

Supernetworks

Qiong June Dong
School of Business

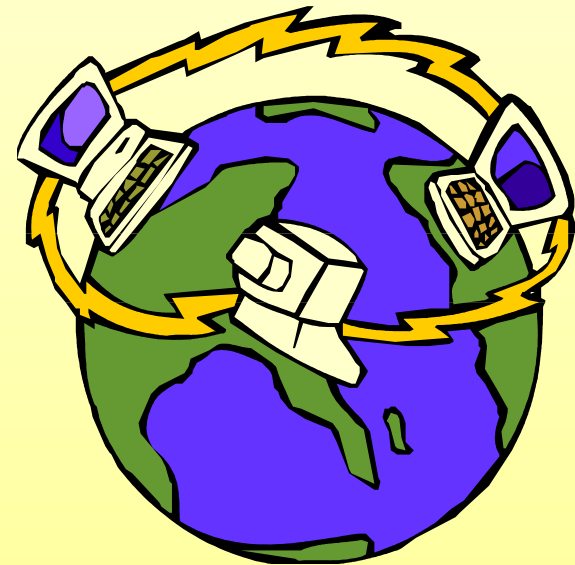


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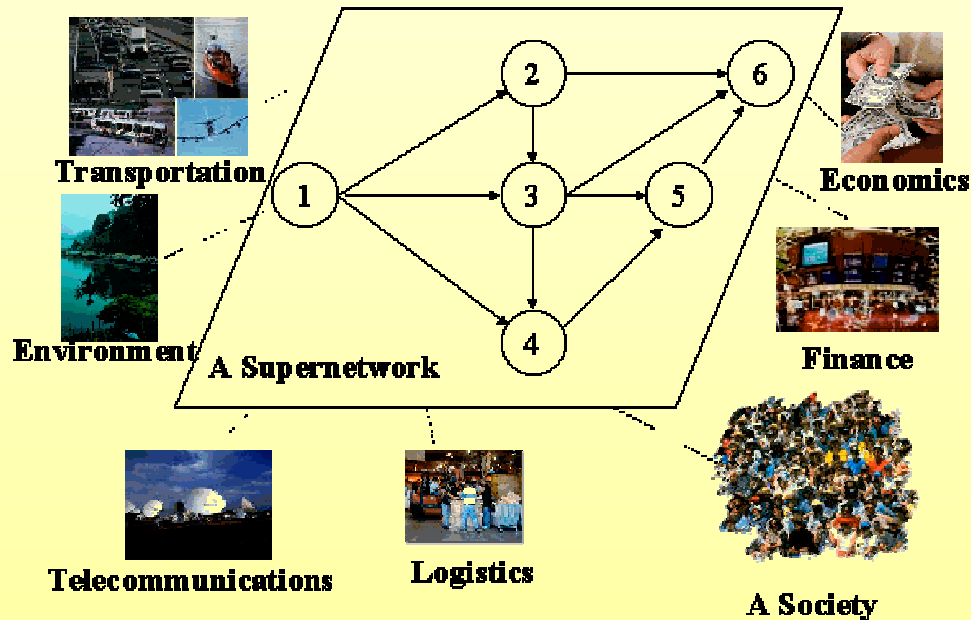
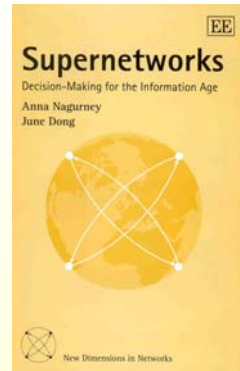


- **Networks** are pervasive in our daily lives and essential to the functioning of our societies and economics.



What is a Supernetwork?

A **Supernetwork** is a network, consisting of nodes, links, and flows, that is *over and above* existing networks.



Challenges

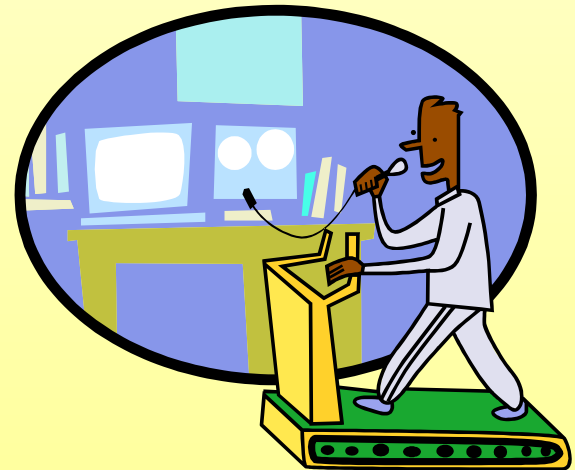
- **Decision Making**
 - Centralized vs. Decentralized
 - More alternatives
- **Complexity**
 - Large scale

