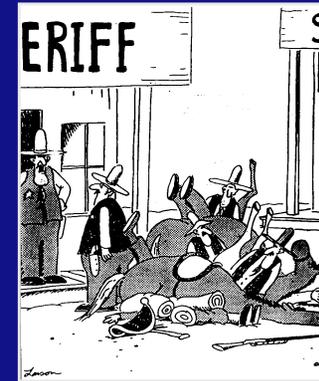


COTS-BASED SYSTEMS

Program Manager Keys to Success

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Assistant Secretary of the Air Force
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“And so you just threw everything together? . . .
Mathews, a posse is something you have to *organize*.”

From *The Far Side*, by Gary Larson

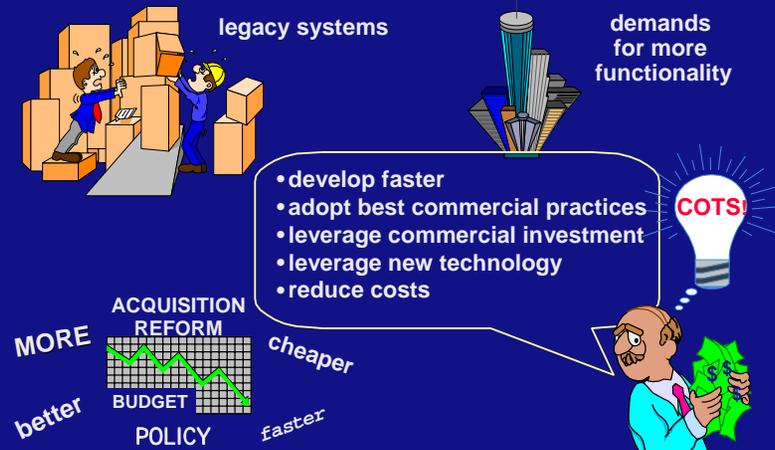


COTS-Based System Fundamentals

Keys to COTS-Based System Success

Recommendations

COTS: Attraction and Motivation



The Story of Two Real Projects

	DCIS	MRP II
End-user Processes	Adapted <i>product</i> to existing processes	Adapted <i>processes</i> to product
COTS Selection	No pre-selection demos	"Try before you buy"
Stakeholders	Late involvement	Early involvement
Source	"Opportunity"-ware	COTS products
Modification	Allowed	NOT allowed
Vendor Relationships	Viewed as subcontractor	Viewed as partnership
Result	Project terminated	Deployed to sites

What is COTS?

A COTS product is a product

- sold, leased, or licensed to the general public
- offered by a vendor trying to profit from it
- supported and evolved by the vendor, who retains the intellectual property rights
- available in multiple, identical copies
- used without modification of the internals

Types of System Components



COTS

products offered to the general public for sale, lease, or license

NDI

items developed for and in use by another government entity

"Opportunity"-ware

products developed by a commercial enterprise but not for general sale or use

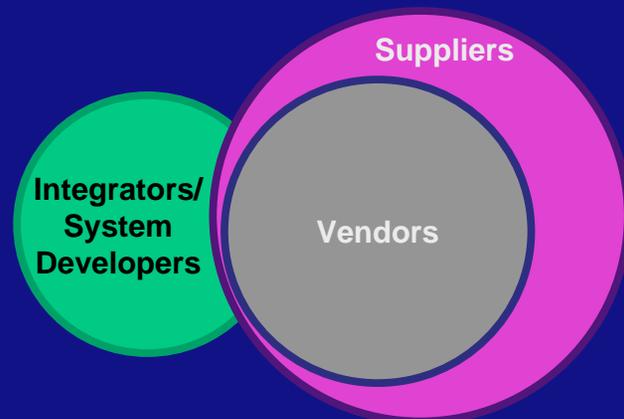
Legacy

parts from "your" existing system(s)

Developmental items

components developed especially for the current system

Roles and Relationships



A Spectrum of COTS-Based Systems



COTS-Solution Systems

One substantial product (suite) tailored to provide significant system functionality

