

**Evaluation Report of
Fujitsu Limited / DMR Consulting Initial Submission to
SPE Management RFP**

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1. Introduction

This document is an evaluation report of Fujitsu / DMR response (ad/00-05-01) against SPE Management RFP (ad/99-11-04) and prepared to be a source for the final evaluation report. This response was evaluated by Nihon Unisys, Ltd, as requested at the evaluation teleconference (May 17th) and based on the evaluation table adopted at Denver PWG Mtg.

Our evaluation activity was performed in the following manner:

- At first, each item (total 90 items) in the evaluation table was evaluated separately.
- Each evaluation item has mark (A,B, or C) and comments fields. Each mark depicts following meaning:
A = well satisfied, B = satisfied, C = not satisfied
Comments fields describe our significant comments on the mark value.
- We focused on the strength of the response rather than the weakness, because we think PWG should identify additional requirements for revision activity and obtain better revised responses at the next stage by extracting and concatenating individual excellent points of two proposals.
- The result is given in section 4.
- Next, this result was summarized in every status category (Mandatory, Optional,...). The evaluation summaries of those categories are given in section 3.
- Sections 3 and 4 form the main body of this document.
- Finally, based on those summarised comments, general comments were overviewed. These are given in section 2.

The rest of the document is not structured in order of those activities but constructed with three sections; General Comments, Evaluation by Status Category, followed by its detail list. The reason is simply the improvement of understandability. Evaluation table has too many evaluation items and their contents are too much complicated to capture the essence.

We hope this report would provide the evaluation team a helpful information for the final combined evaluation report. We welcome any question and criticism on the contents of this evaluation report.

Participants in this evaluation are Hiromichi Iwata, Toshihiko Tsumaki, and Kiyoshi Sakaguchi.

2. General Comments

(1) This proposal can be used as a good starting point to obtain better revised response and also a basis to create usable SPE facility, because :

- The proposal aims to cover a wide range of process life cycle and broad scope of SPE domain. Proposed metamodel is not limited to Process Definition.
- The proposed metamodel uses UML Activity Graphs and State Machine packages to represent complex flow / decomposition of activities, their dynamic nature, their relationships to various resources, and perhaps the process enactment.
- The proposed metamodel and its terminology seem independent of any specific process methodology, in particular, terms of the essential SPE concepts are fairly compliant with those specified in the RFP.
- Descriptive element and real SPE entity are clearly distinguished and properly structured in the metamodel.
- The proposed metamodel is totally UML compliant.

- (2) Generally speaking, concrete modelling constructs to support concepts specified in the RFP are properly defined in the metamodel. Those include Activity, SoftwareProcess, ProcessComponent, Phase, Milestone, Technique, Metric, ResouceType, DeliverableType, Team, Language, DescriptiveElement, PresentationElement, Perspective, and ProcessCategory. Some of those form unique characteristics of the proposal.
- (3) On the other hand, although this proposal aims to cover broad range of process life cycle and global SPE scope, it seems the current proposal would lack for several necessary modelling constructs and discussions. Model examples or illustrative examples are desired to facilitate understanding, particularly in process enactment aspect. In addition, it is desired that well-formedness rules would be specified in each metaclass description to supply necessary semantics and constraints. For further detail see the rest of this document.
- (4) Proper use of UML mataclasses seems to be satisfied, but relationships between SPE metamodel, MOF, and M1 level process model are not adequately discussed, particularly in process enactment aspect.
- (5) There are some issues to be discussed in our perspective. They are mainly related to the process enactment and project management aspects. For further detail see the rest of this document.

