Software Subcontract Management
Process and Guidance

Neil Potter, Mary Sakry
The Process Group
P.O. Box 700012
Dallas, TX 75370-0012

Tel. 972-418-9541
Fax. 972-618-6283

E-mail: help@processgroup.com
Web: http://www.processgroup.com

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Outsourcing Process and Guidance: Objectives

At the end of this workshop you will be able to:

- Summarize the Software Subcontract Management Process.
- Use the process templates, checklists, and other work aids.
- Review several techniques for requirements development.
- Identify and manage risks for an outsourced project.
- Develop a Request for Proposal.
- Select a qualified supplier.
- Manage an outsourced project.
Agenda

◆ Introduction to Outsourcing
  ✓ outsourcing to offshore suppliers
  ✓ selecting a project for outsourcing
◆ The Software Subcontract Management Process
◆ Process Steps and Tips for Successful Execution
  ✓ requirements development
  ✓ risk management
  ✓ project management
  ✓ key deliverables
    ● Vision and Scope Document
    ● Statement of Work
    ● Request for Proposal
    ● Contract
    ● Subcontract Management Plan

SSM templates at
www.processgroup.com/ssm.htm
What is Outsourcing?

- Contracting with a **separate organization** to develop or maintain a system or software product
- Also called **subcontracting**
- Think of it as “partnering” or “collaboration”
- Not the same as staff-augmentation contracting
Possible Motivations for Outsourcing

- Insufficient resources available in house
- Parallel or joint development
- Reduce time to market
- Offload legacy or non-core competency work
- Exploit supplier’s technical or quality capabilities
- Control development costs
Some Key Outsourcing Issues

Cultural Differences

Communications

Intellectual Property Ownership

Issue Management

Use of Effective Processes

Active Project and Risk Management

Accurate and Complete Requirements

Knowledge and Skills Transfer
Our Mission

Work collaboratively with customers worldwide to improve their software engineering process capability. Provide assessments, training, and consulting to meet their specific needs, resulting in improved software quality and delighted customers.

help@processgroup.com
Your Class Expectations

• Your job.
• Subcontracting problems / issues?
• Expectations for this class (e.g., 5/5 score?)
### Some Definitions

<table>
<thead>
<tr>
<th><strong>Acquirer</strong></th>
<th>Organization that outsources a project</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Contract</strong></td>
<td>Legally binding agreement of project terms</td>
</tr>
<tr>
<td><strong>Request for Proposal</strong></td>
<td>Acquirer’s description of project and invitation to suppliers to bid</td>
</tr>
<tr>
<td><strong>Software Requirements Specification</strong></td>
<td>Documented statement of product’s functional and nonfunctional requirements</td>
</tr>
<tr>
<td><strong>Statement of Work</strong></td>
<td>Acquirer’s description of work to be performed by supplier; includes SRS</td>
</tr>
<tr>
<td><strong>Supplier</strong></td>
<td>Organization that contracts to build product</td>
</tr>
<tr>
<td><strong>Vision and Scope Document</strong></td>
<td>Defines acquirer’s business objectives for project and strategic vision of product</td>
</tr>
</tbody>
</table>
Technical Issues with Offshore Suppliers

- Many are at high CMM maturity levels.
  - You still need to get the requirements right.
  - You still need to actively manage the subcontract relationship.
  - You still need to ensure that they follow their stated process.
    - Is it effective?
    - Do they expect the process to replace people?
    - Do they expect staff to be interchangeable?
  - Their process won’t compensate for weaknesses in yours.

- They should have data from previous projects.
  - Ask to see size, schedule, effort, defect data.
  - Request status, quality, and peer review data for project tracking.
Group Discussions: Outsourcing Issues

List outsourcing-related problems, concerns, and questions that your project has. For each problem, also state the **impact** of the problem and identify **root causes**.

**Example**

**Problem:** Multiple acquirer individuals are identified as points of contact.

**Impact:** Time is wasted as supplier attempts to get questions answered.

**Root cause:** Unclear project roles and responsibilities.
Selecting a Project for Outsourcing

- Well-understood, stable requirements
- Well-defined scope, limitations, and interfaces
- Not highly innovative
- Not subject to critical design or integration constraints

- Core competency
- Proprietary knowledge or technology needed
- Acquirer needs to develop internal technical expertise
- Emergent or exploratory projects
- Extensive, ongoing customer involvement needed
- Very short projects
## Partial Outsourcing Analysis Worksheet

<table>
<thead>
<tr>
<th>Category Weight</th>
<th>Relative Weight</th>
<th>Category</th>
<th>Project Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>35</td>
<td>10</td>
<td>Project Complexity and Interaction</td>
<td></td>
</tr>
<tr>
<td></td>
<td>20</td>
<td>The product does not involve developing critical or strategic code.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>25</td>
<td>The project is not highly innovative or exploratory.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>Your team members will be able to learn enough about the product to maintain it.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>You can specify the requirements clearly to ensure that you get what you need.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>You can evaluate whether a supplier’s estimates are realistic and achievable.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>You can define objective product acceptance criteria and performance goals.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>Subtotal</td>
<td>0</td>
</tr>
<tr>
<td>45</td>
<td>25</td>
<td>Acquirer Readiness</td>
<td></td>
</tr>
<tr>
<td></td>
<td>25</td>
<td>You have insufficient staff available to do the project in-house.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>25</td>
<td>The development and operation environments are likely to be stable.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>25</td>
<td>Project type and size are consistent with acquirer outsourcing guidelines.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>25</td>
<td>There are no legal restrictions on outsourcing this type of work overseas.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>Subtotal</td>
<td>0</td>
</tr>
<tr>
<td>20</td>
<td>15</td>
<td>Supplier Preparedness</td>
<td></td>
</tr>
<tr>
<td></td>
<td>25</td>
<td>A supplier with domain expertise exists.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>30</td>
<td>A supplier can complete the project faster than your team could.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>A supplier can complete the project more cheaply than your team could.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>A supplier can produce a higher quality product than your team could.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>The project requires skills that your staff does not have, but a supplier has.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>Subtotal</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>Overall Score</td>
<td>0</td>
</tr>
</tbody>
</table>

