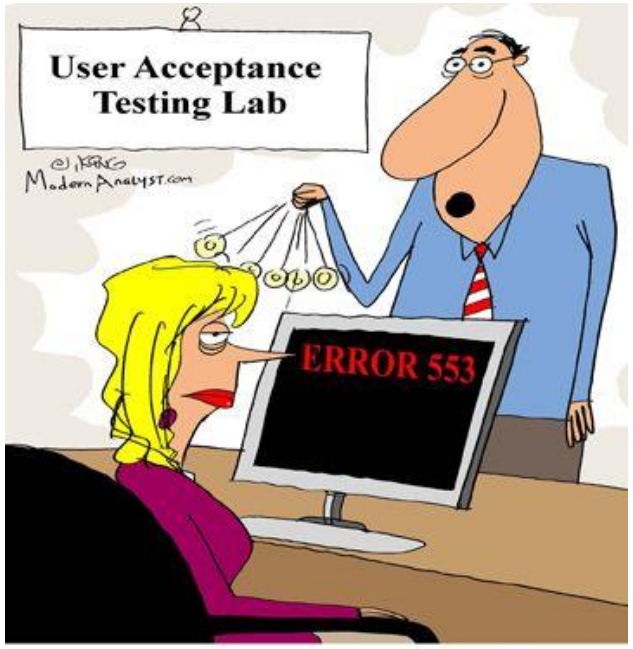
Lazy business analysts 'at work'...



"You love the system! ... You love the system!"

System Stakeholders; System Measures

10th Jan 2019.

System Acceptability

- The *degree of success* of any human-made system and its mission(s) ultimately depends on:

1. Whether the marketplace is ready for introduction of the system—an operational need driven **"window of opportunity."**

2. The User's perception of the system's ***operational utility*, *suitability*, and *availability*.**

3. The system's ability to accomplish the User's mission—*system* ***effectiveness***.

4. The return on investment (ROI) for the resources expended to operate and maintain the system— ***cost effectiveness***.

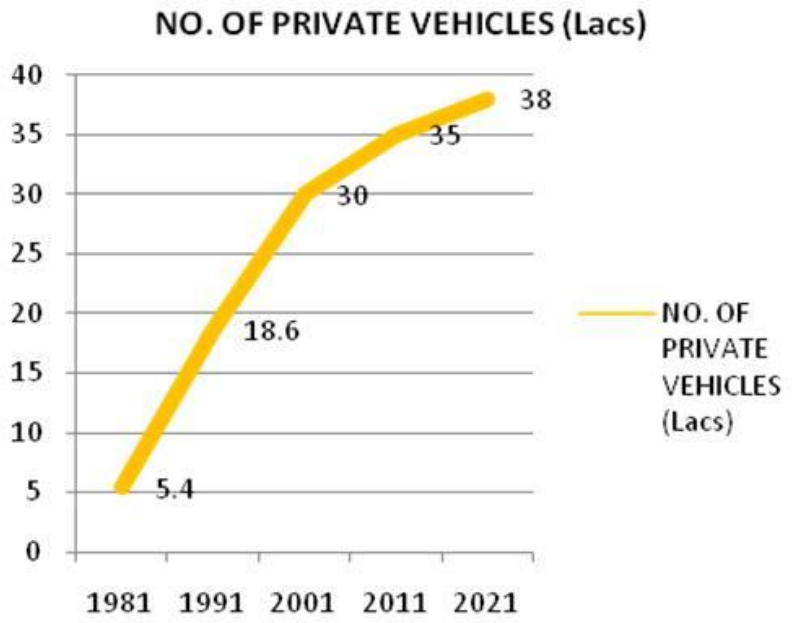
Different groups in the chain view this differently