3. Evaluation By Status Category

3.1 Mandatory Requirements

Strength:

- (1) The scope of the response is very wide and aims to cover almost all SPE domains as well as a wide range of process life cycle. Proposed SPE domain is not limited to the Process Definition.
- (2) UML Activity Graphs and State Machine are properly used and the relationships between SPE metaclasses and the UML metaclasses are explicitly modelled.
- (3) Terms of essential concepts are fairly compliant with those specified in the RFP.
- (4) A metaclass PresentationElement is provided to support the connection to individual CAPE tool, though the usage is unclear, maybe due to lack of examples.
- (5) Proposed metamodel is totally UML compliant.
- (6) Two examples are provided as a proof of concepts accompanied by some concrete modelling examples, but they are inadequate in particular for the process enactment aspect.
- (7) DescriptiveElement is provided separately from DescribedElement, which represents real SPE entity. Two metaclasses DescriptiveElement and Language are properly modelled to support descriptive information in various natural language. The former supports multimedia as well as text.
- (8) A metaclass ProcessCategory is provided to support taxonomy of the process components, but the taxonomy of other things such as resources and products is out of scope.
- (9) Phase is defined clearly, associated with separate metaclass Milestone, which is associated with UML Event metaclass.

Weakness:

- (1) XMI DTD is not provided.
- (2) Glossary is not provided, but several comparison tables are provided to map similar terms used in various standards.

- (3) Model examples should be provided to explain the relationships between some metaclasses and associated UML metaclasses such as UML ActivityGraph and UML ObjectFlowState in order to facilitate understanding.
- (4) It is desired the relationships between SPE metamodel and MOF is more clearly described, particularly in the process enactment aspect.
- (5) Same comment is also applied to conformance to OMG four layer architecture.
- (6) Despite the strength (1) above, the current metamodel does not necessarily cover the entire domain such as process tailoring and process institutionalisation. These are left open to future revision.

3.2 Optional Requirements

Strength:

None.

Weakness:

- (1) UML profile is not provided nor discussed and left to be determined.

3.3 Discussion Points

Strength:

- (1) Deliverables are explicitly modelled separately from other work products (InformationUnit). This is the major strength of the metamodel because, in the management and process enactment point of views, deliverables need different treatment (e.g. packaging and delivery, specific configuration management) and information management from usual artifact.
- (2) Coverage of process life cycle is very broad, but it seems the management process and delivery / maintenance process need different viewpoints, i.e. different modelling considerations.
- (3) Trace and derivation relations between products are defined, in a dynamic sense, in relation to UML ActivityGraph. Also see the weakness (3) below.
- (4) Version of SPE element (DescribedElement) is explicitly given in the metamodel as an attribute. This applies to not only product but also resource and process component. Also see the weakness (2) below.

Weakness:

- (1) Dependencies among products and the rules to constrain product combinations or aggregations are discussed but no explicit modeling constructs are provided. CAPE tool must define a part of such information in a separate construct PresentationElement.
- (2) Configuration and version management of process is discussed but not explicitly modelled.
- (3) In our opinion, trace and derivation relations between products should be also explicitly modelled in SPE metamodel body. In nature, these relations are defined in no connection with activity sequence, but they should be monitored in conjunction with associated activities in the process enactment aspect.

3.4 Evaluation Criteria

In this section only additional comments are listed, because many parts of the evaluation criteria are duplicated with those requirements mentioned earlier.

Strength:

- (1) In each section of metaclass description, M1 level instance examples are properly provided.
- (2) The proposal and proposed metaclass are totally independent of any process methodology.
- (3) The proposal could be also a good starting basis for the creation of a usable SPE facility - -- though current metamodel is not rich enough.
- (4) The proposal focuses on a way to structure Software Process Definition (SPD) data within a CAPE tool repository, but the usage is unclear.
- (5) Technique is clearly defined as metaclass Technique and its superclasses ReferenceElement and ProcessElement.
- (6) Team as a set of HumanResourceType is defined as a kind of ResourceType.
- (7) UML ActivityGraph metaclass is imported to support details of work breakdown structure. On the other hand also see weakness (6) below.
- (8) Metaclass Metric is defined properly to support various project metrics.
- (9) An explanation is provided to support realization of benefits to stakeholders as one of the ServiceProcess. A metaclass Perspective is also provided to represent various viewpoints including stakeholders. This class provides just reference information. According to our opinion, however, in process enactment and project information management aspects such viewpoints should be explicitly modelled as first class modelling construct, because the information needed to do various actors job --- this is represented as attribute or association link --- is dependent on actors viewpoints.
- (10) Comparison table is provided to map SPE terms into OMG Workflow terms.

