Eskisehir Technical University
Civil Engineering Department

Introduction to Transportation Planning

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Week 4

- Sussman’s 30 Key Points

Purpose of 30 Key Points

- Sussman's 30 Key Points provide an insight to the most important aspects of the transportation systems.

  Specifically;

  - Planning and operational perspectives
  - Integration with social, economical and political aspects
  - Evaluation of cost and LOS (level-of-service)

30 Key Points

1. People and organizations alter behavior based on transportation service expectations.

    - running to catch a bus or elevator

2. Transportation service is part of a broader system -- economic, social and political in nature.

    - your primary purpose?

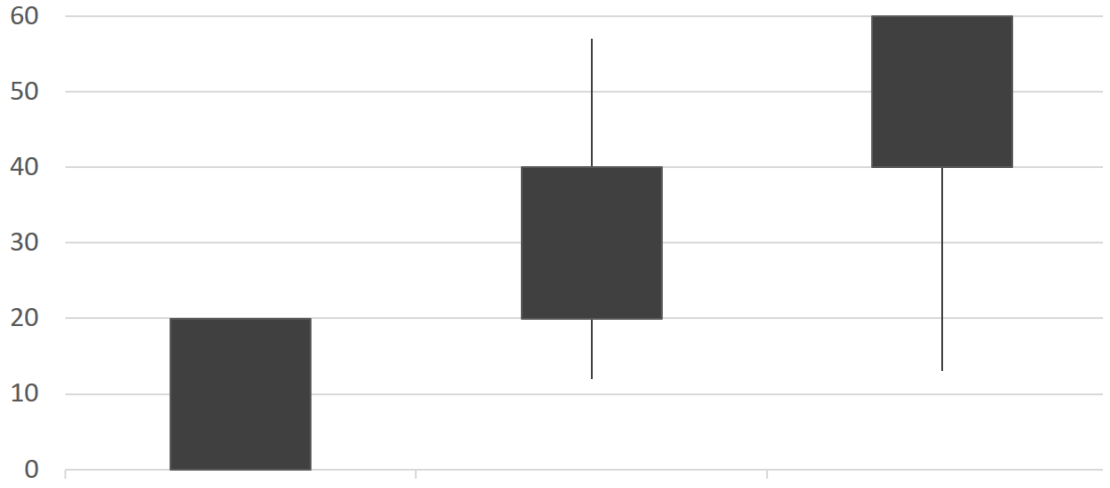
3. Competition (or its absence) for customers by operators is a critical determinant of the availability of quality transportation service.

    - different bus service providers on same route

30 Key Points

4. Analyzing the flow of vehicles on transportation networks, and defining and measuring their cycle, is a basic element of transportation systems analysis.

(cycle)



30 Key Points

5. Queuing for service and for customers and storage for vehicles/freight/travelers, etc., are fundamental elements of transportation systems.

- Çarsi Tram Stations
- Providing waiting areas for cabs

30 Key Points

6. Intermodal and intramodal transfers are key determinants of service quality and cost.

    - waiting a lot at transfer centre, low quality, yüksek maliyet

7. Operating policy affects level-of-service.

    - Quality of service

8. “Capacity” is a complex, multi-dimensional system characteristic affected by:

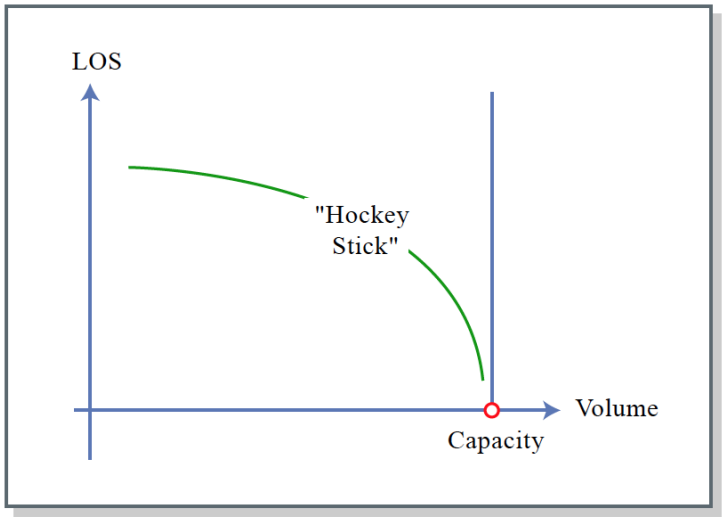
    Infrastructure — vehicles

    labor — technology

    institutional factors — operating policy

    external factors (e.g., “clean air”, safety, regulation)

30 Key Points



9. Level-of-service = ƒ(volume); Transportation Supply.

As volume approaches capacity, level-of-service deteriorates dramatically -- the “hockey stick” phenomenon.