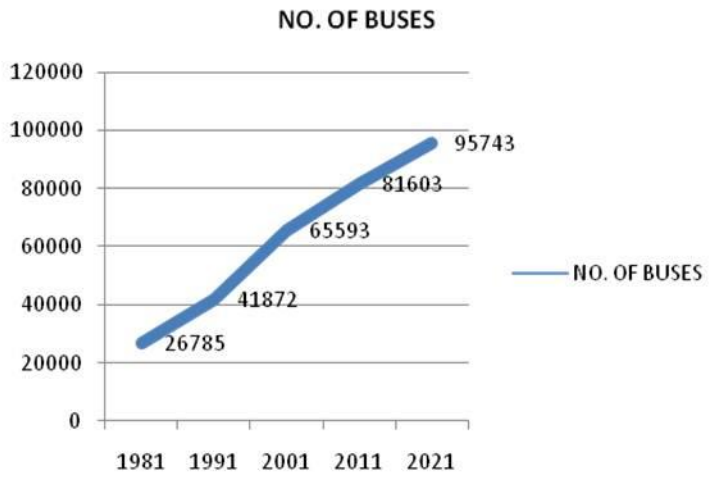
- Choice and Use of the System
- Objective assessment and measures
- Subjective measures

Example: Delhi metro - timeline

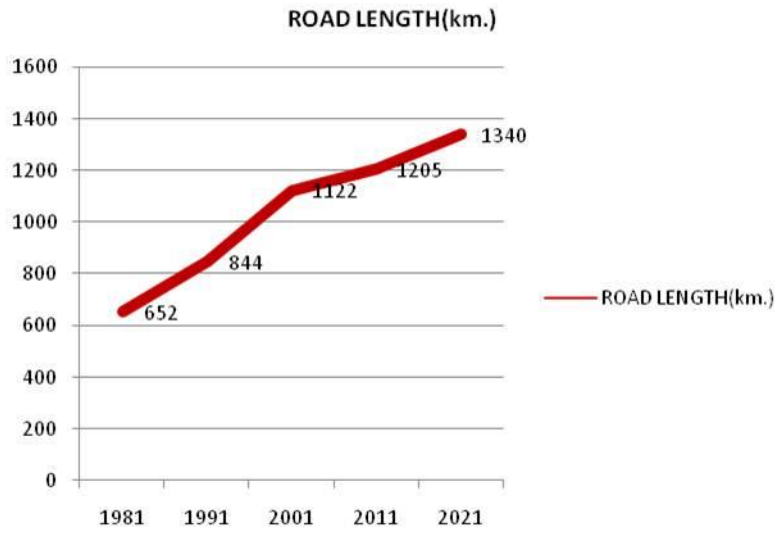
- 32 years of planning & feasibility studies – changes and reconfigurations.
- 1969-70 - CRRI carries exhaustive study on travel characteristics and demand projections
- 1975 - Metropolitan transport project (MTP), Delhi conducts survey and recommends MRTS having 36 km of underground and 97 km of elevated corridors
- 1984 - DDA prepares a perspective plan for traffic projections for 2001 and recommend a multi-modal transport system
- 1987 - The ministry of railways appoints task force to assess the choice of technology and recommends a pilot based on magnetic levitation system and light rail transit system
- 1990 - Rites limited submit feasibility report and recommend three component system comprising rail corridor, metro corridor and dedicated bus way with a total length of 198.5 km
- 1995 - The Delhi metro rail corporation limited is registered on may 3, 1995 under the companies act, 1956
- 1996 - The union cabinet approves the first phase of the Delhi metro project in September, 1996.
- 1998 - Work on the Delhi metro project starts on October 1, 1998
- 2002 - The first section of the Delhi metro (shahdara- tis hazari) opens to the public on December 25, 2002