Weakness:

- (1) In each section of metaclass description, major constraints should be specified using OCL as well-formedness rules as needed.
- (2) Although the proposal aims to cover such aspect as process tailoring and process institutionalisation, they are not explicitly modelled nor discussed. Despite this, the proposal seems a good starting point to address these aspects. In our opinion, however, project management and process tailoring / institutionalisation aspects should be treated as separate packages.
- (3) Concrete definition of how interoperability between tools will work is not sufficiently described.
- (4) Tool as a resource or a guideline / technique is not explicitly modelled.
- (5) Despite the strength (6) above, a model for personnel assignment to an activity, product, and role is out of scope. This is essential in project management and process enactment aspects.
- (6) Related to the strength (7) above, It is questionable this approach provides good SPE metamodel, because software process has essentially different nature from predefined business workflow.
- (7) Process evolution during project practice and process tailoring in project planning stage should be discussed.
- (8) Following evaluation criteria are discussed nowhere:
 - Work with the tool in context of the whole process
 - Checklist
 - Work schedules (estimated, planned, actual), relationship with external scheduling programs --- these are important aspects for project management and process enactment
 - Risk estimation and management
 - Quality aspect
 - Monitoring project performance
 - Reuse management other than process component
 - Support of distributed application

4. Evaluation List By Each Item

(Notes) 1. Status Category : M= Mandatory, Opt= Optional, Dis= Discussion, Eval= Evaluation

2. Mark : A= well satisfied, B= satisfied, C= not satisfied, N.A.= not applied

3. In Discussion status, mark A means the proposal provides the explicit model, B means the proposal provides only discussions.

#	RFP Section	Requirement	Status Category	Mark	Comments
1	6.2 P 23	Do not define process components as part of the standards	M	A	
2	6.2 P 23	Provide a SPE metamodel	M	A	Strength: The scope is very wide. The proposal aims to cover entire SPE domain. Also see No.49.
3	6.5.1 – Specification of the SPE Metamodel or UML Profile	Submissions shall conform to the four layer architecture defined by the OMG	M	B	In the viewpoint of process definition, the proposal conforms to OMG architecture. On the process enactment and process improvement, the conformance to the four layer architecture is vague - -- see joint response UPM section 13.2.
4	6.5.1	Metamodels shall be clearly positioned in relation to the UML metamodel and built using the MOF meta-metamodel	M	A	Strength: UML ActivityGraph and StateMachine are properly used.
5	6.5.1	Relationships between these metamodels shall be identified and specified	M	B	Relationships between proposed metamodel and MOF should be described more clearly.
6	6.5.1	A submission shall include an XMI DTD for a submitted metamodel	M	C	Not provided.
7	6.5.1	The metamodel shall address at least the following concepts: Tasks, Techniques, Roles, Products, Phases. Responses are not required to use these exact names	M	A	Usage of those terms are well conformed to RFP requirements except Roles. In our opinion, the use of the term Role is desired in stead of the term HumanResource Type, and Role and Skill should be treated as separate metaclasses. Also see No.60. Strength: Phase is defined clearly, associated with separate metaclass Milestone, which is associated with UML Event metaclass.

8	6.5.2 – Examples	Submissions shall submit two or more examples of processes that use the submitted metamodel.	M	B	Two examples are explicitly provided with some concrete modelling samples but they are insufficient in particular for the process enactment aspect.
9	6.5.3 – Process Patterns and / or Components	Submissions are required to define constructs that enable the creation and use of reusable process patterns and/or components	M	B	Explanations are provided but no explicit mechanism. In particular necessary constraint should be formally provided as for process component assembly.
10	6.5.4 – Definition of Terms	Submissions shall include a full glossary of SPE terms. These terms shall have a clearly-defined relationship to the constructs defined in the submitted SPE metamodel.	M	C	Glossary not provided. Several comparison tables of similar terms are provided.
11	6.5.5 – Provide SPE Support particularly suited to UML	The facility shall support the use of UML for software engineering modeling and process modeling.	M	A	Metamodel is totally UML compliant.
12	6.5.5	A specification of relationships between SPE constructs and UML constructs is required, wherever such relationship exist	M	A	Strength: Relationships between SPE metaclasses and UML ActivityGraph / StateMachine are properly used and explicitly specified.
13	6.5.5	Facilities providing help in UML usage, depending on the activity and on the development context, shall also be defined.	M	C	Explanations are provided but this requirement asks the respondents concrete model definition.
14	6.5.6 – Taxonomy Support	A submission shall provide the facility to define a standardized set of categories	M	B	Strength: ProcessCategory is explicitly defined to support typical process category. But this does not address taxonomy of resource and product.
15	6.5.6	A submission shall provide the ability to classify all process elements using these categories.	M	B	See No.14.
16	6.5.7 – National Language Support	A submission shall be organized so that a process can readily be translated between different natural languages without losing its structure.	M	A	Metaclasses DescriptiveElement and Language are defined to address the requirement.

