

# Impacts of Technology Advancement on Transportation Management Center Operations



**AN OVERVIEW**

## Today's Presentation



- **The Context**
  - More technology impacts TMC operations
  - Need to make smart choices
- **The Content**
  - **The Trends**
    - Identified 8 major trends
  - **Successful Strategies**
    - 80 strategies that address trends and offer TMCs a range of options
  - **Implementation Tools**
    - Program level methods for implementing strategies
  - **Recommended Actions**
    - Next steps
- **The Use**

## The Context

- **Pressure on TMCs has never been greater**
  - Technology options increasing exponentially
  - Rapid pace of technology innovation
  - Public expectation of state-of-the-art information
- **A Time of Challenge and Opportunity for TMCs**
  - Proliferation of wireless communication
  - Rise of social media
  - Involvement of third parties

## The Content

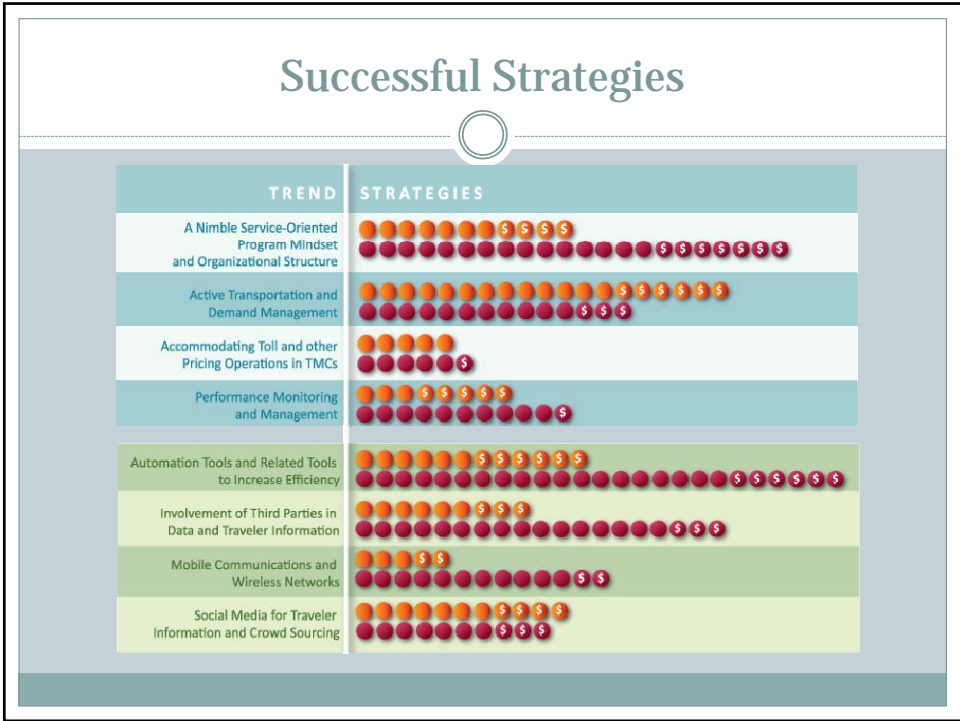
## The Trends

- Literature Review and Expert Input Determined 8 Top Trends and Issues
  - 4 From Transportation
  - 4 From Outside Transportation

	A Nimble Service-Oriented Program Mindset and Organizational Structure
	Active Transportation and Demand Management (ATDM) Concept and Toolkit
	Accommodating Toll and Other Pricing Operations in TMCs
	Performance Monitoring and Management
	Automation Tools and Related Tools to Increase Efficiency
	Involvement of Third Parties in Data Collection, Data Analysis, and Provision of Traveler Information
	Mobile Communications and Wireless Networks
	Social Media for Traveler Information and Crowdsourcing

## Successful Strategies

- Set of 80 applicable strategies that address the 8 trends
  - Primary trend addressed by strategy
  - ⚡ Primary trend addressed potentially feasible on limited budget
  - Secondary trend addressed by strategy
  - ⚡ Secondary trend addressed potentially feasible on limited budget



## Trend 1

# **A Nimble Service-Oriented Program Mindset and Organizational Structure**

## A Nimble Service-Oriented Program Mindset and Organizational Structure

- Constantly looking for ways to improve and embrace change, positions TMCs to be able to effectively change and to successfully select and adopt rapidly changing technologies.
- **Sample strategies:**
  - Share data among agencies
  - Create a TMC Operator Training Program
  - Require application programming interfaces and document for future development

