

# A Manager's Guide to Successfully Implementing Vendor-Supplied Health Information Technology

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**Implementing commercial off-the-shelf (COTS) health information technology products can be very expensive and disruptive to an organization and its care delivery process. A broad management framework is important for the proper selection and implementation of COTS products.**

## Introduction

As crystallized in the Institute of Medicine's (IOM) *Crossing the Quality Chasm* report, the health care delivery system must reform itself to provide more effective and efficient care. Two of IOM's key recommendations include effective use of information technology (IT) and reengineered care processes.<sup>1</sup> The federal government also recognizes the transformative nature of health IT and has established the Office of the National Coordinator for Health IT. It is now generally acknowledged that health IT has the *potential* to help improve the quality and reduce the cost of health care.

To meet these needs, health IT vendors offer a wide variety of off-the-shelf products that promise to transform the care delivery process. If used properly, solutions such as Computerized Physician Order Entry (CPOE) may help clinicians reduce medical errors and lower administrative costs.

In fact, managers in federal government agencies are required to consider the use of commercial off-the-shelf (COTS) products for health IT solutions. The White House's Office of Management and Budget directs agencies to "acquire off-the-shelf software from commercial sources, unless the cost effectiveness of developing custom software to meet mission needs is clear and has been documented."<sup>2</sup>

However, implementing many of the COTS health IT products can be very expensive and disruptive to an organization and its care delivery process. To extract the full value of these solutions, management must have a framework for the proper selection and implementation of COTS software products.

## Critical Success Factors

Selecting a vendor-provided health IT system is no guarantee of success. Off-the-

shelf health IT products are typically very complex solutions that require significant management, clinical, and technical expertise. There are several principles that you should follow for a successful implementation of a COTS-based health IT product.<sup>3</sup>

## Pick the Right Target

Before considering a COTS health IT product, you should first determine if the area under consideration is an appropriate target for a vendor product. COTS products will introduce new workflows and procedures to your organization. Examining and, potentially, redesigning your work and decision processes will provide the functional criteria with which to evaluate alternative COTS solutions. Nevertheless, before making an investment decision, you should be willing to adapt your clinical workflow to take advantage of the capabilities of the product instead of significantly customizing the product.

However, if your process is unique to your organization and creates a competitive advantage, custom developing a solution to fit your process may be more appropriate than a COTS product.<sup>4</sup> If the technology under consideration supports patient care, you should also determine if the available products are appropriate for your clinical requirements and patient demographics. For example, a health system in South Carolina did not select a computer-based home health solution to support its disease management program because of anticipated low acceptance levels in its rural patient population.<sup>5</sup>

### Limit Customization of the Product

By providing pre-packaged IT capability, COTS products have the potential to speed system roll-outs while minimizing cost and risk. However, heavy customization negates these benefits and introduces additional risk to the project. For example, significant customization can make it very expensive and resource intensive to upgrade to a vendor's new software release.

### Be Prepared to Reengineer Clinical Processes and Workflow to Take Advantage of the Product

Limiting product customization will require revamping the clinical workflow to align with the capabilities of the COTS product. The goal of these process modifications is to take advantage of as many out-of-the-box product capabilities as possible while assuring that your basic redesigned processes are supported.

### Consider If You Need to Hire an Integrator

Many of the larger vendors offer products that are very intricate and require experienced personnel for proper configuration and implementation. Many vendors offer certifications to IT personnel that attest to their ability to implement their products

correctly. If you do not have the appropriate skills internally, you may need to hire a systems integrator to assist with the project.

### Plan For an Incremental Roll-out

As is the case with many large endeavors, COTS implementations are often best completed incrementally. Incremental roll-outs can allow users and IT personnel to progress up the learning curve and adjust to the change that large health IT systems can introduce. Examples of logical incre-

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ments include implementing CPOE for one disease at a time or implementing pharmacy automation at a sequence of facilities. If you are implementing a large product suite, you may choose to implement the modules incrementally to make the effort more manageable.

### Utilize a Disciplined Approach

Many COTS implementations involve multiple stakeholders, business processes, and vendors. To manage this amount of complexity, your organization will need to follow a disciplined process for selecting and implementing a product. You will need a well-constructed project management approach that manages the scope, cost, and schedule of the entire initiative.

You will also need a structured software process that progresses the initiative from concept to a functioning system in a logical, predictable manner.

