The Economics of Hypercommunications: Implications for Agribusiness

Dean G. Fairchild

University of Florida

Initial Observations

- ✔FRED as model “enterprise”
- ✔1993: win 3.1, 486, 250 MEG, Centrex, v.32 4.8/9.6 kbps, etc.
- ✔in between…1996 TCA & the ‘net
- ✔1999: win 95/98/NT/UNIX, 7 GB, 56.6(33.4), fiber optic, PBX, Pentium, 32-64 MEG RAM, pagers, cellphones, multiple lines, etc., etc. & etc.

Personal Biases

- ✔ Micro vs... Mainframe
- ✔ Windows vs.. other OS
- ✔ Business, Economics, & Marketing vs.. Engineering & Technical
- ✔ User (Customer) Perspective
- ✔ Intimate knowledge of (-) externalities (& synergies) plus (+) of IT networks
- ✔ More I think I know, less I really know
- ✔ Enjoy Quantity Communication
- ✔ Quality obsessed

Hypercommunications

...the world is in the process of major social and economic changes and ... telecommunications is a driving force of those changes. ...the sector will be *the* leading one in shaping our social, economic, and political futures....the nearly uniform considerations of the experts do portend a dominating future for communications ---domination so extensive that we call the sector hypercommunications. [Stone, 1997, p.1]

US Information Economy

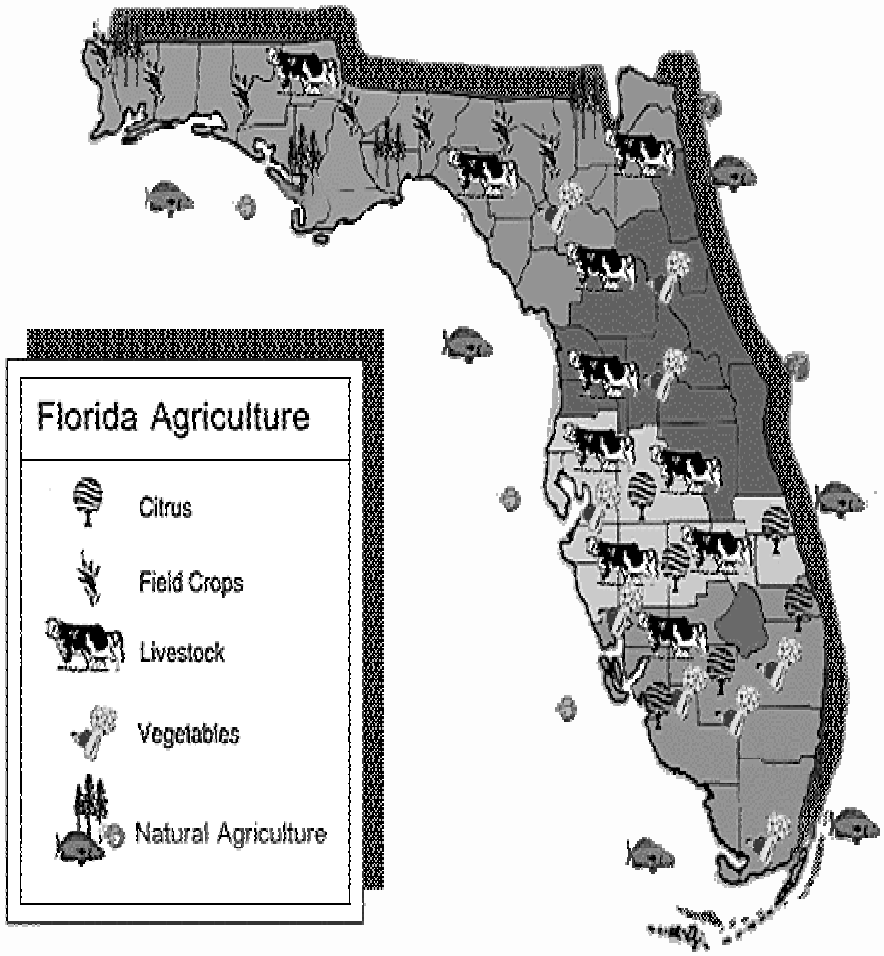
- ✔ IT industries: 8% of GDP = 35% of real growth. (1995-98)
- ✔ Falling IT industry prices brought down overall inflation by an avg. of 0.7 percentage points (1997 & 1998)
- ✔ By 2006, almost 1/2 of US workers will be “employed by major producers or intensive users of IT products & services.

Annual growth in GPO/W "value-added per worker", 1990-1997 US

IT-producing industries	IT goods producing sub-group
10.4%	23.9%
Entire non-farm economy	**Non-IT producing**
1.4%	0.5%

USDOC, The Emerging Digital Economy II, June 1999.