See Appendix B
Software Subcontract Management Process
Software Subcontract Management Process

◆ Based on industry standards
  ✔ Capability Maturity Model for Software
  ✔ Software Acquisition CMM
  ✔ CMMI/SE-SW
  ✔ IEEE Std 1062-1998, “Recommended Practice for Software Acquisition”

◆ Incorporates industry best practices for outsourcing, requirements engineering, project management

◆ Defines roles, responsibilities, process steps, deliverables

◆ Includes many work aids and templates
Process Roles

**Acquirer Staff:**  
Subcontract Manager  
Project Manager  
Product Manager  
Requirements Analyst  
Legal Department  
Purchasing  
Technical Staff  
Senior Management  
Test Lead  
Quality Assurance Manager  
CM Manager  
User Class Representatives

**Supplier Staff:**  
Project Manager  
Senior Management  
Legal Department  
Technical Staff
Process Entry Criteria

- Senior management has approved the outsourcing decision.
- The project has a vision and scope document.
- An overall project manager has been assigned.
- A subcontract manager has been assigned.
- A team has been assembled to prepare the RFP.
- A schedule has been defined for developing requirements, preparing the RFP, selecting a supplier, and preparing the subcontract management plan.
Process Flow Diagram

1. Define Product Requirements
2. Prepare Statement of Work
3. Define Proposal Evaluation Criteria
4. Prepare Request for Proposal
5. Submit RFP to Suppliers
6. Select Supplier
7. Develop Subcontract Management Plan
8. Execute Contract
9. Manage Subcontracted Project
10. Accept Product
11. Support and Maintain Product
12. Close Out Project
Process Exit Criteria

- The **supplier has delivered** all contracted products to the acquirer.
- The products delivered by the supplier have **satisfied all acceptance criteria**.
- The acquirer has made the **final payment** to the supplier.
## Process Step Template

**Purpose**  
Objective of this process step

**Roles**  
Team members who perform the various tasks

**Entry Criteria**  
Prerequisites for being able to proceed

**Inputs**  
Documents and information needed

**Tasks**  
Steps performed to execute the procedure

**Outputs**  
Deliverables produced

**Work Aids**  
Templates, checklists, guidelines that can help

**Verification**  
How to tell if we did the tasks correctly

**Exit Criteria**  
Conditions that must be true to say we’re done
1. Define Product Requirements

**Purpose:** To identify and document the product’s functional and nonfunctional requirements.

**Outputs:**
- Software (or System) Requirements Specification
- Preliminary acceptance criteria
- Preliminary RFP

**Key Roles:**
- Product manager or requirements analyst
- User representatives
- Acquirer test lead
Relative Cost to Fix a Defect


Requirements | Design | Code | Test | Operation
---|---|---|---|---
0 | 20 | 40 | 60 | 80 | 100 | 120

Development Phase
Three Levels of Software Requirements

Business Requirements

Vision and Scope Document

User Requirements

Use Case Document

Functional Requirements

Business Rules

System Requirements

Quality Attributes

Constraints

External Interfaces

Software Requirements Specification
Vision and Scope Document

1. Business Requirements
   1.1. Background
   1.2. Business Opportunity
   1.3. Business Objectives and Success Criteria
   1.4. Customer or Market Requirements
   1.5. Value Provided to Customers
   1.6. Business Risks

2. Vision of the Solution
   2.1. Vision Statement
   2.2. Major Features
   2.3. Assumptions and Dependencies

3. Scope and Limitations
   3.1. Scope of Initial Release
   3.2. Scope of Subsequent Releases
   3.3. Limitations and Exclusions

4. Business Context
   4.1. Stakeholder Profiles
   4.2. Project Priorities

See template at
www.processgroup.com/ssm.htm
Vision and Scope Document

1. Business Requirements

1.1. Background
1.2. Business Opportunity
1.3. Business Objectives and Success Criteria
1.4. Customer or Market Requirements
1.5. Value Provided to Customers
1.6. Business Risks

1. Allow customers worldwide to make and track purchases for all consumable products using a web browser.
2. Allow payment to be made electronically using existing or new accounts.
3. Provide customer with Internet access to accounts payable and receivable functions on existing accounts.
4. Capture needs profile of each customer for future marketing use.
5. …

E.g., Eliminate paper-based orders from world-wide customers by providing a web system for order management. Replace all paper transactions by 200X. Reduce order management costs 30% by 200Y.
2. Vision of the Solution

2.1. Vision Statement

2.2. Major Features

2.3. Assumptions and Dependencies

Context Diagram

- The system name goes in the circle
- Outside boxes represent major external entities
- Flows between externals and the system comprehend high-level user needs
Examples of Use Cases

◆ Order a chemical.
  ✔ from a specific vendor
  ✔ from any vendor

◆ Calibrate a pump controller.

◆ Find the cheapest flight from city A to city B.
  ✔ with an advance ticket purchase
  ✔ without an advance ticket purchase
  ✔ on a specified date
  ✔ within a specified date range

◆ Pay for a purchase made at a web site.
Sample Use Case for an ATM - 1

Name: Withdraw Cash

Actor: Account Owner

Description: The user withdraws a specific amount of cash from a specified account.

Preconditions: The user is properly logged in and has one or more accounts with a positive balance.

Postconditions: The requested amount of cash has been dispensed and the selected account balance is reduced by the same amount.

Priority: High
## Sample Use Case for an ATM - 2

### Main Course:

<table>
<thead>
<tr>
<th>Actor Actions</th>
<th>System Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Select <strong>Withdrawal</strong> action.</td>
<td>2. Display user’s accounts.</td>
</tr>
<tr>
<td>3. Select desired account.</td>
<td>4. Ask user to enter amount.</td>
</tr>
<tr>
<td>5. Enter desired amount.</td>
<td>6. If amount is okay, dispense cash and debit account.</td>
</tr>
<tr>
<td>7. Remove cash from dispenser.</td>
<td></td>
</tr>
</tbody>
</table>

### Alternative Courses:

- ✔ display list of common amounts, let user select one

### Exceptions:

- ✔ amount is not a multiple of $20.00
- ✔ amount exceeds $400
- ✔ amount exceeds account balance
- ✔ amount exceeds cash available in ATM
Use Cases and Business Requirements - 1

**Business Requirements**

Eliminate paper-based orders from world-wide customers by providing a web system for order management. Replace all paper transactions by 200X. Reduce order management costs 30% by 200Y.

