AN INTRODUCTION TO
INTELLIGENT TRANSPORTATION SYSTEMS

1.212
SPRING 2005

Professor Joseph M. Sussman

Mon/Wed 2:30-4:00

LECTURE 21

REGIONAL OPERATIONS PLANNING AND ARCHITECTURE (ROPA)

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ITS Regional Architecture

- There are technological aspects - *The Sausage Diagram*
- There are organizational architectures as well. Composed of:
  - Organizations (formal and informal)
  - Flows among organizations of
  - Roles
  - Responsibilities
  - Information
    - Control (e.g. Hierarchy)
    - Resourses
  - "Code"
    - Laws
    - Regulations
    - Norms of Behavior

REGIONAL ARCHITECTURE

An institutional analysis

◆ Stage one: Identifying the organizations

◆ Stage Two: Characterizing the organizations

- ◆ Geographic scale
- ◆ Temporal scale -- planning, horizon
- ◆ Accountability structure
- ◆ Management philosophy
  - ◆ Land use
  - ◆ Operations
  - ◆ Infrastructure

◆ Stage Three: Characterizing the linkages

- ◆ Hierarchy
- ◆ Information flows

◆ Stage Four: Prescribing new institutional needs based on goals and objectives

-- Sussman

"Regional Concepts of Operations for Transportation System Management and Operations", [Craig Roberts], February 2003.

A KEY DIFFERENCE

◆ Transportation Planning

vs.

◆ Planning for Operations

-- [Roberts]

vs.

◆Operations

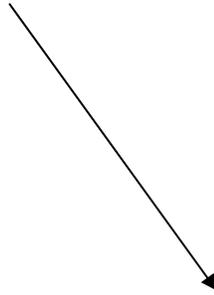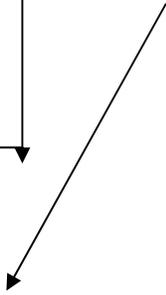[Sussman]

Transportation Planning

Regional
Planning
Architecture

"Lines on Maps",
etc.

Regional
Operations
Architecture

Planning for
Operations

Operations

- ◆ ConOps can address
  - ◆ Incident management
  - ◆ Emergency management
  - ◆ ATIS
  - ◆ Weather issues
  - ◆ Special events
  - ◆ Electronic payment system
    - ◆ Tolls
    - ◆ Transit fares
    - ◆ Parking
  - ◆ Establishing Performance Measures/Performance Standards
  - ◆ How is information
    - ◆ Obtained
    - ◆ Managed/Processed
    - ◆ Shared
    - ◆ Distributed

-- [Roberts]

REGIONAL CONOPS CONTENTS

◆ Description of existing operations

◆ Scope: geographic, linked systems, time period, players

◆ Set of expectations: the "heart" of ConOps -- goals, objectives

◆ Description of new system operations

◆ Scenarios

◆ Resources

-- [Roberts]