17	6.5.8 – Notation	Responses shall include graphical notations or default to UML notations.	M	A	Notations are totally UML compliant. Some minor issues might be pointed out as follows: - Abstract metaclass should be written with italics fonts. - Name of the class and attribute must be written in one word such as DescribedElement and elementVersion.
18	6.5.8	Where a response makes notation recommendations other than UML it shall show the relationship between those recommendations and other established process modeling notations, e.g., IDEF0.	M	N.A.	
19	6.5.8	If a recommended notation is not UML-based, responses shall explain why a different notation is better.	M	N.A.	
20	6.6.1 – Use UML Profiles to define the SPE Metamodel	A submission may define a UML profile	Opt	C	Not provided.
21	6.6.2 – Process Patterns	A submission may define actual process patterns and/or components as examples	Opt	C	Not provided.
22	6.6.3 – Modeling Profiles as a part of a Process Definition	Submissions may reify the UML profile concept	Opt	C	Not provided.
23	6.6.3	The way in which profiles may constrain the development process, notations or tools may be emphasized.	Opt	C	Not provided.
24	6.6.3	Relationships between profiles and activities and between profiles and work products may be clarified	Opt	C	Not provided.

25	6.7.1 – The Nature of Products and Deliverables	Submissions should discuss the distinctions between terms that are used in the submission, such as "product", "work product" and "deliverable";	Dis	A	Strength: DeliverableType is explicitly modelled separately from InformataionUnit and ResourceType. This is the major strength of the metamodel because in the management and process enactment point of views, deliverables need different treatment and information management from usual artifact.
26	6.7.1 – The Nature of Products and Deliverables	Submissions should discuss the ways in which products may be combined or aggregated to form composite products	Dis	B	Explanations are provided. This mechanism is not explicitly modelled and CAPE tool must provide necessary information in a separate construct PresentationElement.
27	6.7.1 – The Nature of Products and Deliverables	Submissions should discuss the rules that may be defined in order to constrain such product combinations or aggregations	Dis	B	See No.26 above.
28	6.7.1 – The Nature of Products and Deliverables	Submissions should discuss the modeling of dependencies between products	Dis	B	See No.26.
29	6.7.1 – The Nature of Products and Deliverables	Submissions should discuss the modeling of trace or derivation relations between products.	Dis	B	This is defined, in a dynamic sense, in relation to UML ActivityGraph. But we insist SPE metamodel itself should have this mechanism also as a static structure.
30	6.7.2 – Evolution of Products through the Life Cycle	Proposals may clarify the nature of different kind of evolution of work products	Dis	B	See No.29 above. Some M1 level model examples should be provided.
31	6.7.3 – Configuration and Version Management of Processes	Proposals should discuss configuration and version management of process	Dis	B	Discussions are provided. An attribute <i>elementVersion</i> is specified to support this requirement but no <i>versionVariant</i> .
32	6.8.1 – Metamodel Leveling, Scope and Structuring	Fidelity to the four-level metamodeling architecture	Eval	B	Further clarification of its relationships to MOF and M1 process model example is desired for the specific purpose here.
33	6.8.1	Breadth of coverage of the process lifecycle	Eval	A	Quite wide. It covers 'business big picture' in its intent. This is the primary strength of this proposal.