1) Allow customers worldwide to **make and track purchases** for all consumable products using a web browser.
2) Allow **payment to be made electronically** using existing or new accounts.
3) Provide customer with Internet **access to accounts payable and receivable** functions on existing accounts.
4) **Capture needs profile** of each customer for future marketing use.
5) Provide **customizable reporting** of system use to executive management (reporting to be defined).
6) Provide simple **transaction reporting** summary to customers (reporting to be defined).
7) Support sales force in **creating and managing Internet accounts** for customers.
8) **Eliminate all lost sales** due to incorrectly routed paper orders.
9) Provide **audit / verification mechanism** to verify orders received and shipped.
Use Cases and Business Requirements - 2

Example Use Cases for Business Requirement #7.

1. Register a site admin – by site admin.
2. Create a new site admin profile – by site admin.
3. Modify site admin profile – by site admin.
4. Remove the site admin profile – by site admin.
5. Register a new user - by site admin.
6. Remove an existing user - by site admin.
7. View own profile - by user.
8. Modify own profile - by user.

Obtain a list of use case names (actor tasks) before expanding each use case.
Functional Requirements Example

**Business Requirement 7:**
Support sales force in creating and managing Internet accounts for customers.

**Use Case 2:** Create a new site admin profile.

**Functional Requirements for Use Case 2:**

<table>
<thead>
<tr>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>No system use will be possible if the license is invalid. The site admin will be asked for a license renewal number annually.</td>
</tr>
<tr>
<td>The system will remember partial profile creations, should the site admin not complete the profile creation process at one time. The site admin will be able to continue where he/she left off.</td>
</tr>
<tr>
<td>The admin record will have these required fields: A, B, C. (See data dictionary definition.)</td>
</tr>
<tr>
<td>The admin tool will not provide any record locking and will depend on the default record locking provided by the database.</td>
</tr>
<tr>
<td>If a user profile is being modified simultaneously by 2 site admins, then the profile in the database will be the profile that was last updated.</td>
</tr>
<tr>
<td>There will be only one site admin per user.</td>
</tr>
<tr>
<td>User membership names and email addresses shall be typed in or imported from a delimited file. The site admin can specify the delimiters used in the ascii file.</td>
</tr>
</tbody>
</table>
System Events as User Requirements

- **Actor**: initiate transaction, continue transaction
- **Sensor**: data reading
- **Device**: control signal, generate feed
- **External Database**: predetermined time

**Your System**
## Sample Event Table: Windshield Wipers

<table>
<thead>
<tr>
<th>Event</th>
<th>System State</th>
<th>System Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>set wiper control to low speed</td>
<td>wiper off or wiper on high speed or wiper on intermittent</td>
<td>set wiper motor to low speed</td>
</tr>
<tr>
<td>set wiper control to high speed</td>
<td>wiper off or wiper on low speed or wiper on intermittent</td>
<td>set wiper motor to high speed</td>
</tr>
<tr>
<td>set wiper control set to off</td>
<td>wiper on high speed or wiper on low speed or wiper on intermittent</td>
<td>complete current wipe cycle; turn wiper motor off</td>
</tr>
<tr>
<td>set wiper control to intermittent</td>
<td>wiper off</td>
<td>read wipe time interval setting; initialize wipe timer</td>
</tr>
<tr>
<td>set wiper control to intermittent</td>
<td>wiper on high speed or wiper on low speed</td>
<td>read wipe time interval setting; complete current wipe cycle; initialize wipe timer</td>
</tr>
<tr>
<td>wipe time interval has passed since completing last cycle</td>
<td>wiper on intermittent</td>
<td>perform one low-speed wipe cycle</td>
</tr>
<tr>
<td>change intermittent wiper interval</td>
<td>wiper on intermittent</td>
<td>read wipe time interval setting; initialize wipe timer</td>
</tr>
<tr>
<td>change intermittent wiper interval</td>
<td>wiper off or wiper on high speed or wiper on low speed</td>
<td>no response</td>
</tr>
<tr>
<td>immediate wipe signal received</td>
<td>wiper off</td>
<td>perform one low-speed wipe cycle</td>
</tr>
</tbody>
</table>
Software Quality Attributes

- **Characteristics** of software that are *visible to users* or important to developers
- Write them to be *quantitative and verifiable*
- Document these in the **SRS**
- Cannot be simultaneously optimized; **there are tradeoffs**

(see DeGrace and Stahl, *The Olduvai Imperative: CASE and the State of Software Engineering Practice*)
Documenting Quality Attributes - 1

Interoperability: Exchange data or services with other programs.

✔ The system shall be able to import chemical structures directly from the ChemDraw and ChemiStruct tools.

Performance: Speed.

✔ 90% of database queries shall be completed in no more than 2 seconds on a 400 MHz Pentium II PC running Windows 98.

Usability: Ease of use, user-friendliness, learning curve.

✔ All functions on the File menu shall have keyboard equivalents defined that use the Control key pressed simultaneously with one other key.
Documenting Quality Attributes - 2

Robustness: Product still functions with bad input & user error.

✔ All inputs shall have default values specified, to be used if the input data is not supplied or is invalid.

Maintainability: How easy it is to maintain the software.

✔ Support costs are 1 person / year or less.

✔ The ratio of comments to source statements shall be at least 0.5.

Testability: Ease with which each feature can be tested.

✔ A test case can be written for each requirement.

✔ The user interface can be tested with playback scripts.

Flexibility: Effort needed to add new product capabilities.