## Strategy Scenario

- A Nimble Service-Oriented Program Mindset and Organizational Structure
- **Strategy:** Require application programming interfaces and document for future development
  - Makes it easier for operators to learn new programs
  - Use of open source APIs provides for innovation and continues technological relevance of traveler information dissemination by government agencies
  - Example: San Francisco SFpark program



## Trend 2

# Active Transportation and Demand Management (ATDM) Concept and Toolkit

## Active Transportation and Demand Management Concept and Toolkit

- FHWA groups ATDM approaches into demand-side, traffic, and parking areas.

Active Demand Management	Active Traffic Management	Active Parking Management
<ul style="list-style-type: none"> <li>•Dynamic Ridesharing</li> <li>•On-Demand Transit</li> <li>•Dynamic Pricing</li> <li>•Predictive Traveler Information</li> </ul>	<ul style="list-style-type: none"> <li>•Dynamic Lane Use Control</li> <li>•Dynamic Speed Limits</li> <li>•Queue Warning</li> <li>•Adaptive Ramp Metering</li> </ul>	<ul style="list-style-type: none"> <li>•Dynamically Priced Parking</li> <li>•Dynamic Parking Reservation</li> <li>•Dynamic Way-Finding</li> <li>•Dynamic Parking Capacity</li> </ul>

- Sample strategies:
  - Implement a suite of emerging transportation concepts, coordinating as necessary
  - Integrated Corridor Management (ICM)
  - Create new technology piloting and testing program

## Strategy Scenario

- Active Transportation and Demand Management (ATDM) Concept and Toolkit
- **Strategy: Integrated Corridor Management**
  - Utilizes extensive modeling to underpin a multi-jurisdictional, multi-modal, and multi-technological approach to maximizing efficiency.
  - Relies heavily upon cooperation among agencies.
  - Example: Niagara International Transportation Technology Coalition cross-border project

## Trend 3

### **Accommodating Toll and Other Pricing Operations in TMCs**

## Accommodating Toll and Other Pricing Operations in TMCs

- The growing need for tolling will require TMCs to manage infrastructure pricing (by agency staff, public-private partnerships, or agency outsourcing).
- Sample strategies:
  - Develop protocols for operations during early feasibility planning
  - Specify automation features in software contracts
  - Consider increased network reliability and data security needs



Source: WSDOT Flickr Photostream

## Strategy Scenario

- Accommodating Toll and Other Pricing Operations in TMCs
- **Strategy:** Consider increased network reliability and data security needs
  - Addresses pricing projects' need for data intensive environment predicated on real time operations and financial management
  - Meets reliability and data security needs beyond the normal DOT standards



## Trend 4

### Performance Monitoring and Management

#### Performance Monitoring and Management

- Over the next 10 years, it is expected that there will be a greater need to monitor performance through data collection and analysis as well as to apply the knowledge to promote more efficient operations.
- Sample strategies:
  - Utilize predictive analysis and forecasting for anticipating congestion
  - Utilize features in software to track and report performance
  - Utilize on-board device data from agency vehicles to monitor pavement condition



## Strategy Scenario

- Performance Monitoring and Management
- **Strategy:** Utilize on-board device data from agency vehicles to monitor pavement conditions
  - As the cost of sensors drop, it becomes feasible to collect data by outfitting agency vehicles engaged in their normal activities to collect information.
  - Example: Michigan DOT

## Trend 5

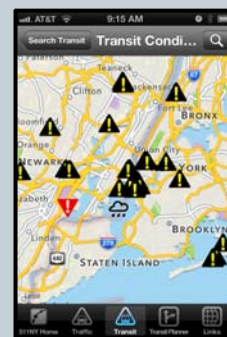
### **Automation Tools and Related Tools to Increase Efficiency**

## Automation Tools and Related Tools to Increase Efficiency

- TMCs can take advantage of new technologies to improve system management, cost-effectiveness, and productivity.
- Sample strategies:
  - Use advanced graphical user interfaces to increase operator efficiency
  - Utilize features in software to track and report performance
  - Consolidate interfaces to or consolidate alert systems across agencies