30 Key Points

10. The availability of information (or the lack) drives system operations and investment and customer choices.
    - Real-time information
11. The “shape” of transportation infrastructure impacts the fabric of “geo-economic” structures.
    - A system with 60 elevators going to each floor!
    - Import/Export
    - regional power!,
    - Increase in highway construction?

30 Key Points

12. The cost of providing a specific service, the price charged for that service, and the level-of-service provided may not be consistent.
    - The same level of service to each floor, or to each person?

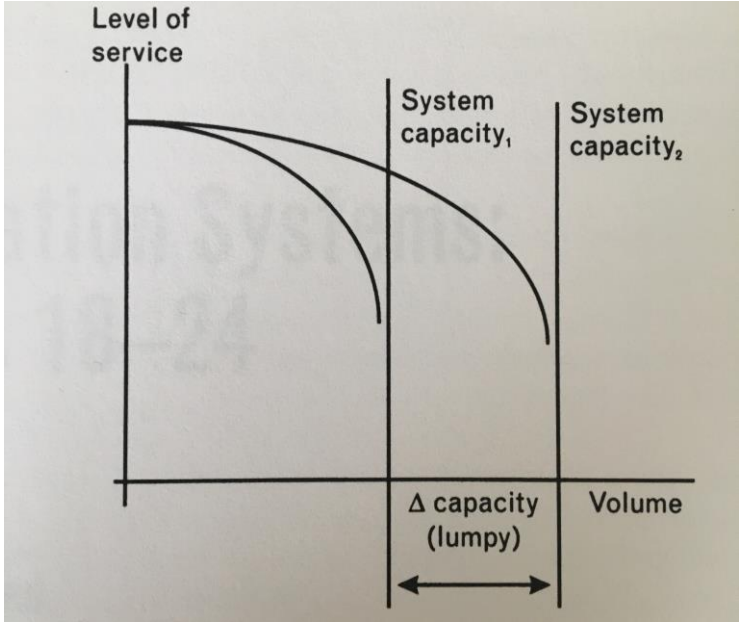
13. The computation of cost for providing specific services is complex and often ambiguous.
    - number of parameters, equality, environmental effects, etc.
14. Cost/level-of-service trade-offs are a fundamental tension for the transportation provider and for the transportation customer, as well as between them.
    -Level of service and cost balance
    -Pricing and comfort complaints

30 Key Points

15. Consolidation of like-demands is often used as a cost-minimizing strategy.

    - hub-and-spoke (topla ve dağıt)