✔ It shall be possible to add a new supported hardcopy output device in two hours or less.
Design and Implementation Constraints

- The test device must use USB and Firewire connections.
- Only $10 and $20 bills can be dispensed from the ATM.
- The process control code must be written in Ada 95.
- The control module must be mountable in a standard 18-inch electronics rack.
- The power supply cannot weigh more than 3.5 pounds.
- All user interface elements shall conform to Product Family Style Guide 2B.
Exercise: Writing Quality Attributes and Constraints

1. Identify 2 or 3 quality attributes likely to be important for your project. Consider these:
   - Availability
   - Robustness
   - Portability
   - Integrity
   - Performance
   - Efficiency
   - Maintainability
   - Reliability
   - Usability
   - Flexibility

2. For each attribute, write 1 or 2 quantitative and verifiable statements of appropriate goals for your project.

3. Identify several constraints.
Additional Information
**Example Use Case #2 - 1**

<table>
<thead>
<tr>
<th>Use Case ID</th>
<th>US2.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use Case Name</td>
<td>Create a new site admin profile.</td>
</tr>
<tr>
<td>Created By</td>
<td></td>
</tr>
<tr>
<td>Date Created</td>
<td></td>
</tr>
<tr>
<td>Last Updated By</td>
<td></td>
</tr>
<tr>
<td>Date Last Updated</td>
<td></td>
</tr>
<tr>
<td>Actor</td>
<td>Sales Administrator.</td>
</tr>
<tr>
<td>Description</td>
<td>Create a site admin profile for a customer. The site admin can then create users.</td>
</tr>
<tr>
<td>Preconditions</td>
<td>Site admin has a valid license ID to enter. Site admin will have a list of user membership names &amp; email addresses to enter for this new profile.</td>
</tr>
<tr>
<td>Postconditions</td>
<td>A new site admin ID will be created for the customer. The site admin can then access this profile and delegate management of the profile to users under him/her.</td>
</tr>
<tr>
<td>Priority</td>
<td></td>
</tr>
<tr>
<td>Frequency of Use</td>
<td>Every new account.</td>
</tr>
</tbody>
</table>
### Example Use Case #2 - 2

<table>
<thead>
<tr>
<th>Normal Course of Events—User Actions</th>
<th>Normal Course of Events—System Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The site admin will log in with new license ID.</td>
<td>2. Display screen to create the new profile.</td>
</tr>
<tr>
<td>3. Enter the user ID.</td>
<td>4. Check if member profile exists.</td>
</tr>
<tr>
<td>5. The admin can set a flag to specify an “admin only” user, where he/she can administer other users – but cannot do any transactions.</td>
<td>• (If the member profile does not exist then the user must first register at the <a href="http://www.xxx.com">www.xxx.com</a> site (to create a member profile), and then only the Profile can be created.)</td>
</tr>
<tr>
<td>6. Enter user membership names and email addresses for new profile.</td>
<td>7. Insert the site admin profile in the database.</td>
</tr>
<tr>
<td>9. Log off.</td>
<td>8. Display confirmation that new profile has been created. Email copy of profile information to site admin.</td>
</tr>
</tbody>
</table>
### Example Use Case #2 - 3

<table>
<thead>
<tr>
<th>Alternative Courses—User Actions</th>
<th>Alternative Courses—System Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>The admin may assign user membership names to the newly created site admin profile using the ABC toolkit.</td>
<td>None.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Exceptions—User Actions</th>
<th>Exceptions—System Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1. If the site admin profile already exists.</td>
<td>A2. Site admin not added. The site admin is prompted to use the modify option.</td>
</tr>
<tr>
<td>B1. If the user or site admin that is to be added is not in the <a href="http://www.xxx.com">www.xxx.com</a> membership accounts list.</td>
<td>B2. Site admin not added. An error will be displayed and the user will have to first register at the <a href="http://www.xxx.com">www.xxx.com</a> site, before his/her profile can be created.</td>
</tr>
<tr>
<td>B3. Open new browser window for <a href="http://www.xxx.com">www.xxx.com</a></td>
<td></td>
</tr>
</tbody>
</table>

### Includes

**Special Requirements**

The site admin should be able to maintain his/her own profile and should be able to add more users under him/her.

### Assumptions

Site admin must use Internet Explorer 5.X or greater. All existing site admin profiles remain unaltered.

### Notes and Issues

Can an admin add another admin? Will there be more than one admin who will be adding/modifying the same profile?

<table>
<thead>
<tr>
<th>Resolutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes, an admin can create another admin and more than one admin can modify the same profile.</td>
</tr>
</tbody>
</table>
## Comprehending Other Actors

<table>
<thead>
<tr>
<th>Use Case ID:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Use Case Name:</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Created By:</strong></td>
<td>Last Updated By:</td>
</tr>
<tr>
<td><strong>Date Created:</strong></td>
<td>Date Last Updated:</td>
</tr>
</tbody>
</table>

|--------|--------------|---------------|----------------|----------|------------------|--------------------------|----------------|------------------|------------------|----------------|-------------|-------------|---------------|

<table>
<thead>
<tr>
<th>Special Requirements:</th>
<th>Assumptions:</th>
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<table>
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<th>Notes and Issues:</th>
<th>Resolutions:</th>
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2. Prepare Statement of Work

**Purpose:** To describe the work the supplier will perform, when the work is due, how the acquirer will evaluate the work, and the working relationship between the acquirer and supplier.

**Outputs:**
- Revised RFP, with SOW included
- Risk analysis

**Key Roles:**
- Acquirer project manager
Contents of the Statement of Work

◆ SOW is Section 6 of the Request for Proposal template.

◆ It contains these sections:

6.1 Project Organization
6.2 Communication
6.3 Dependencies and Constraints
6.4 Design, Development, and Implementation Methods
6.5 Evaluation and Monitoring
6.6 Change Management
6.7 Product Acceptance
6.8 Support and Maintenance

See template at www.processgroup.com/ssm.htm
Risk Analysis and Risk Management

◆ Both **acquirer** and **supplier** should perform risk analysis.

◆ Have **multiple team members** identify risks.
  - ✔ acquirer project manager
  - ✔ subcontract manager
  - ✔ engineers
  - ✔ testers
  - ✔ marketing/product managers
  - ✔ support staff

◆ **Plan risk management activities.**
  - ✔ small projects: include in project management plan
  - ✔ large projects: write separate risk management plan
What Is Risk Management?