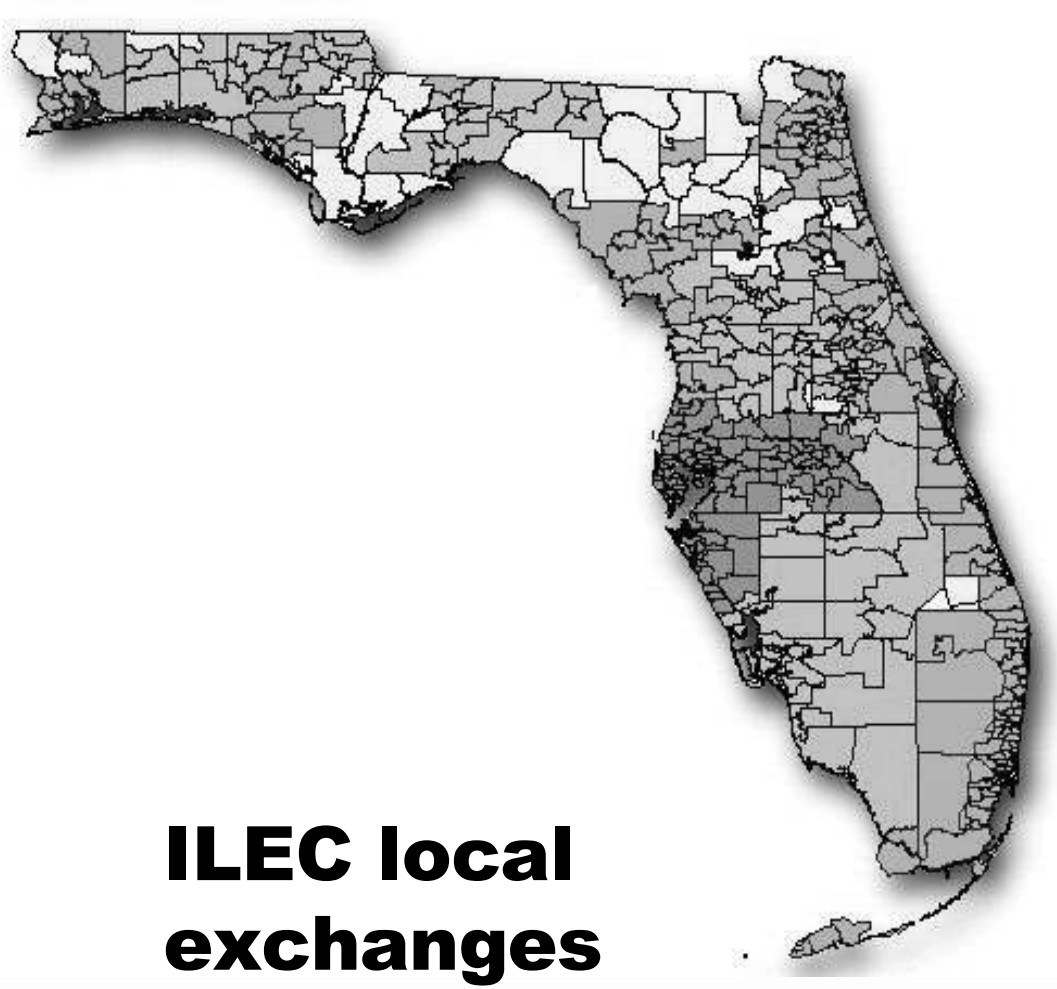
Florida Agribusiness



- ✔ **Second largest economic sector**
- ✔ **15% of all jobs, 23 % of all non-metro jobs**
- ✔ **Palm Beach & Miami-Dade are ranked 11th and 35th in 1997 sales market value**
- ✔ **$1.2 billion in ag exports, 1997**

