Lesson Proper for Week 15

SOFTWARE SUBCONTRACTOR

PROGRAM AND PROJECT SELECTION

The selection of a subcontractor for software programs and projects is important due to the expectations and technical work disciplines required. Selecting a subcontractor for contracted software design/development is the responsibility of program and project managers.

The program and project managers provide the direction to perform various job tasks related to the day-to-day software design/development to be delivered for subcontracted work products. There is competition from other subcontractors to obtain assigned work.

The planning for the subcontracted work is performed during a program and project start-up once decisions are made to employ outside support. The outputs from this action are the responsibility of a software subcontractor plan (SSP), but specific tasks can be assigned to this plan or to other teams depending on organizational requirements or needs. A statement of work (SOW) will list subcontractor requirements.

A list of requirements, expectations, and interfaces between the program and project are documented in a statement of work. The goals of selected software processes are given to the subcontractor per the direction of program and project managers in order to flow down plans for required tasks during a software life cycle. This permits the software subcontractor to abide by internal software processes that require objective evidence to be reviewed and ensure goals are being accomplished.

The selection and search for a subcontractor is required by program or project plans or the subcontractor program or project managers. Support may include teams or the coordinated experience of software engineers for understanding all aspects of a technical approach, evaluation, cost, estimates, and software-related tasks as

needed.

For many years, I have been in the role of a customer and subcontractor. When you are the customer, allow the subcontractor to present his or her case and the reason it was selected and under contract. Many WebEx and face-to- face meetings are needed. The subcontractor will feel comfortable and know the purpose for selection. Many subcontractors are uncomfortable when presenting what their company can provide to customers. Give them a chance and let them relax. Be positive when presentations are provided for review and ask questions to see what the answers will be. Be positive; some companies will not select you as a subcontractor but will move on to the next customer. The learning process will benefit upcoming subcontractors for understanding what customers will want to hear.

SUBCONTRACTOR APPROACH

The software subcontractor is an integral part of the team for software work product development. Ensure progress by the appropriate subcontractor for software activities and progress is based on agreed evidence of completion. The program and project organizations, with the support of senior managers, oversee the subcontractor's work quality, engineering, and systems and are in continuous support as required by contract.

SOFTWARE SUBCONTRACTOR PLAN

The SSP provides the direction for the subcontractor hired and the program and projects for understanding the requirements and guidelines for both organizations. Each software subcontractor is responsible for configuration management of his or her software at the subcontractor's own facilities in accordance with the plans and procedures and abides to the standards, processes, and procedures of the program and projects under the signed contract.

The plan identifies the program and project managers' approach to manage the required subcontractor's effort. This plan will describe:

- The task for each subcontractor
- The processes for configuration management and quality audits
- Requirements
- Risk management
- Configuration management
- Schedules for delivery of work products

The plan includes support responsibilities and explanations for subcontract development and how the subcontractor will be managed. The associate subcontractors and major subcontractors are defined in the plan along primary roles that specify how the program and projects interface and measure performance.

All subcontractor deliveries to a customer require receiving and inspection of the software work product. Software could be delivered as media or electronically. The data are stored with configuration management for accountability and checkout for use. Hardware deliveries are received as packages or boxes. This process is also defined in the plans or internal procedures.

Ø **Software Audits**

The software audit is comprised of program and project reviews to be conducted at subcontractors' site of business by defined dates as documented in the SOW. The subcontractor software plans and procedures are audited per defined and documented audit methods to trace information for software requirements to/from applicable test cases/test procedures and per the signed contract.

The subcontractor plans that are audited must ensure the software test environment performs its intended function and meets contract requirements. The purpose of this task is to ensure that the software under test is qualified on acceptable test tools.

