

Technical Software Development Process in the XML Domain



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- Background and Motivation
 - Macro/Micro processes
 - Technology domain & Quality attribute driven processes
- Project, Methodologies and Data Collection
- Results
 - Extracted technical development processes (TDP)
 - Alternative mechanisms for integrating TDP with life-cycle models
- Observations and Recommendations in Modeling TDP Using Process Meta-models
- Conclusion

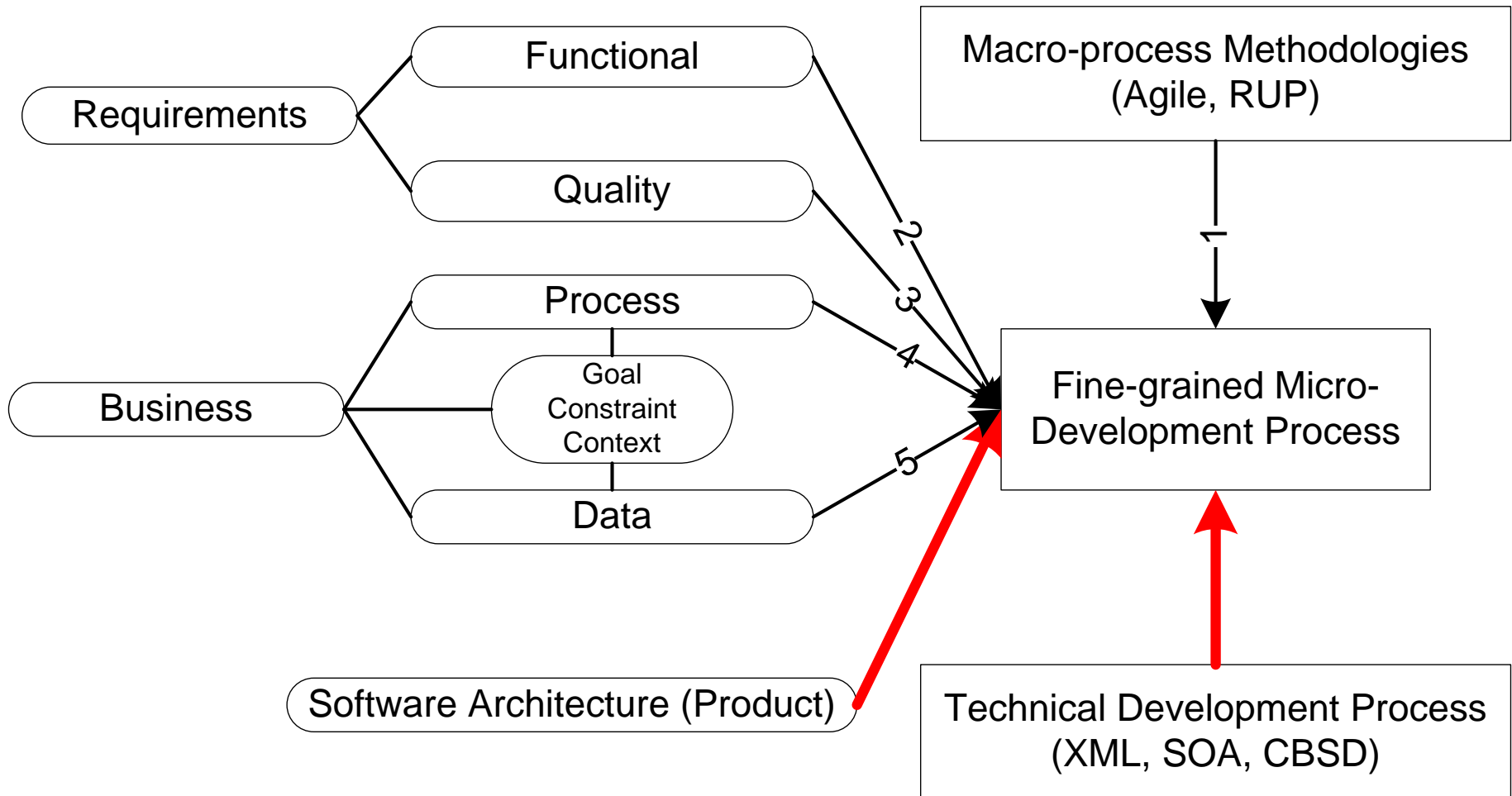
- Macro-Process & Micro-Process
 - Black box effects vs. white box inner working (Osterweil'05)
 - Mgt-centred life-cycle vs. practice-driven task level
 - Examples:
 - Macro: Agile, Waterfall, RUP, COTS/Component-based
 - Micro: Technical practices, task-oriented, technique-driven
- Domain and Quality Attributes Driven Processes
 - Domain: Service-Oriented, Embedded Systems, CBSE, XML....
 - Quality attributes. (Trustworthy): safety, performance...
 - Integration with life-cycle processes: build assurance cases