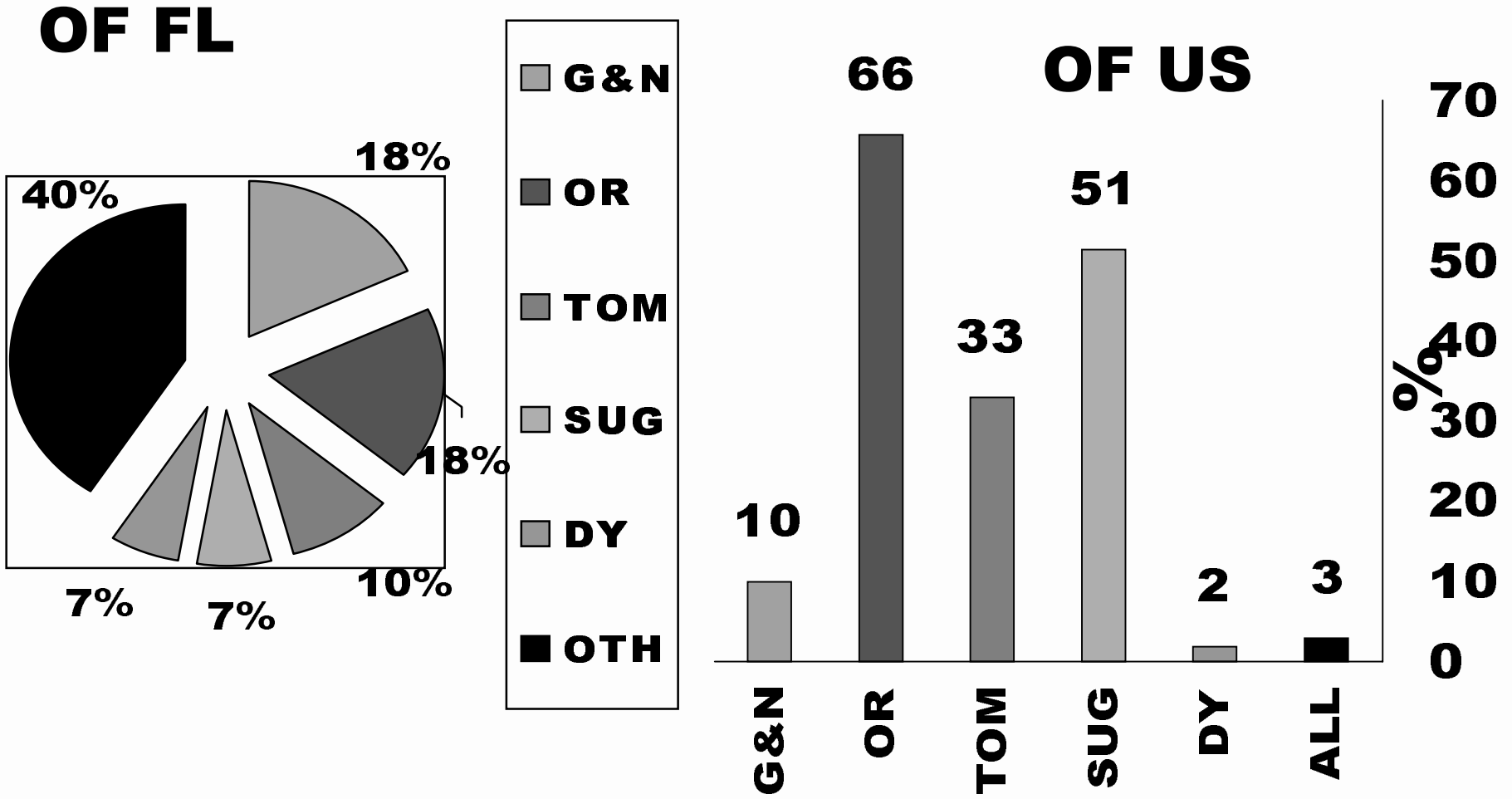
Florida Hypercommunications

- ✔ 10 ILECs
- ✔ 275 ALECs
- ✔ 500+ ISPs
- ✔ 12 OSPs
- ✔ 50IXCs facbased
- ✔ Cablecos (54 p.)
- ✔ Cellular, PCS, paging, landline wireless, STS, satcoms (100s)



ILEC local exchanges

Top 5 Ag Commodities, by Share of Total Gross



‘97 Hypercom is huge (FCC)

- ✔ national “telco” gross revenues
  - – $231 billion (B)
  - – $105 B ILECs
  - – $2.5 B ALECs
  - – $30 B wireless
  - – $3 B paging
  - – $90 B toll

- ✔ Florida phone
- ✔ $14 billion, 1997
- ✔ 6.1 % of US
- ✔ 22.3 % + 95-97
- ✔ 12/98 10.5 million “loops”
- ✔ 6.2 M Bell loops
- ✔ 4.1 M GTE/Sprint

Ten Important Definitions

Hypercom & Communication

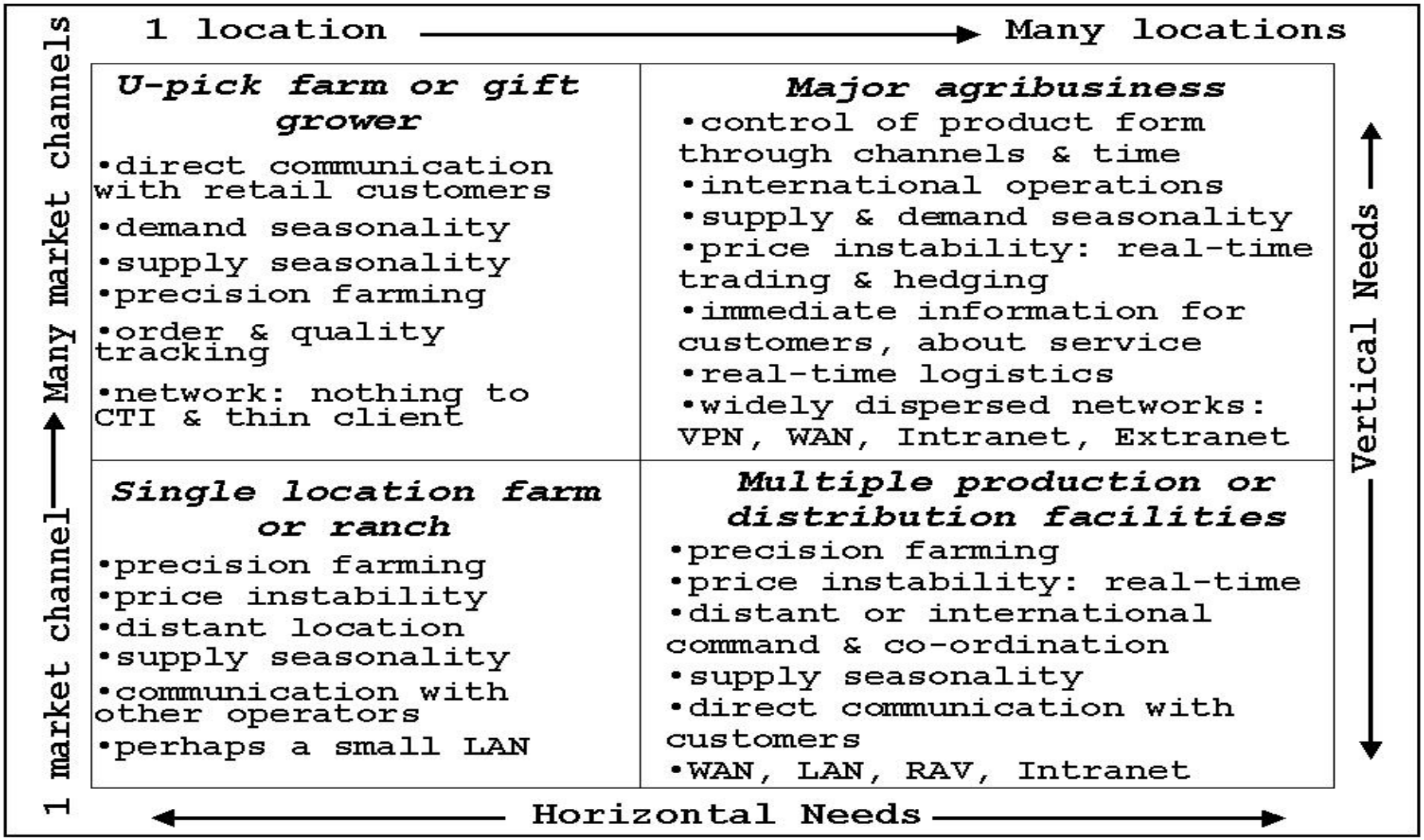
- ✔ 1. Technology
- ✔ 2. Information
- ✔ 3. Bandwidth
- ✔ 4. Digitization
- ✔ 5. Infrastructure
- ✔ 6. Universal Service & Universal Access
- ✔ 7. Quality of Service (QOS)
- ✔ 8. OSI Layers
- ✔ 9. Bundling
- ✔ 10. Packet (cell) & circuit switching

