

Raines' Rules Revisited: Lessons Learned & Roads Not Taken in the Era of Service-Oriented, Component-Based Architecture

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Raines' Rules

- Issued October 25, 1996 (10th Anniversary)
- Guidance under the Information Technology Management Reform Act (Clinger-Cohen Act)
- Criteria for IT Investments Included in President's Budget
- Eight Broad "Rules"
 - ▶ Including Three "Pesky Questions"
- Part of Our Nation's History
 - ▶ What Can We Learn from This Part of Our History?
 - ▶ Can We Avoid Re-living the Mistakes of the Past?

**Those Who Refuse to Learn the Lessons of History
Are Doomed to Relive Them.
~Santayana, 1903**



Raines' "Pesky Question" Rules 1 - 3

Does the Investment:

1. Support core/priority mission functions that need to be performed by the Federal government?
2. Need to be undertaken because ***no alternative private sector or governmental source*** can efficiently support the function?
3. Support work processes that have been simplified or otherwise redesigned to
 - ✓ reduce costs,
 - ✓ improve effectiveness, and
 - ✓ make ***maximum use of*** commercial off-the-shelf (***COTS***) technology?



Raines' Rules 4 & 5

4. Demonstrate a projected return on investment that is clearly better than alternative uses of available resources.

5. Be consistent with Federal, agency, and bureau information architectures which:
 - ✓ integrate agency work processes and information flows with technology to achieve the agency's strategic goals ... and

 - ✓ specify ***standards that enable information exchange*** and resource sharing, while

 - ✓ retaining ***flexibility in the choice of suppliers*** and in the design of local work processes.



Raines' Rules 6 & 7

6. Reduce risk by:

- ▶ **avoiding** or isolating **custom-designed components**
- ▶ using **fully tested pilots**, simulations, and prototypes
- ▶ establishing clear measures and accountability for project progress; and
- ▶ securing substantial involvement and buy-in ... from program officials who will use the system.

7. Implement in **phased, successive chunks**

- ▶ as **narrow in scope and brief in duration** as practicable,
- ▶ each of which **solves a specific part of an overall mission problem** and
- ▶ delivers a measurable net benefit **independent of future chunks**.



Raines' Rule 8

- Employ an acquisition strategy that
 - ▶ appropriately allocates risk between government and the contractor,
 - ▶ effectively uses competition,
 - ▶ ties contract payments to accomplishments, and
 - ▶ takes maximum advantage of ***commercial technology***.



More Recent Guidance (Small Subset)

- Service & Component-Based Architecture Strategy
- Enterprise Architecture Principles
- Federal Transition Framework (FTF) & Catalog
- FEA Mapping Quick Guide
- Efficient & Effective Information Retrieval & Sharing (EEIRS) Report
- Other Relevant Guidance?



Service & Component Based Architecture (SCBA)

Executive Strategy v. 3.5, January 31, 2006

- Most important aspect is focus on **reuse of services and components** – referred to as **Service Components**
 - ▶ information technology assets that perform useful business functions through a well-defined interface

- Despite emphasis on services, SCBA accommodates the concept of component reuse
 - ▶ where cross-agency service sharing is not possible due to regulatory or security restrictions.



SCBA-Oriented Changes

SCBA emphasizes changes not only in technology but also:

- **Policies** – alter policies to support reusing assets from any source, and set specific, measurable goals for levels of reuse.
- **Strategies** – move from strategies that are narrowly focused on programs to focus on producing and integrating reusable services across the entire Federal government.
- **Processes** – alter software development and capital planning processes in order to make identification of opportunities for reuse a core task.
- **Culture** – change through a combination of executive recognition and incentive programs that strongly reward reuse.
- **Governance** – change to take into account that a service may be used by multiple organizations and institute appropriate service level agreements.



