FTA RESEARCH

FEDERAL TRANSIT ADMINISTRATION

Mobility Services for All Americans (MSAA): Planning to Overcome Challenges

Date

Presenter Name(s)

U.S. Department of Transportation

Federal Transit Administration

Presentation Outline

- Brief Review of Presentation #1
- Describe basic principles of structured design approach
- Identify needs
- Develop and value alternatives
- Develop Concept of Operations
  - Purpose
  - Definitions
  - Process
- Identify resources

Presentation #1 Review: The Challenge

- Many Americans have difficulty accessing some of their basic needs, particularly **seniors**, **persons with disabilities**, and those **economically disadvantaged**, because they rely on human service transportation systems that are often:
  - **Fragmented**
  - **Unreliable**
  - **Inefficiently operated**
  - **Segregated**

The Challenge (continued)

- Disparate funding programs also contribute to the overall challenge
- The inefficiency also creates excessive cost to the government
- Lack of coordination is the leading obstacle to meeting the mobility needs of the people who depend on the services most

The Opportunity

Currently over 80 Federal programs fund transportation services for transportation disadvantaged

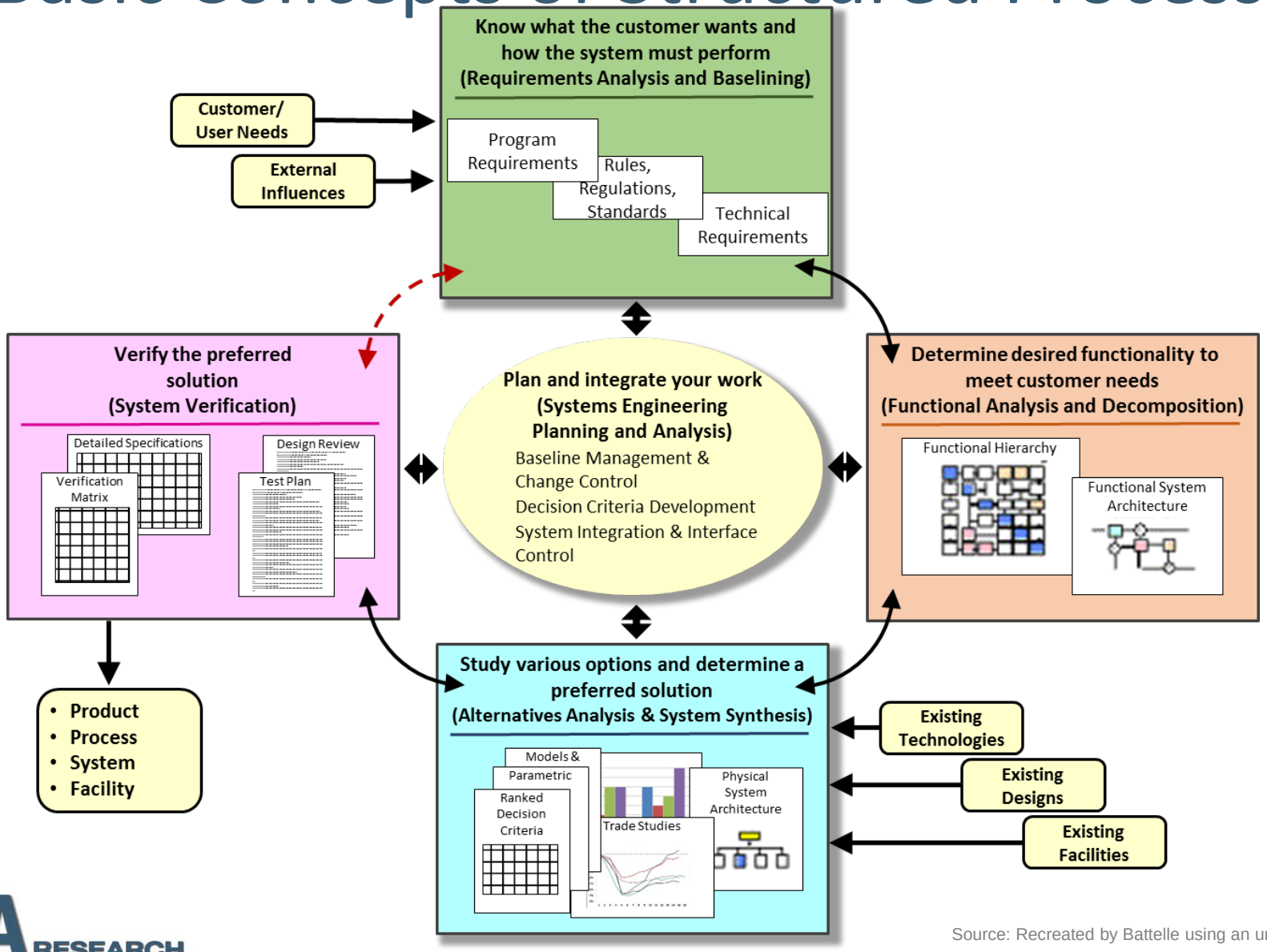
- Coordinated Human Service Transportation (HST)
- Veterans Transportation and Community Living Initiative (VTCLI)
- Mobility Services for All Americans (MSAA)
- Mobility on Demand
- Rides to Wellness
- Others

The Opportunity (continued)

- Intelligent Transportation Systems (ITS) and other technologies instrumental in addressing many challenges

Source: USDOT

Basic Concepts of Structured Process



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Why Use Structured Approach?

Management of System Requirements	Stakeholders or users define what system should do (not how it should do it) and manage these "system requirements"
Risk Management	Need to identify and minimize risk
System Integration	Components of technology system have to be integrated from physical and organizational perspective
Management of Complexity	The process helps you manage complexity
Enhancement of Communications	The process enhances communication and system understanding
Verification of User Needs	Must verify that system meets users' needs

Tools: National ITS Architecture

- Common framework for ITS:
  - Documents what ITS should do from the user's perspective
  - Defines functions and information exchanges
  - Maintained by USDOT
- Website (http://www.iteris.com/itsarch/) can support alternatives development
- Search by goal or problem/solution pair within Service Package section

National ITS Architecture (cont'd)

Graphic | Equipment Packages | Flows | **Goals and Objectives** | ITS Applications | User Services | Transaction Set

Associated Planning Factors and Goals

Planning Factor	Goal
D. Increase the accessibility and mobility of people and for freight;	Achieve a significant reduction in congestion
G. Promote efficient system management and operation;	Improve the efficiency of the surface transportation system

Associated Objective Categories

Objective Category
Transit Operations and Management: Transit Signal Priority
Traveler Information: Data Collection and Sharing on Travel Conditions

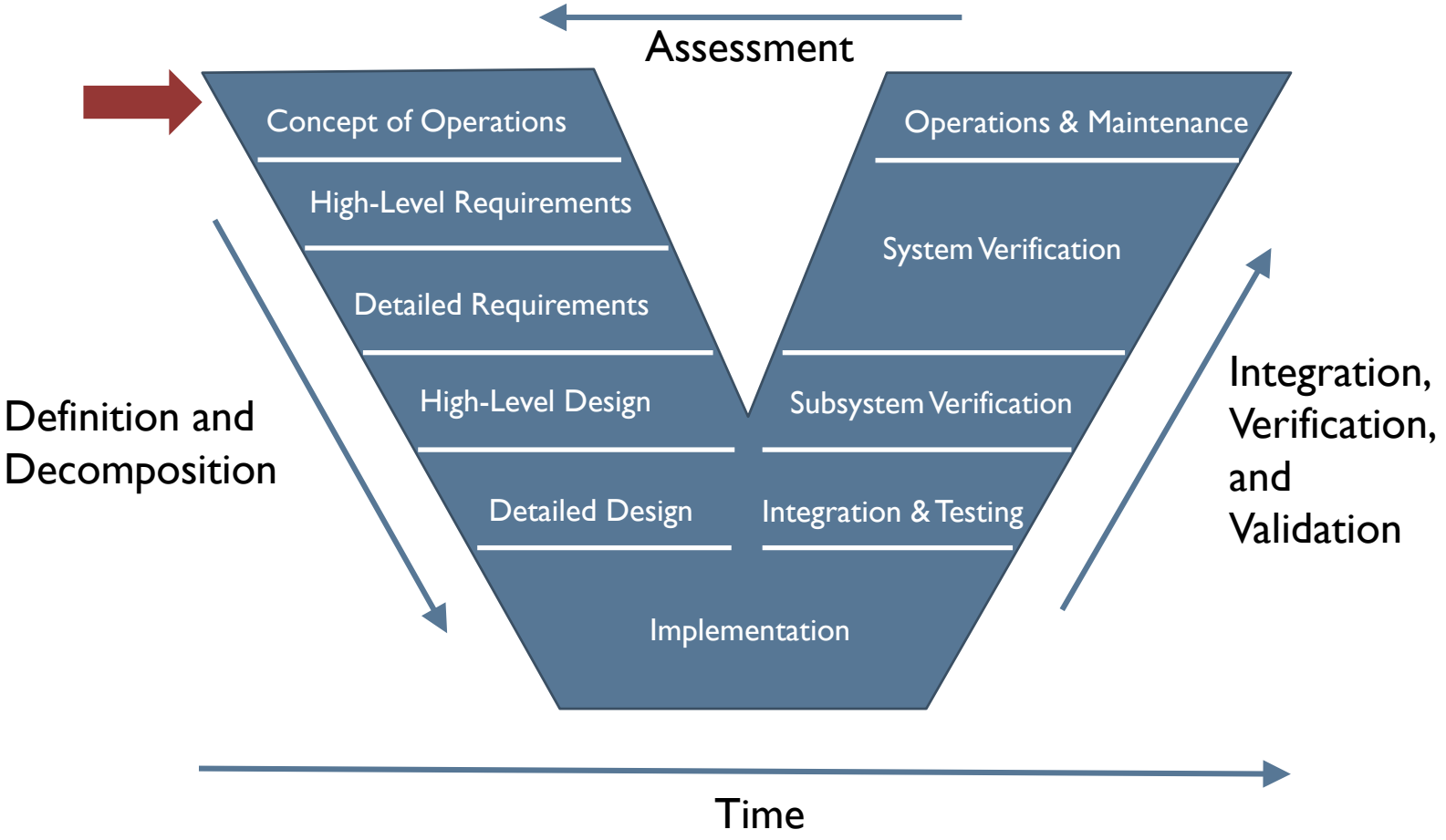
Associated Objectives and Performance Measures