The why of Delhi metro





Nearly 70% of these are two wheelers



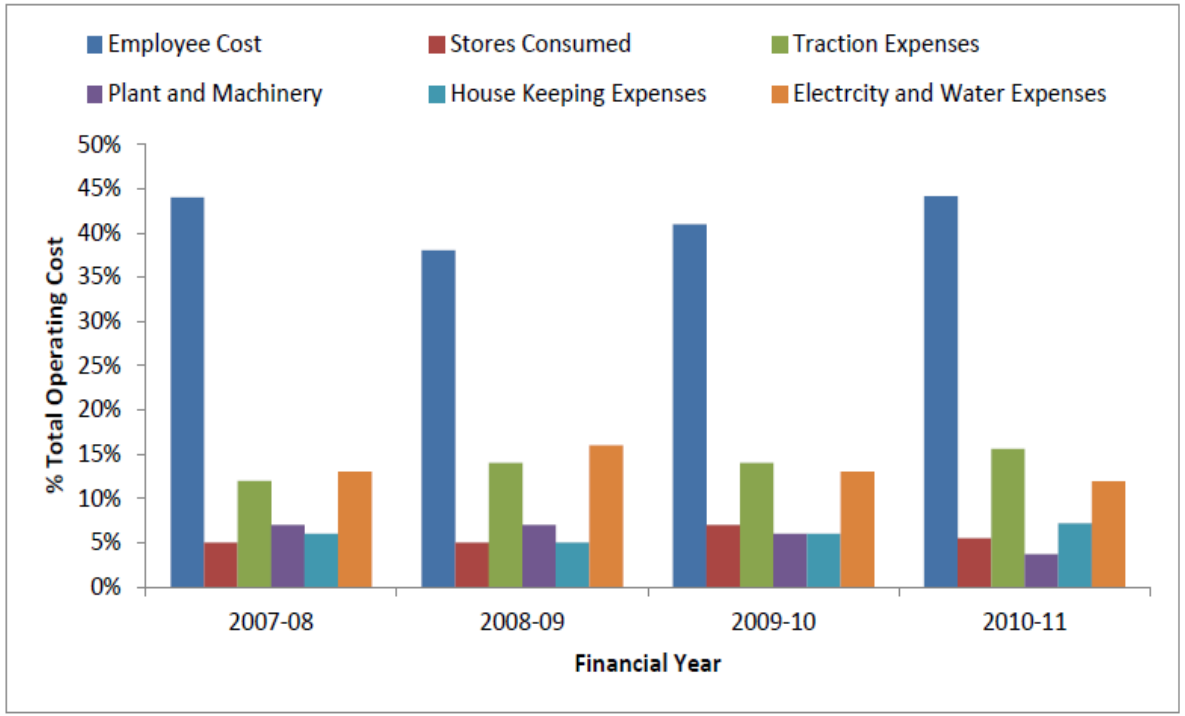
Costs

- Phase I: Rs. 10,571 crores
- Phase II has been estimated as Rs.19, 131 crores.
- Phase III is Rs. 41,079 crores.

In March 2014, the total pending amount of the JICA loan stood at Rs. 18,324.80 crores

But, the Delhi Metro has seen an enormous increase in ridership over the last 13 years and currently holds a record of the highest-ever ridership this year — about 25 lakh people in a single day.

Figure 10. Major components of operational cost and their percentage contribution



RoI

1. Traffic Operations: Income from train operation, feeder bus earnings, rental income of space for kiosks, parking, shops, restaurants, advertisements, sale of tender forms and sale of carbon credits.