34	6.8.1	Non-redundancy between SPE metaclasses and UML metaclasses	Eval	A	It seems UML ActivityGraph and StateMachine are effectively used.
35	6.8.1	Elegance with which modeling concepts are described	Eval	N.A.	Not sure.
36	6.8.1	Clarity with which related levels of abstraction are explained	Eval	A	
37	6.8.2 - Understandability	Strike a judicious balance between textual and graphical material and between formality and informality	Eval	B	In each section of metaclass description, major constraints should be specified using OCL as well-formedness rules if possible . The relations to M1 level model examples are desired, in particular related to the process enactment.
38	6.8.2	Natural language elements should be related to formal elements and vice versa	Eval	B	See No.37 above.
39	6.8.2	The documentation should be arranged according to a clear structure, preferably the package structure	Eval	A	Documentation has clear structure but is not arranged along its package structure.
40	6.8.2	Terms should be defined as needed as well as collected together into their own section	Eval	C	Glossary should be provided.
41	6.8.2	The use of refinement in structuring the proposal	Eval	N.A.	Not sure.
42	6.8.2	Explanation of what problem is being addressed and of the solutions adopted	Eval	B	Section 2.1, 2.2, and 5 address a part of this requirement.
43	6.8.2	Semantics of model elements communicated by supporting textual elements such as OCL or natural language	Eval	B	It seems clarity of semantics of the metamodel is rather insufficient. OCL descriptions are desired in some portions of the proposal.
44	6.8.3	Clearly separate illustrative material from normative material	Eval	B	

45	6.8.3 – Separation of Formally Submitted from Illustrative Material	Make full use of the opportunity to provide examples without obscuring the overall content	Eval	B	M1 level instance examples address this requirement. Relation to M1 level model should be provided, for example, as a separate chapter. This is particularly desired in process enactment and improvement aspects as far as the response aims to cover those aspects.
46	6.8.4 – Generality and Descriptive Power	Capable of describing a wide range of well-known software engineering processes and process models	Eval	A	Strength: This proposal is quite independent of any specific process methodology and intends to cover full range of SPE domain .
47	6.8.4	Generality demonstrated by examples	Eval	A	Generally this requirement is satisfied.
48	6.8.5 – Proof of Concept	Demonstrate the workability of the concepts by effective proof of concept	Eval	B	See No.8.
49	6.8.6 – Support for Multi-level Process Institutionalization and Customization	Capable of supporting multiple levels of institutionalization, customization or adaptation in a realistic and workable manner	Eval	C	It seems aims of the proposal cover them but they are not explicitly modelled. But it seems the proposal is also a good start point for modelling the institutionalisation. In our opinion, however, project management and process tailoring / improvement aspects need additional packages.
50	6.8.7 – Basis for a Usable SPE Facility	Basis for the creation of a usable SPE facility	Eval	B	Strength: This proposal could be a good start point to create usable SPE Facility, though current metamodel is not rich enough.
51	6.8.8 – Tool interoperability	Enable the interoperation of tools during development within a single defined process	Eval	B	Strength: The proposal focuses on a way to structure SPD data within a CAPE tool repository, but the usage is unclear. Strength: PresentationElement is provided as a connection point for individual CAPE tool, though its usage is unclear.
52	6.8.8	Provide a concrete definition of how interoperability will work	Eval	C	Concrete definition is not sufficiently described.

