
Case Study

Int’l Symp. on Multimedia SE, Dec 11th–13th, 2002
Newport Beach, California

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Agenda

- Introduction and Technology Overview
- Background Information and Related Research
  - Related work on Use-Case Diagram
  - B2B Electronic Commerce and XML
  - Digital Signatures
  - Success factors for B2B e-commerce systems
- Empirical Study
  - Research Process and Methodology
  - User’s Requirements and Use-Case Diagram
- Implementation and Tangible Benefits
- Conclusions
Motivation

- Remote web-based order-and-delivery for auto parts manufacturer
- Evolve to achieve a better (/best) practice in this development domain
- Utilize “formalized” requirements specification to improve dependability, security and maintainability
- Better understanding among stake-holders
Right process for the product to ensure ... and no *silver bullet*!

- High quality software with competitive cost and cycle time...

... we must shrink the triangle!
Quality Attribute(s) Versus Cost Relation

Moore’s law of Software Engineering
SLC Expenditure Profile

Cost

Without Formal Specification

With Formal Specification

Need to validate effective SE methods and tools…
Introduction / Technology Overview

- Today’s systems are complex and user requirements are changing rapidly (reqs creep)
- Visually model the system’s architecture to promote communication/understanding
- Güell et. al., present a method that utilizes
  - requirements gathering
  - conceptual and navigational design of Web applications
  - based on Scenarios, Use-Case and User Interaction Diagrams (UIDs)
- Document B2B e-commerce system development
Introduction & Technology Overview II

- Critical success factors of concern
  - Effective communication
  - Processing time
  - Process cost
  - Reusability
  - Efficiency
  - Security etc.
Visual modeling is a way of thinking about problems using modeling.
Use-case diagram support multiple views

- UML is a language used to specify, visualize, and document the artifacts of an object-oriented system under development.
Architectural Framework of UML Utilized

- Use-Case View
- Design View
- Process View
- Implementation View
- Deployment View
Use-Case View

- Explain system behavior/view for
  - End User,
  - Requirements engineer (analyst),
  - Designer, and
  - Tester.

- Specify factors of concrete system architecture
Design View

- Present system service to end user
  - Consists of Classes, Interface, Collaboration that establish problem and solution area
Process View

- Enables system functionality, flexibility, and capacity
  - Consists of *threads* and *process* which establishes system consistency and synchronization mechanism.
Implementation View

- Present shape management of systemic placement
  - Establishes components and files that make physical system
Deployment View

- Present distribution topology,
- Release schedule and
- Settlement view of system’s physical realization
B2B Electronic Commerce and XML

- Exchange technologies are basically Web sites that use a standard language, XML, to facilitate application-to-application data exchange.
- XML allows:
  - Information regarding orders to interoperate
  - Purchase orders and invoicing standardization
  - To be easily understood by other computers
  - Accessible to organizations of all sizes

- Considered factors such as ease of use, speed, accuracy, security and reliability
- Used Document Type Definitions (DTDs) and XML elements to denote the input and output of the service and values.
Digital Signatures

- Use of a message digest offers the following advantage
  - The run time is reduced and the integrity of the message can be confirmed
  - Forgery and/or falsification of messages can be prevented
A (Sender)

Message

Generate Message Digest with MD5

Message Digest

Encrypt Message Digest with A(Sender)'s Private Key

Message Digest

A's Private Key

B (Receiver)

Digital Signature

Message Digest

A's Private Key

Decrypt Message Digest with A(Sender)'s Public Key

Message Digest

Compare (Yes or No ?)

Message

Generate Message Digest with MD5
Critical Success Factors for Building B2B e-commerce systems

- Harmonious user/developer communication
- Reduced processing cost/time of transactions
- Accuracy of business and transactions data
- Efficiency of the TBD systems
- Shortened systems development life cycle
- Reliability of transactions data
- Security of transmitted data
Empirical Study: Research Process and Methodology

- Research Model

Order and Delivery System → UML + XML + Digital Signature → B2B E-Commerce System

Measurement Variables:
- √ Processing time
- √ Processing cost
- √ Security
- √ Development Life Cycle Resources
- √ Accuracy
- √ Reusability
- √ Efficiency
Empirical Study: User’s Requirements and Use-Case Diagram

- Main and alternate flow of events
- Special requirements
- Pre-conditions
- Post-conditions
Implementation and Tangible Benefits:

Context Diagram

- DTD & XML are saved in the global repository.
- Transaction of XML documentation.

Sharing DTD, Stylesheet, Template

Company (A)

Sharing DTD, Stylesheet, Template

Company (B)

Exchanging Digital Signatured XML Data

M Company

Global Repository
Implementation and Tangible Benefits cont.

```xml
<?xml version="1.0" encoding="en-kr" ?>
<!DOCTYPE clients [ <!ELEMENT clients (client+) ]>
<clients>
  <client>
    <cNum>9293-1100</cNum>
    <cName>Yikwon</cName>
    <cCompanyName>Myung shin Co., Ltd.</cCompanyName>
    <cAdd>Tae-gu, Republic of Korea, Nam-gu Bongduck</cAdd>
    <cKubun>K2-3611</cKubun>
    <cStockNum>F-DF234</cStockNum>
    <cStockName>Oil Filter</cStockName>
    <cStockSize>S-12</cStockSize>
    <cStockQuan>100,000EA</cStockQuan>
    <cStockPrice>1,000,000</cStockPrice>
    <cDeadline>07/09/2001</cDeadline>
    <cPay>CASH</cPay>
    <cCharge>Yikwon</cCharge>
    <cEtc>Handle with Care</cEtc>
  </client>
</clients>
```
Benefits

- Using Use Case Diagrams (and XML) improved the communications among development stakeholders.
- System onto the Internet reduced the time needed to process transaction data.
- There was a cost savings of roughly $12,000 USD per month.
Benefits

- The accuracy of transaction data input to the system was significantly improved
- More usable and ultimately more efficient system
- Combination of SDLC and PDLC shorten development life-cycle
- The reliability of the system was improved
- Authentication of identity and repudiation of forgery/falsification
Conclusions

- Documented the implementation of a B2B e-commerce system
- Requirements analysis was carried out using scenarios and formalized using Use Case diagrams
- Digital signatures were employed for implementing security
- Documentation made by XML
- Eight critical success factors were used
Conclusions cont.

- Harmonious communication between the users and developers
- Reduction in the processing time of transactions
- Reduced processing cost
- Improved efficiency and accuracy
- Security of transmitted data
- Shortened the system development life cycle
Contact Information

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