Managing Enterprise Data in a Federated Development Environment

Mr. Chadwick S. Pfoutz, DR-03
Technical Advisor

Capt. Patrick R. Kennedy
Deputy Program Manager

Enterprise Business System (EBS) Division
AFRL/RCB

27 Aug 2018
AFRL at a Glance

AFRL Headquarters
Wright-Patterson AFB, OH
Kirtland AFB, NM
Arlington, VA
Eglin AFB, FL

International Sites
London, UK
Tokyo, Japan
Santiago, Chile

Employees Civilian Military Contractor
Total 10,417 5,018 1,146 4,253
S&Es 6,371 3,031 564 2,776

DISTRIBUTION A: Approved for public release; distribution unlimited (88ABW-2018-4059)
Overview of EBS
What EBS is all About

The EBS Mission:

“Provide and sustain information technology solutions to support AFRL enterprise business processes.”

IT Tools & Applications
- Implement entire spectrum of AFRL’s core business processes

Business Processes
- Repeatable
- Consistent /Common/Standardized
- Enabling

Data
- Consolidation of TD disparate data
- Horizontal integration across TDs and tools
- AFRL ‘single source of truth’
AFRL Enterprise Business System

- Certified as a Defense Business System (DBS) in 2006
  - Sustainment and Configuration

- 4 Major EBS Capability Areas
  - Financial Management (G2)
  - Integrated Project Portfolio Management (IPPM)
  - Business Intelligence (BI)
  - Collaboration
AFRL Enterprise Business System

- Certified as a Defense Business System (DBS) in 2006
  - Sustainment and Configuration

- 4 Major EBS Capability Areas
  - Financial Management (G2)
  - Integrated Project Portfolio Management (IPPM)
  - Business Intelligence (BI)
  - Collaboration
**Foundational Research**

- **Town Hall meetings uncovered dissatisfaction with Business IT in AFRL**
- **Internal and External studies commissioned to address issues:**
  - Carnegie-Mellon University, Software Engineering Institute (SEI) – Integrated Project Portfolio Management (IPPM) Modernization Study
  - Pro-Concepts – Independent Organizational Risk Assessment
  - Carnegie-Mellon SEI - Data Architecture Study
  - iBPMS Request for Information under NETCENTS 2 Small Business
Why Change IPPM?

• System design decisions made over a decade ago
  – Significant technology evolution since 2004
  – We do not use ~80% of CA-PPM’s inherent capability
  – Difficult to implement new software changes
  – Current version upgrades are very costly and time-consuming

• We pushed a “one-size” acquisition model onto a commercial business tool to manage an AF R&D lifecycle
  – Cultural and organizational issues stymied adoption
  – Requirements were not always managed in totality
  – Collection of information isn’t integral to daily work
  – Captures technology info with snapshots in time
    - lost traceability through maturation process
AFRL Approach to IT Challenges

**Today’s Situation**

**Enterprise Business**
- Rigid, “One-size” COTS/GOTS tools
- Data definitions & business rules interpreted inconsistently
- Data often unreliable and/or stale
- Unclass to Classified is manual

**Mission Organizations**
- Isolated and disparate IT systems
- Unable to share custom applications
- Data center consolidation push
- Cyber-security & reporting burden

**Future State**

**Common Toolbox of Managed IT Capabilities**
- Scalable/ Interoperable
- Intelligent Insights
- Process Agnostic
- Rapid Configuration
- Collaborative BPR
- Simulate Processes
- Reuse & Tailoring of Apps
- Published Definitions
- Single Source Truth
- Self-Service Analytics
- Rules & Standards
- Governance & Oversight
- Unclass & Secret Synched
**Initial Shared Platform Capabilities**

**Intelligent Business Process Management Suite (iBPMS)**

- **Observe/Orient**
  - Business activity monitoring
  - Reporting

- **Decide**
  - Analytics, Business Rules, & Optimization

- **Act**
  - Process Modeling Workflow
  - Content & Case Mgt

**Easy and continuous optimization of business processes**

- Agile BPR/Optimization
- Low Code Development
- Scalable/Re-usable
- Cloud Ready

**Data Visualization**

- Visually Represent
- Monitor
- Analyze & Evaluate
- Manage
- Interaction/Manipulation