16. Investments in capacity are often lumpy (e.g., infrastructure).

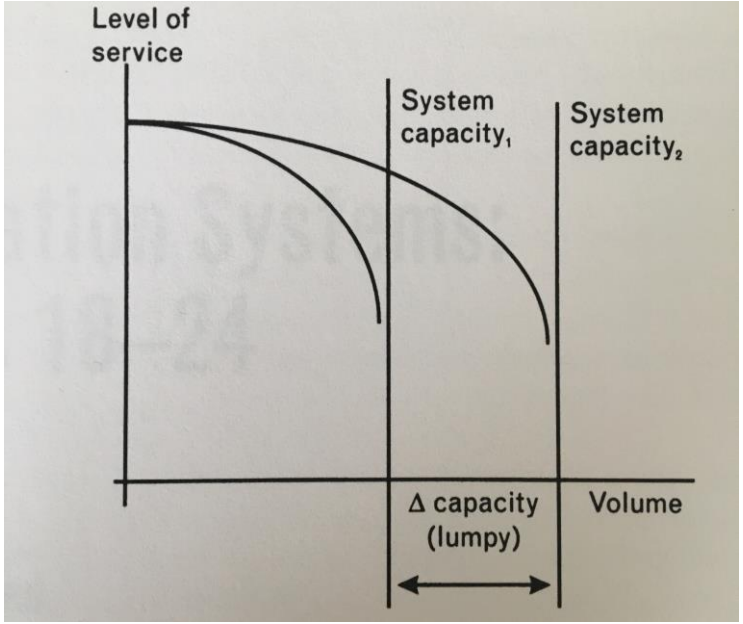


30 Key Points

17. The linkages between **capacity, cost and level-of-service** -- the lumpiness of investment juxtaposed with the "hockey stick" level-of-service function as volume approaches capacity -- is the central challenge of transportation systems design.

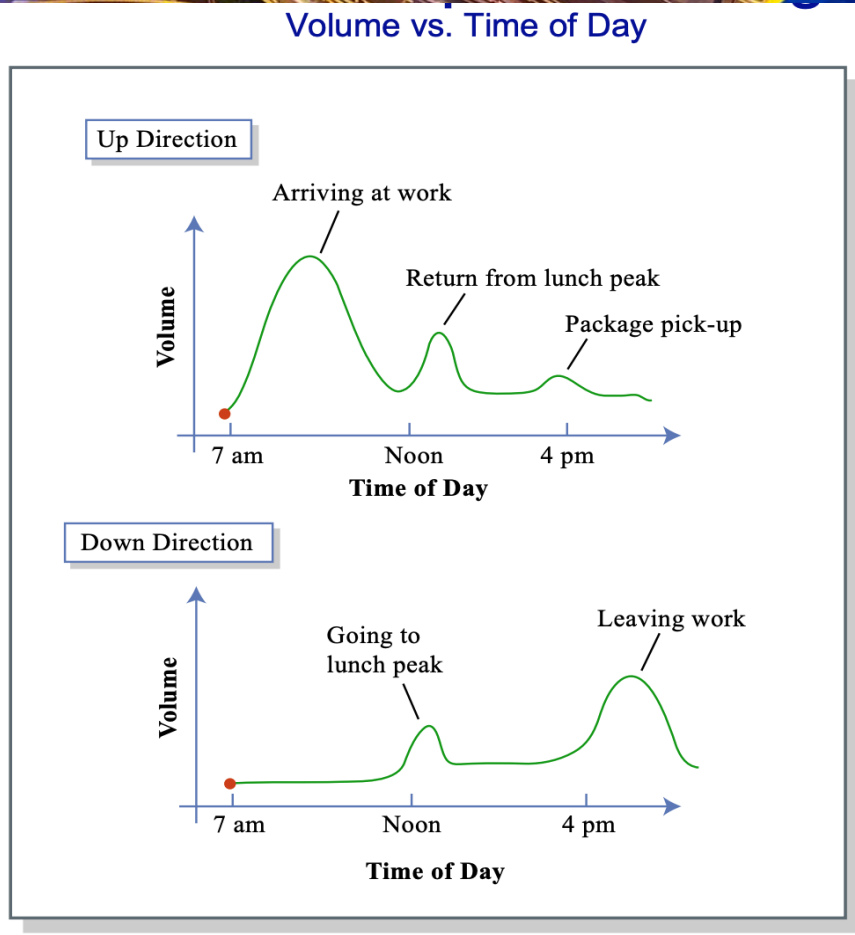
Capacity - insufficient =) LOS, competiton ⇩