Objective	Performance Measure
Decrease delay by X percent per year by increasing the use of queue jumping and automated vehicle location.	Travel time delay on routes with queue jumping and automated vehicle location in use.
Increase the percent of modes in the region that share their traveler information with other modes in the region to 100 percent by Y year.	Percent of modes in the region that share their traveler information with other modes.
Increase the percent of the transportation system in which travel conditions can be detected remotely via CCTV, speed detectors, etc. to X percent by Y year.	Percent of the transportation system in which travel conditions can be detected remotely via CCTV, speed detectors, etc.
Increase the percent of transportation facilities whose owners share their traveler information with other agencies in the region to X percent by Y year.	Percent of transportation facilities whose owners share their traveler information with other agencies in the region.

Since the mapping between objectives and service packages is not always straight-forward and often situation-dependent, these mappings should only be used as a starting point. Users should do their own analysis to identify the best service packages for their region.

Source: ITERIS (http://www.iteris.com/itsarch/html/mp/mpapts01.htm#tab-4)

Tools: The "V" Diagram



Source: Recreated by Battelle using FHWA Guidelines

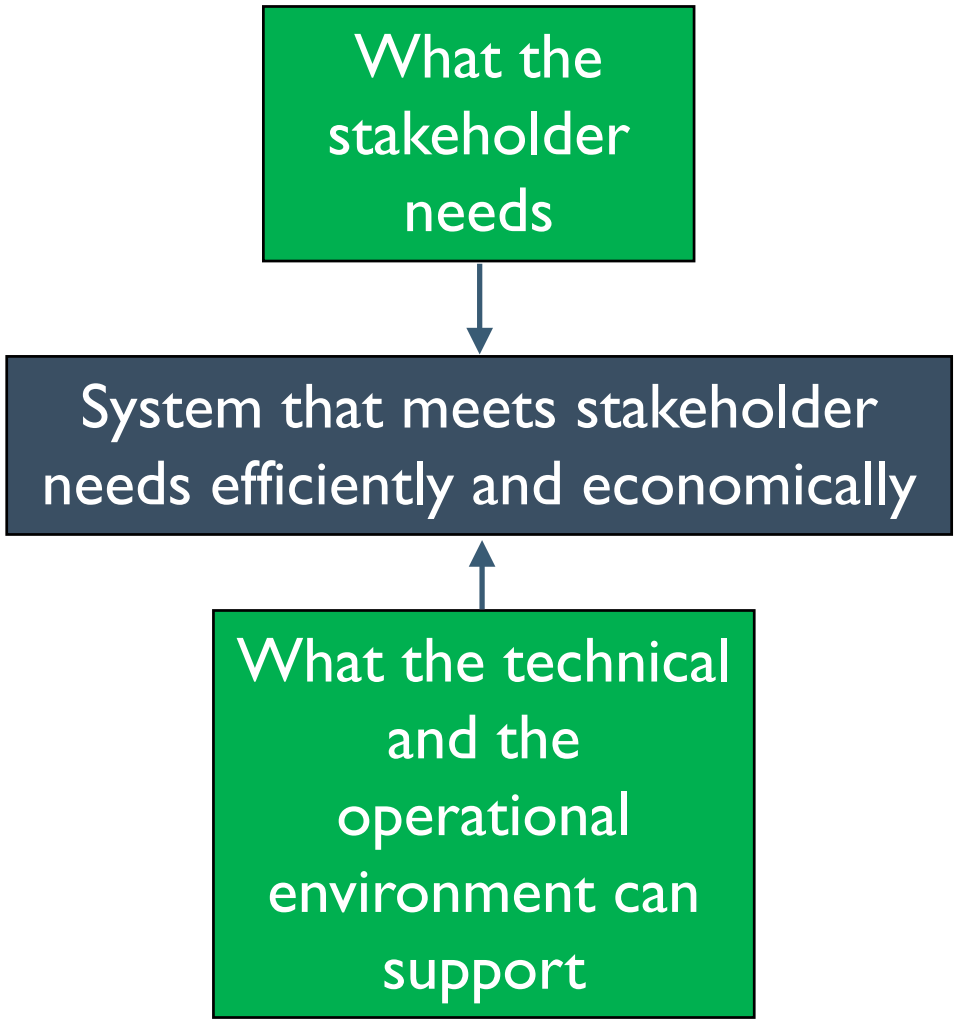
Structured Approach 101

Design approach that focuses on stakeholder needs

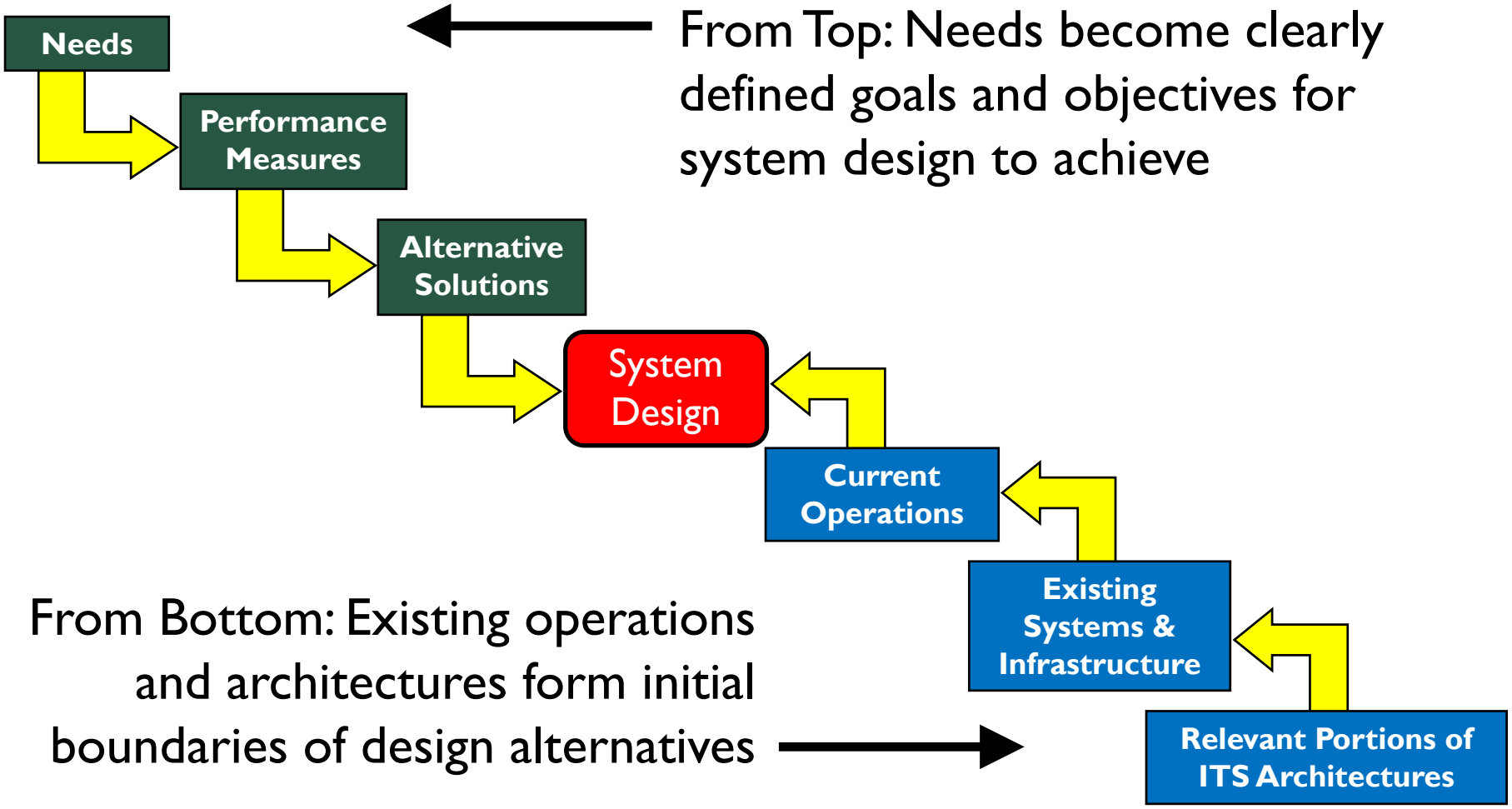
What needs to be done

Not on how it should be done or the latest available software

Structured Approach 101 (cont'd)