Established subcontractor process audit criteria are prepared and provided to the subcontractor before the audits are performed. An audit checklist is provided, and audit questions will be filled out and then presented to the customer. The agenda and participants are identified using a defined audit process applicable per the contract. Involvement in the software first-article inspection (FAI) is the approach; I highly recommend programs and projects prepare an FAI checklist and deliver it to the subcontractor to provide answers to questions before performing the audit. The results save time and cost along with traveling all over the world. We have the technology to perform WebEx or telecommunications capabilities to discuss audits and action items instead of being at the subcontractor's facility.

SOFTWARE AND SYSTEM DELIVERY

It is important to make the right decisions before delivery of software and system end items or hardware to the customer. At times, schedules become the priority before quality, and the lack of confidence in the customer will have an impact on future working agreements and contracts. Make sure that systems design, program and project planning, software requirements, software design, and software and systems integration are successful and that every step or milestone has quality built in during the software design/development life cycle. Knowing problems still exist, senior, program, and project managers do not show a tick mark to show schedule accomplishments to customers. Be honest and up front with the customer and know that quality comes first; then, schedules provide the road map for the teams to produce effective work products.

The effective methods for software and systems integration will provide assurance that customer requirements are met before any thoughts about hurrying delivery. Stay the course and do not deviate from the plan. Before delivery of software and systems to customers, the following are important:

- Software media and data verification and validation are complete.
- Software documentation is released and ready for delivery.
- Necessary FAIs (first-article inspections), FCAs (functional configuration audits), and PCAs (physical configuration audits) are conducted, and all action items are closed.

Ø SOFTWARE MEDIA AND DATA DELIVERY

Software media are identified and labeled per an identification scheme. The identification and media labeling should be in accordance with security requirements for a program and project as presented in a defined and documented security plan.

Marking information can be displayed electronically for all software media and on the exterior of the physical media (i.e., disk sets, DVDs, CDs, etc.) containing software. Software work products are identified in program and project development plans. An identification approach is assigned to all released software and the accompanying software documentation. An example definition of a software part number can be used as follows:

- *Master*: Stays in the CML (remember this all designers/testers)
- *Copy*: User checkout for software design, test, troubleshooting, and the like
- *Disaster copy*: Keep off-site for retrieval due to lost or destroyed media

Ø Software Documentation

Software documentation provides defined and documented releases for various levels of software and systems integration. Software documentation can be used as follows:

- Systems engineering plan (SEP)
- Development plan (DP)
- Software configuration management plan (SCMP)
- Software test plans and procedures
- Software and systems integration plan (SSIP)
- Quality plan (QP)
- Documentation for version control
- Build and installation procedure

Ø **Version Control Documentation**

There should always be documentation to provide version control that will identify and describe software versions of existing work products. This type of documentation, such as a version control document (VCD), is used to release, track, and control the software versions at the software and system levels.

Ø **Build and Installation Procedure**

The build and installation procedure describes in detail how to build and install software for systems integration. The configuration management team, with input from software designers, develops build and installation procedures for software and systems integration builds. The CM organization inside a program and project is responsible for the development, control, and release of build and installation procedures.

Ø **Delivery Package**

The software and systems delivery package consists of software media and documentation associated with the version of the software, printed copies, and identified system work products or hardware packages. Contractual software and systems delivery requirements or agreements ensure delivery to customers.

Software deliveries are used to meet contract delivery requirements or obligations the program has agreed to accomplish. Senior management and program and project managers along with teams provide coordinating and delivering the package document program and project schedules as a completed milestone.

Ø **Final Software and Systems Delivery**

The final software and systems delivery is the last delivery once program and projects have completed the FAI and FCA/PCA. The following steps provide an example:

- Integration testing is completed; results are acceptable and meet technical requirements.
- Customer accepts the as-designed and as-built product and associated documentation.
- A customer notifies that software or system product is received.

In all phases, the delivery system provides processes and procedures to get things done right. By strengthening these delivery systems, programs and projects can sustain continuous improvement. If these systems are ignored, you run a risk of implementing ineffective delivery systems. With a good system in place and constantly improved, the chance for improving work products and services increases.