Risk management is the process of identifying, addressing, and controlling potential problems before they threaten the success of a software or system project.
Examples of Software Risks - 1

Dependencies

- Customer-furnished items or information
- Inter-component or inter-group dependencies
- Availability of trained, experienced people
- Reuse from one project to the next
- External standards being issued
Examples of Software Risks - 2

Requirements Issues

◆ Lack of clear product vision
◆ Requirements are not prioritized
◆ New customers with uncertain needs
◆ New applications with uncertain requirements
◆ Lack of agreement on product requirements
◆ Rapidly changing requirements
◆ Ineffective requirements change management process
◆ Inadequate impact analysis of requirements changes
Management Issues

- Inadequate planning and task identification
- Inadequate visibility into actual project status
- Unclear project ownership and decision making
- Managers or customers with unrealistic expectations
- Ill-defined project roles and responsibilities
- Staff personality conflicts
- Poor communication
Examples of Software Risks - 4

Lack of Knowledge

- Inadequate training
- Lack of experience with languages, methods, or tools
- Inadequate application domain experience
- New technologies or development methods
- Ineffective, poorly documented, or neglected processes
Examples of Software Risks - 5

Communication

◆ **Time to learn** how to work together.
  ✔ meet on-site initially to begin building a relationship
  ✔ keep some staff at the supplier site if possible
  ✔ build long-term supplier relationships

◆ **Times when both parties are available.**
  ✔ plan for national holidays, work schedules, vacations.
  ✔ rotate the inconvenience for meetings and reviews
  ✔ log questions and issues for overnight handling
  ✔ schedule nightly handoffs carefully

◆ **Common tools.**
  ✔ change control, version control, issue tracking
Examples of Software Risks - 6

- Professional attitude, strong focus on quality
- **Reluctance to say “no” or “I don’t understand”**
  - ✔ want to save face
  - ✔ might be too agreeable and eager to please
  - ✔ might not ask for help or clarification
  - ✔ can lead to misinterpretations, unresolved issues, and unachievable commitments
  - ✔ need to read between the lines
- Might not accept responsibility for problems
- Likely to interpret requirements literally
- Might be cultural differences in UI designs
Examples of Software Risks - 7

◆ Date formats vary, so use the name of the month.
◆ Watch out for English/metric system conversions.
◆ Learn about passport and visa issues for supplier staff.
◆ Going through customs can delay shipping by weeks.
  ✔ learn customs rules
  ✔ expect to pay high duties
  ✔ shipping by cargo can be faster than by courier
◆ Use “non-employee” to identify co-ops, trainees, and apprentices.
◆ Check into staff turnover rates.
◆ Respect U.S. export control laws.
An Approach for Risk Management

**Identify**
- plan group session
- participants identify risks
- hold group session

**Analyze**
- individuals rate probability and loss
- collate into single risk list
- identify top 10 risks

**Plan**
- determine approaches
- assign responsibility

**Control**
- implement mitigation approaches

**Track**
- track status regularly
- take corrective actions if needed
Documenting Risks

- State risks as “condition, consequence”
- Quantify relative impact of each risk
- Identify mitigation approaches for each risk
- Assign responsibility and due dates
- Record risks in the risk list

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<tr>
<th>ID</th>
<th>Risk Description</th>
<th>P</th>
<th>L</th>
<th>E</th>
<th>First Indicator</th>
<th>Mitigation Approaches</th>
<th>Who</th>
<th>Date Due</th>
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<td>1</td>
<td>Supplier delivers low quality products, so rework is needed after testing.</td>
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<td>● Hold joint design &amp; code reviews on partial components.</td>
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P = probability of risk taking place (0.1 - 1.0)
L = loss if risk does happen (1 - 10, or actual units: weeks, $$)
E = total risk exposure from this risk item, = P * L
Exercise: Risk List

- List some risk categories that might threaten the success of your outsourced project. Select from the lists on the previous slides.

- Identify several risks from each of your categories.

- Which do you think are the top 5 risks?
3. Define Proposal Evaluation Criteria

**Purpose:** To determine how the acquirer will evaluate supplier proposals to select the best one.

**Outputs:**
- Draft RFP with proposal evaluation criteria
- Proposal evaluation matrix
- Draft of proposal evaluation report

**Key Roles:**
- Subcontract manager
- Acquirer project manager
- Purchasing
- Requirements analyst
# Partial Proposal Evaluation Matrix

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<th>Category</th>
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Proposal Evaluation Report Template

Executive Summary

Evaluation Team

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Evaluation Process

Suppliers Considered

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Supplier Scores

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<tbody>
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</table>

Conclusions

See Appendix G
Exercise: Proposal Evaluation Criteria

Worksheet #6

◆ Select your own proposal evaluation criteria, starting with the list given.

◆ Change or add individual criteria if you like, or detail “Specific product requirements” into subcriteria.

◆ Assign weights to the major categories (shaded cells in first column); they must total 100.

◆ Within a category, assign weights to the individual criteria (shaded cells in second column); each set must total 100.
4. Prepare Request for Proposal

*Purpose:* To prepare an invitation to prospective suppliers to submit bids for the acquirer’s project.

*Outputs:*  
- Request for Proposal

*Key Roles:*  
- Subcontract manager  
- Acquirer legal department  
- Acquirer project manager  
- Purchasing

[Bud Porter-Roth, *Request for Proposal*, Addison-Wesley, 2002]
Inputs to the Request for Proposal

- **Subcontract Manager**
- **Acquirer Test Lead**
- **Acquirer Project Manager**
- **Purchasing**
- **Product Manager, Requirements Analyst**
- **Other RFP Sections**

**Proposal Evaluation Criteria**
- **Acceptance Criteria**
- **Technical Requirements**
- **Statement of Work**
Request for Proposal Template

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Revision History
1. Statement of Confidentiality
2. Abbreviations, Acronyms, and Definitions
3. Introduction
   2.1 About Our Company
   2.2 About This Request for Proposal
   2.3 Submitting Proposals
   2.4 Accepting Proposals
   2.5 Contracting Schedule
4. Proposal Preparation Guidelines
5. Project Overview
6. Statement of Work
   <details shown in process step 2>
7. Supplier Requirements
   See template at www.processgroup.com/ssm.htm
8. Technical Requirements
9. Deliverables
10. Cost and Schedule Estimates
11. Contracts and Licenses
   11.1 Purchase Agreement
   11.2 Licensing Agreements
   11.3 Intellectual Property Ownership
   11.4 Supplier Warranties
   11.5 Performance Bonds, Late-Delivery Penalties, and Early-Delivery Bonuses
   11.6 Maintenance Contract
   11.7 Supplier-Supplied Training
   11.8 Nondisclosure Agreements

See template at www.processgroup.com/ssm.htm
5. Submit RFP to Suppliers

**Purpose:** To send the RFP to potential suppliers and invite them to prepare a response with a proposal that the acquirer will evaluate.