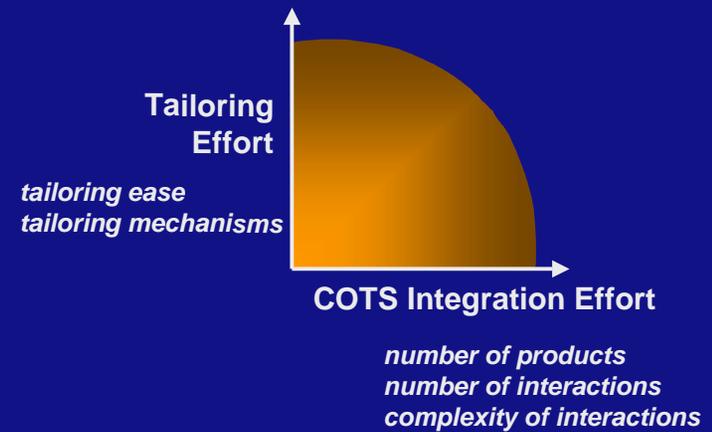
- reflect generic end-user processes
- tailoring focus
- vendor maintained

COTS-Aggregate Systems

Multiple products from multiple suppliers integrated to collectively provide system functionality

- may be more flexible to specific end-user processes
- integration focus
- project maintained

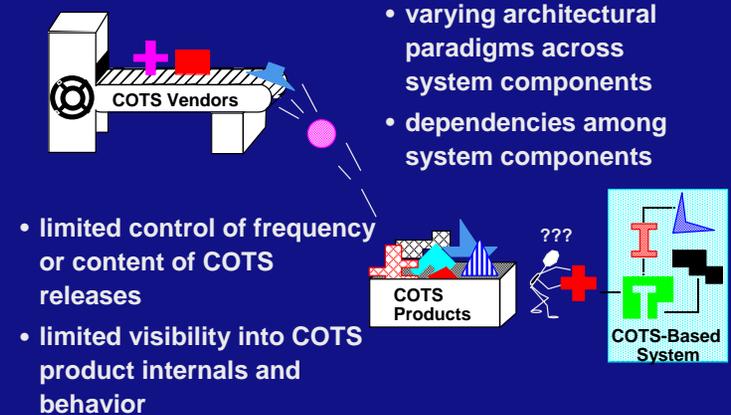
Relative Magnitude of Effort



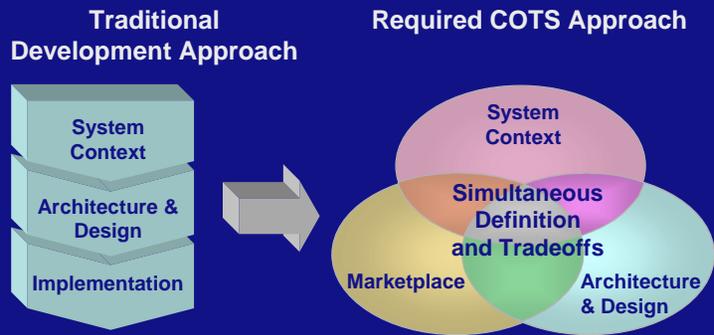
What Makes COTS Challenging? -1



What Makes COTS Challenging? -2

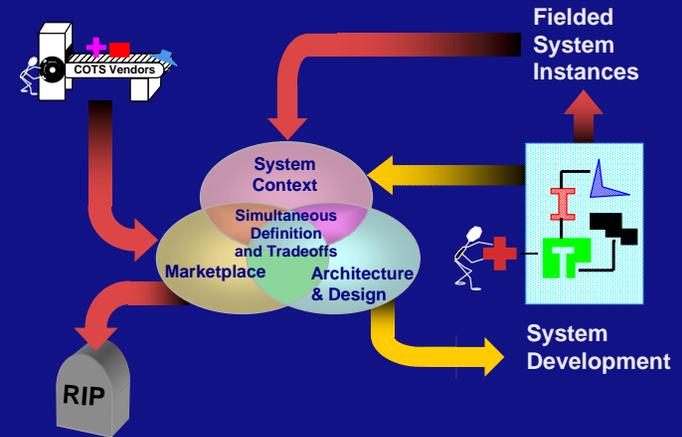


CBS Fundamental Change



This change applies to *business* and *contractual* activities, as well as the *engineering* ones.

