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The Application of the Workflow Primitive Framework to e-Commerce Business-to-Business Processes: Enhancing the "Electronic Supply Chain"

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Introduction

Although many companies have a presence on the Internet, relatively few are using the global network for their business-to-business transactions (Vijayan, 2000). Concerns regarding cost have been a significant factor in the implementation of a business-to-business e-commerce infrastructure. However, through the adoption of standard protocols upon which applications can be built, this cost can be significantly mitigated. The potential cost savings are realized through the increase in efficiency through the standardization of business-to-business transactions throughout the supply chain. The primitives identified in the Workflow Management Coalition's Workflow API provide a method for this standardization. Aggregated into "meta-primitives" and grouped by function, WAPI can be used as the basis for the building blocks of this protocol. The WAPI protocol represents an emerging ubiquitous standard for workflow. These meta-primitives are conceptually analogous to the class definitions used in object-oriented design, with the low-level being represented by the class methods. Just as classes are generic components, so are these WAPI building blocks.

Although these meta-primitives are combined to describe universal e-commerce functions (checking inventory, transferring funds), the resulting applications are necessarily industry specific. In this paper, we outline a possible instantiation of this framework using the healthcare industry. First, a set of questions will be presented whose answers will completely describe a business process. Next, we will present a conceptual view of the problem, where the high-level, transaction-oriented building blocks will be presented. Finally, we will demonstrate how those questions can be applied to a specific industry by describing a workflow within a typical transaction.

Theoretical Level

In order to successfully create an accurate mapping of meta-primitives to the information system activities that take place within an organization, designers must be able to correctly identify the critical processes. Todd and Benbasat (1987) argue that verbal protocol analysis is an appropriate method for identifying and understanding complex organizational processes. This method allows for the "elicitation of knowledge from problem-solvers" in a

Process Questions

1) Describe the business process (company procedure).

Beginning of the Process

2) What are the components needed to begin this process? Who are the players?
3) What information is provided to carry out this procedure (inputs)?
4) Who provides that information?

Steps of the Process

5) Describe each step of this process.
6) What is used to confirm successful completion of the step (signature, form)?
7) What happens if the step fails (exceptions)?
8) How might this step cause a bottleneck?

End of the Process

9) What information is provided as a result from this process?
10) What happens after this process is completed?
11) How do we verify that the process has completed successfully?
12) If the process does not complete successfully, what happens?

Development of the Process

13) How often is the process revised?
14) How long has the process been employed? In its current state?
15) Which parts of this are done electronically?
16) Evaluate the performance of this process in terms of usefulness and efficiency.

Inset: Process Questions

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problem domain that is not easily quantifiable. From a series of questions (see inset), information about these processes can be extracted. This information can be used to build systems to support business-to-business (B2B) electronic commerce.

The information gained from these questions can be used to design the meta-primitive "classes" required by e-commerce applications. The adoption of the Workflow API allows developers on both sides of a B2B relationship to develop these applications using a common protocol. Wacker and Treleven (1986) have shown that standardization has significant cost implications through lowering development costs, one of the main obstacles in B2B application development. Further arguing for the adoption of a single standard is research by Foray (1994) that shows the inefficiencies that exist when multiple standards are employed within a single environment. Because firms engaged in B2B activities are likely to interact with multiple organizations, there is the potential for many of these inefficiencies to occur within a single business process. This standardization can be enforced through this object-oriented approach using an inheritance structure built around classes describing these business processes.

Conceptual Level

By aggregating the low level, granular WAPI primitives into meta-primitives, a common descriptive language is created (Gill et. al., 1999). Each grouping of the primitives describes a complete step in a business process. This then gives us a common language that is well suited to describe the business process across the entire supply chain. Trading partners on both sides of a relationship are able to uniformly describe the necessary steps needed to carry out an e-commerce activity. The designers of a system have a set of building blocks at their disposal that help them map the business requirements directly into meta-primitives for programmers to code. Because the domains of these meta-primitives are standard, they can be used as building blocks for e-commerce applications. This standardization will minimize overlap (duplication of functionality) between the meta-primitives while still maintaining sufficient coverage of the business process (see Figure 1). In addition to the ease of system development, this methodology facilitates information exchange through a standard interface for the exchange of messages between software components. In B2B commerce, there is a flow of data between the various partners. Exchanging data between multiple partners has previously involved creating a custom solution for each partner's system. As the number of partners grows, this becomes both difficult and costly, potentially negating the cost savings from the electronic supply chain. Therefore, the use of the meta-primitives can facilitate B2B application development while also reducing overall cost.

