Version 1.00

Tailoring Systems Engineering Processes for a Diverse Acquisition Portfolio

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Agenda

- Introduction
- Model Development
- Model Application
- Model Validation
- Application to Other Industries
- Areas of Further Research

Introduction

SE policy for large organizations with diverse acquisition portfolios is necessarily broad to span the variety of programs in the portfolio

- Diverse Acquisition Portfolio Examples

Lockheed Martin	• Ground combat systems • Chemical and biological systems • Medical Communications
Department of the Army	• Cybersecurity • Satellites • Data analytic systems
Department of Homeland Security	• Border surveillance systems • E-verify • Fast response cutters

Challenge

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- SE practitioners must rely only on their experience to apply the broad SE policy to their project
- Depends on the characteristics of MY project
- Is there a way to use the characteristics of my project, best practices from industry, and organizational policy to identify what SE processes I should plan and execute?

Process Tailoring Approaches

- What is Process Tailoring?
  - Modifying a standard process to meet the needs of a particular project
- Types of approaches
  - Case based
    - Retrieving a previous process case based on common characteristics
    - Common in medical treatment and software development
    - Only as valuable as the repository of previous cases
  - Rule based
    - Generating a process set based on a policy driven set of rules
    - Also common in software development

Research Goal

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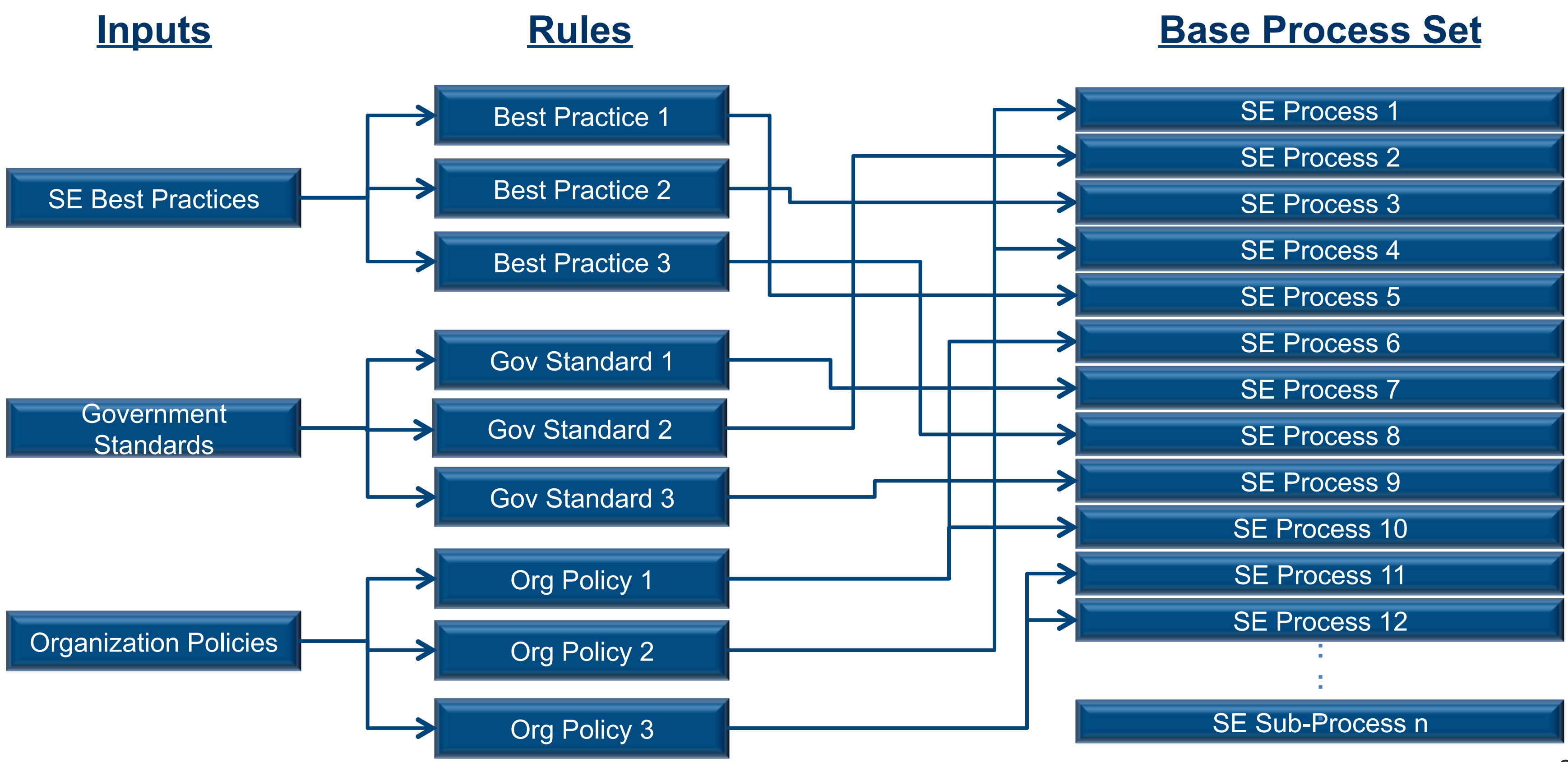
Demonstrate that project characteristics and rule-based reasoning can be used to increase efficiency in tailoring the systems engineering lifecycle.

