

Lecture 21: Operations and Security

- **Role of AVL Technology in Improving Service Delivery**
 - **AVL Applications**
 - **Service and Operations Control**
 - **Real-time Control Strategies**
 - **Real-time Passenger Information Systems**
 - **Decision Tree for IT applications**
- **Security**
 - **General**
 - **Terrorism**

AVL Applications

1. **Service and operations control**
2. **Passenger information**
 - pre-trip
 - en route
 - automated stop announcements
3. **Emergency response**
4. **Signal priority**
5. **Performance monitoring**
6. **Operations planning**
7. **Incident investigation**
8. **Automatic fare collection schemes**

Service and Operations Control

Prior History

- significant trials in 1970s
- relying on central control
- generally disappointing results

Important Questions

- what level of “support” should be provided to the decision-maker?
- who should the decision-maker be:
 - the driver
 - the central controller
 - the field supervisor
- how early to intervene?
- what benefits are achievable?
- what is the value of additional information?

General Operations Control Problem

- **Operating costs are fixed in short-run**
- **Provide best possible service quality**
 - **waiting time**
 - **riding time**
 - **transfers**

Real-Time Control Strategies

- **Holding: scheduled-based or headway-based**
- **Short-turning**
- **Expressing**
- **Deadheading**
- **Using reserve vehicle**

Holding

Benefitted passengers:

- **boarding beyond holding point**

Disbenefitted passengers:

- **those on board at holding point**

Ideal scenario:

- **midway along route**
- **few through passengers**
- **short preceding headway, long following headway**

Real-Time Control Strategies

Short-turning

Benefitted passengers:

- reverse direction passengers boarding after short-turn point

Disbenefitted passengers:

- passengers travelling past short-turn point
- reverse direction passengers boarding before short-turn point

Ideal scenario:

- close to end of route
- few through passengers
- heavy reverse direction passenger flow
- long preceding headway, short following headway

Real-Time Control Strategies

Expressing

Benefitted passengers:

- those travelling beyond the express segment those boarding after the express segment

Disbenefitted passengers:

- those travelling to skipped segment
- those boarding in skipped segment

Ideal scenario:

- start and end express segment at major boarding points
- long preceding headway, short following headway

Real-Time Control Strategies

Deadheading

Similar to expressing but no passengers carried over express segment

Need to start deadhead at a terminal

Using Reserve Vehicles

Issues:

- how many vehicles to hold in reserve
- when to deploy them

Real-Time Passenger Information Systems

Objectives:

- to increase public transport ridership
- to improve satisfaction of current riders

Pre-trip information systems aim to influence:

- mode selection
- trip timing

En route systems aim to influence:

- customer satisfaction
- ease of use

Focus has been on “en route” systems with many European systems:

- London, etc.

Real-Time Passenger Information Systems

Findings to Date:

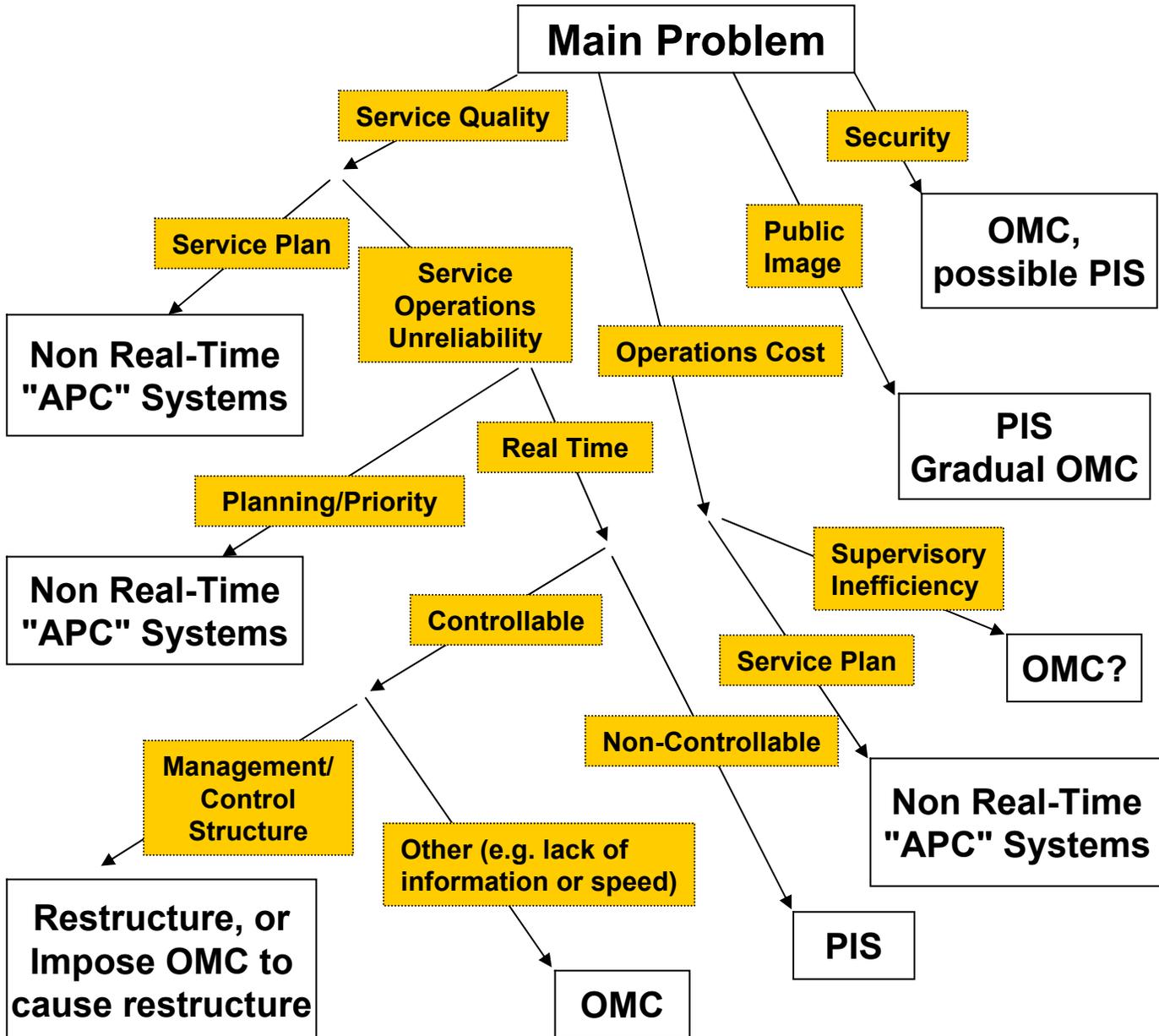
- forecasting bus arrival time is feasible
- passengers place value on the information
- ridership gains have been modest
- cost-effectiveness of AVL systems for this purpose alone is highly uncertain
- not a substitute for good static information