## Strategy Scenario

- Automation Tools and Related Tools to Increase Efficiency
- **Strategy:** Consolidate interfaces to or consolidate alert systems across agencies
  - Promotes information and data sharing along with software or traffic problem-solving discussions through a unified interface
  - Example: New York 511 app



## Trend 6

### **Involvement of 3rd Parties in Data Collection, Data Analysis, and Provision of Traveler Information**

#### Involvement of 3rd Parties in Data Collection, Data Analysis, and Provision of Traveler Information

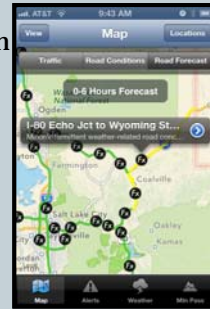
- Third party involvement includes utilizing data services provided by third-party vendors to manage traffic on roadway networks and deliver traveler information to the public. Third parties also provide data analysis and storage services and offer traveler information to agencies and directly to the public.
- **Sample strategies**
  - Share data among agencies
  - Consider increased network reliability and data security needs
  - Utilize private sector meteorological services or in-house meteorological resources

## Strategy Scenario

- Involvement of 3rd Parties in Data Collection, Data Analysis, and Provision of Traveler Information

- **Strategy:** Use Private Sector Meteorological Services or In-House Meteorological Resources

- Enhances ability of operators to be more proactive and responsive to roadway incidents and congestion
- Meteorologists can provide continuous forecasting and can coordinate directly with a designated TMC operator on providing travel advisories during weather events.
- Example: Utah DOT



## Trend 7

### Mobile Communications and Wireless Networks

## Mobile Communications and Wireless Networks

- Mobile communications can generate data used by TMCs and transmit that data almost instantaneously to allow traveler to access information almost continuously and provide convenient platforms to monitor, test, and maintain field devices and other TMC equipment.
- Sample strategies:
  - Research solutions that others have used to solve similar problems
  - Efficiently expand field device coverage and reduce operations cost using wireless networks
  - Utilize commercial mobile devices and apps to support collaboration between freeway service patrol and other emergency responders, TMC operations staff, and field maintenance staff for improved communication and enhanced field collaboration



Source: Parsons Brinckerhoff, Inc.

## Strategy Scenario

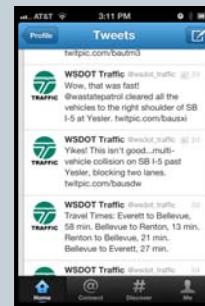
- Mobile Communications and Wireless Networks
- **Strategy:** Utilize commercial mobile devices and apps to support collaboration between freeway service patrol and other emergency responders, TMC operations staff, and field maintenance staff for improved communication and enhanced field collaboration
  - Exchange information through application sharing from the operator's machine to the responder's mobile device
  - Example: Minnesota and Nevada DOT maintenance vehicles

## Trend 8

### Social Media for Traveler Information and Crowdsourcing

#### Social Media for Traveler Information and Crowdsourcing

- Social media tools, such as Twitter and Facebook, allow targeted real-time two-way communication among and between agencies, travelers and third parties. This opens up great possibilities for TMCs to both receive and distribute information.
- Sample strategies
  - Portable work zone ITS systems
  - Regional or multi-state coordination of detours and traveler information
  - Provide incentive for drivers to participate in crowdsourcing