Problem Statement

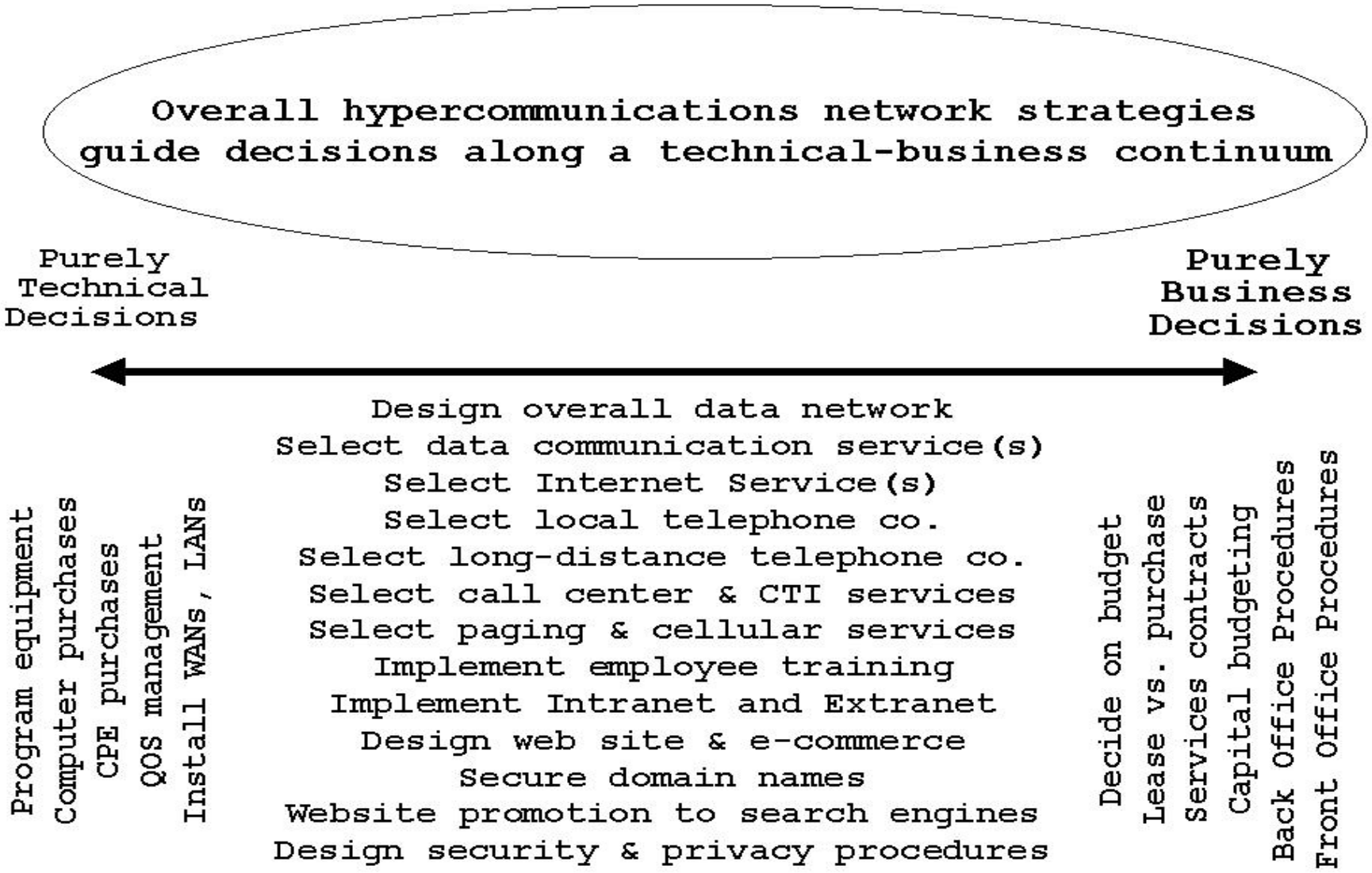
3 Organic Problems

- ✔**1. "agriculture doesn't need hypercommunications."**
- ✔**2. Understand agriculture's unique communications needs.**
- ✔**3. Use economics & marketing to help agribusinesses understand hypercom strategies & decisions.**

Unique Ag Hypercom Needs



Hypercom Decision Continuum



Objectives

- ✔ Why do hypercommunications exist?
- ✔ What are hypercommunications?
- ✔ Where and how do hypercommunications infrastructures & markets form?
- ✔ Identification of unique hypercommunications needs of agribusiness.
- ✔ How come? How Much? Provide real world ideas of usefulness & cost.
- ✔ Strategic implications of agribusiness hypercommunications (supply & demand)