Architectural Principles for the Federal Government

June 23, 2006

- Focus on ***Citizens***
- ***Single***, Unified ***Enterprise***
- Collaborate with Other Governments
- Mission-Driven
- Core Needs include Security, Privacy & Info Protection
- Information is a National Asset
- EA Simplifies Government Operations



Federal Transition Framework (FTF)

Purposes

- More consistent, complete and detailed information about ***cross-agency initiatives*** to more quickly to inform EA, CPIC & implementation activities
- Use information describing cross-agency initiatives to make better informed decisions about IT investments
- Improve the effectiveness and efficiency of IT investments to realize service improvements and cost savings

Karen Evans Memo, July 6, 2006



FTF Metamodel

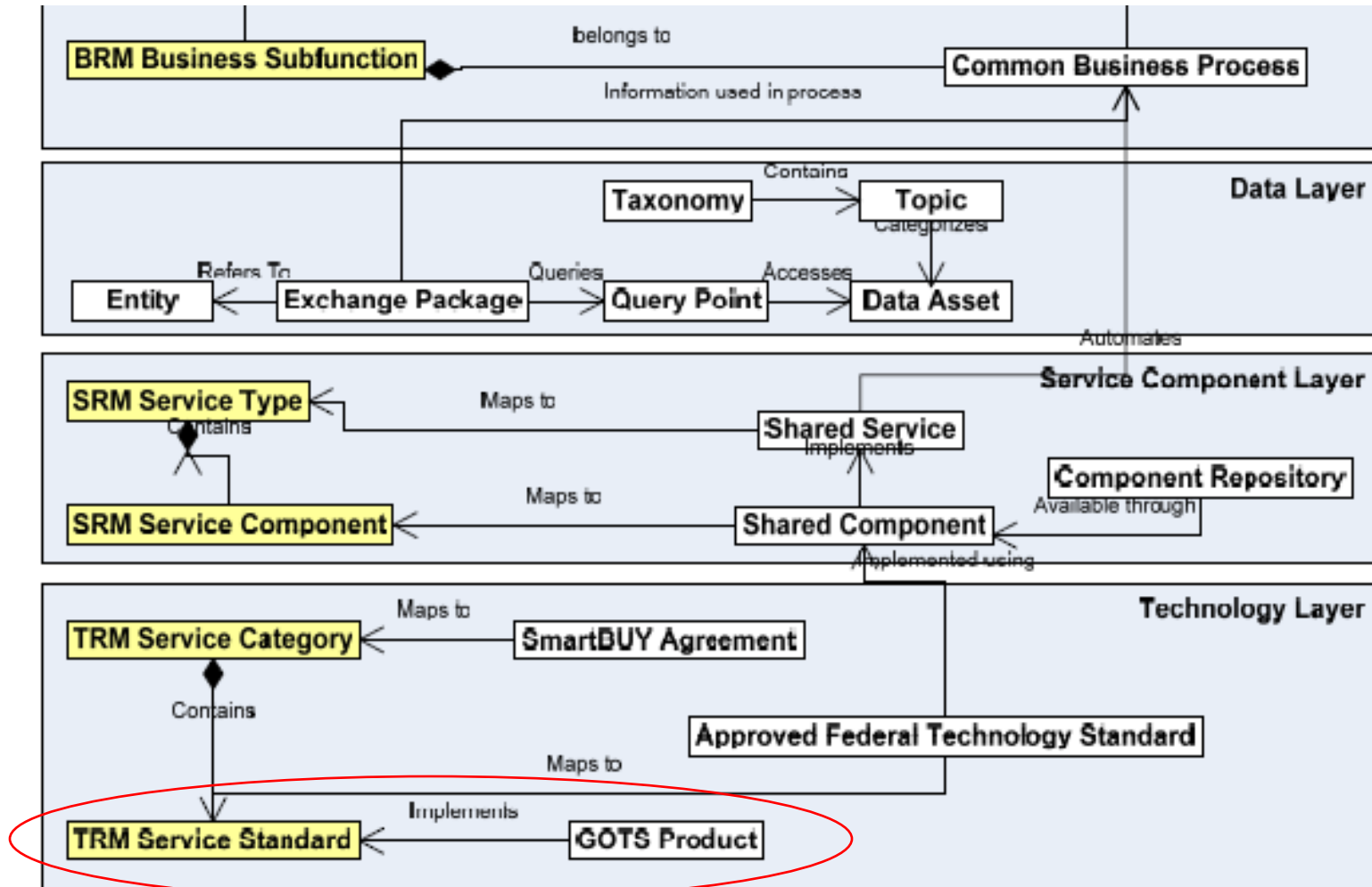
- GOTS Products Implement
 - ▶ TRM Service Standards
 - ▶ “Customized” COTS? (RR#6)
- TRM Service Standards Map to
 - ▶ Approved Federal Technology Standards
 - ▶ Approval process?
 - ▶ Inherently governmental in nature? (OMB Circulars A-76 & A-119)
- Shared Components
 - ▶ Are Implemented Using Approved Federal Technology Standards
 - ▶ Available through a Component Repository
 - CORE.gov
 - Relationship to FTF Catalog? To EEIRS report?
 - COTS? GOTS? Customized COTS?