- Improved insights
- Drive higher data quality
- Analysis of trends
- Faster decisions
Federated Development Tenets

• Operate shared platform-based IT capabilities
• Establish core team to:
  – Manage the platforms
  – Become a center of excellence
  – Implement “just enough” governance
• Provide enterprise level capabilities, data & business rules
• Provide flexibility to meet local conditions
• Empower all AFRL organizations to create capabilities and processes to meet their needs by configuring the platform
• Enable sharing of capabilities, processes, and IT talent across AFRL
Centralized Model vs. Federated Model

AFRL Organizations using a **Centralized** Application  
“On size fits all”

AFRL Organizations using apps on a **Federated** Platform  
“Enable Local Variation”
Flexibility to Meet Local Conditions

- Establish AFRL Enterprise processes, data & business rules
- Enable organizations to meet local conditions by inheriting from the enterprise and making changes within the bounds of the enterprise rules
Enhanced BPR: Leveraging Modern Methods

Traditional BPR Approach

- Waterfall Implementation Model
- Lacks Insight into Impacts & Metrics
- Unable to Easily Test

iBPMS Enabled BPR Approach

- Agile Real Time Configuration
- Identifies Issues & Metrics Upfront
- Test in Real Time via Simulation

Increased engagement and immediate user feedback
iBPMS Platform Prototype Evaluation

• Using Other Transaction Authority (OTA) in 10 U.S.C. Section 2371-b
• Exploring Intelligent Business Process Management Suite (iBPMS) Platform
  – Ensure AFRL required functionality is met
  – Utilize Agile methodologies to demonstrate business process optimization
  – Develop governance to support Federated Development on a shared platform
• Informs Business Capability Acquisition Cycle (BCAC) process

Whitepapers & Limited Proposals
• Down-select to two viable candidates
• Aug-Oct 2017

Cloud Pilots
• Prove capability using test data and relevant use cases
• Nov 2017 – Mar 2018

On Premises Pilot
• Prove iBPMS platform is viable on AFNET
• Apr-May 2018

Extended Pilot
• Develop procedures and prototype initial capabilities
Prototyping and App Development

- **iBPMS On-Premises Pilot (through OTA)**
  - Configuration
  - Prototype App @ Wright Patterson AFB
  - Prototype Apps @ Kirtland AFB

- **Contractor App Development**
  - Bus Rules V1.0
  - Process & Data Models V1.0

- **Continuous Business Process Improvement**

- **Science & Technology Lifecycle Management**

- **Governance**

- **Tactical Operational Governance**
“To Be” Process Artifacts

Integrated S&T Business Processes
- Work Unit Initiation & Reporting
- AFRL Program/Project Mgt
- AFRL Future Capability Planning
- AFRL Contract Management
- MIPR Processing
- Internal AFRL Info Requests
- Work Order Management
- Research Equipment Tracking
- Safety/Flight Test
- Public Release
- Intellectual Property Mgt
- Enterprise Reqmts Process
- Idea Management

Information Assets
- Research Plans
- Contract Information
- AFRL Funding Data
- AFRL Budget Data
- R&D Case Files
- Work Unit Plans
- Schedule / WBS
- Technology Plans
- Requirements
- AFRL Final Reports
- R&D Deliverables

Governance
- Revised AFRL Operating Instructions
- Data Management Strategy
- Revised AFRL Business Rules
- Multi-Level Security Environment
- Training Manuals/Guidance
- Updated Test Strategy
- Risk Strategy
- Cybersecurity Strategy
Lessons Learned:
Using Other Transaction Authority (OTA)

• Great methodology for developing prototypes and maturing technology quickly

• Utilize successive competitions for down-selecting against well-written technical requirements (e.g., whitepapers, proposals, pilot implementations)

• Notify offerors from the beginning that the results of the OTA may lead to a production contract

• Ensure prototypes are completed prior to award of a production contract
Enterprise Architecture Governance Model

• Mission
  – Defines processes, roles, and responsibilities for S&T LCM, business, and operations

• Data
  – Defines data management and maintains the AFRL data architecture using data modeling, master and reference data, metadata, and content management

• Applications
  – Defines methods and standards for development, interoperability, and configuration management of applications

• Technology
  – Defines technical standards for IT infrastructure; hardware, software, services, networks, and connectivity

• Integration
  – Ensures the governance layers are not silos
  – Enables interoperability