Competition

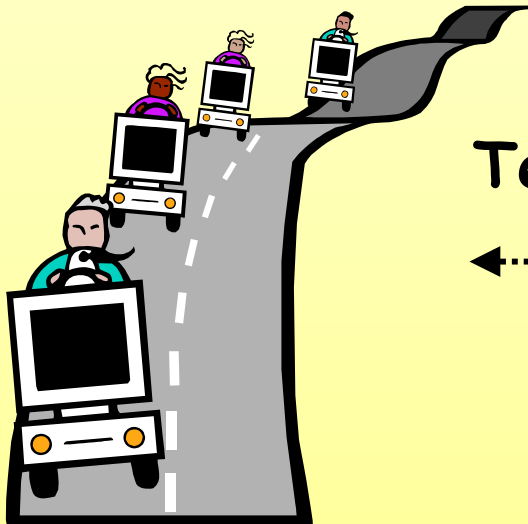
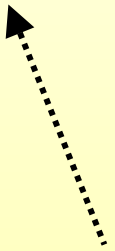
- Equilibrium vs. Optimization



Commuting



Telecommuting

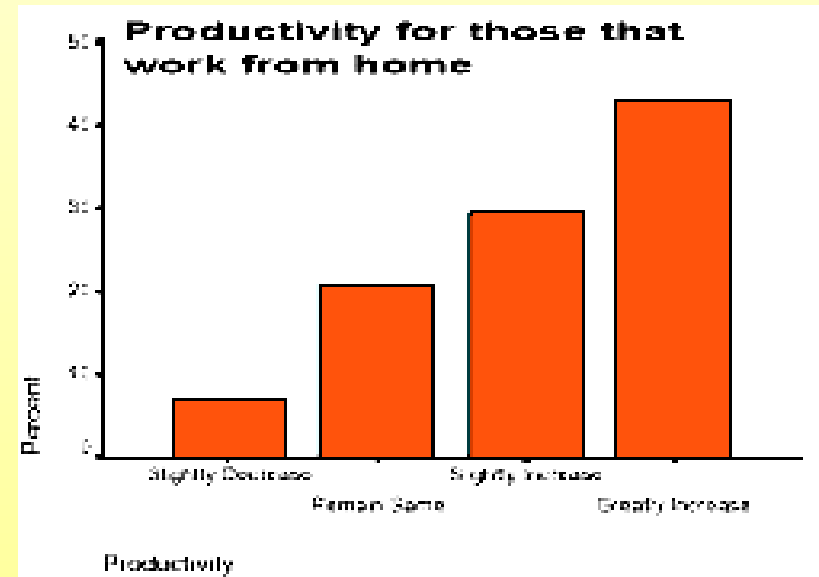


Why Telecommuting?

- Reduce traffic congestion
- Reduce emissions
- Land use
- Human resource policy

Telecommuting

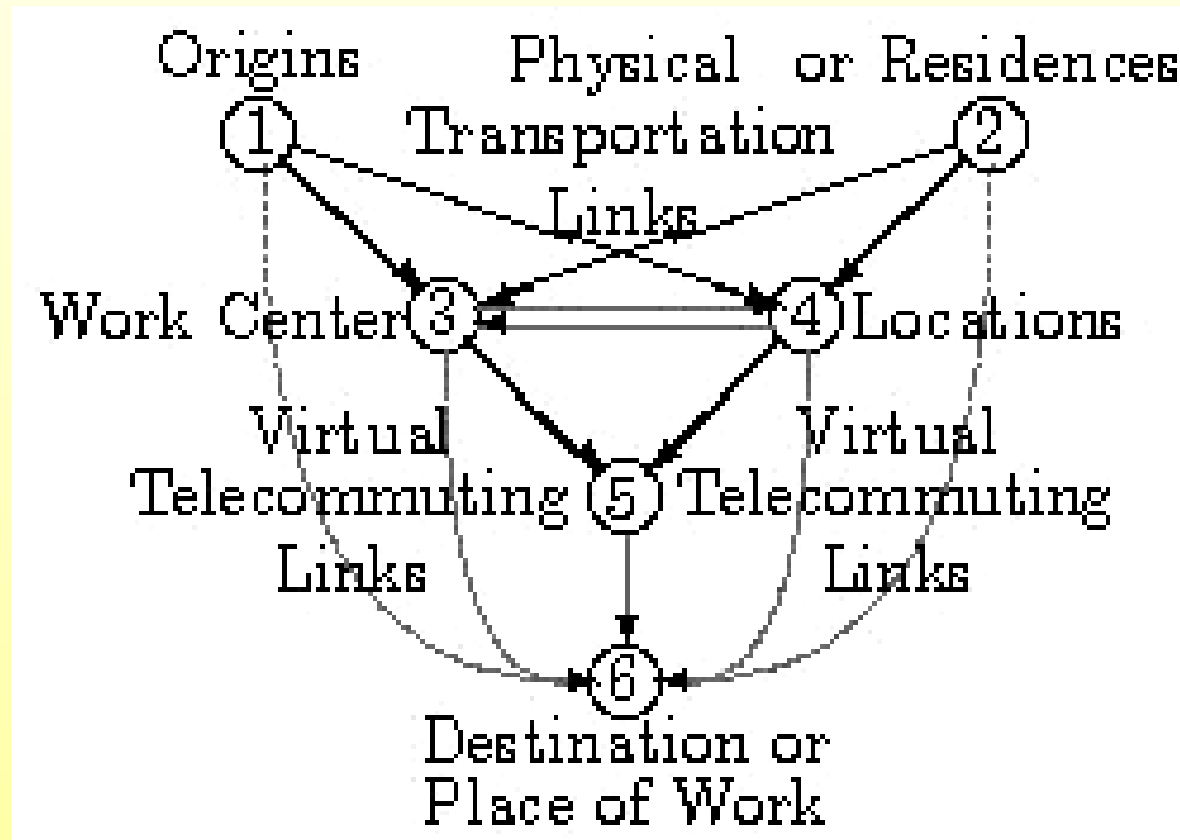
- Number of telecommuters increased from **4 million** to **23.6 million** in the past decade.
- **72.4%** reported that working at home slightly or greatly increased productivity
- Recent legislation permits federal employees to select the telecommuting option