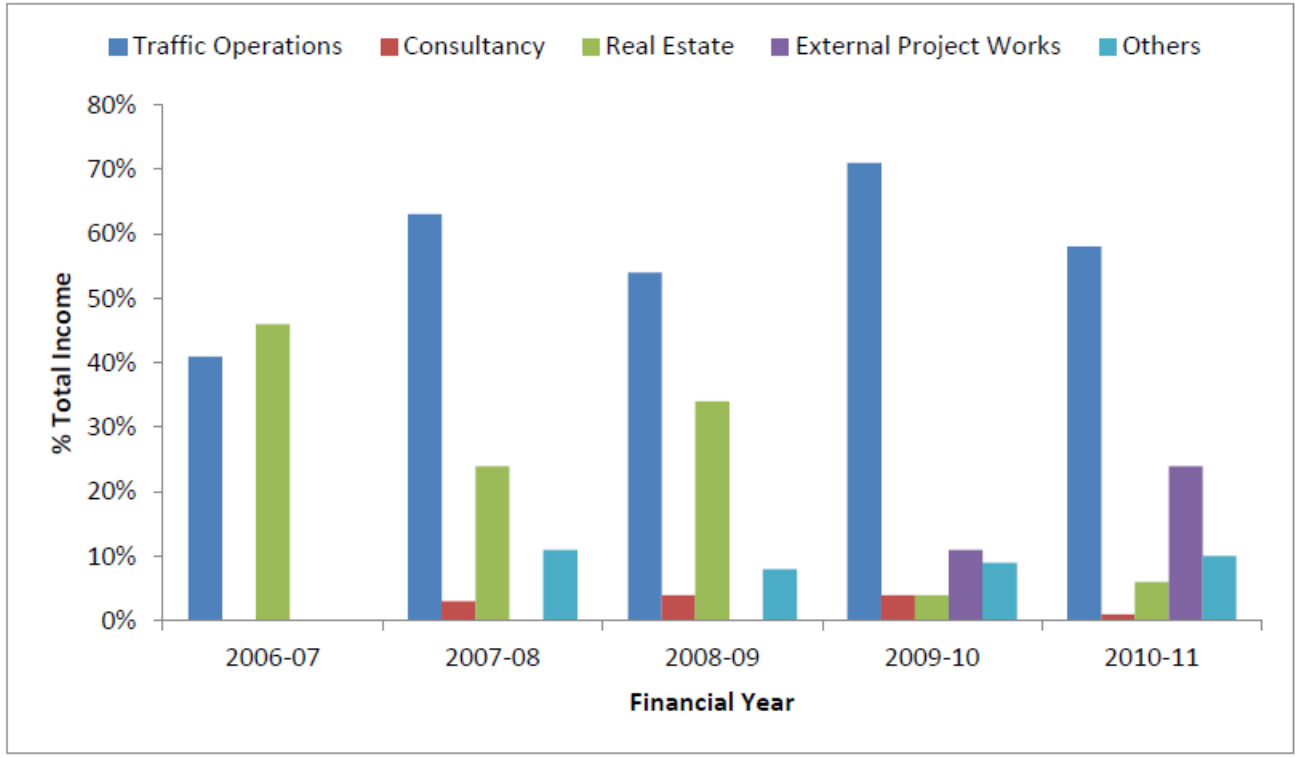
2. Consultancy: Income from consultancy services to other metro systems in India, and abroad, and sale of tender forms.

3. Real Estate: Income from sales of land, and leases.

4. External Project Works: Income from works carried out in other metro projects.

5. Others: Deferred government grant, income from sale of carbon credits, sale of tender documents, etc.

Figure 7. Revenue sources of Delhi Metro and their percentage contribution to total income



Source:**Case Study of Metro Rails in Indian Cities by** Rahul Goel,
Geetam Tiwari. Transportation Research and Injury Prevention Programme, IIT Delhi

Discussions

- So, considering the metro rail was a system:

A) missed the window of opportunity or was in ‘just the right time’?