Applies to both the overall AFRL Architecture and the EBS Architecture
Data Governance Principles

• **Data is defined in a consistent manner**
  – Enables data assets and data

• **Data asset ownership is properly identified**
  – Enables the trustworthiness of data assets

• **Data artifacts are built and maintained to create the enterprise data architecture**
  – Enables data assets to be leveraged for reuse and linked for interoperability

All principles enable VAULT: Visible, Accessible, Understandable, Linked, and Trustworthy
Holistic Data Management

Data Representation
- Modeling & Design
- Reference & Master Data
- Metadata
- Document & Content Management

Data Infrastructure
- Storage & Operations
- Security
- Integration & Interoperability

Data Exploitation
- Business Intelligence
- Analytics
- Data Quality

Data Governance and Data Architecture
Data Governance Specific Disciplines

Data Representation
- Modeling & Design
- Reference & Master Data
- Metadata
- Document & Content Management

Data Infrastructure
- Storage & Operations
- Security
- Integration & Interoperability

Data Exploitation
- Business Intelligence
- Analytics
- Data Quality

Artifacts created & maintained for each data asset
Disciplines reside in Technology Governance
Disciplines reside in Application Governance
Defining Data Representation for Each Data Asset

Data models enable discovering, analyzing, and scoping data requirements, and then representing and communicating those requirements. They can include conceptual, logical, and physical data models.

- Person
  - String name
  - Date birthday
  - List addresses
  - List phone numbers

- Address
  - String name
  - String street
  - String city
  - String state
  - Zipcode

- Zipcode
  - String zipcode

- Artifacts created & maintained for each data asset
Defining Data Representation for Each Data Asset

Reference & Master Data
Reference data is data that define the set of permissible values to be used by other data fields. Master Data defines and represents key business entities and all their necessary detail.

Reference Data
- Building Number
  - 20016
  - 16
  - 20653
  - 653
  - 20071A
  - 71A

Master Data
- Base Address
  - Building Number
    - Alphanumeric string
    - 1-8 digits long
  - Room Number
  - Street Name
  - State
  - Zip Code
  - County
Defining Data Representation for Each Data Asset

Metadata is data about data. There are three types: descriptive, structural, and administrative. Types of metadata includes items such as: origination system, last updated date, usage information, title, author, etc.

Artifacts created & maintained for each data asset

Extended Definition

- **Descriptive**: Discovery & Identification
  - Title
  - Abstract
  - Author
  - Keywords

- **Structural**: Describes data containers
  - Pages form a chapter
  - Version control
  - Relationships

- **Administrative**: Manage the resource
  - Data created
  - File Type
  - Permissions
Defining Data Representation for Each Data Asset

Document and content management is the lifecycle management of data and information found in any form of medium.

- RX Program Management Review Charts
  - PPT file is submitted for each program found in the Clarity database
  - The file will be stored in the RX Investment SharePoint site

- Lifecycle Management
  - The PMR charts are updated once a year
  - Previous year charts are archived

- Describes how non-relational database data will be managed
  - Files
  - Images
  - Lab Notebooks

- Lifecycle Management
  - Disposition
  - Records Plan
  - Vital Records Plan

Artifacts created & maintained for each data asset

Data Representation

- Modeling & Design
- Reference & Master Data
- Metadata
- Document & Content Management
Data Governance Implementation

- Establish data stewards and stakeholders for Data Assets
  - Define who is Responsible, Accountable, Consulted, and Informed with a RACI chart

<table>
<thead>
<tr>
<th>Role</th>
<th>R</th>
<th>A</th>
<th>C</th>
<th>I</th>
</tr>
</thead>
<tbody>
<tr>
<td>Org 1</td>
<td></td>
<td>✓</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Org 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Org 3</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
</tbody>
</table>

- Use Data Assets to build Enterprise Architecture
- Actively manage the architecture as part of the Agile development process
Lessons Learned:

Governance

• **Empower governance focal points to ensure fit for purpose and initiate change to data architecture**
  - Mission governance sets priority for changes
  - Focal points act as facilitators

• **Provide clear and concise documentation**
  - Translate key business roles, processes, data, and their relationships into the enterprise architecture

• **Apply an Agile mindset**
  - The enterprise architecture and data definitions continuously evolve to meet mission needs