment. Set the value 0-100. Recommended as part of a minimal set of attributes.   Recommended Stakeholders: User; and Acquirer.  0 = The system does not meet any of its key specified mission objectives while operating in its expected environment.  50 = The system meets about half of the key specified mission objectives in its expected environment but about half are not met.  100 = The system meets or exceeds all the most important specified mission objectives while operating in its expected environment.   1. Does the system provide enough margin for future growth in performance required to accommodate anticipated future mission needs? – Degree by which the system, product, or capability allows for future growth in performance. Set the value 0-100.   Recommended Stakeholders: Acquirer; and Supplier.  0 = The system has no performance margin for contractual, or expected, growth in performance or capacity for known future needs.  50 = The system has about half contractual, or expected, performance margin allowance for growth for known future needs.  100 = The system meets all contractual or requested performance margin allowance for future growth for known future needs.   1. Is the downtime to perform upgrades or maintenance reasonable and acceptable? – Degree by which the downtime to perform upgrades and maintenance affect performance. Set the value 0-100.   Recommended Stakeholders: User and acquirer.  0 = The system cannot perform during upgrade or maintenance events or down-time is unacceptable.  50 = The system has minimal operation but acceptable down-time during upgrade or maintenance events.  100 = The system is fully operational with no down-time during upgrade or maintenance events. |
| **Dependability Attributes** | 1. Is the system, product, or capability reliable and available when needed? – Degree of impact of failures, shutdowns, system locking up, or waiting on system to the user, mission, or objective. Set the value 0-100. Recommended as part of a minimal set of attributes.   Recommended Stakeholders: User; Acquirer; and Supplier.  0 = System failures, shutdowns, locking, and operational delays prevent efficient or effective operation.  50= System failures, shutdowns, locking and delays happened occasionally and precludes execution of some missions with existing resources or requires excessive resources to meet mission objectives.  100 = There are no failures, shutdowns, locking, delays or degradation in operation exhibited by the system.   1. Did you get the system, product, or capability when you needed it? - Ability to rapidly deliver, update, and/or fix system, or capability to meet operational needs. Set the value 0-100. Recommended as part of a minimal set of attributes.   Recommended Stakeholders: User; Acquirer; and Supplier.  0 = Delivery, update, and fix capability does not meet operational needs.  50 = About half the delivery, update, or fix capabilities provided meet operational needs.  100 = All expected mission capabilities, functions, features, and performance were delivered, updated, or fixed to meet operational needs.   1. Does, or will, the system, product, or capability life expectancy meet contractual or customer needs? – Degree the system, or capability life expectancy meets planned mission or user needs. This may also relate to product roadmap. Set the value 0-100.   Recommended Stakeholders: Acquirer; and Supplier.  0 = Product life expectations will not meet mission or user needs and cannot be extended.  50 = Product life expectations meet current contractual or customer needs but there is no cost-effective means to extend its life.  100 = Product life expectations exceed mission and user needs and can be extended as needed.   1. How easy does the system, product, or capability recover operation from failure mode? – Ability of the system, product, or capability to recover normal or degraded operation as the result of a failure. Set the value 0-100. Recommended as part of a minimal set of attributes.   Recommended Stakeholders: User; and Acquirer.  0 = The system, product, or capability cannot recover any operations as a result of a failure.  50 = The system, product, or capability can recover to degraded operations.  100 = The system, product, or capability recovers full operation automatically after a failure.   1. How easy can the system, product, or capability be developed? – The degree of difficulty of development of the system, product, or capability due to technical issues or technical maturity. Set the value 0-100.   Recommended Stakeholders: Acquirer; and Supplier.  0 = Technical maturity or issues make the system, product, or capability extremely difficult to develop.  50 = Technical maturity and lack of technical issues make the development of the system, product, or capability moderately difficult to develop.  100 = Technical maturity and lack of technical issues make the system, product, or capability easy to develop.   1. Does the system, product, or capability provide enough information, detail, or resources to be maintained during operation? – Degree of information, detail, or resources provided to support maintenance during operations. Set the value 0-100.   Recommended Stakeholders: Acquirer.  0 = No guidance, information, detail, or resources are provided to support maintenance.  50 = Some guidance, information, detail, and resources are provided so maintenance can be done but not easily.  100 = Guidance, information, detail, and resources are provided for easy maintenance.   1. Is the corresponding end-of-life for hardware and other components of the system reasonable and acceptable? – Degree by which all the components of the system have appropriate life expectancies. Set the value 0-100.   Recommended Stakeholders: Acquirer and supplier.  0 = None of the external components have acceptable or reasonable end-of-life.  50 = About half of the external components have acceptable or reasonable end-of-life.  100 = All external components have acceptable end-of-life. |