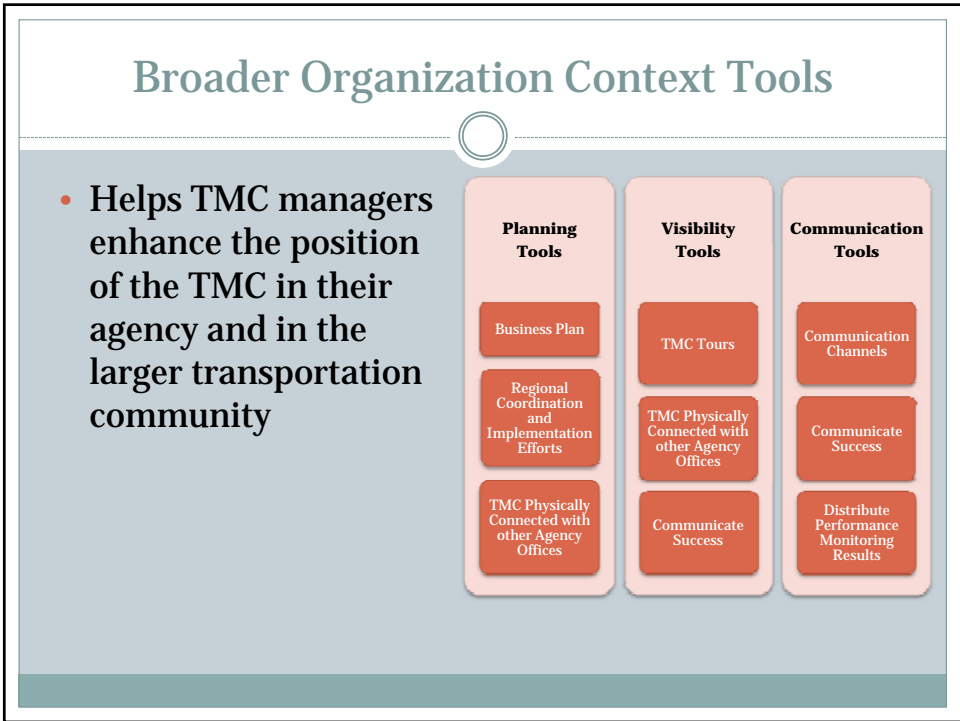
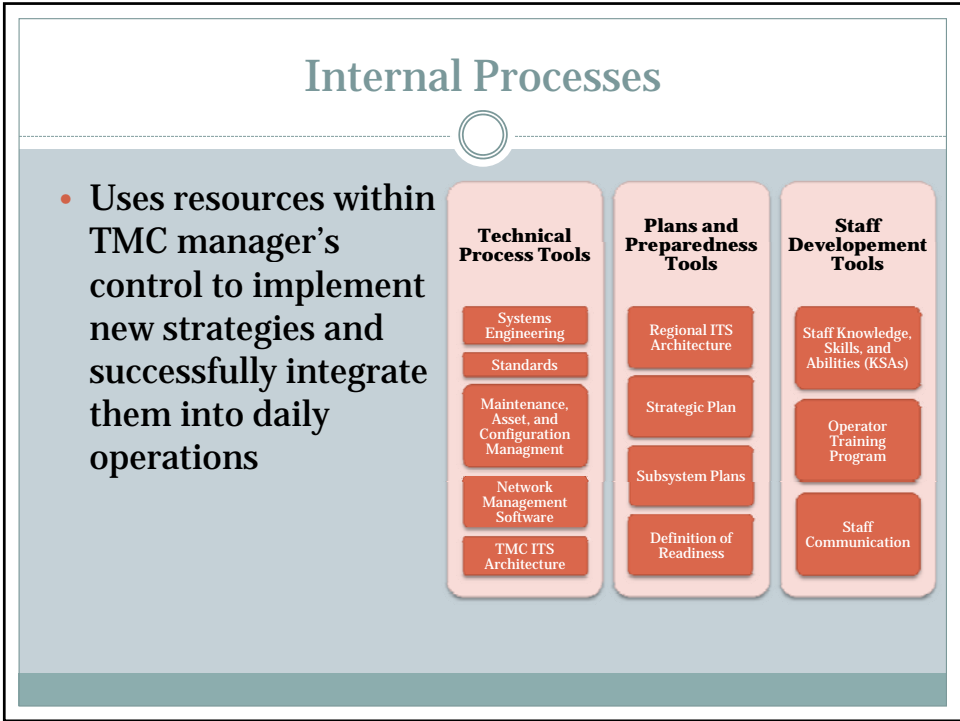
## Strategy Scenario

- Social Media for Traveler Information and Crowdsourcing
- **Strategy:** Provide incentive for drivers to participate in crowdsourcing
  - Show contribution to more effective transportation system operations and more reliable travel times
  - Define and share a strict privacy policy; allow for opt-in and opt-out
  - Example: Waze

## Implementation Tools

- Program level tools that support implementation of the set of strategies selected
- Two interdependent areas supporting organizational change:
  - Technological and internal processes that can typically be applied directly by the TMC manager
  - Coordination of TMC processes within the broader organizational context



