COTS: The New Challenge of Information Integration

Donald S Lenk Jr

Systems engineering is moving away from specially-designed and built systems to integration of commercial off-the-shelf (COTS) hardware and software. COTS brings new challenges to technical communicators. In the past, we found all our information in-house, now it comes from many sources. We must change our process from pure development to information integration, and we must be part of the COTS selection process.

INTRODUCTION

A new approach to systems engineering is making its mark on both commercial and military systems design. This approach integrates commercial off-the-shelf (COTS) hardware and software instead of developing systems in-house from scratch. The use of COTS presents new challenges to us, the information developers. We must now be a vital part of the systems engineering process. The information developer for COTS systems:

• Takes part in the hardware and software source selection process to ensure the manufacturer’s technical manuals and other data are useful to the end-user directly or can be used to develop end-user documentation.
• Is faced with new challenges in gathering, synthesizing, and producing end-user documentation.
• Must be responsive to rapidly changing system configurations.

This paper is written from the view of a publications developer, but the impacts and methods described here apply to training development as well.

COTS SYSTEM INTEGRATION IMPACTS ON INFORMATION DEVELOPMENT (AND VICE VERSA)

The traditional approach to systems engineering is a linear one, progressing through several stages to design, develop, and produce an end-product. This way of systems engineering works when a system is developed from scratch and is supported by the original manufacturer throughout its life cycle. In this approach, information development depends on a one-way flow of information. At some point during system development, information developers start receiving engineering information which we synthesize into end-user publications and training materials.

In the COTS approach, system engineering goes through these same stages, but a new dimension is added. As Fisher and Skolnick\(^1\) point out, the use of COTS virtually assures that the design, capabilities, or availability of a commercial product will change (technology refresh) during the system’s development and during the rest of its life. Thus the supportability of systems over their whole life cycles is gaining in importance, as Verma, Chilakpati, and Blanchard\(^2\) demonstrate, and in some cases is placed on an equal footing with system design. This emphasis on supportability requires that the all the logistics support elements described by Blanchard\(^3\) be included in COTS source selection.

### The Traditional Approach

<table>
<thead>
<tr>
<th>Requirements Definition</th>
<th>System Design</th>
<th>Preliminary Design</th>
<th>Detailed Design</th>
<th>Production</th>
<th>Support</th>
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Information Development
With COTS, the information developer no longer gets information from just one source (engineering). Instead, it comes from many sources, depending on the project, and the information developer must integrate it for the end-user. Sources can include:
- Technical manuals from COTS manufacturers.
- Proprietary information from COTS manufacturers.
- Hardware and software engineering data.
- Information from other systems to be integrated.
- Legacy data from previous systems.

WAYS TO DOCUMENT A COTS SYSTEM

The adoption of COTS system integration has given us three possibilities for providing system documentation. The following table summarizes their benefits and drawbacks.

<table>
<thead>
<tr>
<th>DOCUMENTATION APPROACH</th>
<th>BENEFITS</th>
<th>DRAWBACKS</th>
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<tbody>
<tr>
<td>WMSIWYG (What the Manufacturer Sent Is What You Get).</td>
<td>Inexpensive. No information integration is required. Just gather up the manufacturers’ publications and ship them with the system.</td>
<td>The system end-user gets a hodgepodge of material, in many shapes and sizes, with varying degrees of usability and quality, much like the publications for your desktop computer.</td>
</tr>
<tr>
<td>WMSIWYG with a system-level publication to “glue” it all together.</td>
<td>More useful for the end-user. The system-level publication ties all the COTS elements together and documents any custom-built software, hardware, or user interfaces. It provides a place to back-fill any information not provided in the COTS publications.</td>
<td>The end-user must still go to the COTS publications for much of the information needed to install and maintain system units.</td>
</tr>
<tr>
<td>Traditional. Create a single source for all the end-user’s information needs.</td>
<td>The system documentation will be of consistent quality and depth of coverage, in a single format, and easier to use.</td>
<td>Expensive to develop and maintain. This method defeats the purpose of using COTS; each time a COTS unit changes, the system documentation must be updated.</td>
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</tbody>
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Documenting a system with COTS materials offers several advantages, disadvantages, and challenges to publications and training developers. These make careful source selection very important. (See the list of source selection questions at the end of this paper.)