### Management Framework

The remainder of this article describes a framework for selecting and implementing vendor-provided health IT systems.<sup>6</sup> The framework provides a foundation for the project management and software implementation discipline that is required for a successful COTS roll-out.

There are eight core phases that need to be planned, executed, and managed carefully for a successful selection and implementation.

- Concept and business case definition
- Process and requirements analysis
- Screen and select product
- Design solution
- Product configuration and development
- Testing
- Implementation, roll-out, and evaluation
- Investment and project review

Additionally, there are three foundational activities that must be addressed throughout the project:

- Project management
- Clinical and business process reengineering
- Organizational change management

Figure 1 presents the framework graphically.<sup>7,8</sup> Although the core phases appear sequential in this diagram, the phases can overlap and be performed iteratively as required to support the project.

### Concept and Business Case Definition

As with any capital investment, a COTS product selection and implementation re-

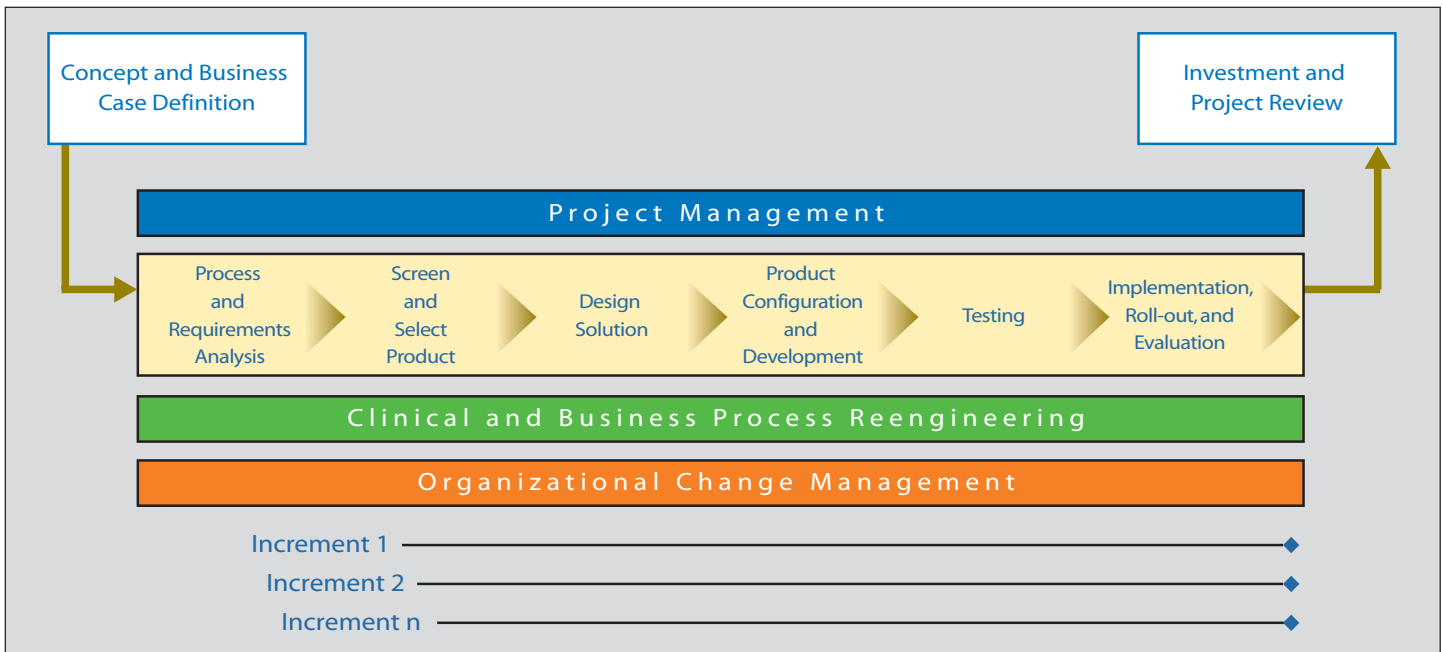


Figure 1. COTS health IT management framework.

quires a business case that defines the rationale, benefits, risks, and metrics of the project. A clear business case will keep the project team focused as it evaluates vendor offerings. Many large vendors have a large array of products that salespeople will offer in various combinations. A clear set of metrics, such as reducing admissions for a disease management program, can help the product selection team cut through marketing messages and make a wise investment choice.