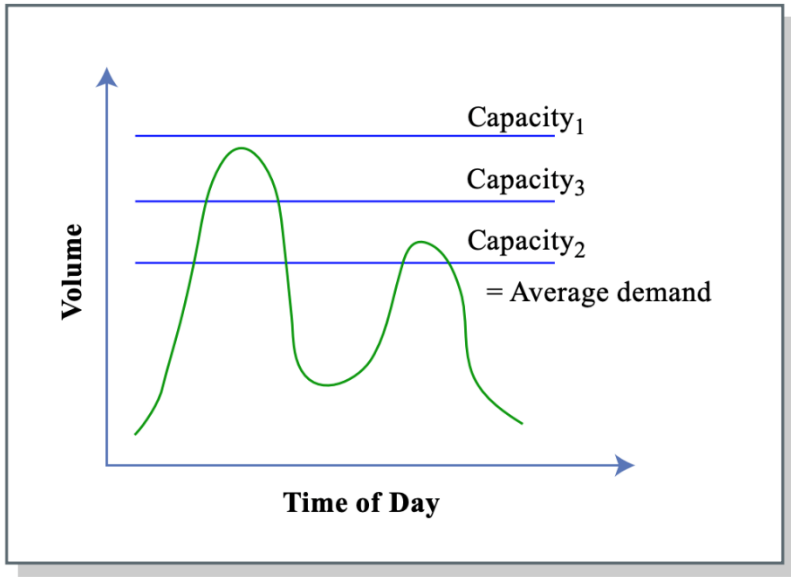
High Capacity =) Cost and Price ⇧



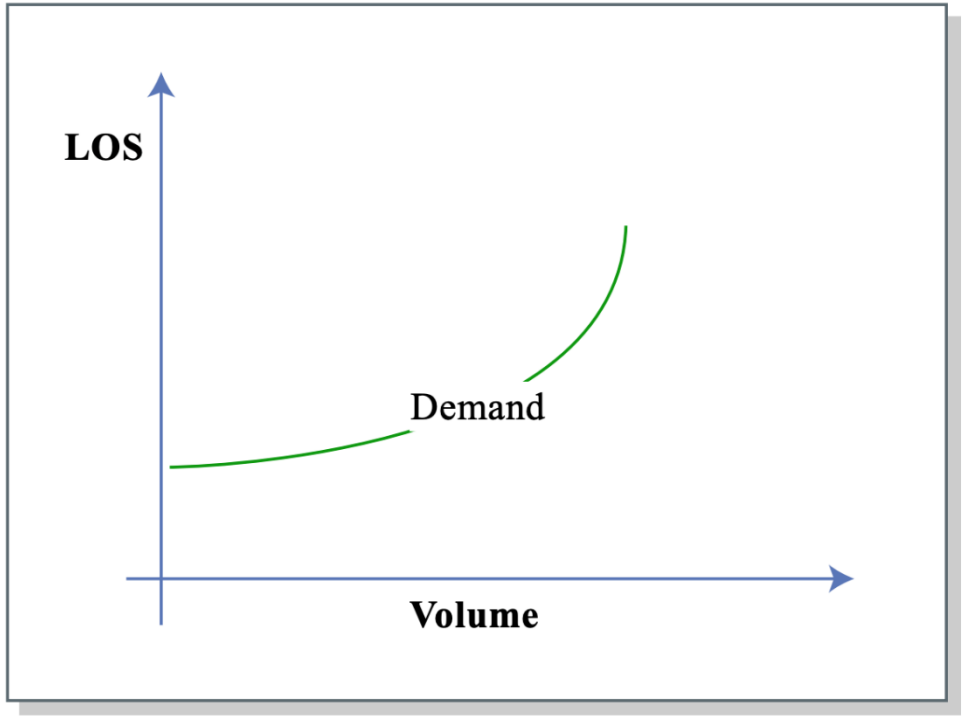
30 Key Points

18. Temporal peaking in demand: a fundamental issue is design capacity -- how often do we not satisfy demand?





19. Volume = ƒ (level-of-service); Transportation Demand.



30 Key Points

20. Level-of-service is usually multi-dimensional. For analysis purposes, we often need to reduce it to a single dimension, which we call utility.

21. Different transportation system components and relevant external systems operate and change at different time scales, e.g.,