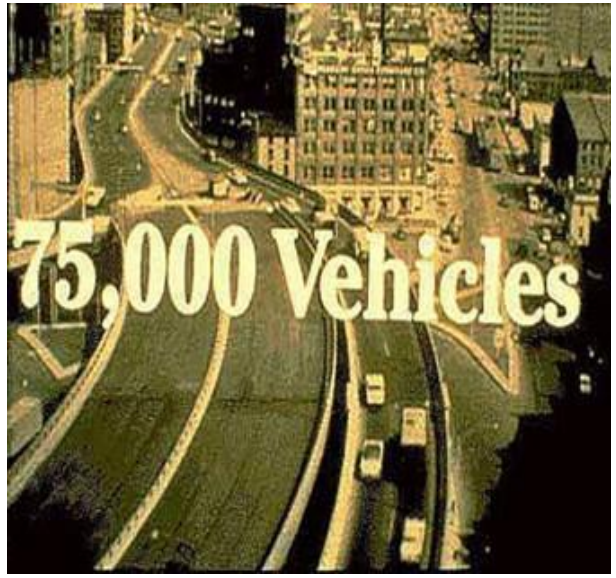
b) User’s operational usability ? List some short gaps.

c) Effectiveness – list some short gaps

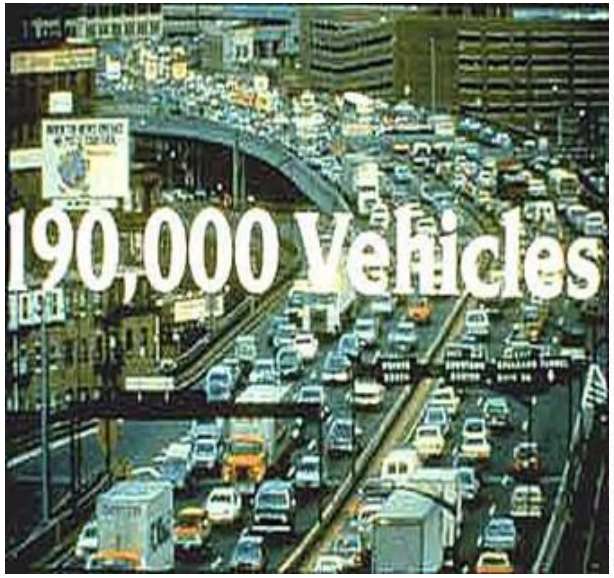
d) Accessibility – ways to increase

And finally:

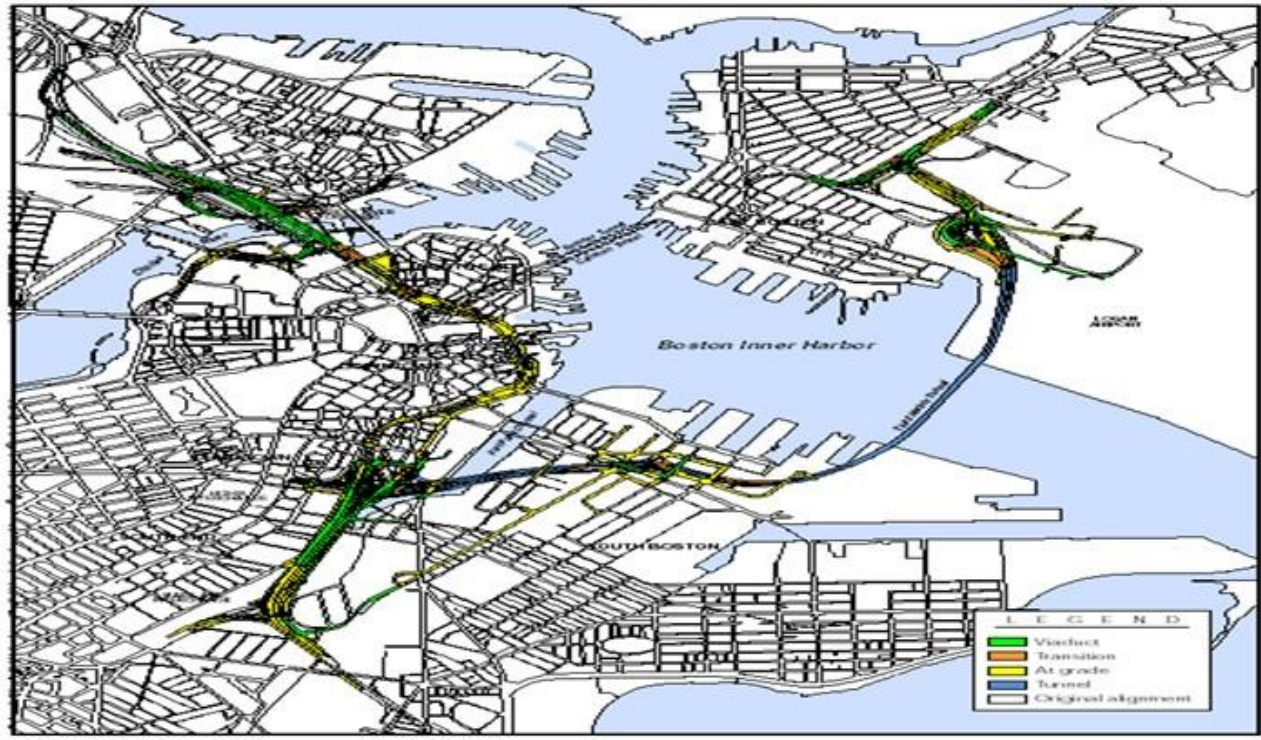
RoI: discuss ways to estimate it and how to improve on it.



