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Variability Analysis in Process-aware Information Systems

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Abstract. Processes can be a cause of variability, a characteristic that distinguishes one product from others. Process-aware information systems (PAIS) whose implementation relies on the process specification do. For defining variability of the PAIS family analyzing variations in processes is advantageous than analyzing system features. Processes are sequential but in many cases, they are not in accordance with organizational units. Moreover, the number of process is too large or complex to analyze variability among process-aware system family members. To manage with this, this paper proposes a hierarchical process framework-based process variability analysis technique. And this paper explains the proposed technique through an FTA origin determination system example.

Keywords: software product line, variability analysis, process-aware information system, hierarchical process framework

1 Introduction

Software product line (SPL) is an approach that develops the family of similar software by maximizing the reusability of development artifacts. SPL is well known that reduces costs and increases productivity, because family members only focus on the specific functionalities of each member and they reuse platforms as they are. Variability, a characteristic that differentiates one product from other member products or some products from others is the most important concept in SPL [1,2]. Processes can be a cause of variability. Especially in the process-aware information systems (PAIS) whose implementation relies on the process specification, it is.

Processes are sequential, but in many cases, they are not when organizational units differ. Moreover, the number of process is too large or complex to analyze variability among PAIS family members. Generally, no single person or organization develops or looks at the entire enterprise model. Rather, each contributes to, and uses, those factors that are relevant to their own position. There are researches to consider variability in business process [3,4], but their focus is on notations for expressing variability in processes or tasks. Therefore, it is difficult to analyze process variability in a whole. To cope with this, this paper proposes a hierarchical process framework-based process variability analysis technique.

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The remainder of this paper is organized as follows: In the next section, we describe the proposed technique with the explanation for the hierarchical process framework. Our technique is explained while applying an example. In Section 3 we describe our conclusion and future works.

2 Variability analysis for process-aware information systems

2.1 The hierarchical process framework

The VBEAF (Value-Based Enterprise Architecture) manages business processes by dividing into four different views and aspects respectively. Dividing processes into different views and aspects reduces complexity and makes participants focus on their roles and responsibilities[5]. The views are windows to examine related portion of the entire model. Each window helps a role or responsibility look at a particular issue or area of concern. The perspective describes the combination of a particular functional specialty and the place occupied within the organizational hierarchy. Executives and enterprise-level planners, business area managers, and application developers are examples of stakeholders that have different perspectives.

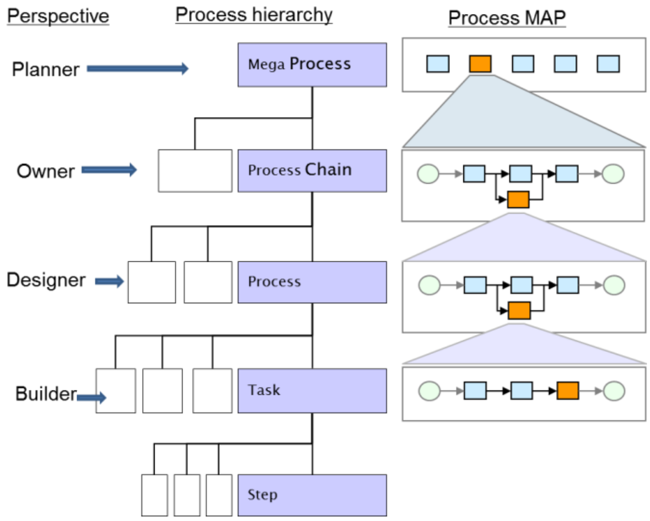
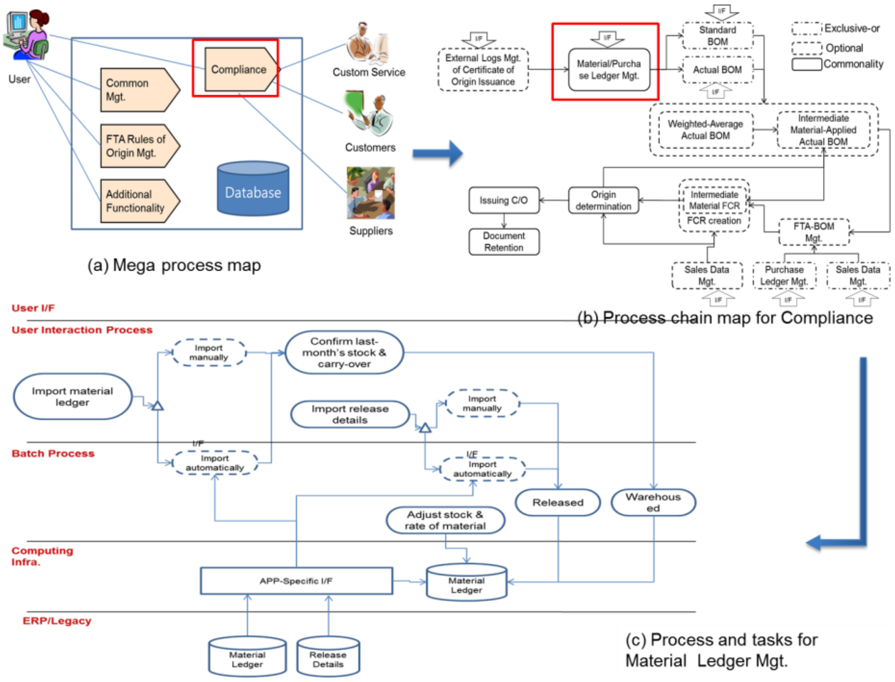