Economic Hypotheses I

- ✔ **H1. Role of infrastructure growth rate & hypercom adoption: today's low rate is tomorrow's decayed competitive position.**
- ✔ **H2. Asymmetric regulation and taxation produces hypercom supply inefficiencies which are, in turn, transmittable to agribusiness input & output markets**

Economic Hypotheses II

- ✔ **H3. Technologically-induced time compression = decision making in shorter time intervals. Adoption delay more costly, but agriculture cannot control seasonality, or plant & animal cycles.**
- ✔ **H4. Networks & information have positive AND negative externalities. Hypercom costs & benefits often not explicitly priced.**

Research Inputs

- ✔ Unavailable
  - econometric data
  - estimates of demand
  - price elasticities
  - new definition of recency
  - data do not fit time compressed periodicities
- ✔ Available
  - GIS data
  - agbiz & hypercom contacts
  - Regulatory data
  - high-tech hype
  - excellent academic theoretical base
  - many prices

Research Methods

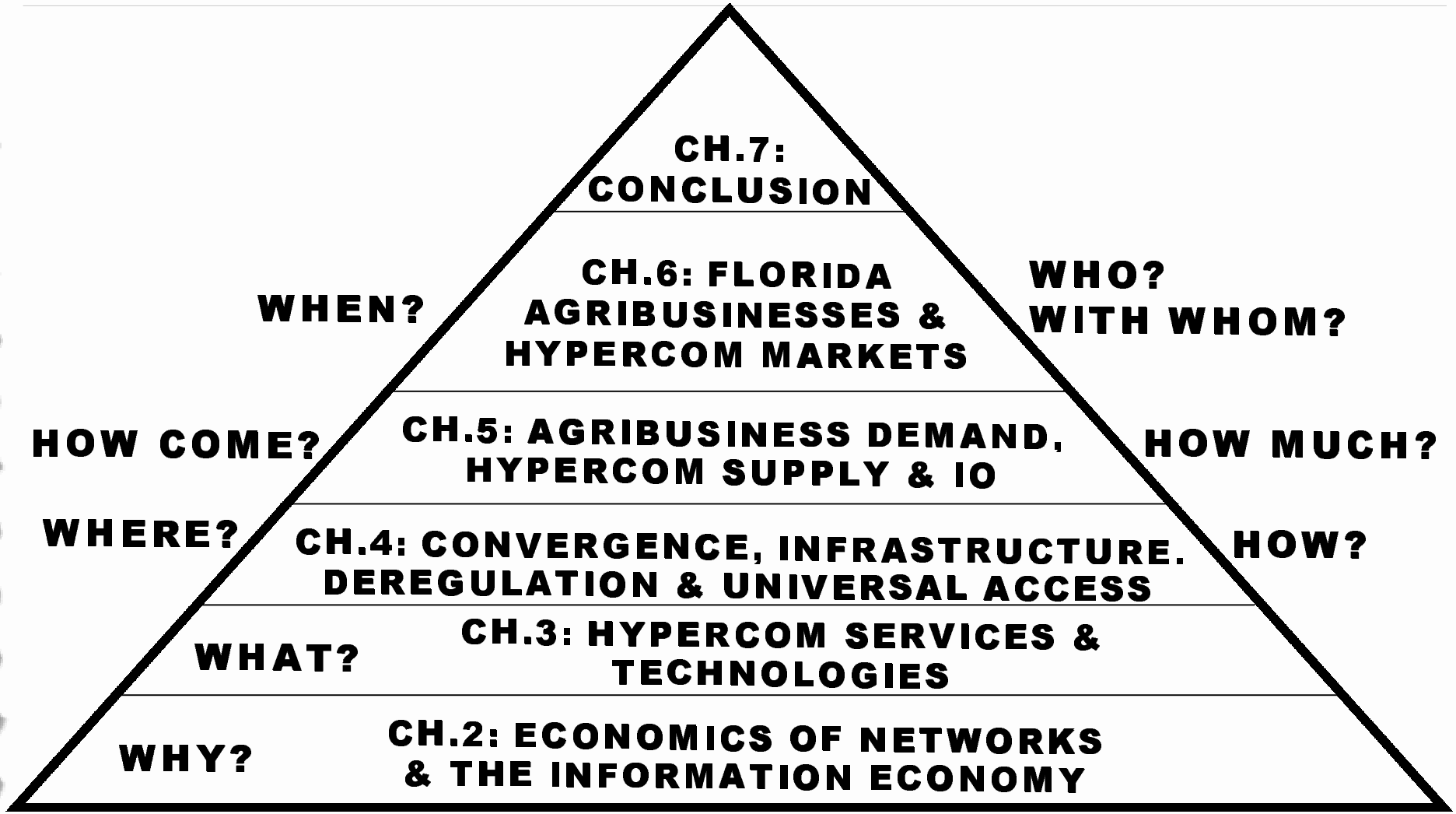
✔ Impossible

- supply & demand function estimation, perfect adoption prediction
- detailed descriptive or inferential stat analysis
- rate of infrastructure development
- structural predictions
- winning & losing hypercom segments

✔ Possible

- quantification of market potential
- general adoption & diffusion processes
- find unique set of agbiz needs
- lit review, analysis, & primary research
- identification of (+) & (-) of FL agbiz strategies