FTF Metamodel, Pilot Version, June 2006 (Fig. 1, p. 7, PDF p. 8)

http://www.whitehouse.gov/omb/egov/documents/FTF_Metamodel_Reference_Pilot_Final_June_2006.pdf



GOTS in FTF Metamodel Graphic





FEA Reference Model Mapping Quick Guide

- Agencies should identify **vendors & products** (rather than technical specifications) in the Service Specification layer of the FEA TRM
 - ▶ Bureaucratic double-speak
 - ▶ SmartBUYing
 - ▶ FAR subpart 11.105 prohibition on specifying brand names
 - ▶ Larger stovepipes?
 - ▶ Proprietary “interoperability”?
 - Inflexibility in choice of suppliers (RR#5)
 - ▶ Relationship to GOTS in FTF abstract model?



EEIRS Report

December 2005

- Publishing directly to the Internet is the most cost-beneficial way to enable the efficient and effective retrieval and sharing (EEIRS) of government information
- However, as an organization moves from a passive or “casual” access model ... the need for ... indexes, taxonomies, or metadata tagging ... becomes apparent



Lessons Learned

1. Citizen centricity
2. Crossing the chasm
3. Difficulty identifying/comparing COTS
4. Change is hard, particularly if large
5. More?



Lesson #1 – Citizen-Centricity

- RR#6 said agencies should reduce the risks associated with IT investments by "... securing substantial involvement and buy-in ... from ***program officials who will use the system ...***"
- However, it ***does not say anything about focusing on service to citizens.***
- Although it does reference GPRA, the terms "citizen" and "stakeholder" are nowhere to be found in the memo -- suggesting that the focus is basically inward, on the bureaucracy itself.
- Per the President's Management Agenda (PMA) and FEA PMO's EA principles
 - ▶ ***eGov projects should focus***, directly or indirectly, ***on serving the needs/interests of citizens.***



Lesson #2 – The Product/Component Chasm

- Visionaries and pragmatists have different expectations
- **Whole product** is a generic product
 - ▶ Augmented by everything needed for the customer to have a compelling reason to buy

~Geoffrey Moore, *Crossing the Chasm*

- Crossing the “chasm” may not lead to profitability

http://en.wikipedia.org/wiki/Crossing_the_Chasm

- By definition, components are not whole products
- Customers may have no compelling reason to buy
 - ▶ Pragmatists may actively resist



Lesson #3 – Discovery of COTS Is Difficult

RR#2: Need to be undertaken because ***no alternative private sector or governmental source*** can efficiently support the function

- Vendors sell marketing hype (“intergalactic solutions”)
- .gov Functions not mapped to COTS components
- Difficult to conduct apples-to-apples comparison of COTS *whole product* “solutions”
 - ▶ Costly subscriptions to IT analyst reports
 - ▶ COTS products & services not mapped to FEA SRM, DRM or TRM
- FTF Catalog (new) for GOTS



Lesson #4 – Change Is Hard Particularly If Large

RR#3: Work processes *simplified or* otherwise *redesigned* to reduce costs, improve effectiveness, and make maximum use of COTS

- Modernization Blueprints
 - ▶ Lengthy documents
 - ▶ Long time lines
 - ▶ COTS? GOTS? Customized COTS?
 - ▶ Components?
 - ▶ Whole product (large) “components”?



Roads Not Taken

- Chunking
- Standard components
- Data standards
- Citizen centricity
- Registries
- More?



Roads Not Taken #1 - Chunking

- Rather than implementing IT in small, manageable, standards-compliant “chunks” each of which adds value in and of itself, agencies routinely acquire, implement, and customize relatively large, proprietary software “solutions”
- The SCBA [executive strategy](#) (written by integrators) says:
 - ▶ Experience with component-based architectures has shown that reuse can be successful when the reuse efforts focus on **large-scale** components ... (page 1-3, PDF p. 13, emphasis added)
- While innovation continues apace in start-ups and small companies, the trend seems to be toward consolidation through mergers and particularly acquisitions



Roads Not Taken #2 – Standard Components

Contrary to [RR#7](#)

- Vendors lack incentives to sell commodity components
- Gov agencies may lack incentives to buy components
 - ▶ COTS failure to comply with interoperability standards ([RR#5](#))
- Proprietary “whole product solutions” may be an easier sell
 - ▶ But are they a better buy for the citizens (taxpayers)?
- So-called “large-scale components” make good business for integrators
 - ▶ Integrator lock-in (as opposed to COTS vendor lock-in)
 - ▶ GOTS “intergalactic solutions” even more likely to fail than COTS
 - Except for the incredible inertia of bureaucratic legacy systems
 - Good or bad thing? Tried and proven?
 - Honoring sunk costs. Truly irrational?