Model Development

Model Overview



Inputs

- Systems Engineering Best Practices
  - Application of Systems Engineering to COTS acquisitions
  - Application of various Systems Engineering development models
  - Scaling Systems Engineering based on program size
- Government Standards
  - Environmental considerations
  - Privacy considerations
- Organizational Policies
  - IT policies
  - Security policies

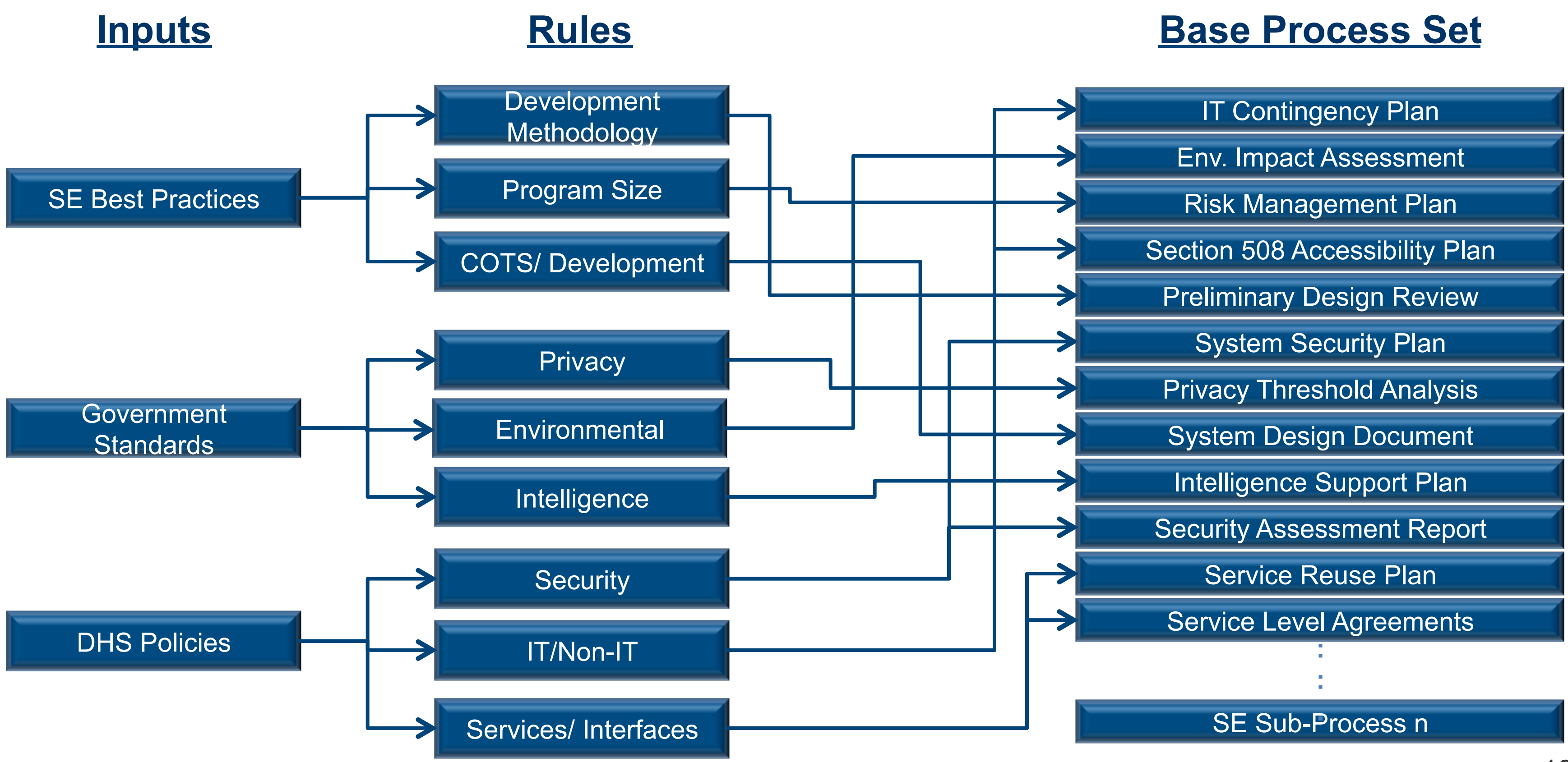
Rules

- Driven by a project's acquisition strategy and characteristics
- Establishes conditional links between the inputs and the baseline process set
- Examples
  - IF the agile development methodology will be used, THEN do X, tailor Y; do not do Z.
  - IF the acquisition strategy is COTS-based, THEN do X, tailor Y; do not do Z.

Base Process Set

- Large organizations will have a standard set of SE processes to be implemented on a project
- Examples
  - Department of Defense
    - Systems Engineering Guide
    - Systems Engineering Plan with required SE processes and sub-elements
  - Department of Homeland Security
    - Systems Engineering Lifecycle (SELC) Guide
    - Systems Engineering Lifecycle Tailoring Plan with required processes and tailoring justifications
- Base process sets consist of stages, reviews, and artifacts (SRAs)

Model Applied to DHS



Model Application

Model Inputs

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Project Characteristics

Organization:
● DHS ○ DoD ○ Company X

Development Methodology
● Waterfall ○ Incremental ○ Agile

Level of Development
○ Full Scale ● COTS/NDI

Program Size
○ > $1B ● < $1B

Privacy System
● Yes ○ No

Environmental Considerations?
○ Yes ● No

Intelligence System?
○ Yes ● No

Security Considerations?
● Yes ○ No

Information Technology System?
● Yes ○ No

Service Exchanges or Interfaces?
● Yes ○ No

- Selection of “Organization” retrieves the applicable baseline process set
- Other characteristics drive the tailoring considerations:
  - What activities should be Standard (S)
  - What processes should be Tailored (T)
  - What processes should be Deleted (D)