**Outputs:**
- Nondisclosure agreements
- Draft proposal evaluation report

**Key Roles:**
- Purchasing
- Subcontract manager
Handling Communications With Suppliers

◆ Send RFP to contact person on supplier information sheet.

◆ Ask suppliers to indicate if they intend to bid.
  ✓ identify single point of contact at supplier
  ✓ suppliers who do not bid must return RFP

◆ Supplier submits questions in writing.
  ✓ identify acquirer single point of contact
  ✓ share all questions and answers with all suppliers who received RFP

◆ Supplier submits hardcopy proposal.
  ✓ specify final submission date
  ✓ identify proposal recipient
6. Select Supplier

Purpose: To choose the most appropriate supplier to develop the outsourced software.

Outputs: ● Accepted supplier proposal
● Issues requiring supplier response
● Proposal evaluation report

Key Roles: ● Subcontract manager
● Acquirer project manager
● Purchasing
Evaluating Proposals

◆ Make sure every proposal is complete and in good form.
  ✔ could invite supplier to make modifications

  ✔ use subteams for different categories
  ✔ understand the basis for supplier’s estimates
  ✔ do price and schedule section last

◆ Contact references that supplier provided.

◆ Arrange for site visit if possible.

◆ Select primary and alternate supplier.
  ✔ identify issues and questions for supplier
  ✔ confirm that supplier still wants a contract

◆ Notify rejected suppliers.

Evaluation Matrix without Price and Schedule

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### Evaluation Matrix with Price and Schedule

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Guidance for Selecting Suppliers

See Appendix H

Management Issues

Legal Issues

Technical Issues

Financial Issues
7. Develop Subcontract Management Plan

**Purpose:** To describe how the acquirer will manage, monitor, and control the outsourced work.

**Outputs:**
- Subcontract management plan
- Supplier’s software development plan

**Key Roles:**
- Subcontract manager
- Supplier project manager
Subcontract Management Plan Template

Table of Contents
Revision History
1. Overview
2. Abbreviations, Acronyms, and Definitions
3. Project Organization
   3.1 Staffing
   3.2 Interfaces to Supplier
   3.3 Decision-Making
4. Communication Plan
5. Project Tracking and Oversight
   5.1 Status Reporting
   5.2 Metrics
   5.3 Risk Management
   5.4 Commitment and Issue Tracking
   5.5 Senior Management Review
6. Change Management
7. Product Acceptance and Transition
   7.1 Product Acceptance
   7.2 Transition to Support
   7.3 Requirements Tracing

See template at www.processgroup.com/ssm.htm
Communicating With Your Supplier

◆ Establish communication plans with supplier.

◆ Address frequency and content of:
  ✓ regular teleconference meetings
  ✓ periodic status reports
  ✓ technical and management reviews

◆ Define conditions for senior management review.

◆ Agree on how to document risks, issues, decisions.

◆ Define communication methods.
  ✓ phone, e-mail, videoconference, face-to-face
  ✓ Web-based groupware tools
  ✓ plan for the additional costs
The Supplier’s Software Development Plan

1. Project Summary
   1.1. Project Overview
   1.2. Project Deliverables, Commitments, and External Milestones
   1.4. Reference Materials
   1.5. Definitions and Acronyms

2. Project Organization
   2.1. Software Development Life Cycle
   2.2. Project Organization
   2.3. External Organizational Interfaces
   2.4. Team Roles and Responsibilities

3. Managerial Process
   3.1. Management Objectives and Priorities
   3.2. Assumptions, Dependencies, and Constraints
   3.3. Risk Management Plan
   3.4. Project Tracking and Metrics
   3.5. Staffing Plan

4. Technical Process
   4.1. Methods, Tools, and Techniques
   4.2. Project Documentation
   4.3. Project Support Functions

5. Work Packages, Schedule, and Budget
   5.1. Work Packages
   5.2. Work Package Dependencies
   5.3. Resource Requirements
   5.4. Budget and Resource Allocation
   5.5. Schedule and Internal Milestones
Software Development Plan Reality Check

- Do all the needed resources really exist?
- Does the plan address the agreed-upon scope?
- Are all expected deliverables in the plan?
- Are the estimates plausible at the 50% confidence level?
- Are contingency buffers included for growth and risks?
- Are any tasks missing?
- Are roles and responsibilities clear?
- Are there early milestones?
- Is the critical path clear?
8. Execute Contract

**Purpose:** To document legal commitments the acquirer and supplier are making to each other.

**Outputs:**
- Contract
- Contingency plan for nonperforming supplier

**Key Roles:**
- *Acquirer legal department*
- Supplier legal department
- Acquirer project manager
- Purchasing
- Subcontract manager
Contents of a Contract

- Statement of work and technical requirements
- Terms, conditions, and payment schedule
- License and confidentiality agreements
- Dependencies between supplier and acquirer
- Work products the supplier will deliver
- Milestones for formal management status reviews
- Performance monitoring and evaluation procedures
- Performance bonuses and penalties
- Conditions and procedures for changing the contract
Legal Aspects of Contracting

- Define conditions for termination by either party.
- Supplier might have standard terms they insist be included.
- Describe the dispute-resolution process.
  - ✓ arbitration
  - ✓ mediation
- State legal jurisdiction for contract interpretation and litigation.
- Consider cultural and legal issues when different nationalities are involved.
Negotiating Open Issues

◆ Think *win-win*.