Roads Not Taken #3 – Data Standards

- Data Reference Model (DRM) last FEA model issued
- Agencies pushed back on use of XML for DRM
 - ▶ Preference for abstraction rather than implementation
 - ▶ Inability to efficiently share DRM data descriptions
 - The purpose of which is to facilitate the sharing of data
- Assumed that legacy applications will exist for long time
 - ▶ Data mapping will be required for foreseeable future
- Failure to perceive, much less “implement” Government as a “single enterprise” (contrary to EA Principles)
- Can we truly *know* our (We the People’s) “business” without understanding our data architecture? (RR#s 1, 5 & 7)
 - ▶ Lack of .gov data standards leads to *vendor* lock in (RR#s 5 & 7)
 - ▶ Proprietary large-scale “components” lead to *integrator* lock-in



Roads Not Taken #4 – Citizen-Centricity

- In many ways, the focus on so-called “one-stop” portals is a return to the mainframe stovepipe paradigm
 - ▶ No citizen “lives” in any .gov portal
 - ▶ FirstGov’s citizen-centered “life-events” taxonomy not implemented
- All that is truly “inherently governmental” in nature are the ***data standards*** required to conduct We the People’s business efficiently and effectively (RR#s 1 & 2)
 - ▶ Citizens should be free to use whatever client and server/host software interfaces ***they*** choose
 - Via SOA, XML & Web Services
- Bureaucracies still are and may always be self-centered
 - ▶ Particularly if Congress continues to insist on funding stovepipes
 - ▶ Political legacies



Roads Not Taken #5 – Registry(ies)

- Notwithstanding a ROI in the range of 500 – 1400 percent, Congress failed to fund the President’s request for \$2.1 million for the XML Registry (In spite of RR#4)
- Agencies pushed back on the thought of being expected to render their Data Reference Models (DRMs) in valid XML instance documents
- Some agencies have refused to publish their XML schemas on the Web (In spite of EEIRS report)
- Thus, it is far more difficult than it should and could be for agencies to discover data elements and schemas as reusable “chunks”/components

FBI Virtual Case File (VCF)

FIVE YEARS LATER | *Technical Difficulties*

The FBI's Upgrade That Wasn't

\$170 Million Bought an Unusable Computer System



Zalmay Azmi, the FBI's top technology officer, discovered widespread flaws in promised software.

By DAN EGGEN and GRIFF WITTE
Washington Post Staff Writers

As far as Zalmay Azmi was concerned, the FBI's technological revolution was only weeks away.

It was late 2003, and a contractor, Science Applications International Corp. (SAIC), had spent months writing 730,000 lines of computer code for the Virtual Case File (VCF), a networked system for tracking criminal cases that was designed to replace the bureau's antiquated paper files and, finally, shove J. Edgar Hoover's FBI into the 21st century.

It appeared to work beautifully. Until Azmi, now the FBI's technology

chief, asked about the error rate.

Software problem reports, or SPRs, numbered in the hundreds, Azmi recalled in an interview. The problems were multiplying as engineers continued to run tests. Scores of basic functions had yet to be analyzed.

"A month before delivery, you don't have SPRs," Azmi said. "You're making things pretty. . . . You're changing colors."

Within a few days, Azmi said, he warned FBI Director Robert S. Mueller III that the \$170 million system was in serious trouble. A year later, it was dead. The nation's premier law