    Short run -- operating policy

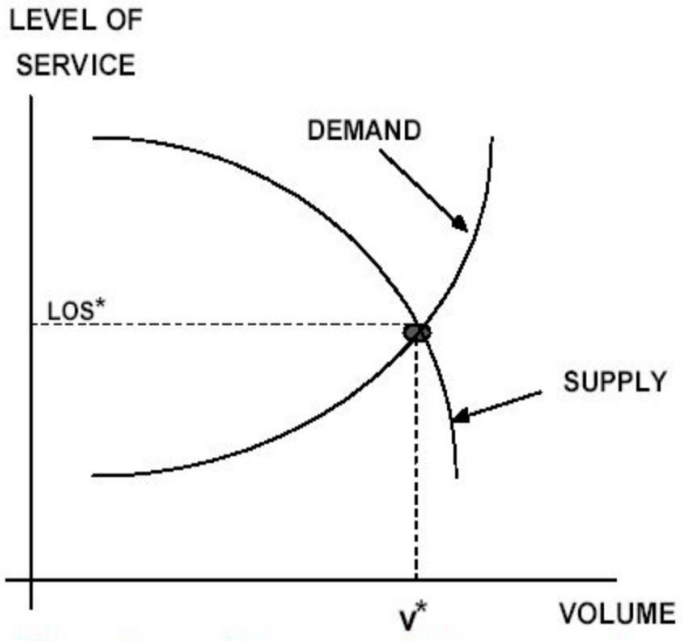
    Medium run -- auto ownership

    Long run -- infrastructure, land use

30 Key Points

22. Equilibration of transportation supply and demand for transportation service to predict volume is a fundamental network analysis methodology.

23. Pricing of transportation services to entice different behavior is a mechanism for lowering the negative externalities caused by transportation users on other users and society-at-large.



24. Geographical and temporal imbalances of flow are characteristic in transportation systems.

morning: towards city center

evening: towards suburbs

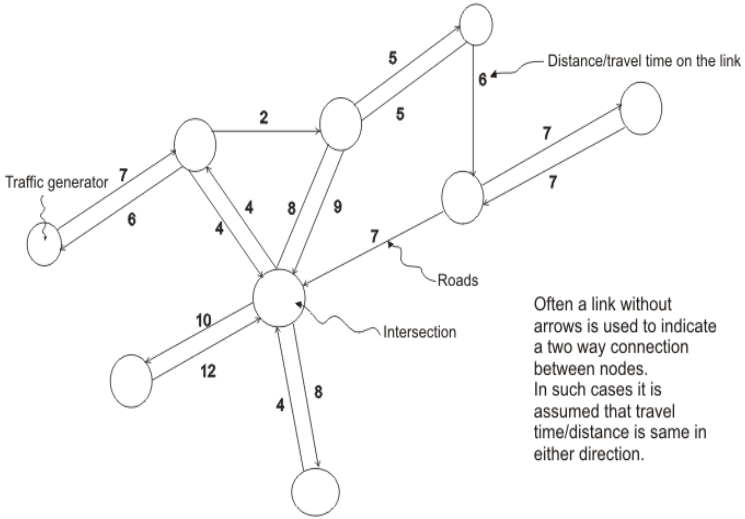
30 Key Points

25. Network behavior and network capacity, derived from link and node capacities and readjustment of flows on redundant paths, are important elements in transportation systems analysis.

Stadium

Roadwork

Traffic accident



30 Key Points

26. Stochasticity -- in supply and demand -- is characteristic of transportation systems.

27. The relationship among transportation, economic development, and location of activities -- the transportation/land-use connection -- is fundamental.

    -Agricultural or industrial production regions

28. Performance measures shape transportation operations and investment.

    -Receive feedback

30 Key Points

29. Balancing centralized control with decisions made by managers of system components (e.g., terminals) is an important operating challenge.

30. The integrality of vehicle/infrastructure/ control systems investment, design and operating decisions is basic to transportation systems design.

    -Elevator Shaft

    -Harbours

    -Roads

Level of Service - LOS

- LOS Parameters
  - Price / Fare
  - Travel time
  - Access time
  - Waiting time
  - Service frequency
  - Comfort
  - Service reliability

LOS Utility Function

LOS Parameters	Indicators	Constants	Signs	Bus
Travel Time	t_t	a_1	-	5sa
Access Time	t_a	a_2	-	1sa
Waiting Time	t_w	a_3	-	0,5sa
Fare	F	a_4	-	1sa
Comfort	H	a_5	+	1sa
Reliability	R	a_6	+	1sa

Utility Function:

$$V_i = a_0 + a_1 t_t + a_2 t_a + a_3 t_w + a_4 F + a_5 H + a_6 R$$

Utility Function:

$$V_i = a_0 + a_1 t_t + a_2 t_a + a_3 t_w + a_4 F + a_5 H + a_6 R$$

$$V_{Bus} = a_0 - 10 - 1 + 3 = a_0 - 8$$