Structured Approach 101 (cont'd)



From Top: Needs become clearly defined goals and objectives for system design to achieve

From Bottom: Existing operations and architectures form initial boundaries of design alternatives

Structured Approach 101 (cont'd)

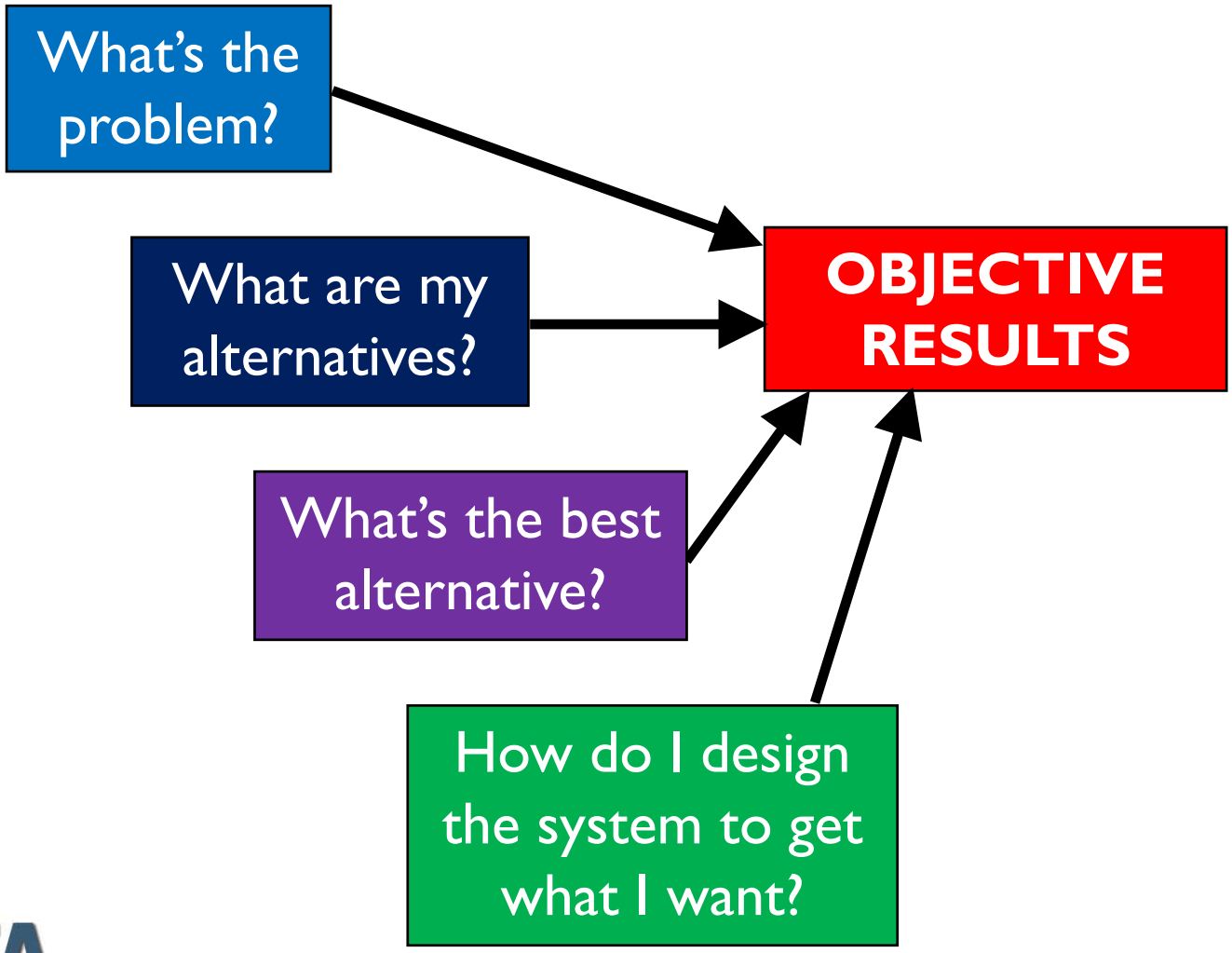
What's the problem?

What are my alternatives?

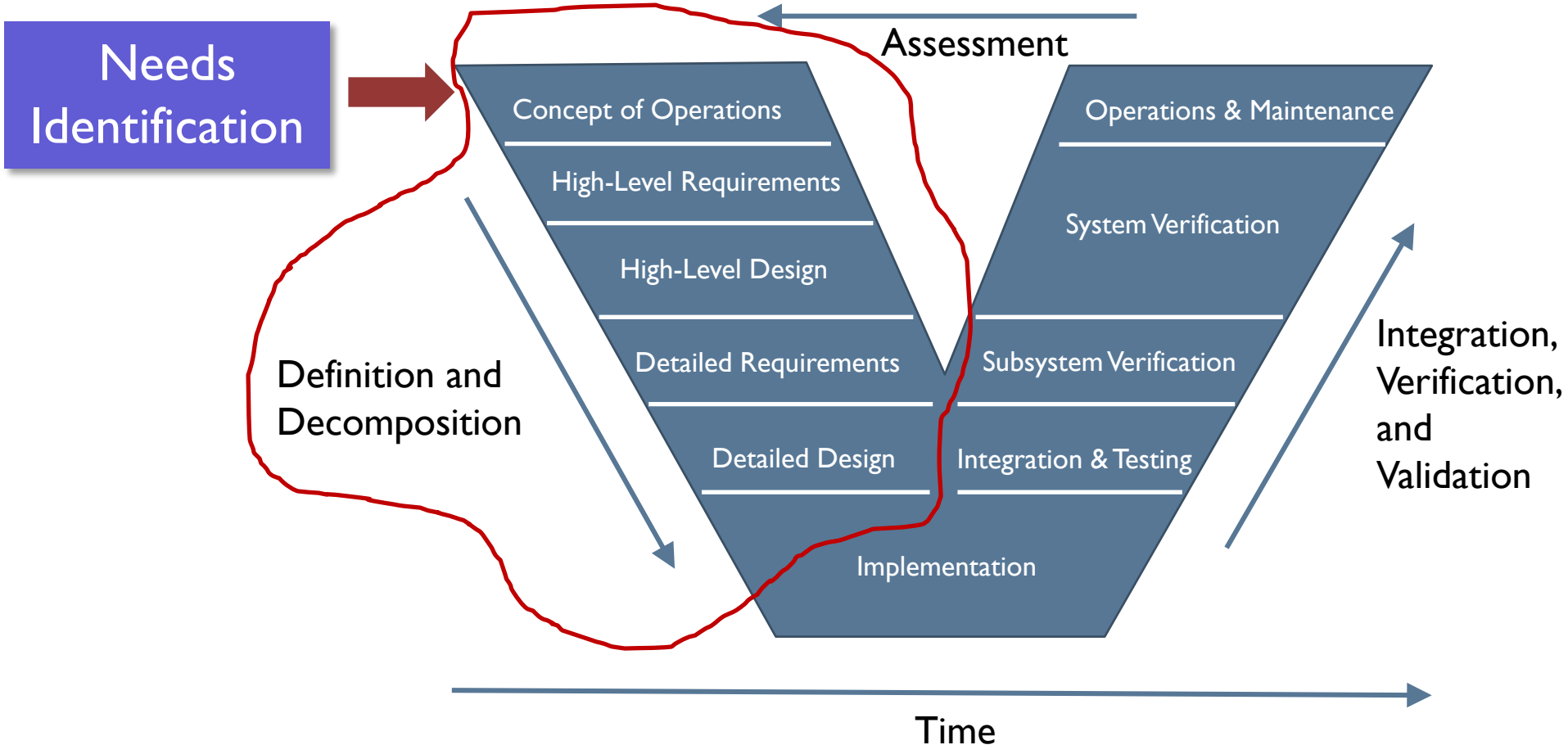
What's the best alternative?

How do I design the system to get what I want?