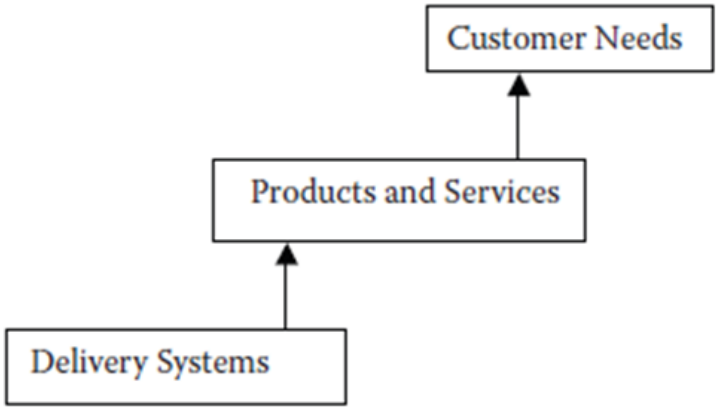

FIGURE 10.1: Customer needs.

All programs and projects have customers. Always make the customer happy. The customer can be part of the software and systems integration activities. This environment serves the needs of customers as shown in Figure 10.1.

To survive the global market, programs and projects must continuously improve their work products, services, and delivery systems. Configuration management streamlines the ability to identify and refine the requirements during software and systems integration and through the entire software life cycle.

Business goals are accomplished when delivery systems are created to support those goals. The delivery system must be effective and efficient. The right way to build these systems is to comply with the business process infrastructure.

Programs and projects create work products and services to meet a customer's needs and need to develop the right delivery systems. Always improve the delivery system to improve the future customers coming your way.

FIRST ARTICLE INSPECTION

An FAI for software is conducted to examine subcontractor production units and if the software is ready for delivery to the customer. If the subcontractor cannot complete all of the tests for the production unit, the FAI will not serve its purpose. Military or aerospace companies are doing a subcontractor a favor by allowing the subcontractor to use his own environment for the formal test. Why should a company receive a production unit without the applicable documentation supporting a formal acceptance test? If a subcontractor cannot find any way to complete a test, call the software FAI off until the subcontractor is ready for the FAI to be conducted. Military and aerospace programs provide detailed test cases and regression analysis for fixing problems, including the following:

- The test stand description that confirms the components (part numbers) matches the conform test stand.
- The test cases/reports are rerun for the software changes.
- The analysis shows the fix will not affect other parts of the system.

· The new software has been tested through the test stand and witnessed by a company engineer to confirm the new implementation is working properly.

Subcontractors work with the customer's engineering teams to finalize the regression analysis. Software FAI checklists include:

· *Verification requirements*: For embedded software, state the approved production test procedure (TP), including software version. State that testing is completed, results are acceptable, and the software meets technical requirements.

· *Data package*: The product released and approved and software meet requirements allocated to the software. All requirement deviations are recorded and approved. Software life-cycle data comply with plans and standards and are controlled with software plans. Software and life-cycle data are in a controlled software library and archived both on-site and off-site.

· *Version control document*: Traceability is established to system name, subcontractor system part, and document number. Source code components for the software are identified, and problem reports are resolved since the last product baseline was identified. Version documentation identifies the software life-cycle environment and operating software. Software and verification tools are identified.

· *Verification process*: Verification testing is conducted, defined, and controlled. Verification and validations are complete, and discrepancies are captured in problem reports.

· *Product release*: The executable object code was generated from released, controlled, archived source code and released procedures.

The released software is identical to the tested software. If not identical, the differences must be specified and justified. For loadable software, the released object code loaded on media is identified in compliance with loadable software standards. The displayed software configuration identifiers or checksums match high-level and version-controlled procedures. For loadable software media, the label indicates acceptance by quality/configuration management teams.