Model Outputs

SRA	Activity	Tailoring	Justification
S3	3. Design	D	COTS system acquired. No Design Stage will be executed.
S4	4. Development	D	COTS system acquired. No Development Stage will be executed.
R5	Preliminary Design Review (PDR)	D	COTS system acquired. No design reviews will be executed.
R6	Critical Design Review (CDR)	D	COTS system acquired. No design reviews will be executed.
R8	Production Readiness Review (PRR)	S	
R10	Operational Readiness Review (ORR)	S	
A1	Mission Need Statement (MNS)	S	
A5	Concept of Operations (CONOPS)	S	
A10	Operational Requirements Document (ORD)	S	
A28	Intelligence Support Plan	D	Solution has no intelligence based requirements or components.
A38	Environmental Impact Assessment	D	A CATEX was developed for the project.
A39	Security Test and Evaluation (ST&E) Plan	S	
A41	Contingency Plan	S	
A43	System Requirements Document (SRD)	D	Requirements are decomposed to the Functional Level only because this is a COTS project.
A45	Logical Design Document (LDD)	T	Will be included as part of the Contractor developed "Technical Data Package"
A46	Data Architecture Document (DAD)	T	The intended items in the DAD will be documented in the Data Management Plan.
A47	System Design Document (SDD)	T	Will be included as part of the Contractor developed "Technical Data Package".
A65	Security Accreditation Package	S	
A66	Privacy Impact Assessment (PIA)	S	

Model Validation

Validation Case Studies

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Development Methodology	25
Waterfall	11
Incremental	11
Agile	3

Level of Development	25
Development	19
COTS/NDI	6

Program Size	25
> $1B	15
< $1B	10

IT System	25
IT	12
Non-IT	13

Privacy	25
Yes	10
No	15

Environmental	25
Yes	7
No	18

Intelligence System	25
Yes	3
No	22

Security System	25
Yes	15
No	10

Service Exchanges or Interfaces?	25
Yes	8
No	17

Validation Approach

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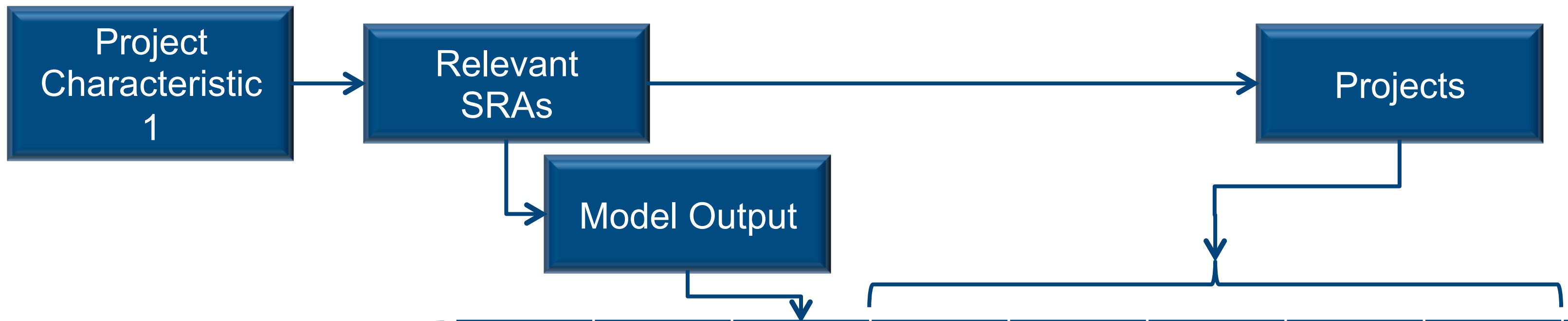

PC	SRA	Model Output	Project 1	Project 2	Project 3	…	Project M	% Match (must be > 80%)
1	1	D	D	D	D	…	D	100
1	14	D	S	D	D	…	D	89
1	15	S	S	S	D	…	D	74
1	21	D	D	D	S	…	S	85
1	22	D	D	S	S	…	S	89
1	…	…				…		…
1	N	D	D	D	S	…	S	95
							% Meeting Threshold (must be > 80%)	**95%**

Final Thoughts

Application to other Industries

- SE best practices span various industries
- Government regulations span various industries
- Rule set must be customized based on organizational policies that affect a project's SE approach
- Base process set should be modified to relevant organization

Areas of Further Research

- Expanded analysis of mixed IT/non-IT types of programs
- Investigate the middle ground of “COTS integration” types of programs
- Validate model with an additional organization’s data set
- Explore concept of combining rule-based and case-based reasoning

Questions?

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