AGRIBUSINESS & HYPERCOMMUNICATIONS



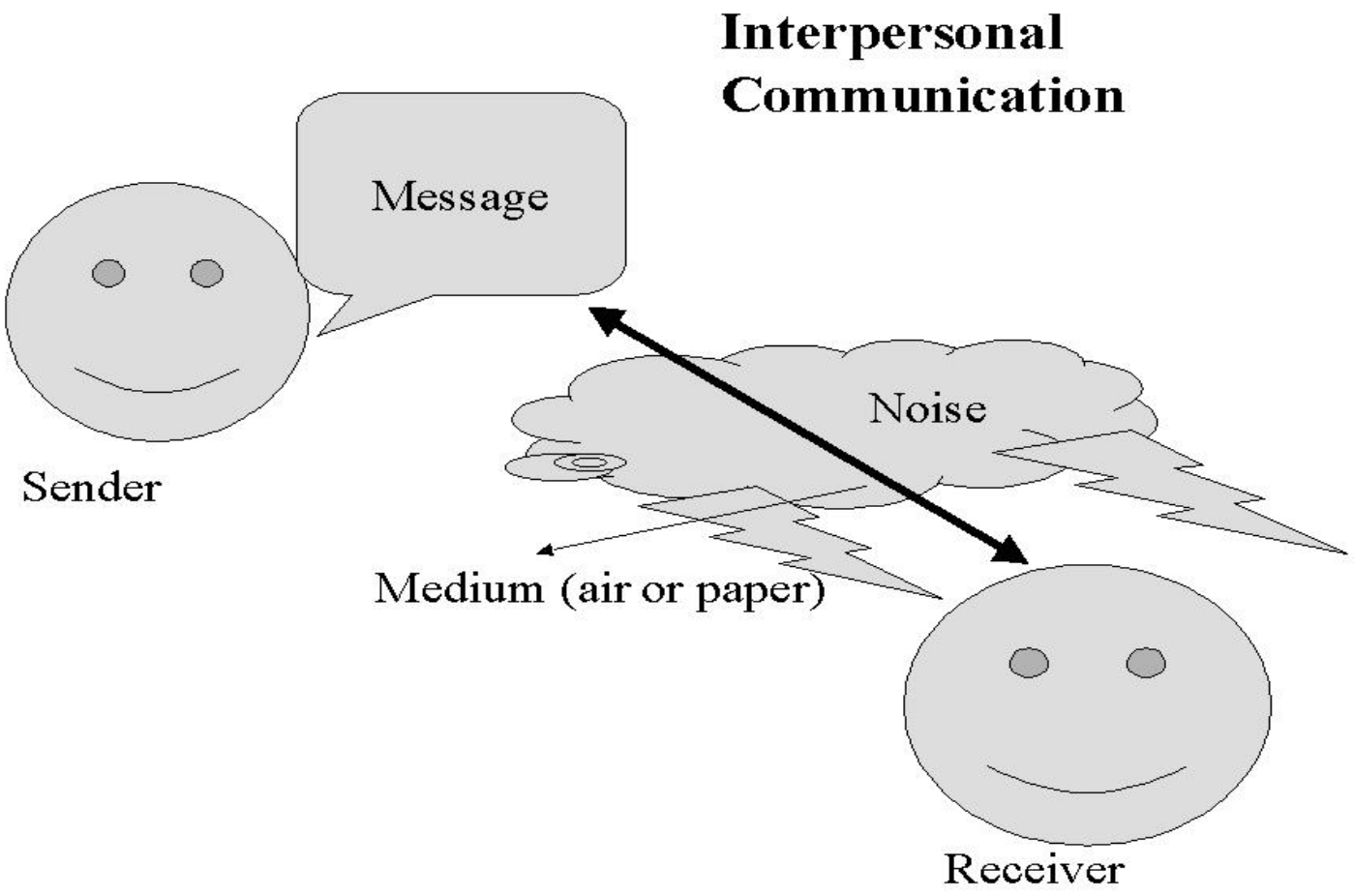
Chapter 2: Why hypercom?

