S.E. Regulations for ITS ("Rule 940")  
– Expectations & Reality

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Presentation Topics:

1. Evolution of Technology in Transportation
2. Emergence of S.E. Regulations
3. California Development of S.E. for ITS
4. Experiences with S.E. in Calif.
   a) Challenges
   b) Benefits
   c) Lessons learned
5. Conclusions
Transportation Technology is >100 years old!
Huge Boost ~1992: “IVHS” Brand and Organization

STRATEGIC PLAN FOR

Intelligent Vehicle-Highway Systems
in the United States

Report No: IVHS-AMER-92-3
Prepared by IVHS AMERICA
May 20, 1992

($$ followed)
The original IVHS Vision…
Mid-1990s:

- Created by USDOT
- Goal: Define a standard, national, interoperable, ITS structure
- Guideline for future transportation systems
- Built upon S.E. concepts & terminology
Late 1990’s – ITS Arch. & SE “Rule”

- Codified in: 23 CFR 940
- Defined ITS and ITS Projects (940.3)
- Required:
  - Regional ITS Architectures in all Urban Areas (940.9)
  - “Systems Engr. Analysis” for all ITS projects (940.11)
- Defined ITS Architecture & S.E. concepts and terminology; still widely used today.
- (Drew heavily on aerospace & I.T. concepts, terminology, and people.)
23 CFR 940.11 says …

“All ITS projects … shall be based upon a Systems Engineering Analysis…” SEA shall include:

1. Regional ITS Architecture elements
2. Roles & Responsibilities
3. O&M Resources & Procedures
4. Requirements Definition
5. ITS Standards & Testing Procedures
6. Alternatives Analysis
7. Procurement Options
Early 2000’s – FHWA-CA + Caltrans Defined S.E. for ITS Projects

- Early emphasis on “High-Risk” ITS projects
- Published funding-approval procedures (LAPG)
- Defined a 3-step process (see next)
- Conducted extensive training statewide
- Developed “S.E. Guidebook for ITS”
  ( www.fhwa.dot.gov/cadiv/segb/ )
3 Steps to 940.11 Compliance

Step 1: Classify Project
- Exempt
- Low Risk
- High Risk

Step 2: SERF
- Planning/programming
- Development and implementation (E-76)

Step 3a: Planning
- Program/Budgets
- Project Initiation
- Preliminary Engineering

Step 3b: SEMP
- Ops & Maintain
- Change & Upgrade
- Retire/Replace

LAPG 13.1.1

TOC

Coltrans
SERF Includes

7 Risk-Assessment Questions:

Will the project...

1. ... require *only your agency* to implement/operate?
2. ... use only *proven software* (no new software)?
3. ... use only *proven hardware* and communications?
4. ... use only *existing interfaces* (no new interfaces)?
5. ... use existing, *written system requirements*?
6. ... use existing, *written operating procedures*?
7. ... use only technology with *service life >2-4 years*?
High-Risk Projects Must use S.E. Process

Figure 1-2 ITS Project Life cycle Phases and the Life cycle Tasks in this Guidebook
Examples of S.E. in Calif. ITS Projects

- ExpressLanes (I-10, I-110, I-680, etc.)
- Parking Pricing/Info System (L.A. ExpressPark)
- Traffic Management Systems
- Truck scheduling at Ports ("FRATIS")
- I-15-SD Integrated Corridor Management
Los Angeles Express Lanes (I-10, I-110)
Los Angeles ExpressPark
Truck Scheduling at POLA/POLB ("FRATIS")
Traffic Management Systems
Lessons Learned: Benefits

Better outcomes = schedule, budget & products
- Standardized terminology & processes
- Fewer contract disputes & change orders
- Clearer documentation of development process
- Efficient oversight by FHWA & Caltrans
Lessons Learned: Challenges

1. S.E. difficult to learn: new concepts, terminology (some want “SE Lite”)
2. Few SE-ITS Training Opportunities (Univ. + OJT)
3. Lack of SE skills in public sector → over-reliance on consultants and poor contract management
4. Poor document reviews by public agencies
5. Inadequate Verification testing.
6. Limited FHWA & Caltrans oversight resources

See handout (ITS-WC Paper) for detailed info.
Observations & Conclusions

1. S.E. institutionalized in California (also in some other states)
2. “V” model is most common; a few projects use “Agile” development.
3. S.E. is “Best Professional Practice” for some ITS applications
4. FHWA-CA continues to require S.E. for high-risk ITS
5. Some folks love S.E.; some hate it.
References


2. Caltrans Local Assistance Program Guidelines (LAPG), Chapter 13 (ITS): http://dot.ca.gov/hq/LocalPrograms/ITS/ITS.htm

Are We There Yet ...?
Comments?

Questions?