53	6.8.8	Discuss connections between UML metamodel and SPE metamodel/profile	Eval	B	It does not discuss the connections to UML profile.
54	6.8.8	Discuss task support	Eval	A	See No.7. Task corresponds to Activity.
55	6.8.8	Discuss notations	Eval	A	See No.17.
56	6.8.8	Discuss techniques	Eval	A	Technique is clearly defined as metaclass Technique.
57	6.8.8	Discuss work with the tool in context of the whole process	Eval	C	No specific discussions on this issue. Also see No.51.
58	6.8.8	Discuss the structure, version control and content of higher-level products	Eval	B	See No.29, 31. Version is defined in any DescribedElement including process and product.
59	6.8.8	Discuss traceability between work products	Eval	B	See No.29.
60	6.8.9 - Coverage	Support task role and resource definition	Eval	B	Resource should be also discussed in a viewpoint of its procurement. In process enactment viewpoint, Role is a kind of association class between Activity and Person, and this defines an assignment of a person to an activity with specific role. Skill is another class associated with Role and Person. Person is a kind of Resource.
61	6.8.9	Support textual description of elements	Eval	A	DescriptiveElement and PresentationElement address the requirement. Also see No.16.
62	6.8.9	Support checklists	Eval	C	No explicit modelling construct.
63	6.8.9	Support work product definition	Eval	A	See No.25.
64	6.8.9	Support versioning and configuration of work products	Eval	B	Discussed but the mechanism is not modelled. Also see No.58.
65	6.8.9	Support work schedules: estimated, planned and actual; relationship with external scheduling programs	Eval	C	No specific description.
66	6.8.9	Support risk estimation and management	Eval	C	No specific description.
67	6.8.9	Support metrics	Eval	A	Metaclass Metric addresses this.
68	6.8.9	Support project organization	Eval	B	Teams as a set of Human Role types are defined, but the personnel assignment to an activity, product, and role is out of scope. This is

					a weakness in the project management and process enactment aspects.
69	6.8.9	Support techniques	Eval	A	Metaclass Technique addresses this.
70	6.8.9	Support tools	Eval	C	Tool as a resource or a guideline is not explicitly specified. This is also a weakness.
71	6.8.9	Support work breakdown structure	Eval	B	Details are defined in UML ActivityGraph. It is questionable this approach provides good SPE metamodel, because software process is essentially different from predefined business workflow .
72	6.8.9	Support traceability and refinement	Eval	B	Traceability and refinement of work products are defined only in UML ActivityGraph. Also see No.29.
73	6.8.9	Support context-specific help and guidelines	Eval	B	It seems this is provided in DescriptiveElement.
74	6.8.9	Support quality aspects, such as integration of performance information with functional models	Eval	C	No discussion.
75	6.8.10 – Process improvement	Support development of the process	Eval	C	No discussion on its specific aspect.
76	6.8.10	Support institutionalization of the process by adaptation at different organizational levels	Eval	C	It seems the proposal aims to cover the requirement, but this is not discussed anywhere.
77	6.8.10	Support deployment and customization of the process	Eval	C	See No.76.
78	6.8.10	Support monitoring of project performance	Eval	C	See No.76.
79	6.8.10	Support capture of project metrics	Eval	A	Metaclass Metric addresses this.
80	6.8.10	Support analysis of metrics	Eval	A	Metaclass Metric and its superclass ReferenceProcess address this.
81	6.8.10	Support realization of benefits to stakeholders	Eval	B	Discussed as one of the ServiceProcesses. Metaclass Perspective is provided to represent various viewpoints including stakeholders. This class provides just a reference information, but such viewpoints should be modelled as first class mechanism because the information needed to do

					various actor's job, such as attribute and association link, is dependent on his viewpoint.
82	6.8.10	Support management of reuse	Eval	C	Reuse of the process component is discussed but other area of reuse is not.
83	6.8.10	Support merging of processes from different sources	Eval	B	See No.9.
84	6.8.10	Support configuration management and version control of processes and process parts	Eval	B	See No.31.
85	6.8.11 – Relationship to workflow standards	Distinguish between those processes that fit within the OMG workflow model and those that do not	Eval	C	Not specifically discussed. Also see No.71.
86	6.8.11	Clarity of mapping of Work Products or other artifacts into OMG Workflow concepts of process context, process results and Workflow Resource	Eval	B	Comparison table of the terminology is provided.
87	Added	Pick up process examples, try unusual process (examples : express programming, scrum) and check how well they can be expressed by this structure.	Eval	C	No discussions.
88	Added	See how well processes integrating reusability, integration of new elements are integrated	Eval	C	Process evolution during project practice and process tailoring in the project planning stage should be discussed.
89	Added	Show how a process designer can justify a step, or the appropriateness of an activity	Eval	C	No discussion on this specific issue.
90	Added	Show how well processes can supported distributed applications	Eval	C	See No.89 above.