· *Acceptance test*: The acceptance test environment is defined and controlled, and the TP is approved and released and under configuration control.

· *FAI completion*: There is evidence of software acceptance, and action dates for action items are defined; the software FAI checklist is provided to stakeholders.

FUNCTIONAL CONFIGURATION AUDIT

The FCA verifies that the work product performance complies with the hardware, software, and interface requirements specification (IRS). It is required that the test data are reviewed and verified, showing that the hardware and software perform as required by the functional and allocated configuration identification. The FCA

provides the prerequisite to acceptance of a configuration item. A technical understanding is a requirement to be accomplished concerning the validation and verification per the TP concerning software. FCA activities involve the following:

- Verification that the work product performs to required configurations.
- Major or minor engineering changes are released.
- A product and configuration baseline is established.

PHYSICAL CONFIGURATION AUDIT

The PCA identifies the baseline for production and acceptance of the work product, both hardware and software in Table 10.1. The PCA verifies that the as-built configuration correlates with the as-designed product configuration, and the acceptance test requirements are comprehensive and meet the necessary requirements for acceptance of the production unit. Equally important, it demonstrates that management systems for quality, engineering, and configuration management information accurately control the configuration of subsequent production units. Incremental and progressive audits are performed on systems and major assemblies to build up to the PCA.

TABLE 10.1: Configuration Baseline

Baseline	Description	Documentation
Functional baseline	System design requirements	System design: high- and lower-level documents
Allocated baseline	System and software requirements	Systems design documents Requirements documents Design documentation System design: lower-level documents Software test documents
Product baseline	Aggregation of internal systems components into software work products	Operations and maintenance documents System and software design documents Version control documents (VCDs) Software user documents, manuals, and procedures Systems and software installation procedures
High-level product baseline	Aggregation of systems design and software high-level documentation into a component	Software user documentation, manuals, and procedures Systems and software installation procedures
Lower-level product baseline	Aggregations of systems design and software and lower-level documentation into a component	Software user documentation, manuals, and procedures Systems and software installation procedures

PCAs have an option to be conducted concurrently with the FCA. Extracts from the previous FCA audit plan are made available to the team. Quality assurance and senior management ensure available budget, and engineering personnel execute per the PCA audit plan. Metrics captured for the FCA are similar for the PCA for compliance and review during the audit. The PCA entry checklist is provided in Table 10.2.

After reviewing the materials presented, including known issues and subcontractor status, the recommendations by the PCA team are favorable, so the PCA may proceed. PCA execution and the metrics will be completed, and the schedule for the PCA final meeting is coordinated with the customer.

TABLE 10.2: PCA Entry Checklist

Entry Checklist	Yes	No	Achieved
Kick-off meeting is held to define roles and responsibilities for conduct and performance of formal audit.	X		Roles and responsibilities defined and used as guideline to support the formal audit.
Delivery is received of data packages (i.e., plans, procedures, drawings, system designs, media, logs, etc.) to support the formal audit.	X		All data packages and artifacts are provided as requested by the formal audit team.
Approved nomenclature and terms are agreed on as applicable during formal audit.	X		All nomenclatures and terms are in accordance with the formal audit and understood by the formal audit team.
List of current deviations, waivers, and higher-level changes are requested or approved.		X	Action item 1
Approved requirements documentation identifying the baseline is available.	X		Approved requirements documentation identifying the baseline is provided to the formal audit team.
As-built records are complete and released.		X	Action item 2

AI	Description	ECD
1	List of current deviations, waivers, and higher-level changes requested or approved are not ready for use by the formal audit team.	mm/dd/yyyy
2	As-built records are not completed and released for use by the formal audit team.	mm/dd/yyyy

Note: AI, action item.

PCA activities are as follows:

- The as-built configuration correlates with the as-designed product configuration.
- The acceptance test requirements are determined per quality assurance.
- Engineering changes are released.
- The final product baseline is established.

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