See FBI, A12, Col. 1



Case Study – VCF Violated All RRs

- Planned launch of new software all at once, with minimal testing
 - ▶ RR# 6 & 7 – Pilots & chunks
- Program lacked common navigation features
 - ▶ RR# 2, 3 & 8 – COTS
- FBI left identifying/defining essential processes to outsiders
 - ▶ RR# 1, 3 & 5 – Inherently governmental functions, simplified
- “legal fiction ... that government knows what it’s doing ..”
 - ▶ RR# 3, 5 & 8 – EA, simplified functions, appropriate risk sharing
- Scope expanded by 80 percent
 - ▶ RR# 3, 5 & 7 – *Narrow* chunks, EA, simplified processes
- Nineteen gov personnel changes in three years
 - ▶ RR# 5, 6 & 7 – EA, *brief* chunks & user acceptance
- If new system didn’t work would put FBI out of business
 - ▶ RR# 4 & 8 – Unacceptable risk, infinitely negative ROI?
- Replacement for VCF will not be *fully* operational until 2009
 - ▶ RR# 3 & 7 – Successive (COTS/SOA) chunks? Simplified processes? Lesson learned?!

The FBI’s Upgrade That Wasn’t, *The Washington Post*, August 18, 2006



Want to Help?

If you'd like to help document and share lessons learned and information on roads not taken relative to Raines' Rules in the era of service-oriented, component-based architecture, please feel free to post your well-considered thoughts in the appropriate section(s) of the wiki at

<http://colab.cim3.net/cgi-bin/wiki.pl?RainesRules>

&/or

Contact me at Owen_Ambur@ios.doi.gov

Please share your lessons learned so that we can avoid reliving the mistakes of the past!



Raines' Rule #1 – Lessons & Roads Not Taken

1. Support core/priority mission functions that need to be performed by the Federal government

▶ Lessons Learned?

▶ Roads Not Taken?

Contribute at http://colab.cim3.net/cgi-bin/wiki.pl?RainesRule_1



Raines' Rule #2 – Lessons & Roads Not Taken

2. Need to be undertaken because ***no alternative private sector or governmental source*** can efficiently support the function

- ▶ Lessons Learned?
- ▶ Roads Not Taken?

Contribute at http://colab.cim3.net/cgi-bin/wiki.pl?RainesRule_2



Raines' Rule #3 – Lessons & Roads Not Taken

3. Support work processes that have been simplified or otherwise redesigned to reduce costs, improve effectiveness, and make *maximum use of* commercial off-the-shelf (**COTS**) technology

▶ Lessons Learned?

▶ Roads Not Taken?

Contribute at http://colab.cim3.net/cgi-bin/wiki.pl?RainesRule_3



Raines' Rule #4 – Lessons & Roads Not Taken

4. Demonstrate a projected return on investment that is clearly better than alternative uses of available resources.
 - Lessons Learned?
 - Roads Not Taken?

Contribute at http://colab.cim3.net/cgi-bin/wiki.pl?RainesRule_4



Raines' Rule #5 – Lessons & Roads Not Taken

5. Be consistent with Federal, agency, and bureau information architectures which:
 - ▶ integrate agency work processes and information flows with technology to achieve the agency's strategic goals ... and
 - ▶ specify ***standards that enable information exchange*** and resource sharing, while
 - ▶ retaining ***flexibility in the choice of suppliers*** and in the design of local work processes.

- Lessons Learned?
- Roads Not Taken?

Contribute at http://colab.cim3.net/cgi-bin/wiki.pl?RainesRule_5



Raines' Rule #6 – Lessons & Roads Not Taken

6. Reduce risk by:

- ▶ ***avoiding*** or isolating ***custom-designed components***
- ▶ using ***fully tested pilots***, simulations, and prototypes
- ▶ establishing clear measures and accountability for project progress; and
- ▶ securing substantial involvement and buy-in ... from program officials who will use the system.

- Lessons Learned?
- Roads Not Taken?

Contribute at http://colab.cim3.net/cgi-bin/wiki.pl?RainesRule_6



Raines' Rule #7 – Lessons & Roads Not Taken

7. Implement in *phased, successive chunks*

- ▶ as *narrow in scope and brief in duration* as practicable,
 - ▶ each of which solves a specific part of an overall mission problem and
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-
- Lessons Learned?
 - Roads Not Taken?

Contribute at http://colab.cim3.net/cgi-bin/wiki.pl?RainesRule_7



Raines' Rule #8 – Lessons & Roads Not Taken

8. Employ an acquisition strategy that
 - ▶ appropriately allocates risk between government and the contractor,
 - ▶ effectively uses competition,
 - ▶ ties contract payments to accomplishments, and
 - ▶ takes maximum advantage of ***commercial technology***.
- Lessons Learned?
 - Roads Not Taken?

Contribute at http://colab.cim3.net/cgi-bin/wiki.pl?RainesRule_8