### Process and Requirements Analysis

Before selecting a COTS product, the project team *must* document the process and requirements that the product will support. Selecting a product without process and requirement definition significantly increases the risk of a poor selection.

**Document processes.** Clearly documented processes and procedures are absolutely critical for implementations of COTS-based health IT systems. The majority of

the screens, information collection, and other software capabilities are provided out-of-the-box by the vendor. Therefore, the bulk of the effort should be to align the product's native functionality with the required clinical or business processes. If the area under consideration does not have documented processes, the project team must plan for and execute a process documentation effort.

As the current state procedures are documented, the project team must identify opportunities to overhaul the clinical workflow. Automating a flawed process, such as prescription fulfillment, could increase the occurrence of errors and decrease medical quality.

**Document requirements.** The project team must document the requirements for the ultimate solution from all stakeholder perspectives. Most importantly, the requirements should capture the user needs that the system should fulfill independent of

technology. The requirements definition effort should recognize that different user groups may have varying needs. For example, physicians may be most concerned about organizing screens and information in a way that facilitates fast data entry. However, management users may be most interested in reporting on the cost-effectiveness of selected procedures.

### Screen and Select Product

Once the project team documents the process and requirements, the next step is to select a vendor and product. Given the number of vendors in some domains and the complexities of their products, you should plan adequate time for the selection phase.

**Document a complete set of criteria for product selection.** You must consider a complete set of evaluation criteria when selecting a product. An incomplete set of criteria could lead to a product investment that does not result in expected outcomes.

Table 1 identifies the four major categories of selection criteria and presents typical questions that need to be answered in each category as the selection process is carried out.

**Functional criteria** are frequently the most obvious criteria to consider. Functional criteria determine how well the products under consideration meet the defined business and user requirements (e.g., does the COTS product collect the information that is needed?). However, functional criteria are not the only criteria of concern. **Technical criteria** determine how closely the products meet the organization's technical architecture and policy.<sup>9</sup> Selecting a product that does not align with existing technology infrastructure and policy could lead to unexpected costs, schedule delays, security risks, or other undesirable consequences. **Life cycle cost criteria** evaluate the complete life cycle costs of implementing and operating the COTS product. Life cycle costs include expenditures for the acquisition, implementation, and maintenance of the selected product. Finally, you should evaluate the stability and viability of the software **vendor**. Selecting a COTS product creates a dependency on the software vendor. If the vendor goes out of business, discontinues the product line, or is acquired, the organization may have an unsupported COTS product and no access to the source code.<sup>10</sup>

**Try before you buy.** You must beware of "vaporware." Vaporware is software or hardware which is announced by a developer well in advance of release, but which then fails to emerge without a protracted development cycle.<sup>11</sup> One technique for avoiding vaporware and ensuring that the product meets your requirements is to install a version of the system in your environ-

ment and use it in a mocked up mode. This activity should include clinicians entering sample data into the system and viewing sample reports. This activity should also allow your IT personnel to get a preview of the inner-workings of the product.

**Check references.** As part of the selection process, interview other organizations that have implemented the product. If possible, check references that the vendor does not provide as part of its sales process to get

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the most objective feedback. The purpose of these interviews is to solicit opinion on the product's capabilities, quality of the vendor's support processes, and implementation experiences.

**Include all stakeholders in the selection process.** The selection should include a cross-section of all users affected by the new product. This includes all clinicians and management who will use the product. This should also include the IT project team that will implement and support the product.

### Design Solution

Once you select a product, you must engage in a design process. The objective of

the design process is to identify the configurations needed on the pre-packaged system to meet your organization's specific requirements.

**Perform a gap analysis.** The first step in the design phase is to compare your organization's requirements and process flow to the out-of-the-box product capabilities. The gaps identified during this activity will highlight product configurations and customizations that are required. This activity will also highlight areas where the current clinical workflow should be modified to align with the product.

**Design configurations and customizations.** Based on the gap analysis, identify the configurations that are required to the product. Configurations are vendor-allowed modifications to the product that allow for integration into a particular environment. For example, many vendors will allow you to rename a label on a screen so that it makes sense to end users. Configuration also includes designing the specific workflow and alerts that a system should provide. If necessary, this step should also design customizations that are required for a product to be integrated into your environment.