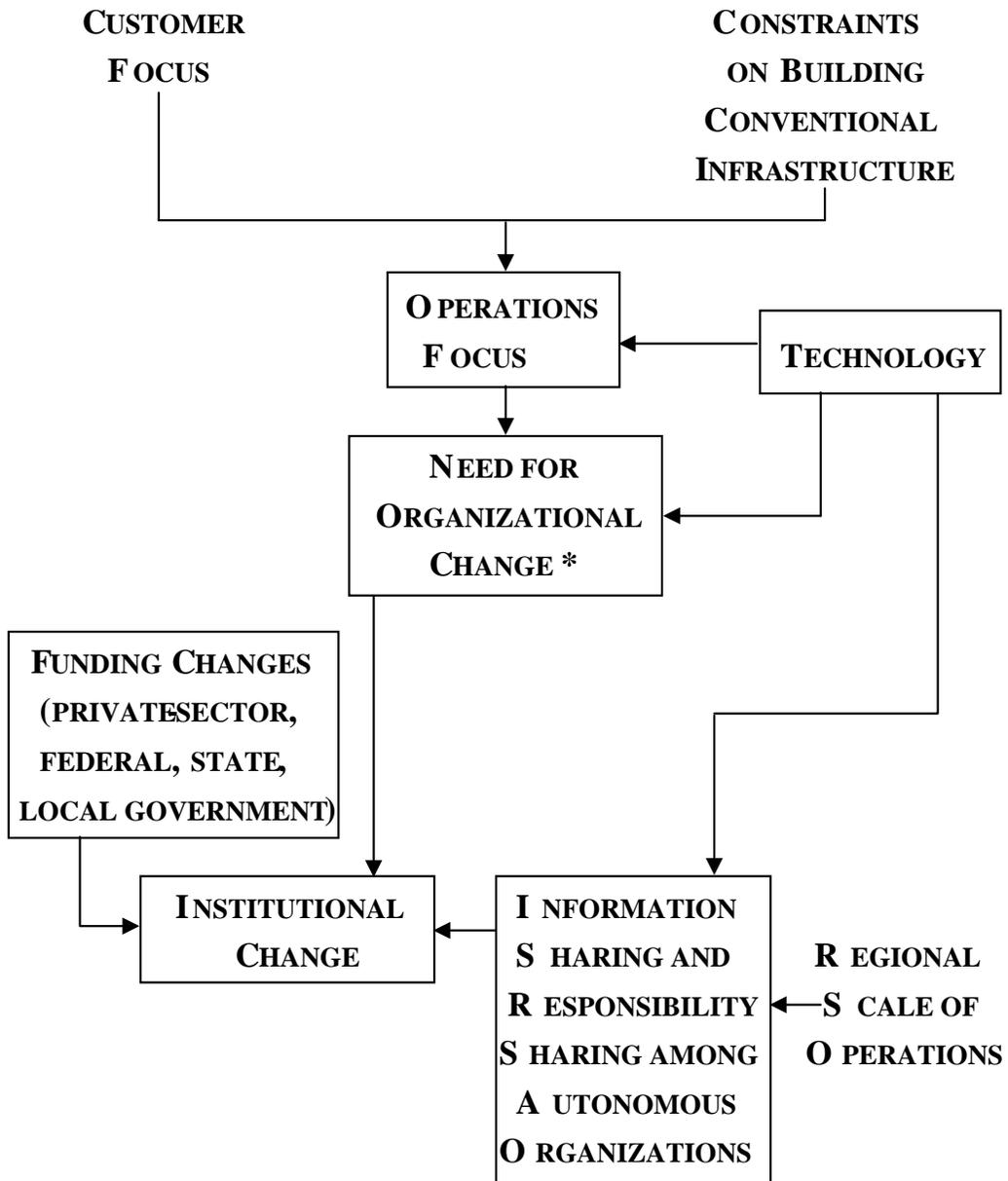# TRANSPORTATION OPERATIONS: AN ORGANIZATIONAL AND INSTITUTIONAL PERSPECTIVE

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Transportation Operations: An Organizational and Institutional Perspective

CUSTOMER FOCUS

CONSTRAINTS ON BUILDING CONVENTIONAL INFRASTRUCTURE

OPERATIONS FOCUS

TECHNOLOGY

NEED FOR ORGANIZATIONAL CHANGE *

FUNDING CHANGES (PRIVATE SECTOR, FEDERAL, STATE, LOCAL GOVERNMENT)

INSTITUTIONAL CHANGE

INFORMATION SHARING AND RESPONSIBILITY SHARING AMONG AUTONOMOUS ORGANIZATIONS

REGIONAL SCALE OF OPERATIONS

* E.G., HUMAN RESOURCE DEVELOPMENT, REWARD AND INCENTIVE STRUCTURE FOR OPERATIONS-ORIENTED PROFESSIONALS

Transportation Operations:
An Organizational and Institutional Perspective

A Key Motivator:

TEA-21 Reauthorization

Transportation Operations: An Organizational and Institutional Perspective

Why Institutional Issues Arise

- **Concern with autonomy**
- **Mission mismatch**
- **Differences in resources**
- **Funding sources**
- **Ideology**
- **Technology**
- **Information**

Transportation Operations: An Organizational and Institutional Perspective

What We Need to Be Successful in an Operations Mission

Operations needs to be *3F/3I/3R*.