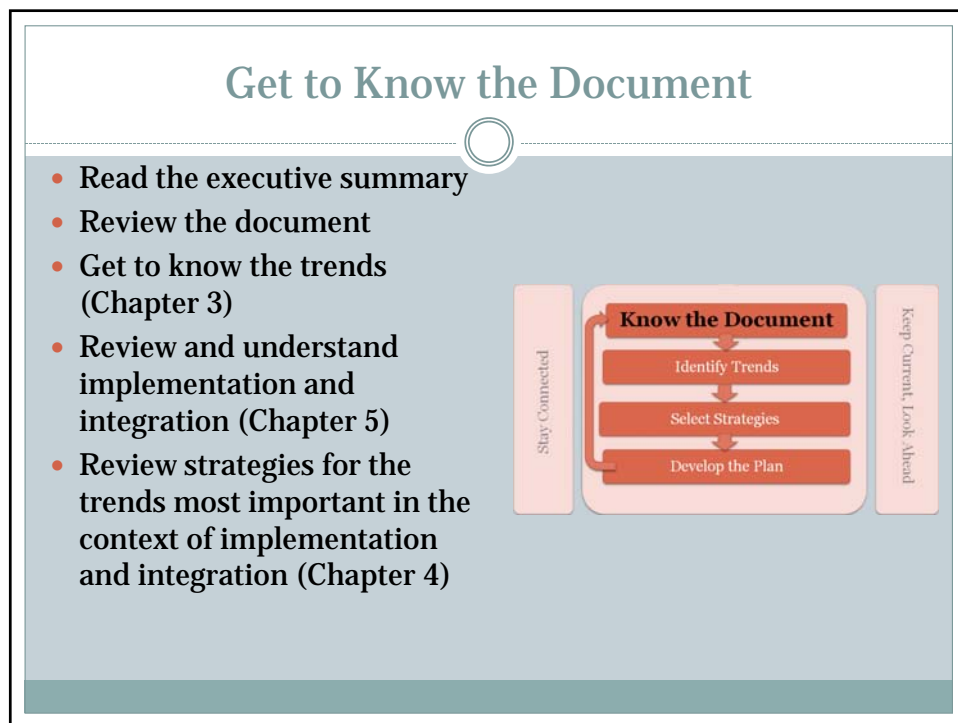
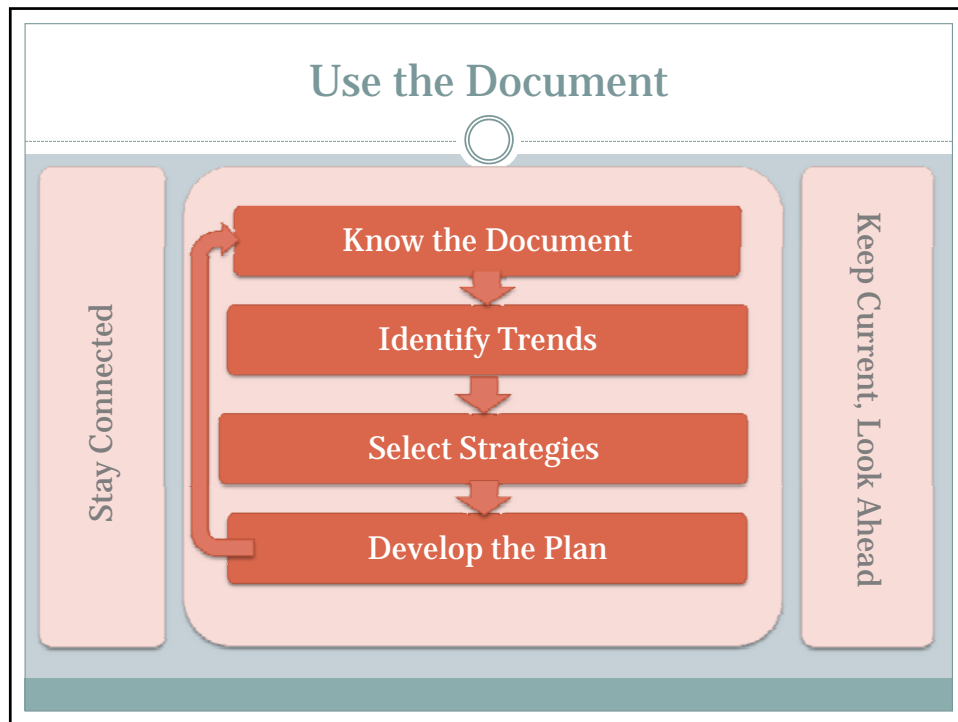