2.1 Introduction & Definitions

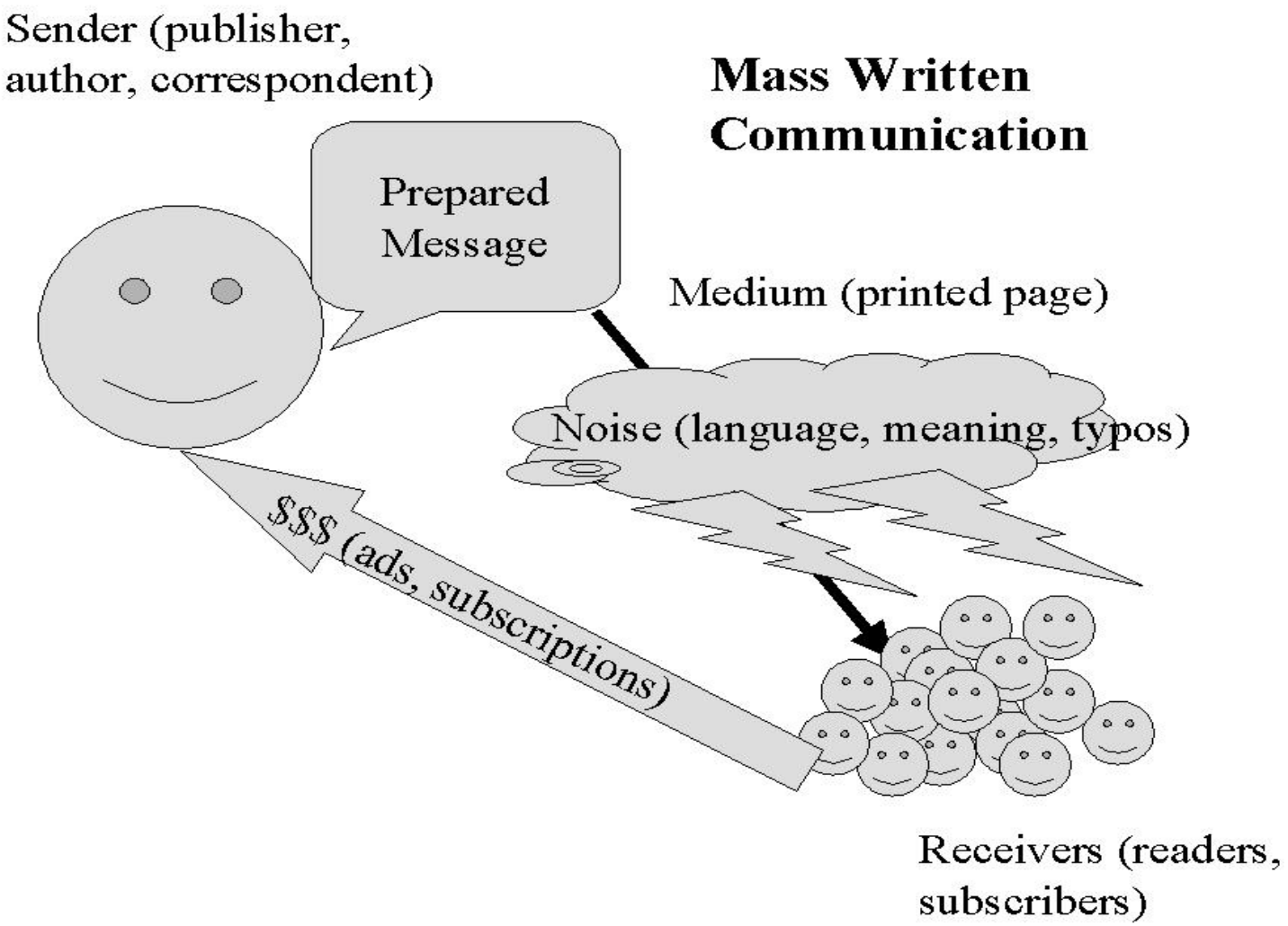
Interpersonal & Mass Communication Models
Telecommunications
Engineering VS. Behavioral elements of hypercommunications
Technology: Economic & Technical views
Information: Economic & Technical views