1959



1980's



Source: bigdig.com

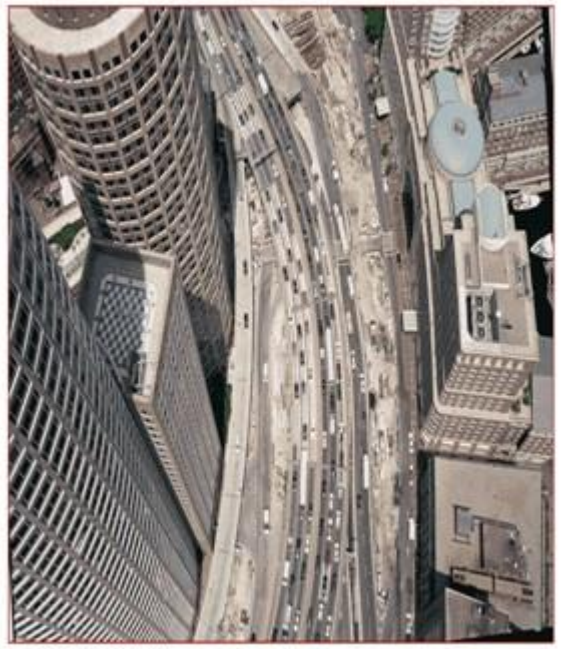
What:
Demolition of the existing central artery and replacement with underground tunnels .
Ted Williams tunnel connecting to logan airport
Zakim bridge over the Charles river

Why:
Alleviate serious traffic congestion
Eliminate eyesores
Reconnect old neighbourhoods
Create open space in the middle of the city

Example – the big dig project in Boston

- Planning began in 1982;
- The construction work was carried out between 1991 and 2006;
- The project concluded on December 31, 2007.
- The project was originally scheduled to be completed in 1998 at an estimated cost of $2.8 billion (in 1982 dollars, US$6.0 billion adjusted for inflation as of 2006).
- By December 2007 the cost was over $14.6 billion ($8.08 billion in 1982 dollars, meaning a cost overrun of about 190%) as of 2006.