| **Security Attributes** | 1. Is the system, product, or capability secure to use? Context: Degree that the system, or capability protects the user and data from harm.   Recommended Stakeholders: User, Acquirer, Supplier.  0 = Security controls are ineffective, or not provided and prevents, degrades, and/or places operation at unacceptable risk.  50 = Some security controls are included but operations is still at risk but has been accepted by the user.  100 = Improved security controls reduce mission risk.   1. Does the system, product, or capability resist cyber and/or physical interruption, intrusion, spoofing, or degradation of its intended functionality and operation? - Degree by which the system, product, or capability can prevent or resist any interruptions in normal operations due to external influences. Set the value 0-100. Recommended as part of a minimal set of attributes.   Recommended Stakeholders: User; Acquirer; and Supplier.  0 = The system, product, or capability has no resistance to any physical and cyber interruption, intrusion, spoofing or degradation of its intended functionality.  50 = The system, product, or capability resists some physical and cyber interruption, intrusion, spoofing, with some degradation of performance.  100 = The system, product, or capability resists all known physical and cyber interruptions, intrusions, spoofing with no degradation of its functionality or performance.   1. Is the system, product, or capability, vulnerable to security attacks? - Degree of which the system, product, capability resists, or prevents security attacks. Set the value 0-100. Recommended as part of a minimal set of attributes.   Recommended Stakeholders: User; Acquirer; and Supplier.  0 = The system, product, or capability has no resistance to security attacks, and they may cause shutdown.  50 = The system, product, or capability has some resistance to security attacks, but operation is still at risk.  100 = The system, product, or capability has built in resistance and preventive measures to security attacks with no degradation in operation.   1. Is the approach for recurring accreditation reasonable and acceptable? - Does the approach for renewing security accreditation meet needs of the user and acquirer? Set the value 0-100. Recommended as part of a minimal set of attributes.   Recommended Stakeholders: Acquirer; and Supplier.  0 = There is no approach or plan for recurring accreditation.  50 = There is an approach for recurring accreditation, but it is not acceptable.  100 = The approach and plan exist and are acceptable to both user and acquirer. |
| **Business Value Attributes** | 1. Will the system, product, or capability, improve mission needs while meeting or exceeding project budget constraints? - Degree by which the system, product, or capability will improve the mission capability and yet stay within budget constraints. Set the value 0-100. Recommended as part of a minimal set of attributes.   Recommended Stakeholders: Acquirer; and Supplier.  0 = The system, product, or capability does not improve mission needs and is not expected to perform to budget constraints.  50 = The system, product, or capability may improve mission needs but not perform to budget or may perform to budget but not improve mission needs.  100 = The system, product, or capability will improve mission needs and is expected to perform well within budget constraints.   1. Does the system, product, or capability, add to supplier portfolio and market share? - Degree of business impact and product portfolio. Is this a new line of business or product line? Set the value 0-100.   Recommended Stakeholders: Supplier.  0 = There is no market or portfolio advantage for system, product, or capability.  50 = There is continuing market for the product and/or is an important part of the supplier’s portfolio but no future investment.  100 = There are market demands and portfolio advantages for the system, or capability, and is, or will be, available to meet market demands and the supplier will continue to invest and improve.   1. Does the system, product, or capability have financial value for the supplier? - Degree of financial impact to the company (Cash flow, revenue, profit…) or the ability of the organization to support the project with their current budget and resources. Will this positively impact company financial standing? Set the value 0-100.   Recommended Stakeholders: Supplier.  0 = Supplier will suffer severe negative financial impacts or loss of organization’s ability to support the system  50 = The is no financial advantage to the supplier.  100 = Supplier would make financial gains with potential for future business or the organization can provide significant increases support with lower cost and resources   1. Is the system, product, or capability, cost effective to produce? - Degree of cost investment versus return for the company /organization efficiency/effectiveness? (Return on Investment) Set the value 0-100.   Recommended Stakeholders: Acquirer; and Supplier.  0 = Investment will not be recovered in short term or long term.  50 = The cost of investment and return cancels each other. No loss or gain.  100 = Return on investment is better than expected.   1. Is there an impact to value due to delay in delivery? Separate value for supplier, acquirer, and user impacts. - Degree of impact to the value of the system, product, or capability if it is delayed compared to its potential lifetime value. the value 0-100.   Recommended Stakeholders: User; Acquirer; and Supplier.  0 = Significant impact to the stakeholder’s business model. I.E. loss of future orders/profit/revenue/market leadership, cancelled deployments, delayed retirement of other systems, loss of program funding…  50 = Some impacts to the stakeholders’ business model I.E. delays and or reductions in orders/profit/revenue, reduced market share, delayed deployments, reduced program funding, delays in fielding follow on capabilities  100 = Minimal or no impact to stakeholder business models |