Questions

- Telecommute or Commute?
- How often?
- What's the impact on traffic?
- What's the impact on land-use?
- What's the impact on environment?

A Conceptualized Supernetwork of Commuting vs. Telecommuting





Be Aware of Paradoxes

A **decrease** in **demand** on a supernetwork with a zero emission link may result in an **increase** in **emissions**.

Adding a new path which consists solely of a zero emission link and which shares no links with any other path may result in an **increase** in **emissions**.

What do we see?

- The importance of the incorporation of Network Topology, Cost and Demand Structure, Users Behavior.
- The interconnectivity among distinct network systems

A **Supernetwork** may have both **virtual and physical links**

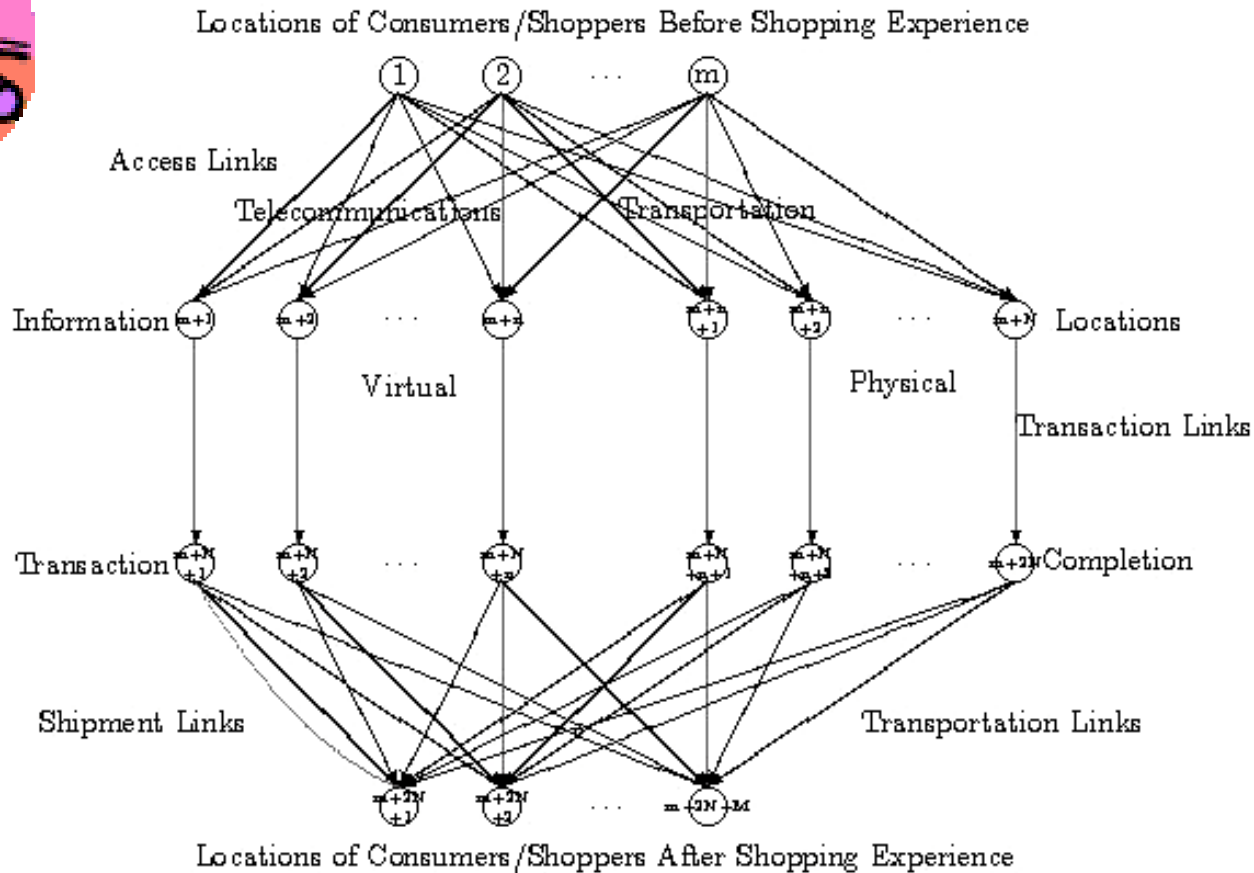
A **Supernetwork** may be **multitiered and multilevel.**