Structured Approach 101 (cont'd)



Structured Approach 101 (cont'd)



Source: Recreated by Battelle using FHWA Guidelines

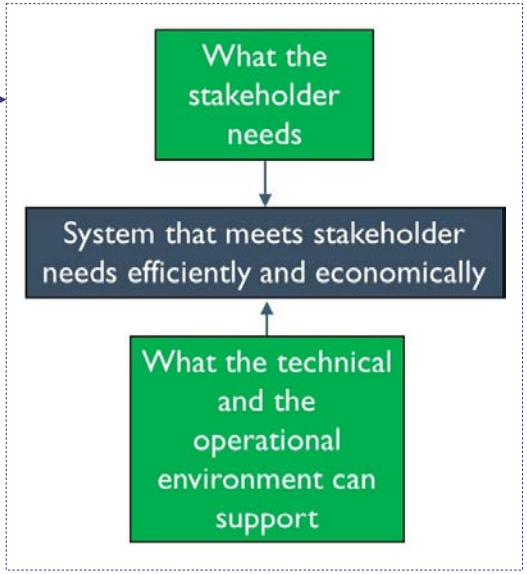
Structured Approach 101 (concluded)

Three Concepts in Structured Process

1. Use a combined top-down/bottom-up approach

2. Focus on stakeholders/users' needs, **NOT** technology

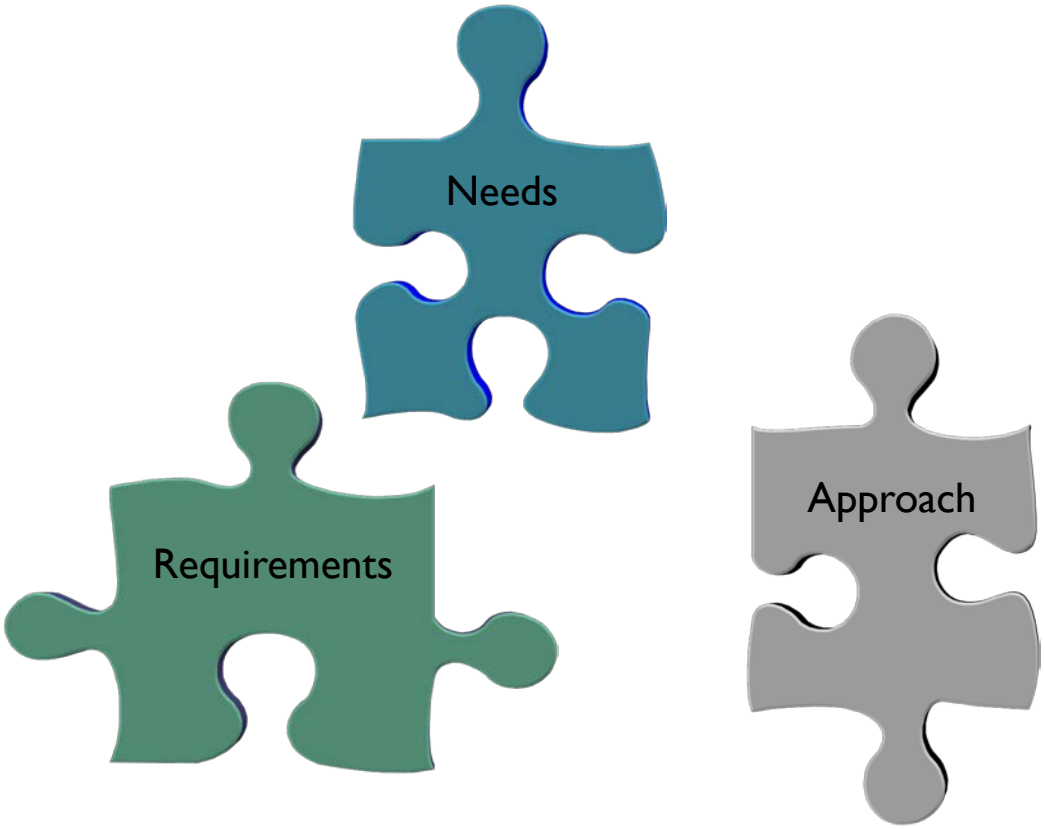
3. Scale your process to the size and complexity of the project



"Systems engineering practitioners tailor their favorite processes to meet the needs of the specific project…"

International Council on System Engineering (INCOSE)

Identifying Needs



"Defining the problem is the most difficult part of the … process"

Systems Engineering and Analysis, Third Edition

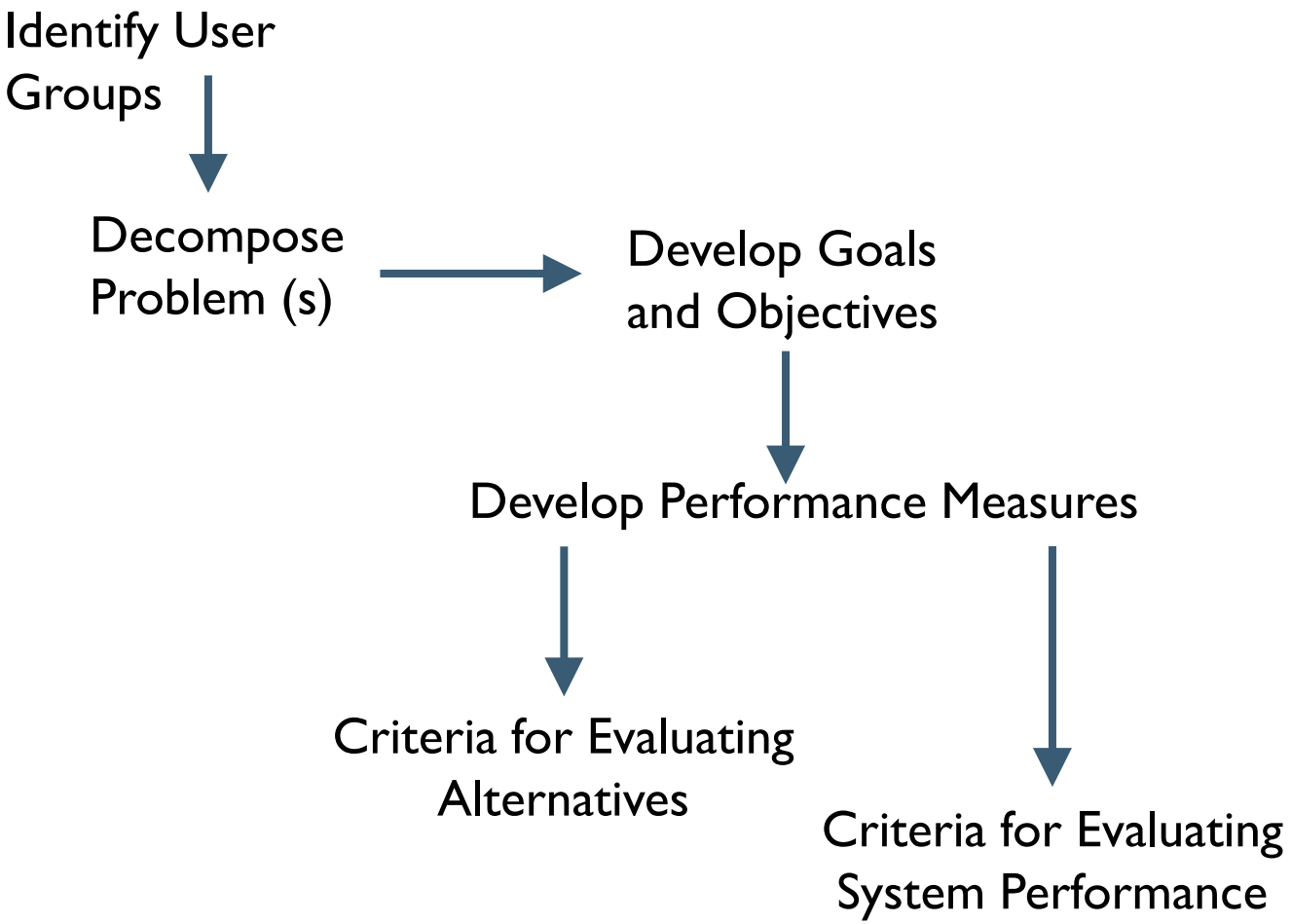
Identifying Needs (con't)

- Needs can be one or more of the following:
  - ☑ Problem to be solved
  - ☑ Process to be improved
  - ☑ New capability
- Critical that system users define the needs

Anyone could identify needs, but users can best articulate what is necessary for system to function

- For example, users may describe needs that reflect how they envision interacting with system

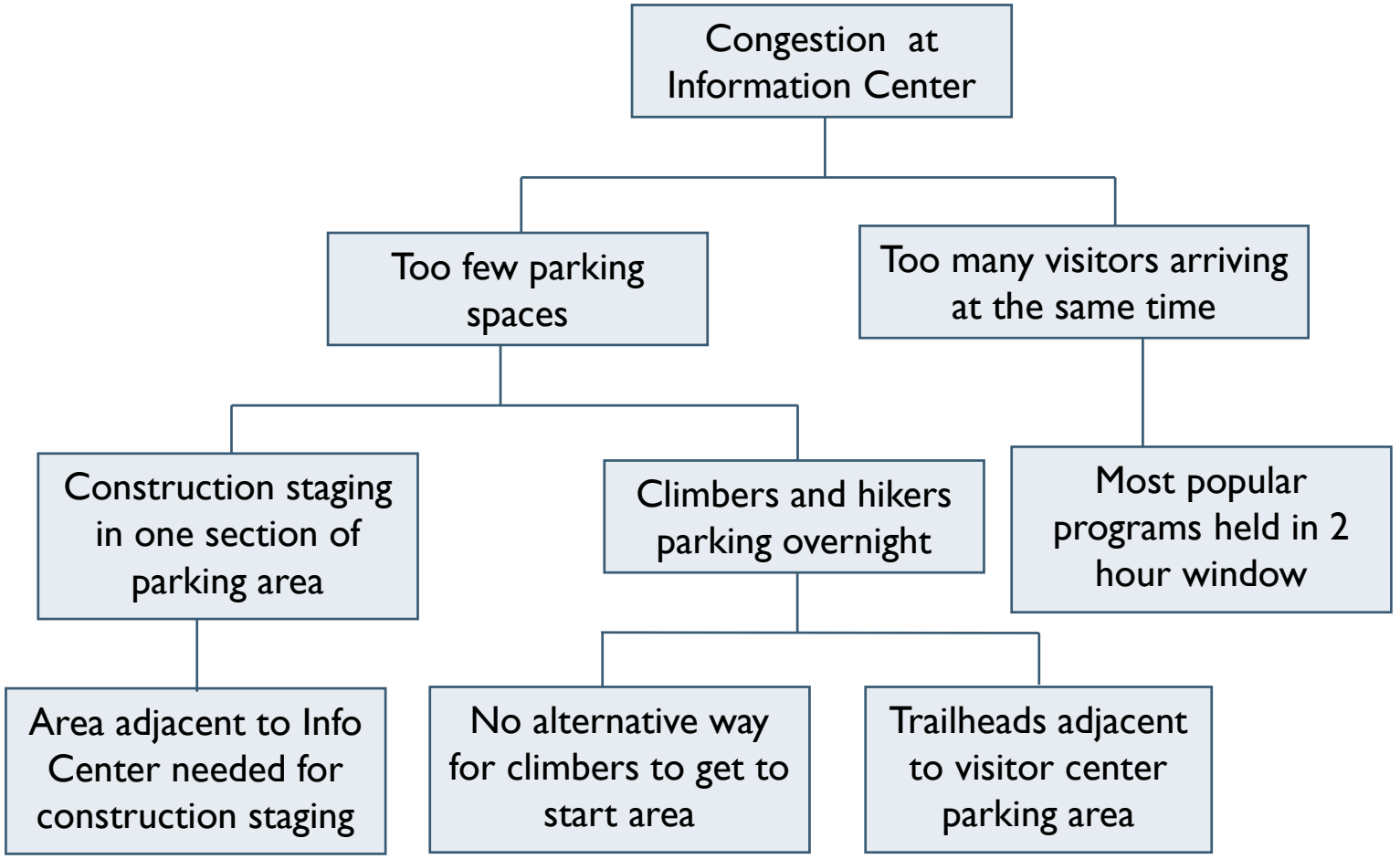
Identifying Needs (con't)