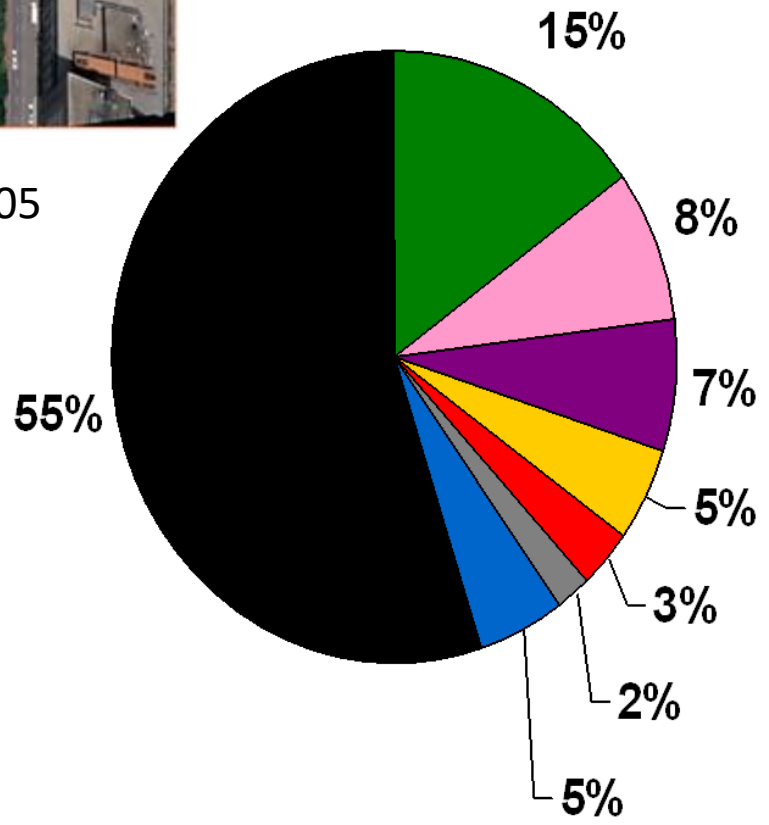
The Boston Globe estimated that the project will ultimately cost $22 billion, including interest, and that it would not be paid off until 2038



Before : 2003

After: 2005

The breakup for the increase in costs



Social measures & actual benefits

- Aesthetics and open space – yes (property prices went up)
- Travel time – yes, as per the environmental impact review (EIR). Annual time saving benefit (cars) : 450 million $ (est 1990).
- Accidents – No, data not very clear
- Air/noise pollution – No, included in property values
- Jobs created – yes, only during the project duration. Post wages from financial/Real estate sector showed the max increase followed by retail and services.

But, the escalation in costs, the corruption and mismanagement of funds made the benefits not so significant by 2003. One needs to be careful on how to use the cost to benefit numbers provided by any large project such as this.

Discussion

- For the big dig, were the metrics for measuring system acceptability different?
- If so, why?

Measures of a System

- **Measures of Performance (MOP)**
– **Measures of Effectiveness (MOE)**
– **Measures of Suitability (MOS)**