Further Work:

[1] Chiam, Y.K., Staples, M., Zhu, L.: Representation of Quality Attribute Techniques Using SPEM and EPF Composer. In: European Software Process Improvement (EuroSPI). CCIS. Springer, 2009

[2] Chiam, Y.K., Zhu, L., Staples, M.: Quality Attribute Techniques Framework. In: European Software Process Improvement (EuroSPI). CCIS. Springer, 2009

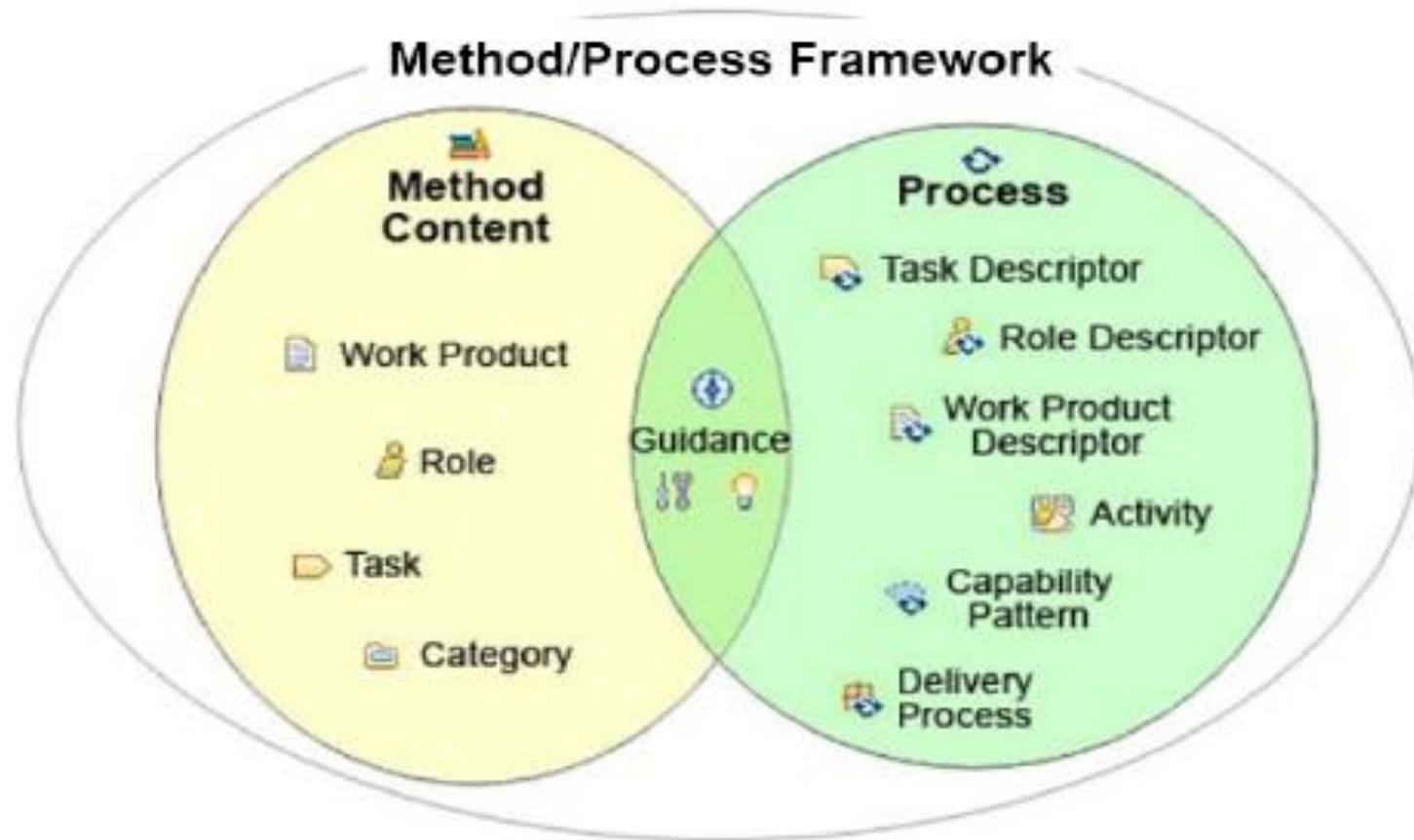
Factors Affecting Micro-Processes



- Project specific process tailoring:
 - Top-down: select/modify variant macro-process elements -> low level reuse of “tailoring” itself
 - Bottom-up: compose micro-process elements -> poor composibility and hard to validate
 - Limited tailoring context: size and types of systems
 - No systematic integration between context-specific techniques and life cycle models (e.g. EPG)
- Process meta-models: SPEM, OPF, OOSPICE, SMSDM
 - Often intended for macro-processes