Identifying Needs (con't)

- Figure out the problem: Use problem tree or other method to clearly define
- Goal:
  - Desired product or outcome
  - Usually qualitative
  - "Destination"
- Objectives:
  - Activities or products used to achieve goal
  - Usually quantitative
  - "Paving stones that form path to the destination"

Identifying Needs: Define the Problem



Problem

Cause

Cause

Cause

Identify Needs (cont'd)

Identify Needs (cont'd)

- User groups may represent distinct demographics that will affect how they interact with the system:
  - Technical climbers may be more likely to access using web-based approach
  - Windshield tourists may be more comfortable using the phone/may not have access to web

Identify Needs (concluded)

- Operators may be constrained by contract rules:
  - Example: Transit operators may be working under contracts with specific rules governing what they do – will your new system be covered under their work rules?
- Once problem identified, develop goals and objectives to address it

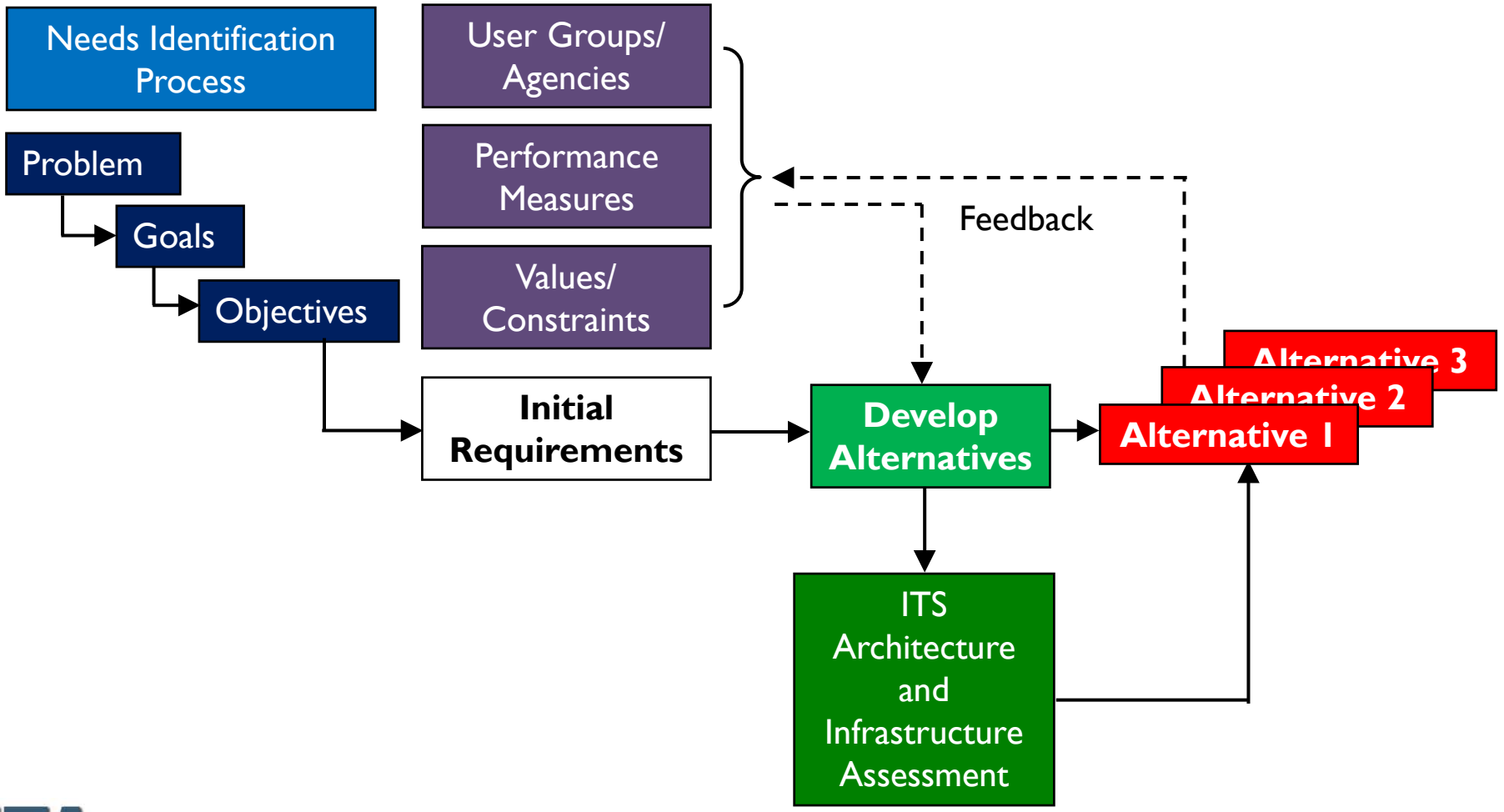
Developing Alternatives

- Do not be afraid to "Think Outside the Box"
- Majority of required FTA Policy elements clustered here:
  - ID relevant portions of regional ITS architecture
  - ID participating agencies roles/responsibilities
  - Initial requirements definitions
  - Analysis of alternative system configurations
- Iteration plays important role
- Does not occur in a vacuum – existing systems form an initial guideline

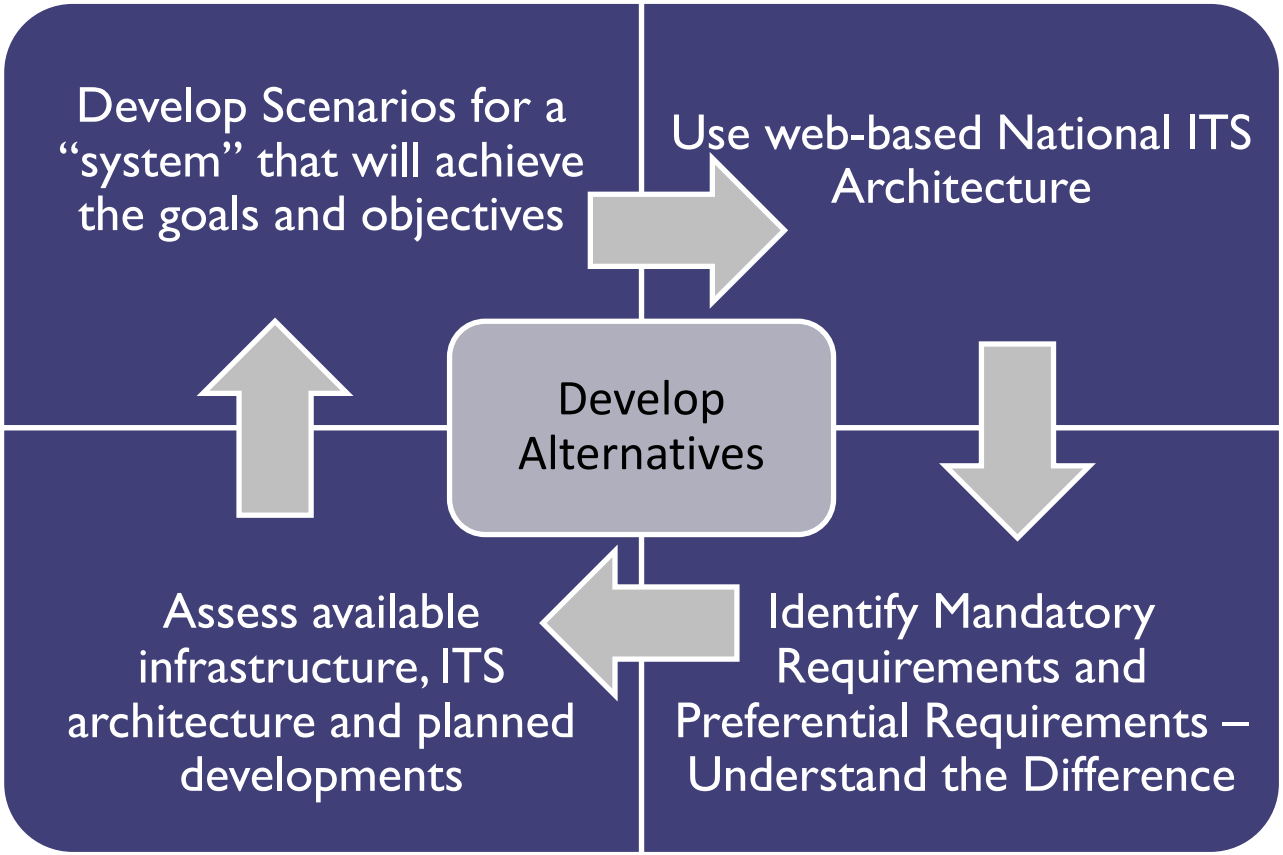
Developing Alternatives (con't)