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| **Cumulative Flow**  **(8.4)** | *Is current capacity keeping up with demand? Is the flow of work proceeding through the value chain?*  Cumulative Flow Diagrams (CFDs) are information-rich indicators depicting how efficiently work is being completed across project workflow stages, the rates of task arrivals vs. departures (slopes of CFD bands), and potential queues or backlogs where work rates seem to be slowing. CFDs are generated for project tasks or stories, which are project-specific measures that typically cannot be directly aggregated across projects. At the enterprise level a *Summary* indicator can used to show “mini-CFDs” for a set of projects, based on percentage distribution across workflow states.    Figure : Workflow Indicator  Look for indicators of anomalous workflow distribution, trends, backlogs, ratios of work arrivals vs. departures, and transitions of work to completion states. Distribution will be very dependent on the situation, age and lifecycle state of each project and cannot be compared across projects.  This indicator depends on common workflow states across projects – transformations and mappings of native project workflow states to an enterprise standard such as those shown here may be needed if schemas vary across projects.  A healthy demand-driven workflow will have approximately equal rates (parallel CFD bands) of new work (arrival rate) vs. completed work (departure rate), i.e., departures/arrivals ≅1.0. See Figure 15, Notional CFD Diagram for details. Ratios >1.0 indicate the project is deploying completed work at a rate faster than new work is arriving; values <1.0 can indicate a growing backlog of new work received or committed to. Project departure/arrival rates can be depicted in a *Stoplight* dashboard summarizing at a glance how well work completion is balanced vs. the incoming demand of new work, and which projects may need more investigation to ensure efficient workflows and sufficient resources.    Figure : Cumulative Flow Stoplight |
| **Cycle Time / Lead Time**  **(8.5)** | *How long does it take to implement a feature or capability?*  Cycle Time and Lead Time are generally measures and analyses specific to a team, product or environment, measuring the duration from the start of a task (cycle time) or receipt of a customer/user request (lead time) until the task or product is completed and delivered to a baseline or operational environment. (See Figure 2, Measurement Context Diagram) Due to widely varying project or product characteristics it can be difficult to aggregate cycle time measures to the enterprise level. *Summary* indicators can be used to depict cycle times and trends across a set of projects.  These metrics also don't align well with defined-scope type contracts where work does not continuously flow (such as a capacity-based or Time & Materials type contract). |
| **Defect Detection**  **(8.6)**  **Defect Resolution**  **(8.7)** | *How many defects were contained (discovered, saved) prior to internal or external release?*  At the project or product level, the intent is to remove defects during development and initial testing of iterations or releases before they escape to impact downstream work.  Measures of overall enterprise defect detection efficiency can be generated in an *Aggregation* indicator very similar to the project-level indicator but summing base measures across projects as an indicator of overall enterprise capability. Trend data provides early warning of performance issues.  In particular, executives often focus on defect escapes, especially those that escape to the field. Executives also want to know if the rate of defects generated is going up over a period of time. |
| **Mean Time to Repair**  **(8.8)** | *How efficient are we at removing defects once found? How long does it take to restore service?*  Enterprise MTTR analysis indicators are similar to those at the project level but reflecting an *Aggregate* of measures across projects. MTTR units (hours, minutes, days) may vary depending on the project mix and operational status. (Figure 4) Analyses is often filtered by defect category to determine closure time for the most critical defects. Root cause analysis can be conducted at the enterprise level to identify opportunities for improvement.    Figure : Mean Time to Repair  At executive levels, *Stoplight* indicators (or summary project counts by stoplight color), Figure 5, can be used as flags to managers on how project MTTR measures and trends by reporting period compare to defined enterprise objectives and thresholds.  Different objectives may exist for different Service Level Agreements (SLAs), so emphasis may be on those programs that exceed their agreements.    Figure : MTTR Stoplight Indicator |
| **Release Frequency**  **(8.9)** | *How often can we deploy new releases?*  The speed and frequency of product releases is often a primary business objective. The Release Frequency indicator spec (8.9) provides an example of an enterprise *Summary* indicator depicting the number of internal or external releases per month by project.  Derived *Aggregate* measures of average release times at the enterprise level can also be generated, but these tend to be more useful for specific teams or products.  The defined data collection intervals for release reporting may vary based on business need (e.g., annually, quarterly, monthly, weekly, daily). Some enterprises or projects may achieve continuous delivery releases in a near-ops/ ops environment several times per day. |
| **Velocity**  **(8.10)**  **Acceleration** | *Is productivity improving (more work completed per unit time)?*      Figure : Aggregate Software Productivity - Acceleration  Story points and velocity per iteration cannot typically be compared or aggregated across projects due to differing project-specific operational definitions. But as introduced in 8.10, Acceleration is a derived measure that indicates relative changes in Velocity (ratio) compared to an average of recent iterations. Acceleration = 1.0 indicates steady velocity; >1.0 increasing velocity; <1.0 decreasing velocity. Acceleration can be calculated as a project measure, *Aggregate* measure across projects, or as a *Summary* set of “mini-Acceleration” indicators for multiple focus projects. *Stoplight* indicators can also be used at the executive level to summarize project acceleration relative to threshold ranges.  Under stable conditions (staffing, etc.), Acceleration can be used to assess if productivity is improving, declining or steady at the project or enterprise levels. However, since its underlying base measure is story points completed (velocity), Acceleration can be susceptible to variation as the team or product characteristics change. Anomalies are not uncommon and should be understood before taking significant actions.  Table : Acceleration |