◆ Consider long-term collaboration goals.

◆ Ensure that the point under dispute is mutually understood.

◆ Practice principled negotiation.
  ✔ Focus on interests, not positions.
    - understand the underlying interests
    - make sure you’re addressing the real issue
    - deal with reality, not fantasy
  ✔ Separate the people from the problem.
  ✔ Invent options for mutual gain.
  ✔ Base discussions on objective data.

Contract Bonuses and Penalties

◆ Performance incentives
  ✓ monetary bonus for exceeding schedule and quality requirements
  ✓ equity stake or shared IP ownership

◆ Performance penalties
  ✓ X% per month later than committed

◆ Risks of penalties and incentives
  ✓ don’t reward speed at the expense of quality
  ✓ penalties won’t motivate supplier who is already losing money
  ✓ bonuses for time-and-materials contracts can motivate excessive quality practices
# Sample Performance Bonuses and Penalties

## Contract:
- Supplier-tested code available: 12 months
- Defects discovered in system test: <2.0/KLOC
- Defects discovered after delivery: <0.2/KLOC

## Bonus:
- 5%: Supplier-tested code available 1 month early
- 10%: Defects discovered in system test: 1.0-1.5/KLOC
- 20%: Defects discovered in system test: 0.5-1.0/KLOC
- 10%: Defects discovered after delivery: <0.1/KLOC

## Penalty:
- 5%: For each month supplier-tested code is late
- 5%: For each additional 0.5 defects/KLOC discovered in system test over 2.0 defects/KLOC
- 5%: For each additional 0.2 defects/KLOC discovered after delivery to customers over 0.2 defects/KLOC

---

Contingency Plans for Nonperforming Supplier

- Develop **objective criteria for evaluating supplier progress**.
- **Deal with problems proactively** and promptly.
- Attempt to **resolve problems through negotiation first**.
  - ✔ follow your dispute-resolution process
  - ✔ escalate if necessary
- **Plan what actions you’ll take if you must terminate contract**.
  - ✔ bring the work **in-house**
  - ✔ switch to a **second supplier**
  - ✔ re-scope the project
  - ✔ cancel or postpone the project
- **Consider a second source for some work.**
9. Manage Subcontracted Project

**Purpose:** To track actual progress against plans, resolve issues with supplier, and manage change.

**Outputs:**
- Project status reports
- Review meeting summary reports
- Action items from status reports

**Key Roles:**
- Subcontract manager
- Supplier and acquirer project managers
- Supplier and acquirer senior management
Exercise: Project Management Problems

List several problems related to project planning or tracking you have encountered. For each, describe the problem, its impacts, and any root causes. Pick 1-2 problems and develop improvement actions.

Example

Problem: A key team member is lost.

Impact: Critical knowledge, skills, and time are lost.

Root cause: You didn’t have management commitment to keep key individuals on project.

Actions: Train existing team member, rent skilled person, replan project section for when resource is available.
Tracking Project Status

- Supplier project manager provides weekly or biweekly status report to acquirer subcontract manager.

- Carefully review the status reports.

- Watch out for:
  - late, missing, or incomplete reports
  - unexplained cost, schedule, or effort deviations
  - reports that don’t jibe with reality
  - known risks that don’t appear
  - current issues being treated as risks
  - overdue action items, issues, or dependencies by supplier or acquirer
A Possible Status Report Template

- **Management summary**
- **Project performance assessment**
  - ✓ can use color (▁▁▁) indicators
  - ✓ include metrics summary to date
  - ✓ examples: schedule, budget, resources, requirements status, change management, staffing, training, technical infrastructure
- **Major milestone table**
  - ✓ original plan, current plan, actual completion dates
- **Progress against, and deviations from, plan**
- **Current risk list**
- **Current issues and action items**
  - ✓ status, who is responsible, target date for resolution
Some Metrics for Tracking Progress

- **Size**
  - ✔ lines of code, function points, classes, size of executables

- **Time**
  - ✔ planned and actual duration between milestones

- **Cost**
  - ✔ planned and actual expenditures to date

- **Defects**
  - ✔ number of defects found, open, and closed
  - ✔ defect origin and classification

- **Status**
  - ✔ percent of requirements implemented and verified
  - ✔ satisfaction of performance or other quality goals
Monitoring Risks

◆ Assign ownership of each risk to an individual.
◆ Ensure that mitigation actions are implemented.
◆ Maintain a “Top 10” risk list.
  ✔ conduct periodic senior management review
  ✔ assess effectiveness of mitigation approaches
  ✔ watch for risks that persist on the Top 10 list
◆ Look for new risks.
◆ Retire obsolete risks.
◆ If risks materialize, treat them as issues.
Managing Issues

◆ **Maintain an issue log.**
  - ✔ ID, date identified, description, who’s responsible, target date
  - ✔ track issues to closure
  - ✔ resolve acquirer-side issues quickly

◆ **Define a corrective action process.**
  - ✔ steps to take if issues aren’t resolved
  - ✔ need a clear chain of command and scope of authority
Change Control Board

- Diverse individuals
  - ✔ development
  - ✔ project management
  - ✔ customer
  - ✔ testing
  - ✔ documentation

- Authorized to make binding decisions

- Consider change requests periodically
  - ✔ request impact analysis
  - ✔ make accept/reject decisions
  - ✔ set priorities or targeted releases
  - ✔ communicate decisions and impacts to stakeholders

See Appendix M
Managing Changes

User or Tester

Change Coordinator

Supplier Staff

Change Tool database

defect report, enhancement request, requirement change
e-mail with entry
e-mail with response
response
reports
e-mail with entry
e-mail with entry
Warning Signs of Trouble

- Uncompleted action items or failed dependencies
- Unqualified supplier or acquirer staff; staff turnover
- Missing, incomplete, or incorrect deliverables
- Processes that aren’t working well or are bypassed
- Unimplemented or unrequested functionality
- Reviews that aren’t performed
- Slow decision-making
- Missed early milestones
10. Accept Product