 - Limitations in modelling TDP related information
 - Quality attribute & domain driven techniques and their aims
 - Various ways of associating micro-level steps of a technique with different roles/work product/activities across phases

Structure of SPEM and EPF

We chose SPEM/EPF to model technical development processes for life-cycle integration purposes



Project

- Medium-sized company focusing on publishing
- Extensive experiences with XML and document-driven web services
- Development and training
- Some internal use of EPG (Electronic Process Guide)

Methodology

- Two rounds of semi-structured interviews
- Internal documentation and EPG mining
- Other XML development sources to cross-verify
- 15 candidate technical development processes

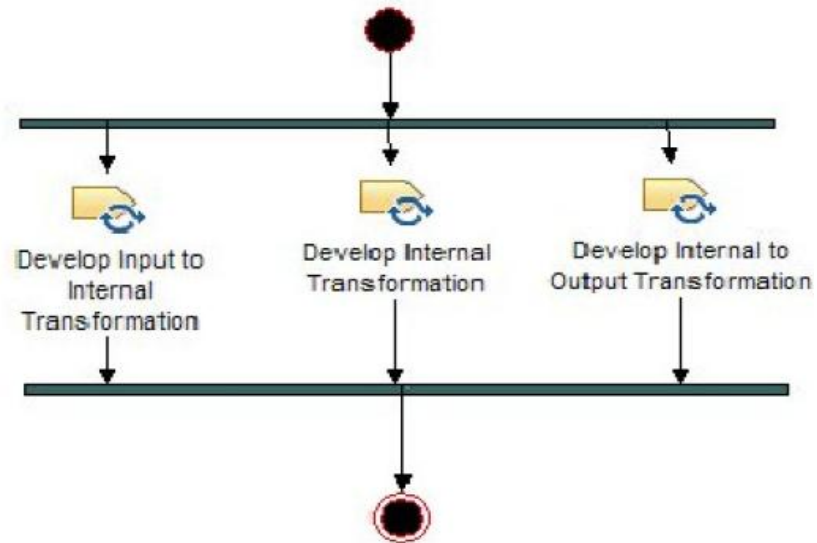
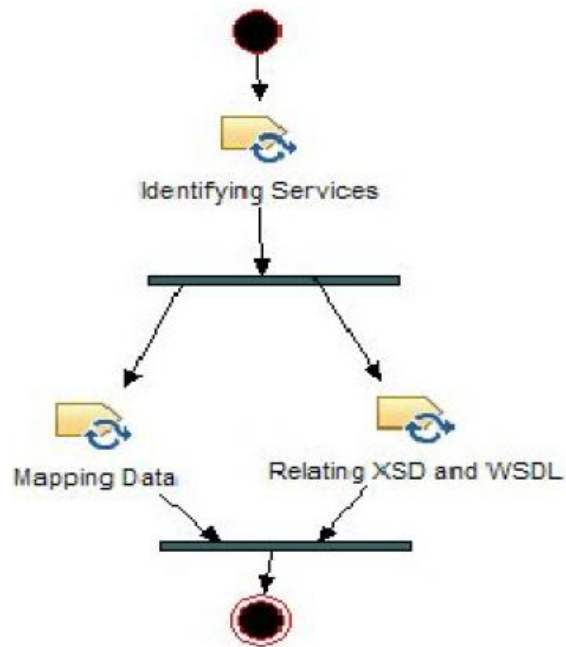
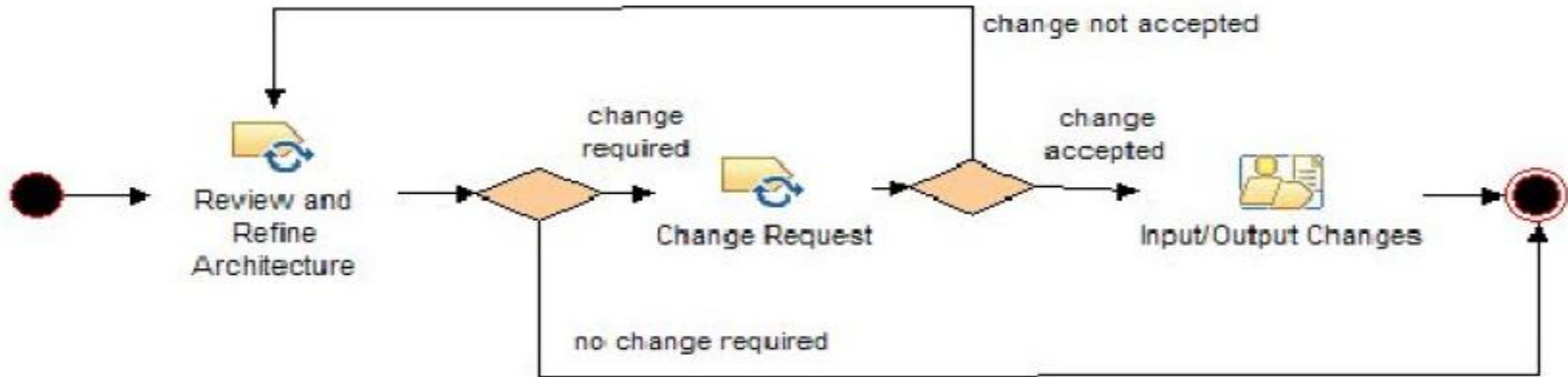
Technical Development Processes