- Based on goals and objectives – various system approaches to achieve
- Develop scenario graphics/flow charts to help visualize how operators and users will interact with system
  - Stakeholders a critical element
  - "Use cases" as scenarios become more mature
- Use goals and issues that you are trying to address to search through National ITS Architecture

Developing Alternatives (cont'd)



Developing Alternatives (concluded)



Value Ranking

- Supports:
  - Evaluation of alternatives
  - Selection of preferred alternative
- Captures organizational or social goals that may not lend themselves to quantification but can be key discriminator
  - Example: Providing worthwhile service vs. efficiency

Value Ranking (cont'd)

- May form the most critical design constraints
- Should be brought to the attention of ITS/design leads early in process
  - Example: Project Managers from National Park Service and State DOT are probably going to have different perspectives on cutting down some trees to clear a path for an inexpensive communications link

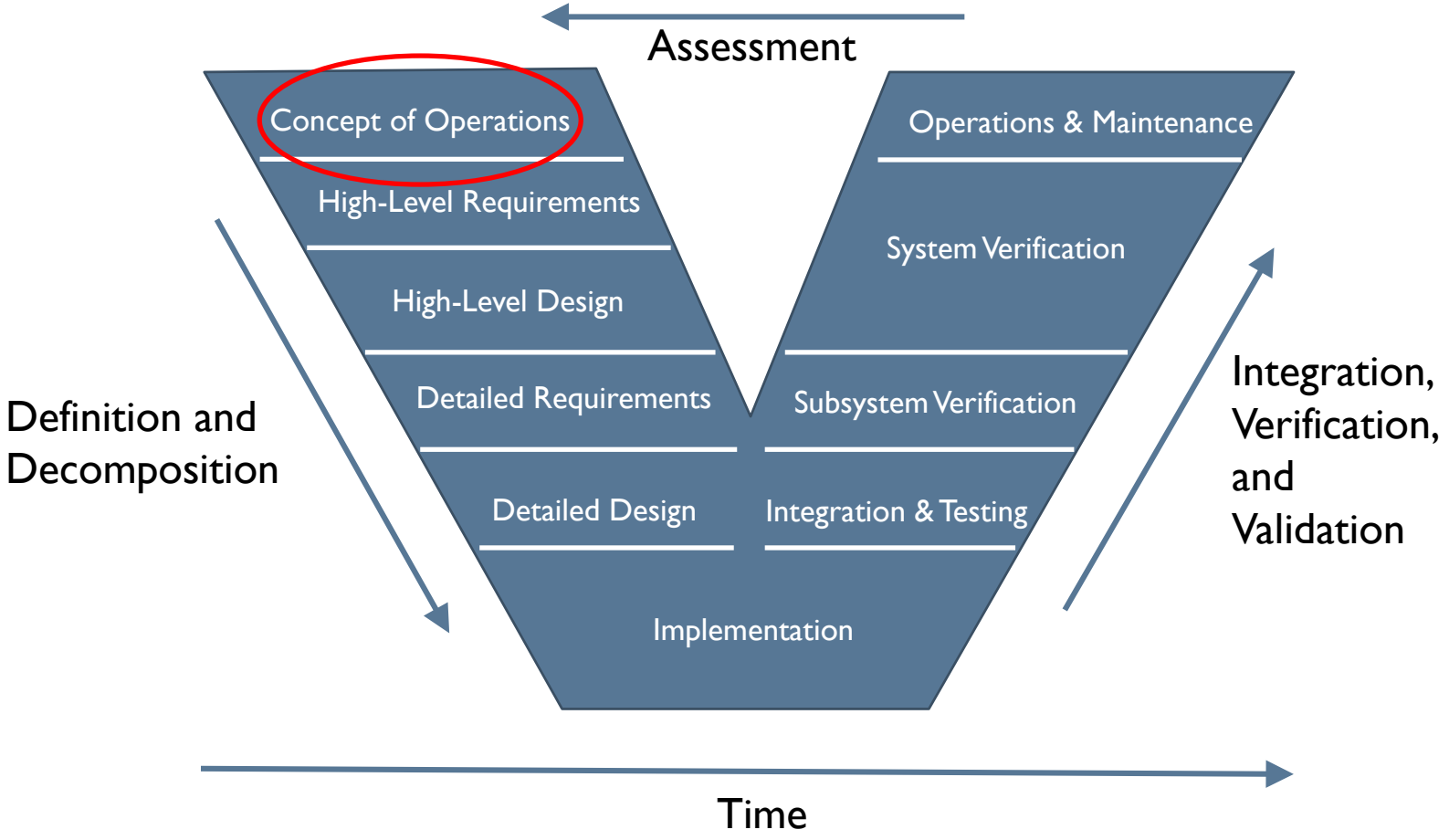
Value Ranking - Example

Values Ranking Matrix
(All must receive ranking)

Values	Ranking								
	Stakeholder Group 1		Stakeholder Group 2		Stakeholder Group 3		Stakeholder Group 4		Totals
PROTECT CULTURAL AND NATURAL RESOURCES									
FACTOR 1 - Prevent Loss of Resources	35		30		20		25		110
FACTOR 2 - Maintain and Improve Condition of Resources	15		5		10		15		45
PROVIDE FOR VISITOR ENJOYMENT									
FACTOR 3 - Provide Visitor Services and Educational and Recreational Opportunities	10		25		30		20		85
FACTOR 4 - Protect Public Health, Safety and Welfare	15		15		5		5		40
IMPROVE EFFICIENCY OF PARK OPERATIONS									
FACTOR 5 - Improve Operational Efficiency and Sustainability	5		5		10		10		30
FACTOR 6 - Protect Employee Health, Safety and Welfare	15		10		15		15		55
PROVIDE COST-EFFECTIVE, ENVIRONMENTALLY RESPONSIBLE, AND OTHERWISE BENEFICIAL DEVELOPMENT FOR THE NPS									
FACTOR 7 - Provide Other Advantages to the National Park System	5		10		10		10		35

Source: Battelle

Continuing with the "V" Model



Source: Recreated by Battelle using FHWA Guidelines

What is a Concept of Operations?

- A concept of operations (ConOps) is a document describing the characteristics of a proposed system **from the viewpoint of an individual who will use that system**.
- It is used to communicate the **quantitative** and **qualitative** system characteristics to all stakeholders.

Why a Concept of Operations?

- Ensures that all users and supporters have same understanding of technologies. By providing description of components and operations:
  - Stakeholder misunderstandings can be reduced
  - Expectations can be managed
- Clearly defines conditions for use of technology This should minimize risks associated with operating technologies