**Purpose:** To verify that all deliverables received are complete, of acceptable quality, and usable.

**Outputs:**
- Product acceptance report
- Accepted deliverables

**Key Roles:**
- **Acquirer test lead**
- Acquirer technical staff
- QA and CM managers
- Subcontract manager
- User class representatives
Product Acceptance Criteria

- **Pass** means no major problems encountered.
- **Fail** means major problem encountered, such as:
  - ✔ installation or integration failure
  - ✔ GPF or similar abnormal termination
  - ✔ UI or control functions that don’t work correctly
  - ✔ violations of UI or interface standards, constraints, or business rules
  - ✔ failure to achieve performance or other quality attribute goals
  - ✔ failure to build correctly in acquirer’s environment
  - ✔ unimplemented requirements
  - ✔ supporting deliverables or documentation missing
Product Acceptance Criteria Categories

- **Functional Testing**: Is the product fit for use?
- **Product Reproducibility**: Can you build it consistently?
- **Defect Data**: Is the number and type of open defects acceptable?
- **Install Testing**: Does it install and uninstall correctly?
- **Customer Documentation**: Are docs accurate and usable?
- **Compatibility Testing**: Does it share its environment nicely?
- **Legal or Regulatory Compliance**: Does it follow the rules?
- **Continuous Operation**: Is it reliable over time?
- **Performance Measurement**: Are performance goals met?
- **Standards Compliance**: Does it conform to standards?
Product Acceptance Procedures

◆ Define procedures to follow for evaluation.
  ✓ user acceptance test
  ✓ peer review
  ✓ standards check

◆ Determine who will accept and evaluate delivered products.

◆ Automate regression testing for multiple deliveries.

◆ Define how to report defects to supplier.
  ✓ defect origin might dictate who pays for correction

◆ Acceptance testing doesn’t replace a full system test!
  ✓ focus on high-probability usage scenarios
  ✓ check major exception conditions
Example Acceptance Criteria for an ATM

- **Functional Testing:** The ATM allows the user to correctly inquire about a balance, transfer funds, deposit a check, withdraw cash, and print a receipt.

- **Defect Data:** No defects are open that could result in a financial inconsistency [define the possible inconsistencies].

- **Legal or Regulatory Compliance:** The ATM enforces all pertinent business rules correctly [point to the rules].

- **Continuous Operation:** At least 400 transactions involving a separate login process can be completed without failure.

- **Performance Measurement:** No transaction requires more than 6 seconds between user initiation and ATM response.
# Product Acceptance Report Template

Report Date: ____________________  Author: ____________________

Product Evaluated: ____________________________________________

Release or Build Number: _____________________________________

## Acceptance Activities

<table>
<thead>
<tr>
<th>Deliverable</th>
<th>Date Due</th>
<th>Date Received</th>
<th>Date Evaluated</th>
<th>Acceptance Procedure</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

## Deviations

<table>
<thead>
<tr>
<th>Deliverable</th>
<th>Problem</th>
<th>Corrective Action Required</th>
<th>Due Date</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


Exercise: Acceptance Criteria

Define several appropriate acceptance criteria for your project.

✔ What documents to accept, acceptance criteria + how to evaluate?

✔ What products to accept, acceptance criteria + how to evaluate?
Transitioning Accepted Products to Support

◆ Establish support capability.
  ✔ identify support organization before contracting
  ✔ ensure that support organization has capacity and capability
  ✔ develop transition plan and assign responsibility

◆ Maintain configuration management.
  ✔ get full inventory of items to be transitioned
  ✔ perform configuration baseline audit
  ✔ use aligned CM tools and processes
  ✔ integrate accepted products into your CM system
11. Support and Maintain Product

**Purpose:** To enhance and correct outsourced products, and to train and support acquirer staff and customers.

**Outputs:**
- Updated deliverables
- Necessary information

**Key Roles:**
- Product manager
- Acquirer and supplier technical staff
- QA and CM managers
Skills and Knowledge Transfer

◆ Rely on multiple information exchange channels.
  ✓ Have an acquirer employee work alongside a critical-skilled supplier employee late in the project.
  ✓ documentation
  ✓ design models
  ✓ peer reviews
  ✓ pair programming
  ✓ telephone coaching
  ✓ collaborative problem-solving
Maintenance and Support Services

◆ **SOW should address customer support** from supplier.
  ✓ How long will support last?
  ✓ Who screens customer problems initially?
  ✓ Will the supplier work with a customer directly?
  ✓ What are the supplier’s and acquirer’s responsibilities for the cost of fixing defects?
  ✓ What HW and SW tools will supplier use for support? Who pays for them?

◆ **Define service-level agreement.**

◆ **Consider hiring third-party support.**

Handling Modifications

- Enhancement Request
- Defect Report
- Customer Problem
- Supplier Support
- Evaluate Change
- Internal Support
- Make Change
- Release Product
- Accept Change
- Integrate Change
12. Close Out Project

**Purpose:** To collect data and insights from completed projects and record lessons learned for the future.

**Outputs:**
- Project metrics data and artifacts
- Lessons learned
- Process improvement action plan

**Key Roles:**
- **Acquirer project manager**
- Subcontract manager
Retrospectives: What and Why

◆ What’s a “retrospective”?
  ✔ a review conducted at the end of a project or phase to consider how it went and identify ways to perform future work more effectively
  ✔ also called post-project review, postmortem, debriefing, after-action report

◆ Look for:
  ✔ what went well? (repeat it!)
  ✔ what didn’t go so well? (change it!)
  ✔ what happened that surprised you? (manage risks!)
  ✔ what still puzzles us? (figure it out!)

◆ Create action plans to address improvement items.

[Norman L. Kerth, Project Retrospectives, Dorset House, 2001]
Summary: Outsourcing Traps to Avoid

- Poor requirements specification and scope management
- Selecting an inappropriate supplier
- Taking a fire-and-forget approach to the subcontract
- Gaining inadequate insight into the technical products
- Failing to respond quickly to supplier questions and needs
- Ignoring early warning signs of trouble
- Unsubstantiated assumptions
- Questions of IP ownership
NO
SURPRISES!
Subcontract Management References - 1