- Each process contains detailed steps
- Some are technology domain driven
- Others are quality attribute (maintainability & changeability) driven

ID	Category	Short description
Use a standard schema	Schema design	When using a standard schema, no schema design is required but additional activities have to be performed.
Use a three-tiered transformation architecture	Data transformation	Build an additional layer between input and output to buffer changes that occur with the input and output structures
Make a choice of data validation techniques	Technology selection	Grammar-based or rule based validation should be selected
Merge different data structures	Data transformation	Combine and reconcile two or more different XML schema structures
Transform a linear structure to a tree structure	Data transformation	Develop a data transformation engine that transforms a linear structure XML (flat hierarchy) to a tree structure (deep hierarchy)

Example TDP Models



Integration Alternatives

Alternative mechanisms for integrating TDP with life-cycle models

Model details of TDP as

- Step-based
- Task-based
- Disciplines
- Guidance
- Capability patterns

Relationships with base tasks in life-cycle models

- Contribute
- Extend
- Replace
- Extra

▼ Content Variability

Specify how this task relates to another task.

Variability type:

Extends

Base:

transform_linear_to_tree_structure, XML TDP/XML System Functionality Types/Data Transformation

▼ Content Variability

Specify how this task relates to another task.

Variability type:

Contributes

Base:

identifying_services, XML TDP/Developing a web standard using an industry specific messaging standard

Limitations of Existing Mechanisms



- Step-based
 - TDPs as steps within a life-cycle task
 - can't be reused in other tasks
 - can't associate a performer different from the task performer
 - Difficult for a TDP to span across tasks and phases
- Task-based
 - TDPs as tasks
 - Relationships with base tasks modeled as “contribute”, “extend”, “replace” ...
 - TDP tasks can't easily contribute/extend/replace different base tasks
- Disciplines
- Guidance
- Capability patterns

Overall Observation

- Project/Technology specific processes
 - Some cannot be generalized
 - Important to integrate with baseline generic processes
 - Important for building trustworthy assurance cases
- Technique selection
 - Major implications on development processes
 - Example: rule-based schema validation has major impact on requirements elicitation
- TDPs can be used for development, training and mgt.
 - Elicited technical development processes were contributed back to the company as EPF repositories
 - TDPs were used for change cost negotiation with customers

Some Recommendations for SPEM



- Allow steps within a task to have different performers
- Add a new “GuidanceKind” for TDP
- Add more elements to the SPEM model to capture additional TPD characteristics
 - Aims, specific relationships with base tasks, resource requirements, parameterized activities
- Support reuse by reference (rather than by value) more widely

- **Validity of results**
 - Small number of developers from a single company but cross-validated
 - Mainly an experience report but led to further work (EUROSPI 09)
- **Extracted TDP from day to day operation**
 - Different technology domains and different quality attributes (trustworthy)
- **Modelled TDP in SPEM through EPF**
 - Alternative mechanisms for integrating with life-cycle macro-processes
 - Comparisons and recommendations
- **Future work**
 - Support systematic integration and analysis of TDP with tool support
 - Explore alternative process specification languages for TDPs