**Use an interactive, demonstration-based design process.** In many cases, the project team can quickly generate screens and reports for user review with a reasonable amount of effort since it is starting with a pre-packaged system. These review sessions, referred to as conference room pilots by some vendors and integrators, allow end users to provide requirements and design feedback based on early versions of the ultimate user interface that will be available to them.<sup>12</sup> Introducing this visual review approach can result in richer user

Table 1. Major categories of evaluation criteria for vendor-supplied health IT systems.

Criteria	The Types of Questions You Need to Answer
Functionality	<ul style="list-style-type: none"> <li>• Does the product have the data entry capability that physicians require (e.g., structured orders, automated check for drug interactions for a CPOE solution)?</li> <li>• Does the product have reporting capability that management requires (e.g., cost of care reporting, workload management reporting for a CPOE solution)?</li> </ul>
Technical Architecture	<ul style="list-style-type: none"> <li>• Does the product support the organization’s standard hardware, operating system, and other supporting technical infrastructure?</li> <li>• How does the product manage security (e.g., user accounts management, authentication, authorization, encryption)?</li> </ul>
Life Cycle Cost	<ul style="list-style-type: none"> <li>• What is the vendor’s software licensing model for the initial purchase? Common options include named seat (i.e., buy one license for each user) and enterprise (i.e., buy the right for all users in an organization to use the product).</li> <li>• Does the vendor charge an annual maintenance fee? Many vendors charge 18 percent of the initial license cost per year.</li> <li>• Do you need to purchase optional product modules to meet the requirements?</li> <li>• Does the vendor assume that the acquiring organization will provide supporting software (e.g., Oracle database, Web servers, etc.)? Do you need to buy any of that software?</li> <li>• Do you need to upgrade the hardware and network environment to have acceptable performance? What is the cost of those upgrades?</li> <li>• Does the vendor sell a technical services package that provides access to experts or upgraded help desk support?</li> </ul>
Vendor	<ul style="list-style-type: none"> <li>• What is the stock performance and investment community coverage of publicly held vendors?</li> <li>• What is the bond rating of the vendor? Does a poor bond rating indicate financial health concerns?</li> <li>• What is the company’s history of total profitability and profit margins?</li> <li>• Does the company have a history of a positive cash flow and enough cash to service its debt?</li> <li>• How stable is the vendor’s source of capital (e.g., is it relying on venture capital funding)?</li> <li>• Does the vendor appear to place a priority on supporting the product line? Are the profit margins and growth rate of the product attractive enough for the vendor to continue supporting the product?</li> </ul>

feedback versus relying solely on paper-based documentation review.

**Product Configuration and Development**

Once the final solution is designed, the project team can perform the configurations and customizations.

**Perform configurations within the context of the vendor’s design.** The primary activity during this phase should be configuring the product within the context of the vendor’s product design. Configurations performed according to the vendor’s methodology will help ensure that you can upgrade to

new software versions as they are released by the vendor.

**Monitor customizations made to the product.**

As the project progresses, you should monitor progress and ensure that each customization is justified. If customiza-

Table 2. Project manager's checklist for a successful health IT selection and implementation.