<table>
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<tr>
<th>Pitfall/Outcome</th>
<th>Description</th>
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<tr>
<td>Reduced development time</td>
<td>(depending on the method you choose).</td>
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<tr>
<td>Fewer repair levels.</td>
<td>Most manufacturers allow very little or no field maintenance of their equipment, requiring that it be returned for repairs. This limits the amount of repair information needed. If it’s not covered in the manufacturer’s manuals, it’s probably not needed by the end-user. However, it may not be easy to convince engineers who are accustomed to highly detailed repair manuals.</td>
</tr>
<tr>
<td>Copyright and other data rights.</td>
<td>A critical element in COTS source selection is the capability to reproduce or otherwise use the manufacturer’s product information, which may be end-user manuals or engineering data, and some of it might be proprietary.</td>
</tr>
<tr>
<td>Style and Quality.</td>
<td>Because the system documentation draws from many sources, it is impossible to guarantee consistent style, quality, and depth of coverage across the whole system library unless you take the traditional approach to system documentation. Prepare a system-level manual to fill in some of the holes.</td>
</tr>
<tr>
<td>Budgeting</td>
<td>Unless you are using a WMSIWYG documentation approach, it’s difficult to know how much work is needed to meet the end-user’s information needs because you don’t know what the COTS source data is. You may need to budget for basic information development at the beginning, and resize the job after you receive the COTS data.</td>
</tr>
<tr>
<td>Technology refresh.</td>
<td>An ever-changing system baseline means constant and rapid documentation updates and new configuration management challenges. If you are not using the WMSIWYG approach, make your information as modular as possible or deliver it in electronic form to make updates easier.</td>
</tr>
<tr>
<td>Data compatibility.</td>
<td>COTS information may come in electronic media, but it may not be compatible with your system or the end-user’s. Make data compatibility part of your source selection criteria.</td>
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**QUESTIONS TO ASK POTENTIAL COTS SUPPLIERS TO AID IN SOURCE SELECTION:**

These are the questions a technical communicator might ask. Engineering will have different requirements. In the end, COTS source selection is a compromise among all disciplines.

- Does the manufacturer provide end-user publications?
  - If so, what do they consist of?
    - Operator Instructions?
  - Troubleshooting instructions?
  - Parts information?
  - Repair instructions?
  - Preventive maintenance instructions?
- On what media are these publications provided?
  - Hard copy?
  - CD-ROM?
  - Diskette?
  - Internet?
- If provided in electronic media, what tools are required to read them?
- Are the publications in the end-user’s language? If so, were they translated from another?
• Will the manufacturer provide samples of the publications for evaluation as part of the equipment evaluation process?
• Will the manufacturer grant copyright permissions?
  • If so, do they include:
    • Duplication?
    • Extraction of information to use in system-level publications?
    • Translation?
    • Transfer to another medium?
• Are there any restrictions on these permissions such as:
  • Review rights?
  • Limitations on number of copies?
  • Cost for permissions?
• Will the manufacturer provide the documentation source files?
  • If so, what medium are they on?
  • What equipment and software are required to read them?
• Cost of end-user publications:
  • Is one copy provided with each unit purchases?
  • Does that include one copy of everything: are only some publications distributed with the unit?
  • Will the manufacturer give or sell additional copies, and what is the cost?
• Does the manufacturer provide translated versions of the publications? If so, in what languages?
• What is the quality of the manufacturer’s publications?
  • Do they support the system maintenance philosophy?
  • Do they meet minimum usability requirements?
  • Do they support the system end-user tasks?
  • Will they reproduce well?
• How does the manufacturer handle updates to the publications?
  • Issue revisions?
  • Issue errata sheets or stick-downs?
  • Doesn’t?

REFERENCES

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2) Verma, Dinesh; Chilakapati, Rajesh; and Blanchard, Benjamin S, “Quality Function Deployment (QFD): Integration of Logistics Requirements Into Mainstream System Design.” Proceedings of the SOLE Symposium (August 1995), San Antonio TX.


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