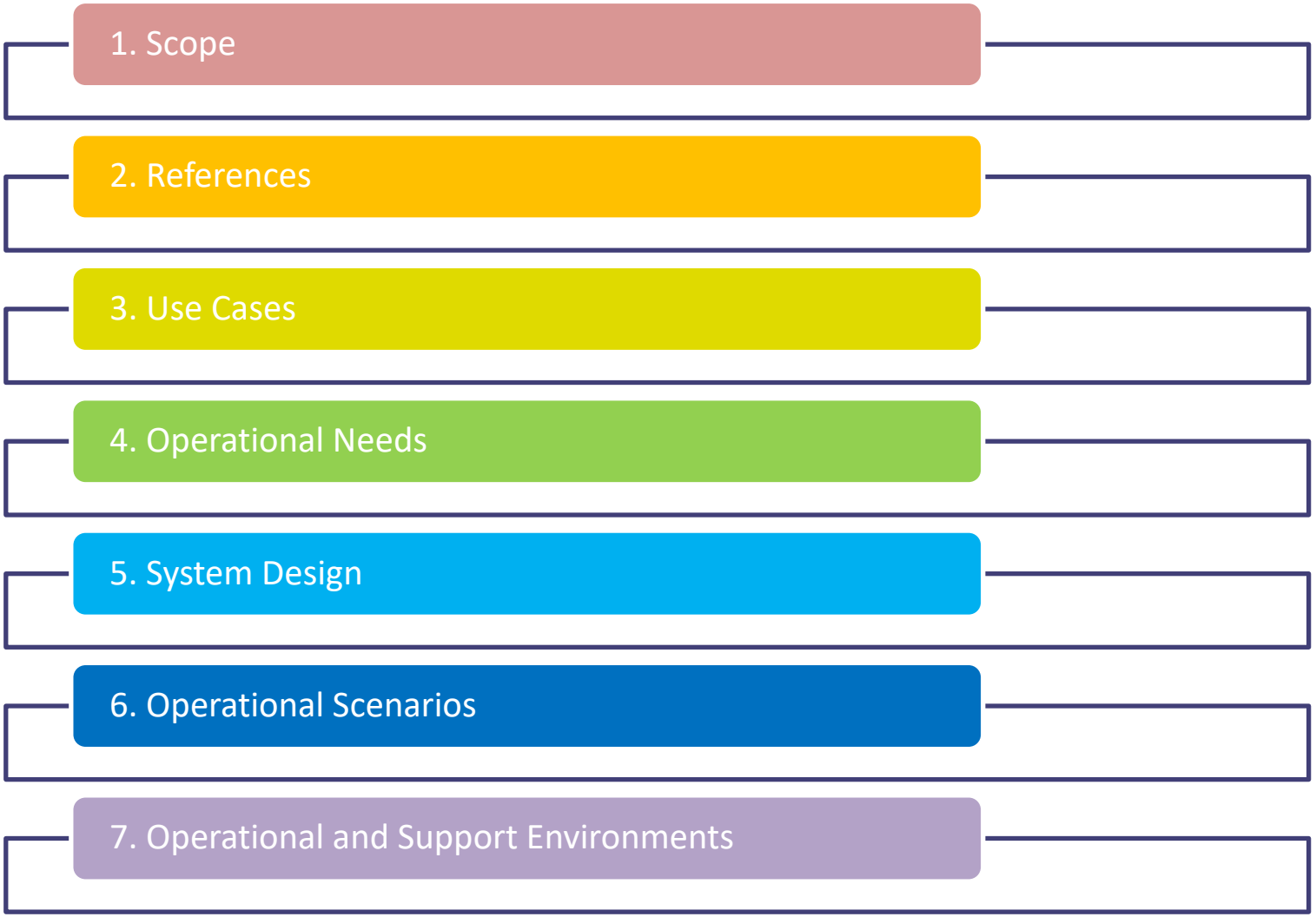
Why Concept of Operations? (cont'd)

- Should include:
  - Non-technical descriptions of all system users
  - Data and information needed to operate and use technologies
  - Conditions under which they use this data and information
- Documents operational needs of users without defining specific technical issues

Why Concept of Operations? (concluded)

- Provides operational needs and proposed characteristics for proposed system
- Describes high-level user expectations and functional requirements for system
- Describes information sharing across programs and operators

Key ConOps Sections



1. Scope

- Purpose of document:
  - To communicate an idea to multiple stakeholders
  - To convey business needs of the system
- Audience for ConOps:
  - Those who will build and implement system
  - Typically does not target all stakeholders
    - e.g. traveling public

Project benefits from a local 'champion' – i.e., one stakeholder (or stakeholder agency) who leads the others in the articulation of system goals, assignment of roles and responsibilities, and provides the project with the extra attention necessary for success.

1. Scope (con't)

- Vision for system: High level "mission statement"
  - Example: To increase mobility and accessibility for the transportation disadvantaged and the general public, and achieve more efficient use of federal transportation funding resources through technology integration and service coordination

1. Scope (con't)

- Goals and Objectives:
  - Enhance existing service elements
  - Improve efficiency of system's operation (reporting, vehicle use, etc.)
  - Provide users (riders) a single point of access for trip planning, questions, etc.
- System Needs: Identify specific needs that will be addressed by system
  - Example: Need 1 – Reduce burden for travelers to schedule trips

1. Scope (concluded)

- System Functions: High-level overview of system functions
  - Example: Function 1 - Provide a single portal for travelers to schedule all trips

- System Scope Boundaries: Briefly identify scope of system
  - What is "in" and what is "out"

2. References

- Summary of inputs that influenced Con Ops
  - Previous reports, such as:
    - Existing mission statements
    - 5-year plans
    - Regional ITS architectures
  - Existing systems, including both internal systems and similar systems employed by others
  - Stakeholder input, including items like Meeting Minutes, etc.

3. Use Cases

- Identify System Users
  - Customers
  - State agencies which fund and administer human service transportation programs
  - Local transit agency
    - Operators
    - Dispatchers
    - Management
  - Community/non-profit operators
    - Operators
    - Dispatchers
    - Management
  - Privately-provided human transportation services
    - Operators
    - Dispatchers
    - Management
  - USDOT
  - State DOT

3. Use Cases (con't)

- Identify functional requirements
  - What do you want the users to be able to do?
    - A single function may be required by multiple users
  - Example: Function 1: Check on vehicle location
    - Both customers and dispatchers will be able to check vehicle location in real-time through an internet web site

4. Operational Needs

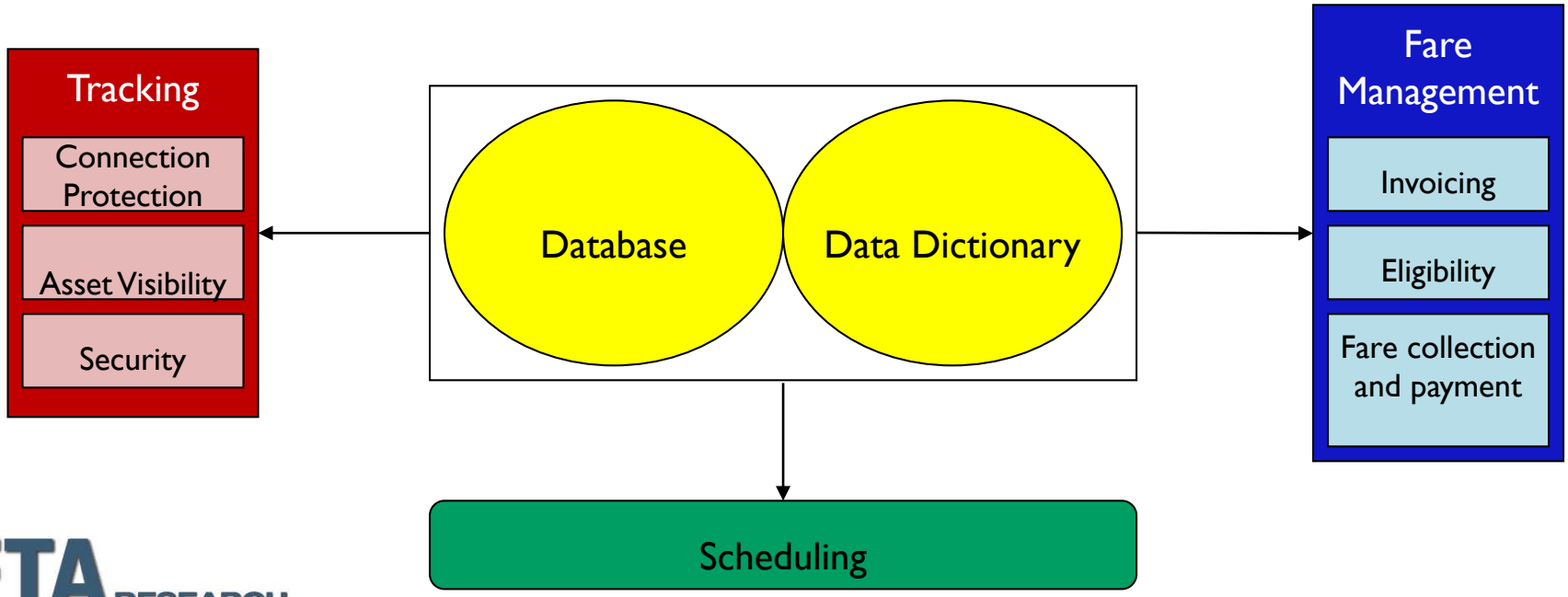
- Typically arise from stakeholder input
- First introduced in the scope
- What do you want to accomplish through deployment of the system?
  - Example: Need 1 – reduce burden for travelers to schedule trips?