Phase	Primary Objective	Most Critical Activities and Considerations
<b>Concept and Business Case Definition</b>	Establish metrics that will govern the remainder of the project and measure success.	<ul style="list-style-type: none"> <li>• Clear metrics will help focus the vendor selection process.</li> <li>• State metrics in terms of clinical and business outcomes.</li> </ul>
<b>Process and Requirements Analysis</b>	Clearly document the business process that the COTS product will support. Document the requirements that the final system must meet independent of technology.	<ul style="list-style-type: none"> <li>• Do not make product selection decisions until the process and requirements are documented.</li> <li>• Identify opportunities to revamp existing processes.</li> <li>• State requirements from all stakeholder perspectives.</li> </ul>
<b>Screen and Select Product</b>	Evaluate candidate products against a documented set of criteria and make a final product selection.	<ul style="list-style-type: none"> <li>• At a minimum, evaluate candidate products against functional, technical, cost, and vendor criteria (see Table 1).</li> <li>• Try before you buy to avoid “vaporware.”</li> <li>• Check the vendor's references.</li> <li>• Include all stakeholders in the selection process.</li> </ul>
<b>Design Solution</b>	Identify the configurations needed on the pre-packaged system to meet the organization's specific requirements.	<ul style="list-style-type: none"> <li>• Compare the requirements against the out-of-the box product capability.</li> <li>• Define required configurations and customizations.</li> <li>• Use an interactive design process.</li> <li>• Whenever possible, modify the clinical workflow to conform to the selected product.</li> </ul>
<b>Product Configuration and Development</b>	Implement configurations and customizations needed to meet the requirements.	<ul style="list-style-type: none"> <li>• Perform configurations within the context of the product's design.</li> <li>• Limit customizations. When customizations are necessary, ensure they are well documented.</li> </ul>
<b>Testing</b>	Test the final solution to your organization's specific requirements.	<ul style="list-style-type: none"> <li>• Plan for thorough testing.</li> <li>• Test cases should reflect the anticipated real-world use of the system.</li> </ul>
<b>Implementation, Roll-out and Evaluation</b>	Execute an orderly roll-out of the new process, roles and responsibilities, and system to end users.	<ul style="list-style-type: none"> <li>• Establish and execute an on-going training and change management program for end users.</li> <li>• Evaluate and adapt the system to tune it so that it will provide anticipated value.</li> </ul>

tions are completed, make sure they are well documented.

### Testing

After the package is configured, the project team must test the final solution before making it available to end users.

**Test cases should reflect the anticipated real-world use of the system.** Although the vendor provides a developed and tested core software package, you must ensure that the final solution functions properly in your environment. Configuring the product to your requirements and installing it on your hardware and network creates a unique system that requires validation. The testing phase should assemble a collection of users that complete the same actions as they will on the production system.

**Ensure that there is adequate time for testing.** All software projects face pressure to compress testing activities in order to facilitate a faster roll-out of the final solution. Avoiding this pitfall can help make a COTS investment successful.

### Implementation, Roll-out, and Evaluation

The final phase involves implementing the configured software product on the production hardware and making the software available to end users. In addition to the technical implementation, the project team must develop and execute a training program to ensure that all stakeholders understand proper use of the system. The training program should also ensure that all users understand new and modified workflows. A formal evaluation should be undertaken to verify that the anticipated value of the system has been achieved. This evaluation will help identify components of the system and associated work processes that need further adaptation to fulfill the system's value expectations.

### Investment and Project Review

Once implemented, you should revisit the project to determine if it met the original investment objectives. This includes determining if the project had the intended impact on clinical outcomes and financial objectives. This activity should also include documenting lessons learned for future increments or initiatives.

### Conclusion

Implementing vendor-based IT products has the potential to transform the care delivery and other critical business processes. However, these projects require substantial planning and management to be successful. This article has presented a framework that can be used to introduce the project management and software implementation discipline that is required for a successful roll-out of vendor supplied IT systems. Table 2 summarizes these considerations into a project manager's checklist for a successful health IT selection and implementation. ❖

### Endnotes

1. "Crossing the Chasm: A New Health System for the 21<sup>st</sup> Century," Institute of Medicine, Washington, D.C., National Academy Press, 2001.
2. A130 Circular, Office of Management and Budget; <http://www.whitehouse.gov/omb/circulars/a130/a130.html#8>.
3. Carol V. Brown and Iris Vessey, "Managing the Next Wave of Enterprise System: Leveraging Lessons from ERP," *MIS Quarterly Executive*, March 2003.
4. C. Todd Couts, "Integrating COTS Software: Ten Lessons for Business," *Sigma*, vol. 6, no. 2, Mitretek Systems, September 2006.
5. The 2<sup>nd</sup> Annual Government Health IT Conference & Exhibition, FCW Events, Washington, D.C., June 15–16, 2006.
6. This framework is based on Mitretek's experience in helping both federal agencies and private sector health care providers acquire and implement vendor-supplied software.
7. Arlene Minkiewicz, "Six Steps to a Successful COTS Implementation," *Crosstalk Journal of Defense Software Engineering*, August 2005.
8. Lisa Brownsword and Patrick Place, "Lessons Learned Applying Commercial Off-the-Shelf Products, Manufacturing Resource Planning II Program," Software Engineering Institute, June 2000.
9. C. Todd Couts, *op. cit.*, 2006.
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11. *Vaporware*; <http://en.wikipedia.org/wiki/Vaporware>.
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