Other analysis (Hickman 1993) suggests:

- modest benefits from real-time information on transit path choice for realistic networks

Real-time information is only one element of higher public transport service quality: increasing ridership will require a much more comprehensive approach.

Decision Tree for Application of Information Technologies



OMC = Operations Monitoring and Control

PIS = Passenger Information Systems

Summary

Operation Control Findings

- typical impact of AVL on operations control has been small
- value of providing the vehicle operator more information
- defining role of “controller” as supporting the operator
- decision support systems not developed to date

Passenger Information Findings

- benefits are largely speculative in terms of ridership and revenue
- real-time systems not a substitute for good static information
- may be useful “add-on” to AVL system where service reliability is a chronic problem

Performance Monitoring, Operations Planning, and Operations Analysis

- increasingly important functions
- no real-time requirements
- low-cost technology

Conclusions

- 1. Getting the drivers support is critical.**
- 2. Full benefits from AVI/AVL/AVM systems require multiple uses of data.**
- 3. A “systems level” view is required in designing these applications**
- 4. Most of the critical questions raised are unanswered.**

Transit Security

- **Security is the freedom from intentional danger**
- **Safety is the freedom from danger**
- **The perceptions of security are a critical factor in discouraging transit use**
- **General security vs terrorism**

Strategies for Improving Security

- **Ordinances regulating quality of life crimes**
- **Concessions**
- **Management options**
- **CCTV**

Ordinances Regulating Quality of Life Crimes

- **Regulations against various offenses on transit property, e.g. disorderly conduct, drunkenness, etc.**
- **Agencies can then enforce these regulations to ensure customers do not feel the transit environment is out of control: zero tolerance policing**

Concessions

- **Concessions can be located in different areas:**
 - directly outside the station area
 - in large intermodal stations as mixed-use development
 - within station but outside paid area
 - at platform area
- **Station area concessions generally believed to deter crime by increasing level of activity**
- **Within station is more controversial -- can contribute to violation of regulations (littering, eating and drinking on vehicles, etc.)**

Management Options

- **Who provides the security services: transit police, local police, security guards, non-security personnel**
- **Evolution from fare collector to station managers with AFC systems**
- **Good combination is:**
 - **security guards trained to maintain order, including issuing fines and tickets**
 - **work in partnership with local police, station staff, and maintenance workers**
 - **station agents should manage the station area, provide information and ensure maintenance**
 - **maintenance staff**

Closed Circuit Television

- **Widely used in transit to monitor station areas and deter offensive behavior**
- **CCTV installation can be + or - in terms of perceptions**

Terrorism

- **Transit is by design an open infrastructure**
- **Depends on high volumes and rapid passenger flows onto vehicles, into stations**
- **Can be a critical element in responding to terrorism threats elsewhere**
- **Need to have well-established and visible plans and well-trained staff**
 - **to deter attacks**
 - **to minimize risks if an attack does occur**

Key Agency Security Efforts

Transit Response

- **Training employees**
- **Outreach to customers**
- **Sharing of best practices between transit agencies**
- **Increased visibility**
- **Increased staffing presence**
- **Vulnerability assessments**
- **Use of canine units**
- **Development/refinement of security & emergency preparedness plans**
- **Develop/strengthen inter-agency coordination**
- **Employee & contractor background checks**
- **Drills (field and table-top)**

Key Agency Security Efforts

Capital Projects

- Upgrade of radio communications
- Automatic vehicle location (AVL)
- CCTV (facilities and vehicles)
- Access control (fencing, locks, smart cards)
- Intrusion detection
- Employee/ contractor ID
- Chemical agent detection
- Overall design to enhance security

Industry Challenges and Needs

Future Focus

- **Sources of Direct Transit Funding for New Era Security Needs**
- **Ongoing Technical and Training Support**
- **Verifying Effectiveness of Security Technologies**
- **Low Cost “Real-Time” Chem/ Bio/ Radiological Detection**
- **Maintaining an Effective *Public Transit ISAC***
- **Frequent/ Aggressive Communication to Industry**
- **Application of Threat Advisory Guidelines**
- **Inter-agency Emergency Coordination, Communications & Drills**
- **Security Sensitive Procurement Processes**