4. Operational Needs (con't)

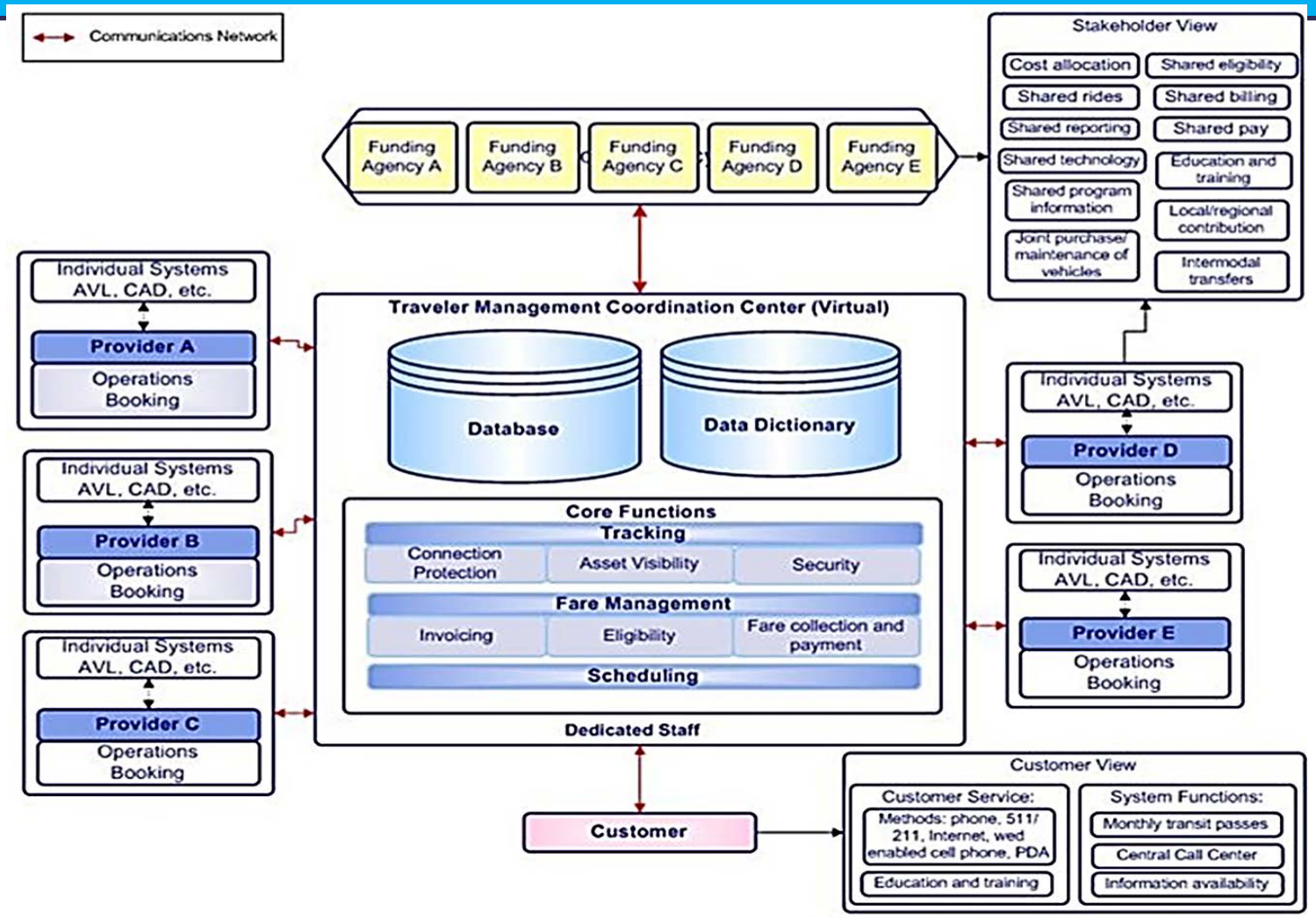
- Other Needs:
  - Minimize areas without service
  - Reduce areas where service is not easy to access
  - Ensure service is flexible for all users
  - Make it easier for riders to plan a trip
  - Allow riders to plan multi-destination or multi-mode trips
  - Standardize reporting among all agencies

5. System Design

- Simple Design Schematic:
  - Outside: core system functions
  - Inside: store support data and information



5. System Design (con't)



6. Operational Scenarios

For each function

- Provide background on how the function occurs today (if at all)
- Present one or more scenarios that identify Who is involved, What they would do, and How they would interface with the TMCC?

Potential scenarios:

- Normal Operations
- Changes in service providers
- Changes in participating Human Service Programs

Scenario elements:

- What modes are affected?
- How does each scenario affect customers' interaction with the system?
- Anticipated impacts
- Potential disadvantages or limitations

7. Operational and Support Environments

- Describes environment in which system will operate:
  - Facilities
  - Hardware
  - Software
  - Personnel
  - Communications Needs

Benefits of Structured Approach

Reduced Time	Reduces time required to move from concept to deployed systems
User Needs are met	Ensures that system meets users' needs
Reduced Deployment Cost	Reduces cost of deploying systems
Change Orders are controlled	Ensures that number of "change orders" is minimized (change orders result in vendors performing more work than expected)

Benefits of Structured Approach (cont'd)

Reduced Risk	Reduces risks associated with system development
Improved System Quality	Improves system quality, reliability, and performance
Improved Communications	Improves communications among team members and vendor during design and development
Sustainable System	Improves ability to sustain and upgrade systems in the future

Successful Technology Project

1. Requirements Analysis and Baselining:
Know what users want and how system must perform

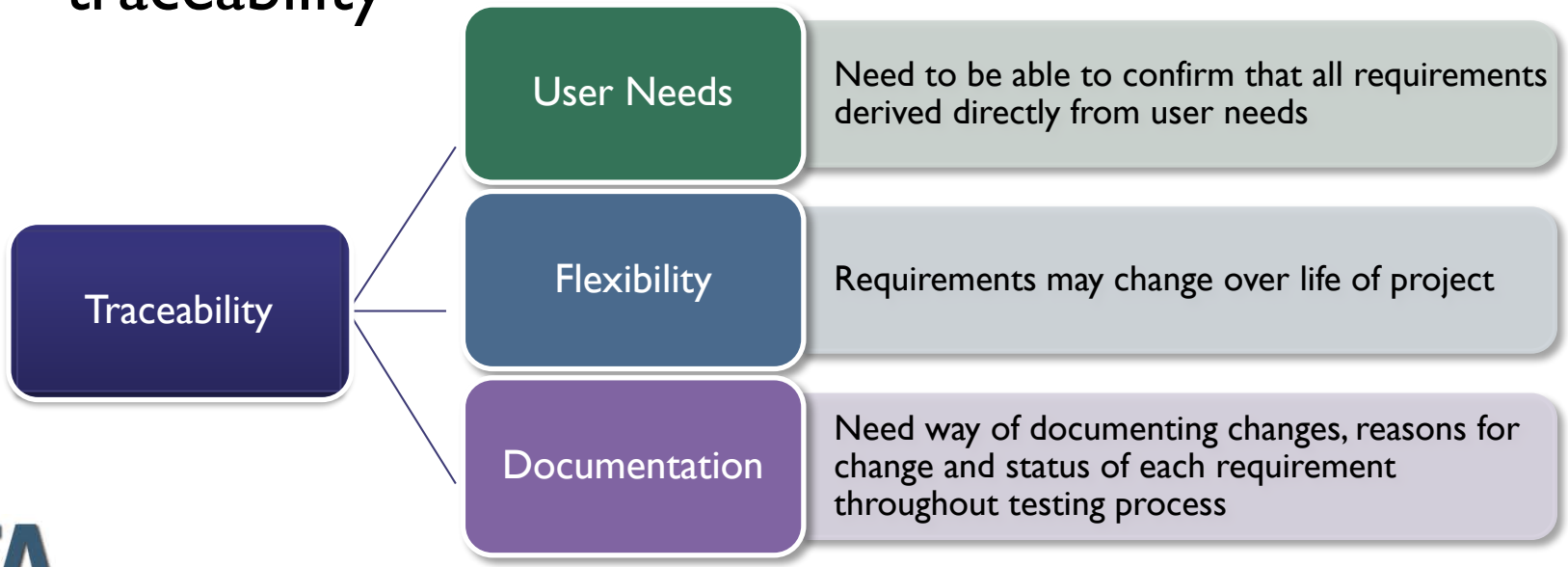
2. Functional Analysis and Decomposition:
Determine desired functionality of system to meet users' needs

3. Alternatives Analysis:
Study various system options and determine preferred solution

4. System Validation and Verification:
Verify preferred solution

Needs -> System Requirements

- System requirements: what the system must do or deliver (after ConOps)
- Once system requirements are developed, project team keeps track of each requirement – called "traceability"



Procurement

- System built consisting of functions identified after ConOps
- Most likely, system will be developed by a vendor, meaning that you will need to procure a vendor's services
- Key elements of procurement and resulting vendor contract on following slides

Procurement Key Elements

- Provide potential vendors with system requirements
- Ensure that vendors can meet those requirements
- Define process that vendor must use throughout project to ensure:

1. They are delivering system that meets users' needs
2. Project is on-time and within budget

Implementation Process

System Requirements Matrix	Maintain system requirements matrix noting status of each requirement throughout project (for traceability, as described earlier)
Bi-weekly Conference Calls	Conduct bi-weekly conference calls or meetings with vendor to discuss project status and action items
Iterative Testing	Define and execute iterative testing to ensure: • System components work as they were intended • All components work together as a system • All requirements are met and can be accepted by your organization

Intended Outcomes of MSAA

Enhanced Experience	Enhance customer experience
Improved Effectiveness and Efficiency	Improve effectiveness and efficiency of services being provided by different transportation providers
Sustainable Institutional Model	Produce **sustainable institutional model(s)** enhanced by information technology
Data Sharing	Data sharing by addressing institutional barriers
Intelligent Transportation Systems	Utilization of Intelligent Transportation Systems

Intended Outcomes of MSAA (cont'd)

State-of-the-art	Advance the state-of-the-art in: • Comprehensive traveler support • **Interoperable** and **coordinated** transportation service operations and management • Streamlined program management requirements
Data Exchange	**Data sharing and exchange** within HST
System Interoperability	**System interoperability** by leveraging existing proprietary solutions

Overall Human Service Benefits

Personal Mobility	Provides choice in personal mobility: • Access to healthcare and jobs • Access to social welfare programs • Better transportation connectivity
Inclusiveness	Encourages inclusiveness
Equity	Provides equity of service access and delivery

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