Cyclic Nature of CBS

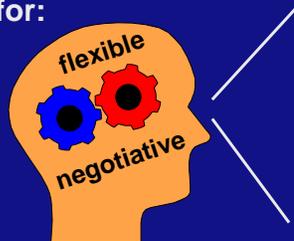


Implications of Fundamental Change

Mindset must change **AT ALL LEVELS**
and in all disciplines and roles.

New processes for:

- end-user operations
- end-user involvement
- development
- management



- Contracts
- Budgets
- Funding
- Strategies & Plans

COTS-Based System Fundamentals

Keys to COTS-Based System Success

Recommendations

Keys to CBS Success



Make COTS-Based System Tradeoffs



Think More Like a Business



Establish Evolution as a Way of Life



Change the Culture

Keys to CBS Success



Make COTS-Based System Tradeoffs

- *Reconcile Products and User Operations*
- *Leverage the Marketplace*
- *Engineer an Evolvable Architecture*
- *Make Tradeoffs Simultaneously*
- *Avoid COTS Modification*

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Reconcile Products and User Operations

Process mismatch is likely

- identify kinds, degree, and implications of mismatch early
- potentially critical for success

Recognize what is/is not negotiable

- organization's control or influence over system context
- feasibility of changing end-user processes



User Operations/Product Mismatch Actions

Program Manager actions:

- identify end-user processes/product mismatch early
- involve end-users and other stakeholders early
- negotiate system context and product tradeoffs
- use domain experts and consultants from the COTS products' suppliers
- use prototypes and pilots to gain product insight

Executive support:

- facilitate negotiation to reconcile mismatch between products and end-user processes



Leverage the Marketplace

Consumers need

- current information about products and suppliers
- knowledge of marketplace drivers
- “try before you buy”
- business-case analyses for decision making
- determination of extent of influence
- influence in the marketplace



Marketplace Actions

Program Manager actions:

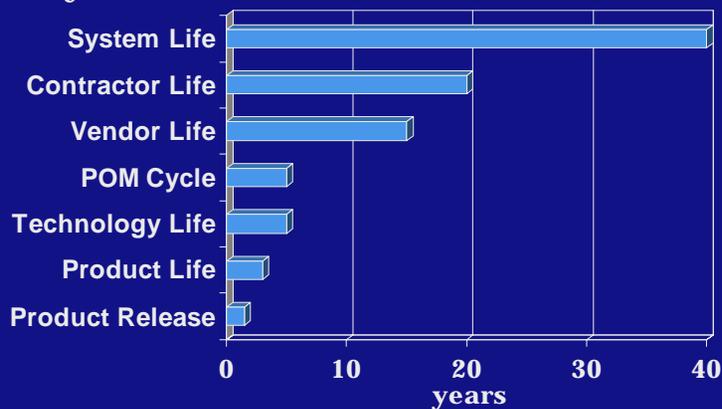
- participate in user and industry groups
- maintain government and contractor marketplace knowledge
- keep current with the marketplace
- evaluate products and suppliers
- use testbeds/prototypes throughout the life cycle
- allocate sufficient resources for marketplace activities

Executive support:

- establish
 - an information sharing structure
 - marketplace watch groups
 - organization-wide testbeds
 - example evaluation criteria and plans
 - technology refresh guidelines



Change Drives COTS-Based Systems



Architectures & Evolvable Systems

An evolvable system architecture encompasses:

- domain knowledge
- technology trends
- anticipated system context changes
- functional abstractions

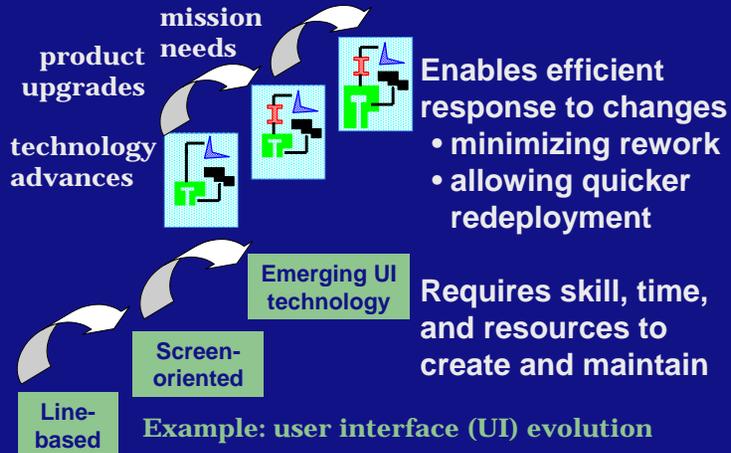


Evolvability:

- specialized layering
- highly modular
- crisp interfaces
- standard interfaces
- common mechanisms



Engineer an Evolvable Architecture



Evolvable Architecture Actions

Program Manager actions:

- consider alternative architectures and designs
- evaluate architecture evolution properties
- validate architecture early through prototypes
- dedicate sufficient resources early to construction of stable architecture

Executive support:

- direct the collection of examples of good architectures
- allocate resources for architectural liaison/coordination



Make Tradeoffs Simultaneously

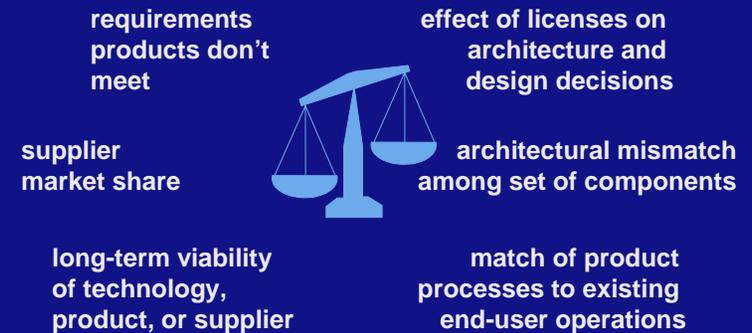


Finding a fit of system context, marketplace, architecture means

- tradeoff simultaneously and continuously
- use spiral or iterative development
- consider engineering, business, contractual perspectives



New Tradeoff Considerations



- Long-term commitment vs. short-term gains
- More stakeholders, more business and contractual angles



CBS Tradeoff Actions

Program Manager actions:

- initiate timely tradeoff studies with appropriate depth
- do tradeoffs early
- do tradeoffs at key product change events
- involve government in making critical tradeoffs
- negotiate realistic system context constraints
- make realistic accommodation of architecture to marketplace
- make realistic accommodation of requirements to marketplace

Executive support:

- facilitate balance of broader interests with program needs
- establish new requirements processes that account for simultaneous tradeoffs



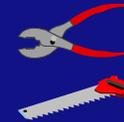
Avoid COTS Modification

Temptations for COTS product changes:

- inability to change end-user processes
- tailoring required for any use
- work required to integrate

Two choices:

- non-surgical tailoring
- surgical modification



Or don't use COTS: do custom development.

All have near- and long-term consequences.