Subjective user criteria

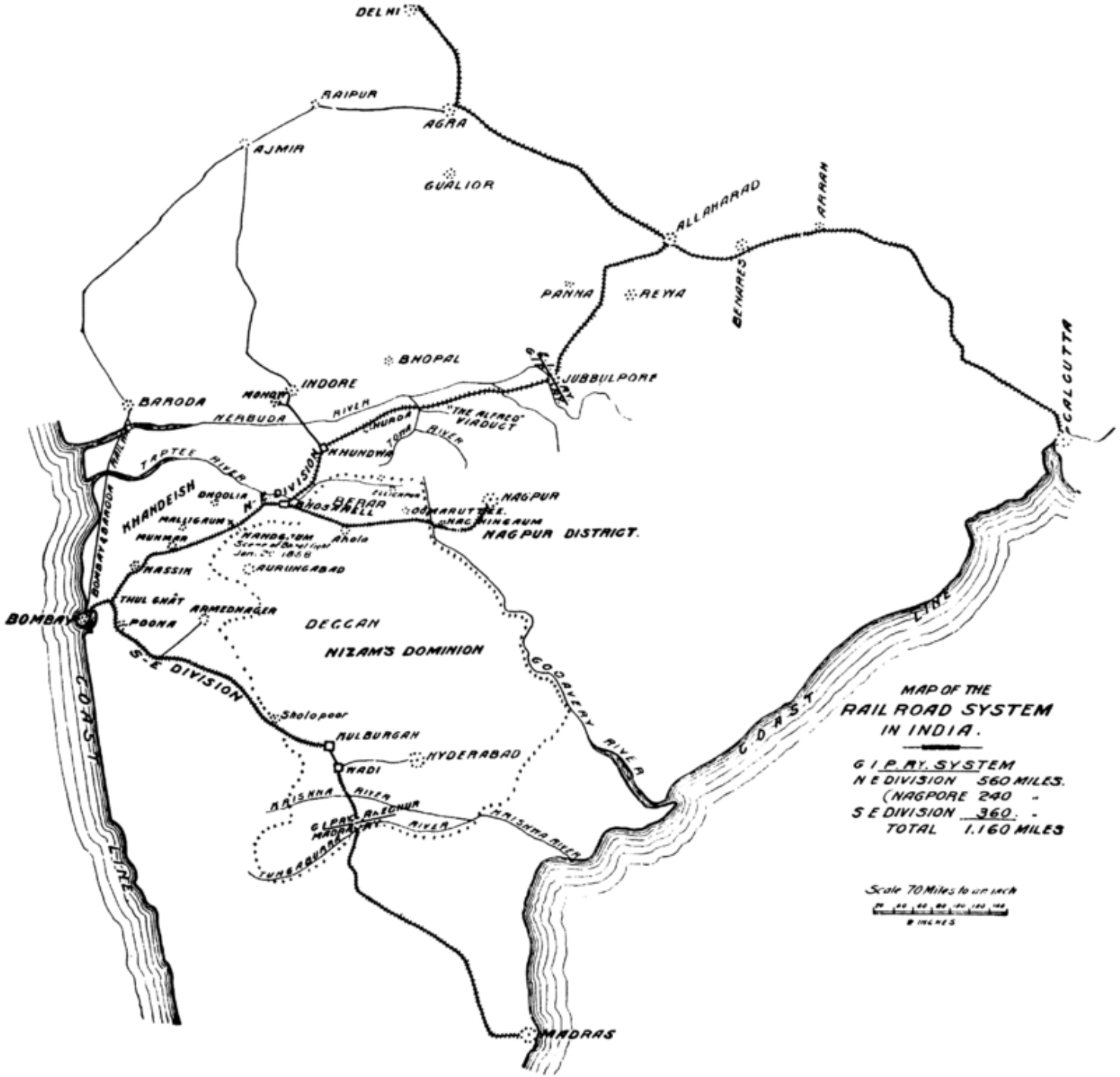
- **Operational Effectiveness**

– “An operational Test & Evaluation (OT&E) metric

- **Operational Suitability**
- **System Effectiveness**

– suitability, dependability, (reliability, availability, maintainability), and capability

- **Cost Effectiveness**


DELHI
RAIPUR
AGRA
AJMIR
GUALIOR
ALLAHARAD
ARARAN
BENARES
PANNA
REWA
BHOPAL
INDORE
JUBBULPORE
BARODA
NERBUDA RIVER
TAPTEE RIVER
KHANDEISH
BHOOLIA
N.E DIVISION
BERAR
NAGPUR
MALLIGAUM
MUNMAR
HANDESHM
AKola
AURUNGABAD
MASSIN
THUL GHÂT
ARMEDNAGER
BOMBAY
POONA
DECCAN
NIZAM'S DOMINION
S.E DIVISION
Sholapoor
MULBURGAH
HYDERABAD
WADI
KRISHNA RIVER
TUNGABUNDRA RIVER
MADRAS
GODAVERY RIVER
NAGPUR DISTRICT.
CALCUTTA
COAST LINE
MAP OF THE
RAIL ROAD SYSTEM
IN INDIA.
G I P RY. SYSTEM
N E DIVISION 560 MILES.
(NAGPORE 240 -
S E DIVISION 360 -
TOTAL 1.160 MILES
Scale 70 Miles to an inch