Procedural Level

To demonstrate how WAPI-based meta-primitive building block can be applied to a specific industry, a procedural level mapping to the healthcare industry is outlined in this section. In the healthcare industry, a portion of the supply chain consists of the transactions between the medical product suppliers and the pharmacies. There could be many different companies that provide a single pharmacy with its products. Even if the product supplier gave each pharmaceutical firm with whom it did business the necessary software to automate its inventory, the pharmacy would have to have a system for each company from whom it ordered supplies. Maintaining several different systems, each different from the others, complicates the management of the electronic supply chain. To serve the needs of both parties, a solution that can be developed using common WAPI-based objects. For example, a CheckPharmaceuticalInventory class could be created, derived from the more general

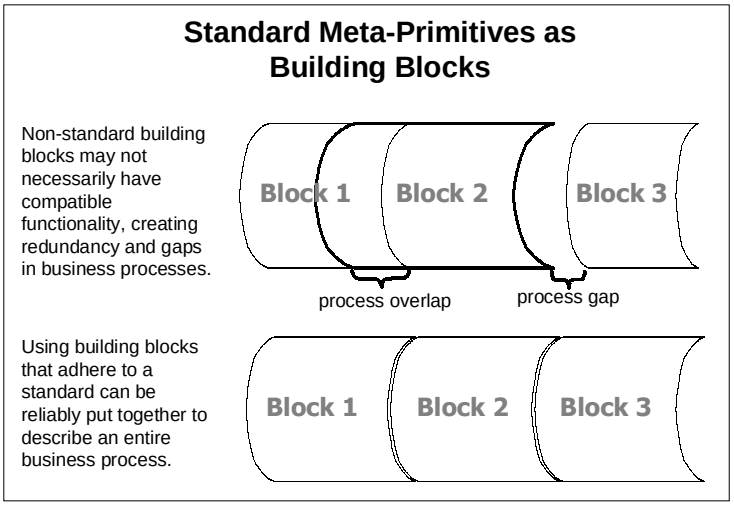

Figure 1 – Meta-Primitives as Building Blocks

CheckPharmaceutical base class would address the specific requirements of this operation. Not only will the use of the meta-primitives facilitate the development of a single system, but it will also make it possible for the pharmacy to add additional partners without having to add new systems. Instead, the existing systems would be compatible with new partners through the ability to pass standard messages from buyer to supplier. Thus, the solution now encourages the use of e-commerce in the supply chain and has the effect of reducing the cost of development and facilitating future modifications.

Conclusion

This paper presents a framework for the development of standardized electronic commerce applications across the supply chain (see Figure 2). Through this framework, three contributions are made to the electronic commerce workflow literature. First, at the theoretical level, we have developed a potential set of questions that can be used in protocol analysis to model business processes. Second, at the conceptual level, we describe how linking these business processes to object-oriented WAPI meta-primitives can form complete descriptions of the entire process. Third, at the procedural level, we have shown how these WAPI-based objects can be applied to an industry-specific domain.

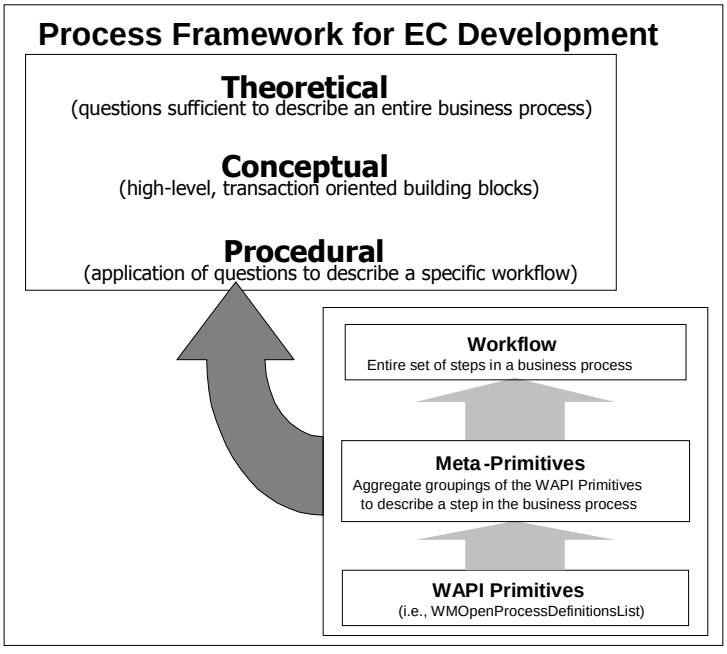

Figure 2 – Process Framework for EC Development

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