Weighing the Choices

	Tailoring	Surgery	Custom
System Context Fit	improved	better	best
Marketplace Exploitation	best	minimal	none
Support - of product - of changes	- supplier - program	- program - program	- program - program
Best If Done By ...	program, with supplier assist if possible	supplier	program



Actions to Avoid Modifications

Program Manager actions:

- weigh modification choices carefully
- acknowledge and accommodate the consequences of COTS product modification
- get vendor commitment to incorporate modifications into the next version of the commercial product
- pay attention to the economics of tailoring

Executive support:

- demand extensive justification of (proposed) COTS surgical modifications

Keys to CBS Success

Make COTS-Based System Tradeoffs

Think More Like a Business



- Live by the COTS Business Case
- Negotiate Licenses & Supplier Relationships
- Realign Budgets for COTS Realities

Establish Evolution as a Way of Life

Change the Culture



Successful Businesses

Know what **business** they are in

Leverage the **marketplace**

Base decisions on sound **business-case** analyses

Partner with suppliers, contractors, end users, and other stakeholders

Treat information technologies as **assets**

Bottom line: to get business advantages, you must think and act more like one



Live by the COTS Business Case

Analyses drive “make vs. buy” decisions.

Differences in COTS business case:

- mission *and market*
- suppliers as well as products
- COTS alternatives react differently to system context
- total cost of ownership addresses marketplace volatility
- currency of market research information

Also important:

- periodic reassessment
- complete rationale for the analysis



COTS Business-Case Actions

Program Manager actions:

- do feasibility studies weighing business, engineering, and contractual issues
- base decisions on analysis results
- maintain timeliness of analysis and business case results
- conduct analysis to appropriate depth based on risk involved and on the scope of the project
- consider cost impacts of COTS products, including upgrades & “end-of-life” events

Executive support:

- establish COTS business case guidance
- enforce use and timeliness of COTS business case



Negotiate Licenses and Supplier Relationships

There are many different kinds of licenses.

- choice of license can greatly affect cost and architecture
- license options are important in building the business case

Benefits of partnering with suppliers:

- influence over product directions
- insight into supplier plans and motivators



Licenses and Supplier Relationship Actions

Program Manager actions:

- develop strategies to create and manage vendor and supplier relationships
- negotiate licenses
- look for volume discounts
- obtain licenses that transfer to the government/maintainers
- create government partnerships with critical second-tier vendors

Executive support:

- watch for enterprise license opportunities



Realign Budgets for COTS Realities

Accommodate marketplace volatilities

- product upgrades, cascading upgrades, end of technology life
- product feature reduction or bloat, vendor demise, changes to license arrangements

Accommodate COTS infrastructure

- technology and market watch
- testbeds
- culture change and training
- information collection and dissemination
- guidance, examples, handbooks
- incentives



COTS Budget & Funding Ideas

Base gross product and technology upgrade cost estimates on trends

- individual upgrade costs may not be predictable

Share COTS infrastructure costs across programs

Seek flexibility in funding to survive marketplace volatility

- during construction
- during sustainment



COTS Budget Realignment Actions

Program Manager actions:

- budget for COTS cultural changes (government/contractor)
- budget for new or increased costs
 - technology forecasting
 - continuous market research
 - continuous evaluation
 - reacting to new product releases
 - reacting to marketplace changes
 - engineering an evolvable architecture
 - (re)integration
 - licensing, warranties, data rights
- estimate life-cycle costs realistically

Executive support:

- budget for the organization's COTS cultural changes
- budget for the organization's COTS infrastructure

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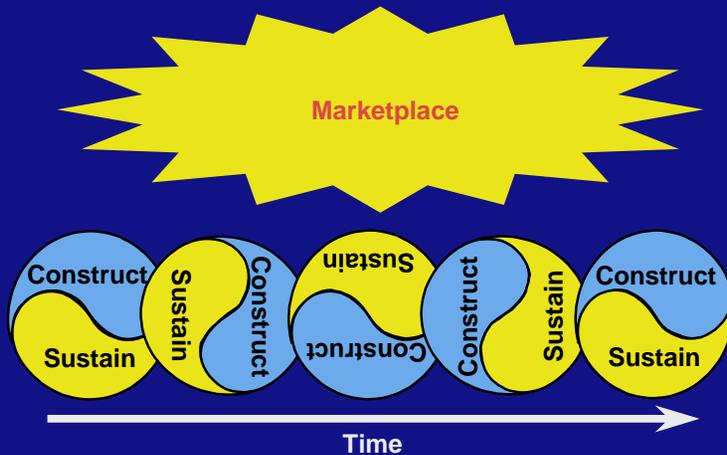
Establish Evolution as a Way of Life