Fig. 1. The hierarchical process framework

The VBEAF has 4 views (Functional, Information, Organization and Infrastructure) and 4 perspectives (Planner, Owner, Designer, Builder). View and perspective dimension are mutually exclusive each other. This paper only uses the functional view because the functional view reveals how everything on the architecture supports or is related to its missions and functions. The purpose of analyzing processes with their variability is to develop a system that supports them.

2.2 Application by FTA origin management system example

Origin of goods is determined through the particular processes. Rules of origin, type of BOM (bill of materials), cost adjustment and so on can differ from target FTAs and types of targets such as products and intermediary goods to determine origin. Process, its detailed tasks and required inputs, thus vary.



(a) Mega process map

(b) Process chain map for Compliance

(c) Process and tasks for Material Ledger Mgt.

Fig. 2. A variability analysis example using hierarchical process framework

The FTA origin management system consists of 'Common Mgt.' for configuration setting, user management and HS-code management, 'FTA Rules of Origin Mgt.' for managing rules for origin determination, 'Compliance' for determining the origin, 'Additional Functionality' for supporting C/O issuance and document retention and 'Database' for storing rules, information, documents, reports and so on. Fig. 2-(a) describes the FTA origin management system at the mega-process level, which is similar to context diagram in software development. Each of components called a mega-process and there are 4 mega-processes. There are no variations at mega-process level.

And then we decompose each mega-process into process chain that consists of two or more processes. Most processes consisting process chain are sequential but they are not always so. Fig. 2-(b) shows a process chain for 'Compliance' mega-process. As shown in Fig. 2-(b) many variable processes have been introduced at this level. For example ‘External Logs Mgt. of C/O Issuance’ process for importing the C/O for materials or intermediary materials is optional process. As for BOM a user can choose one of two BOM, standard and actual. This choice is mutually exclusive. Weighted-average actual BOM or actual BOM for intermediary material can be optionally used in accordance with the types of products.

After that we decompose a process into a task level from different layers, namely user interaction process, batch process, computing infrastructure and ERP/Legacy. Fig. 2-(c) shows the process map for the ‘Material/Purchase Ledger Mgt.’ process that consists of tasks. There are two alternative tasks, ‘import manually’ and ‘import automatically’.

4 Conclusions and future work

This paper described a hierarchical process framework-based process variability analysis technique used for implementing PAIS. We explained the proposed technique using the FTA origin management system whose implementation relies on the process specification. Through applying our technique to implementing the FTA origin management system we found that lots of variations is introduced due to a different sequence of processes and tasks. By analyzing variations among processes and tasks we could determine variability in subsystems, components and detailed modules that support performing processes and tasks. The four layers of system architecture used for analyzing task level variability were helpful to decide variable modules. For making our technique work it is important that seamless and consistent link[6] between process specification and system specification. We are in the progress of studying to tackle this.

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