## The Use

### How to Use This Document

#### “How To” Steps

- Get to know the document and its tools
- Identify the trends (Chapter 3)
- Select strategies (Chapter 4)
- Develop plan (Chapter 5)
  - Selected strategies
  - Implementation opportunities and challenges
  - Internal TMC processes
  - External position
  - Iterate
- Keep current and look ahead (Chapter 5)
  - Adjust the plan as needed
- Stay connected (Chapter 6)



## Tools to Help the TMC Manager

- **Top trends tables for easy reference of strategies to be considered**
- **Checklists to help a TMC manager in implementing the strategies selected, including:**
  - Internal TMC Process Checklist for Technical Processes
  - Internal TMC Process Checklist for Plans and Preparedness
  - Internal TMC Process Checklist for Staff Development
  - Broader Organizational Context Checklist for Planning
  - Broader Organizational Context Checklist for Visibility
  - Broader Organizational Context Checklist for Communication
  - Recommended Actions Checklist for Selecting Strategies
  - Recommended Actions Checklist for Staying Informed on Technological Advancement
  - Recommended Actions Checklist within the Broader Organizational Context

## Example Checklist

Internal TMC Process Checklist for Technical Processes	
<input type="radio"/>	<b>Develop specific systems engineering actions tailored to your TMCs' processes</b>
<input type="checkbox"/>	TMC role in system/project requirements definition
<input type="checkbox"/>	TMC role in system/project implementation
<input type="checkbox"/>	TMC role in system/project integration
<input type="checkbox"/>	TMC role in system/project verification and testing
<input type="checkbox"/>	TMC role in system/project operations and maintenance
<input type="radio"/>	<b>Adopt standards and include them in applicable agency specifications</b>
<input type="checkbox"/>	National ITS standards
<input type="checkbox"/>	Ethernet networking, including network architecture and IP addressing schemes
<input type="radio"/>	<b>Implement maintenance, asset, and configuration management systems</b>
<input type="checkbox"/>	Link maintenance management system to developed data quality standards
<input type="radio"/>	<b>Use Ethernet network management software</b>
<input type="radio"/>	<b>Develop ITS Architecture for the TMC and its systems</b>
<input type="checkbox"/>	Assure that the TMC architecture is consistent with the Regional ITS Architecture
<input type="checkbox"/>	Review and update the TMC architecture when new systems are implemented

## Identify Key Trends (Chapter 3)

- Applicable to technical, physical, and organizational situation
- Keep in mind the strategies supporting the trend
- Select trends with highest impact or payoff
  - Specific to your organization
- Select trends with high likelihood of occurring



## Select Strategies (Chapter 4)

- Consider agency constraints
  - Funding and cultural
- Consider agency goals and objectives
- Compile supporting facts, reasoning, and justification
- Devise a back-up plan
- Gather input from stakeholders
- Include selected strategies in TMC Business Plan
- Investigate funding mechanisms



## Develop Plan (Chapter 5)

- Start with selected strategies
- Identify implementation opportunities and challenges
- Improve internal TMC processes
- Enhance external position
- Iterate



## Keep Current and Look Ahead (Chapter 5)

- Internal processes to prepare for advancing technology
  - Systems engineering
  - Strategic plan
  - Staff training
- External processes / products
  - Business plan
  - Visibility
  - Communicate success



## Stay Connected (Chapter 6)

- **Participate in industry webinars and trainings**
- **Keep current on industry publications**
  - Focus on high-level understanding
  - Collaborate with colleagues
- **Ask for ITS device demonstrations**
  - Especially for new products
- **Consider membership in professional organizations**
- **Participate in local, regional, and national professional meetings**
  - Share meeting minutes and highlights with staff



## In Conclusion

- **An explosion of technologies coupled with diminished resources forces TMC managers to choose wisely for the future**
- **We identified 8 key trends that will impact the industry over the next 10 years**
- **80 strategies, including several lower cost ones, address the key trends**
- **Program-level implementation and integration tools help to establish a supportive climate**

## For More Information



- Detailed descriptions and worksheets are available in the report:

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Transportation Management Center  
Operations**