- *Evolve COTS-Based Systems Continuously*
- *Take the Long View on System Acquisition*

Change the Culture



Construction & Sustainment Merge



Evolve CBSs Continuously

Marketplace volatility is a fact of life

- affects sustainment
- may cause rework
- makes rework costly

Adopt an evolutionary mindset:

- proactively manage continuous change
- use spiral or iterative development and maintenance
- evaluate continuously
- re-integrate and test regularly



Evolution Actions

Program Manager actions:

- use early system prototyping to validate product or technology feasibility
- use prototypes and testbeds repeatedly in response to marketplace events
- balance system instability with marketplace obsolescence
- synchronize marketplace changes with system releases
- budget sufficient resources for evolutionary activities

Executive support:

- allocate resources for COTS migration and transition services
- require collection of cost/resource data associated with migration and evolution
- establish product characterization guidelines
- establish evolution guidelines



Take the Long View on System Acquisition

COTS-based systems: a *long-term commitment*

- both strategic and technological
- benefit may only be realized in the mid/long term

Strive for

- long-term viability of acquisition strategy
- stability of funding
- flexibility of contract vehicles
- long-term relationships in the marketplace/contractor community

Short-term tactics can scuttle long-term strategy.



Actions for the Long View

Program Manager actions:

- create flexible contract vehicles to accommodate marketplace changes
- include contractor incentives in support of the long view
- create an acquisition strategy that covers the life of system
- use acquisition strategy and contracts that support simultaneity of system context, architecture, and marketplace
- plan to reassess strategies

Executive support:

- direct the collection and distribution of acquisition strategy examples

Keys to CBS Success

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Change the Culture



What's New?

Old Way

- “how-to” specification
- tight government control
- creation
- linear thinking



- partnering
- influence
- composition
- simultaneous tradeoffs and continuous evolution



Change the Culture

Who changes? - *everyone*

- government (e.g., executives, program offices, procurement staff)
- contractors
- end users and other key stakeholders

What changes?

- how you *think* about your business activities
- how you *execute* your business activities
- how your *reward structure* operates
- how your *organization* is structured and operates



Cultural Change Actions

Program Manager actions:

- educate and train personnel in new skills for COTS-based systems
- involve qualified government personnel to evaluate contractor COTS decisions and recommendations
- capture, share, and apply COTS-based system lessons learned and metrics

Executive support:

- demand creation and delivery of COTS-based systems training from defense-related sources
- ensure all personnel are trained
- facilitate and incentivize the government and contractor cultural shift

COTS-Based System Fundamentals

Keys to COTS-Based System Success

Recommendations

CBS Recurring Themes



Getting Started -1

- ✓ Determine the CBS skills needed
- ✓ Get appropriate training for personnel, now and as the staff turns over
- ✓ Develop your CBS strategy
 - baseline your situation today
 - determine opportunities for COTS insertion
 - decide your pattern of actions
- ✓ Try to find a pilot project

Getting Started -2

- ✓ Determine application of a spiral approach
- ✓ Prepare to negotiate CBS tradeoffs
- ✓ Start your market research group
- ✓ Determine your CBS evaluation approach
 - prepare to use a testbed
 - decide types and depth of evaluations
- ✓ Get involved in your marketplace

Keys to CBS Success



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Establish Evolution as a Way of Life

- Evolve COTS-Based Systems Continuously
- Take the Long View on System Acquisition



Change the Culture

For Additional Information

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BACKUPS

Evolution of IEWCS Subsystem