Decision-makers may have **distinct criteria** such as time, monetary cost, opportunity cost, risk, and/or safety.

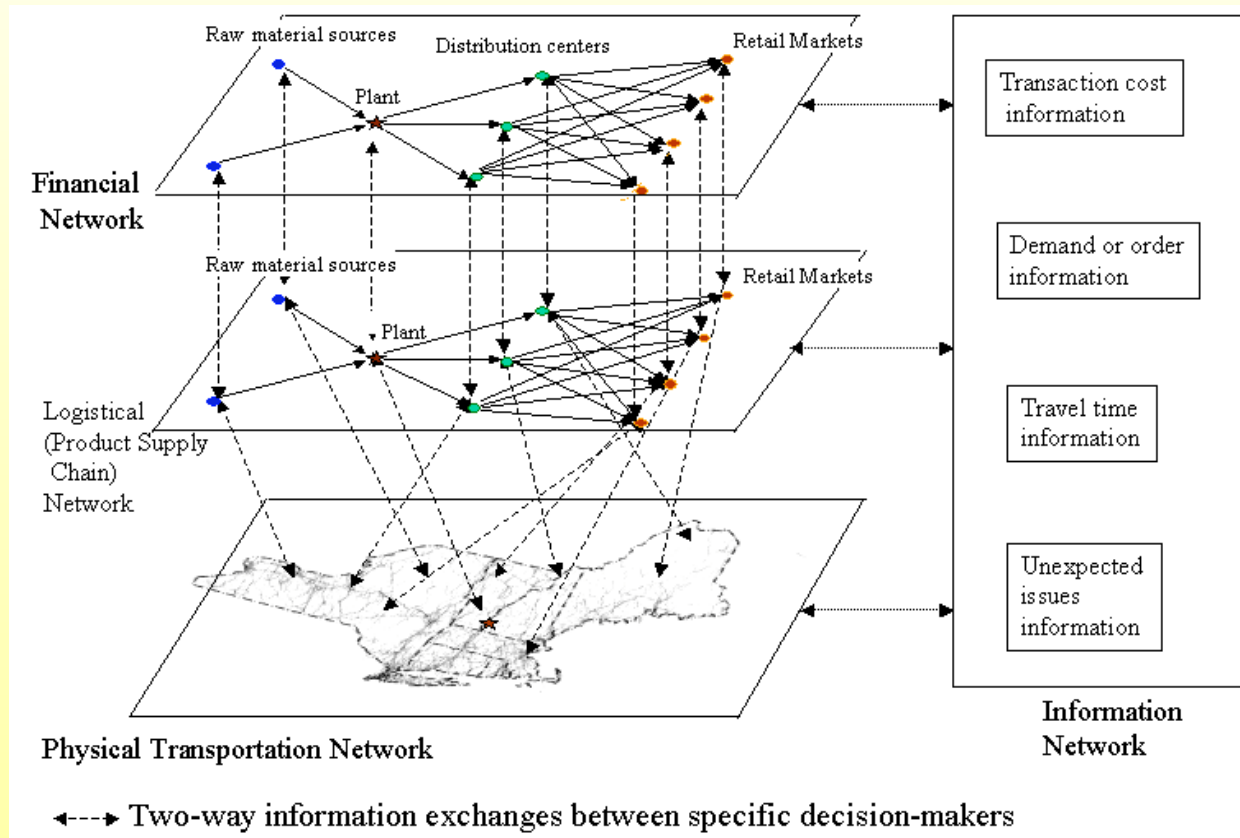
Applications of Supernetworks

- Telecommuting / Commuting decision making
- Teleshopping / Shopping decision making
- Supply Chain Networks with E-commerce
- Financial Networks with Electronic Transactions

Teleshopping vs. Shopping



Supply Chain - Transportation Supernetwork Representation





**THANK
YOU!**