- **FUNDED: First and fundamentally, of vital importance is *continuing reliable financial support for operations*.**

- **FLEXIBLE: Operations are different every day. We need organizations that can respond flexibly to the many, diverse issues that arise. O*perations planning* is the way this flexibility is achieved.**

- **FOCUSED: Discipline and focus is the required organization ethos for operations. This is a part of the 24/7 operations mindset.**
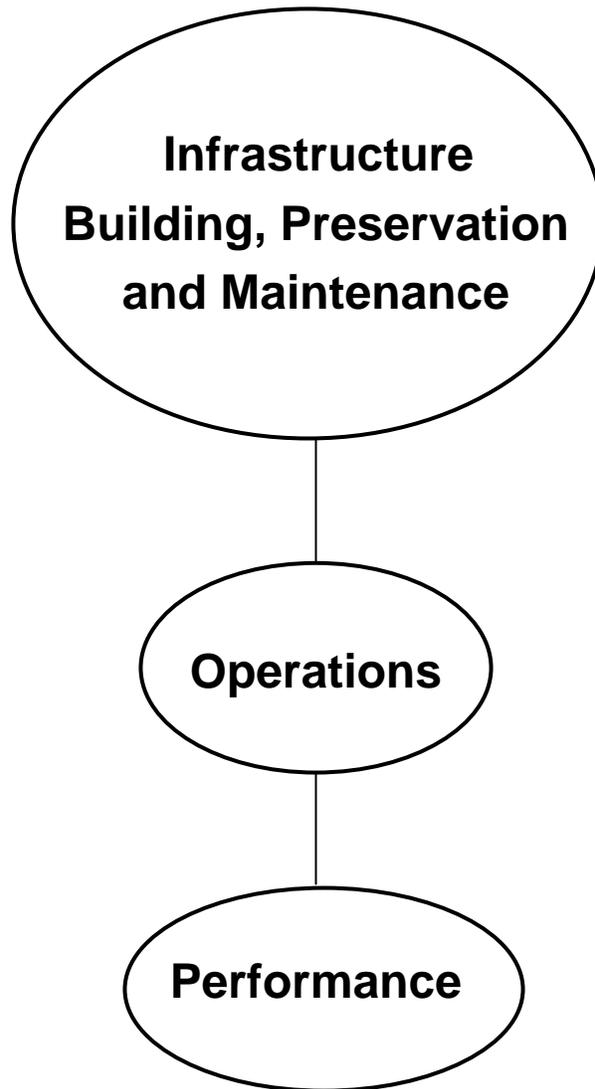
Transportation Operations:
An Organizational and Institutional Perspective

- **INTEGRATED: An integrated organizational response is required to deal with operations in complex, geographically-diffuse transportation networks.**

- **INTERMODAL: Operations should be based on an intermodal concept. Our traveler and freight customers often view our services as intermodal, so we need to deal with transportation operations**

  on this basis as well.

- **INFORMATION- AND CUSTOMER-BASED: New technology has put into our hands the ability to collect, process and disseminate information to our *customers* and to the *partner agencies* concerned with operating the transportation network.**

Transportation Operations:
An Organizational and Institutional Perspective

- <u>R</u>EGIONAL: Operations need to be conducted at a regional scale, preferably using a regionally-scaled platform to support technical systems.

- <u>R</u>EAL-TIME: Operating situations are ongoing, dynamic and driven by random factors. Real-time is the temporal scale on which operating organizations need to respond.

- <u>R</u>OUTINE: While individual stresses on the operating environment cannot be predicted, we can plan for generic kinds of service interruptions and treat them in a routine and decisive manner.

Transportation Operations:
An Organizational and Institutional Perspective

Infrastructure Building, Preservation and Maintenance

Operations

Performance

Transportation Operations:
An Organizational and Institutional Perspective

<u>Focus Change</u>

- **The systems approach**
- **Accountability**
- **Incentives**
- **Leadership**

Transportation Operations:
An Organizational and Institutional Perspective

Agenda

- **Professional Capacity Building**
- **Internal Changes to Transportation Organizations**
- **Institutional Change**

Transportation Operations:
An Organizational and Institutional Perspective

We call for a fundamental rethinking of our transportation organizations for the future -- at all levels of government and including the private sector -- asking them to participate in regionally-scaled transportation *operations*, utilizing new kinds of public-public and public-private partnerships and funding structures to create intermodal services for travelers and freight. This is no small thing to accomplish. Facilitating that kind of change through education and through strong and visionary leadership is central to the future success of the

transportation field.