CH.2: ECONOMICS OF NETWORKS & THE INFORMATION ECONOMY

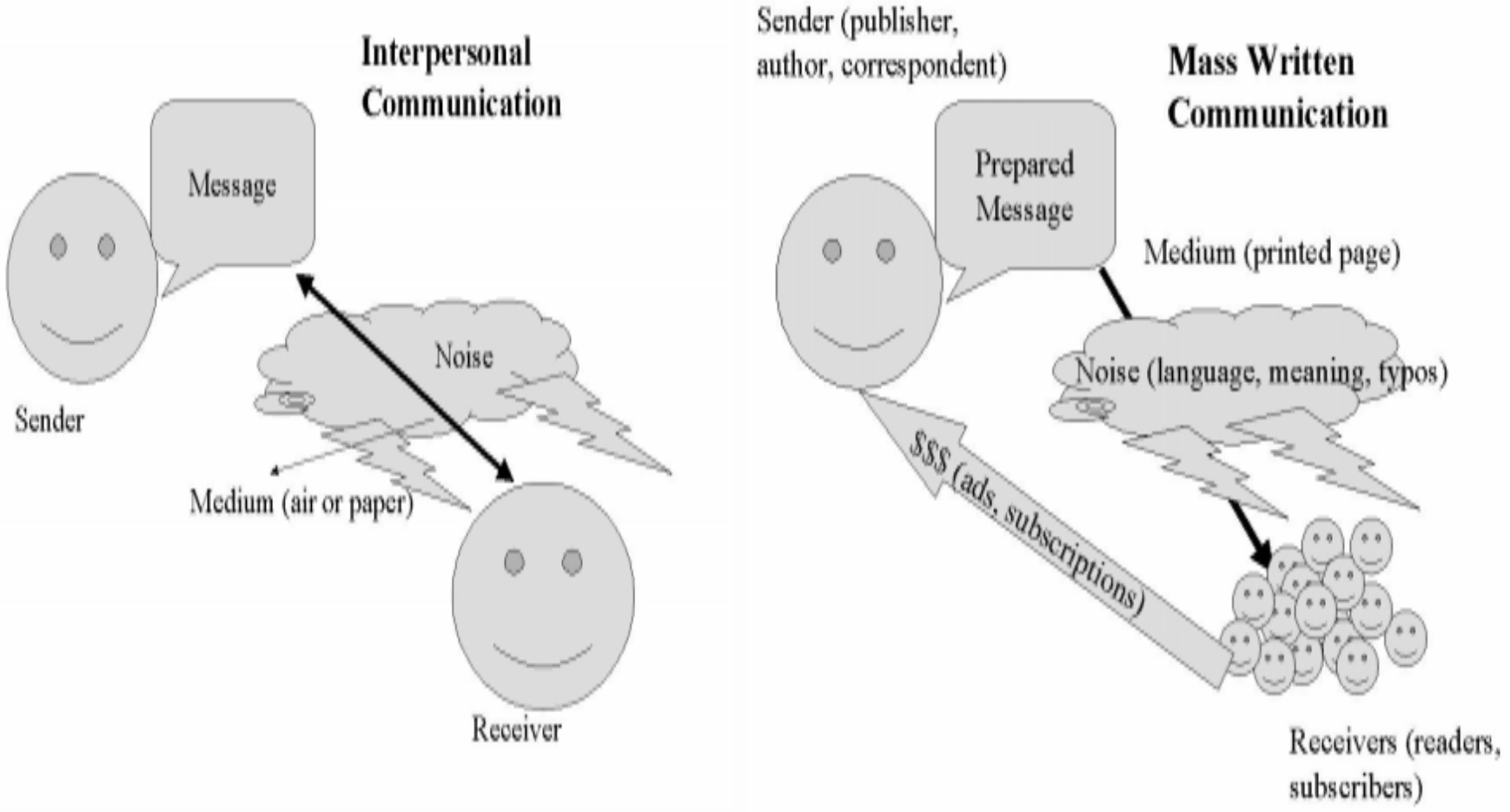
Interpersonal Communication Model

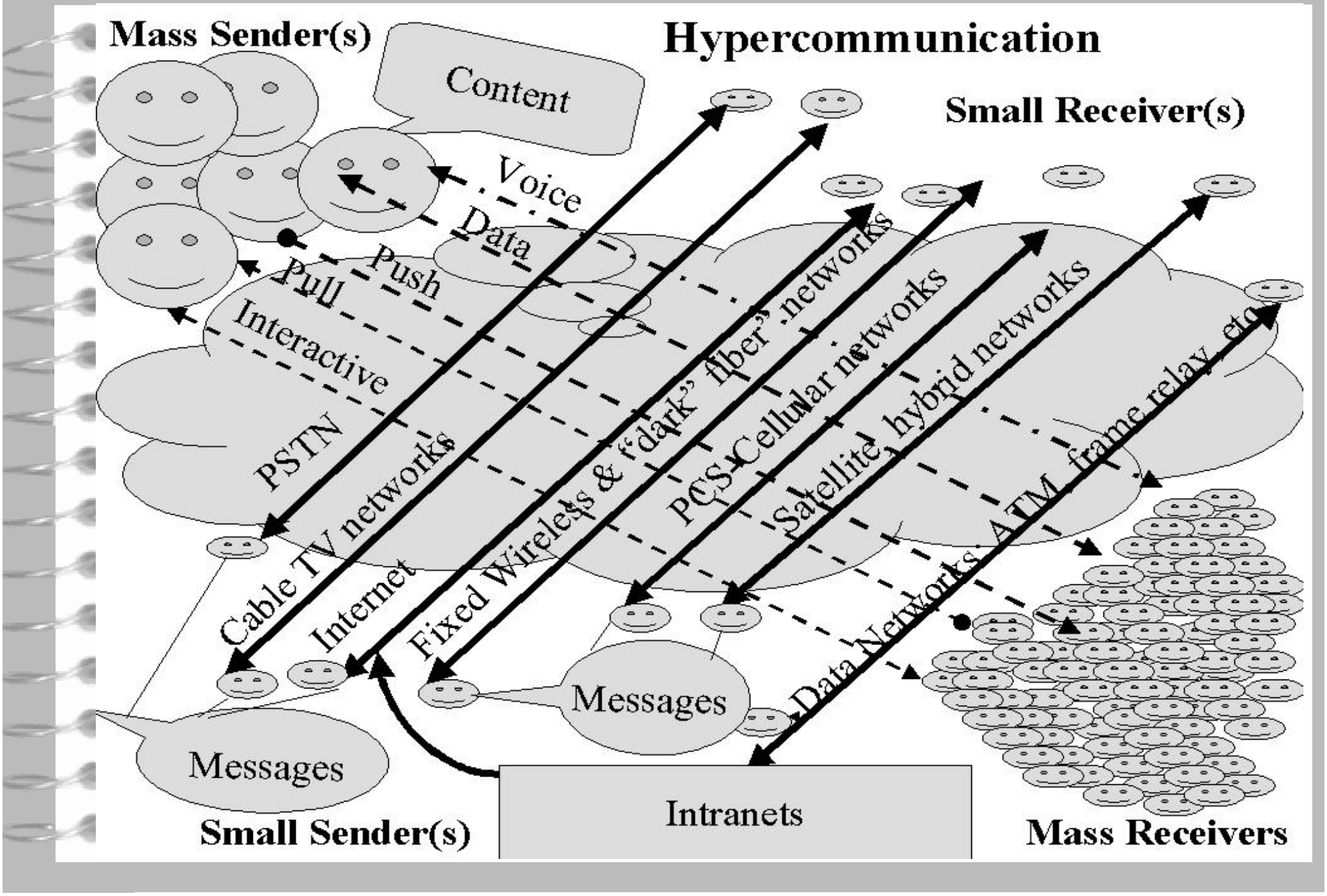


Mass Communication Model



Telecom: medium determines mass *or* interpersonal model




Mass Sender(s)
Hypercommunication
Content
Small Receiver(s)
Voice
Data
Push
Pull
Interactive
PSTN
Cable TV networks
Internet
Fixed Wireless & "dark" fiber" networks
PCS, Cellular networks
Satellite, hybrid networks
Data Networks, ATM, frame relay, etc.
Messages
Messages
Intranets
Small Sender(s)
Mass Receivers

Hypercom Technical Elements

- ✔Content
  - digitized objects & messages
    - bits of “information”
- ✔Interface
  - network hardware & software
- ✔Conduit
  - cables, wires (air)
- ✔Terminal
  - terminus of communication. (devices & sets that users encounter)

Hypercom “behavioral” elements

- ✔ 1. Info processing activity
- ✔ 2. transmission
- ✔ 3. message
- ✔ 4. sender(s)
- ✔ 5. space
- ✔ 6. time
- ✔ 7. Transmission network
- ✔ 8. audience
- ✔ 9. subject to noise & incompatibility

hypercommunication does not equal telecommunication

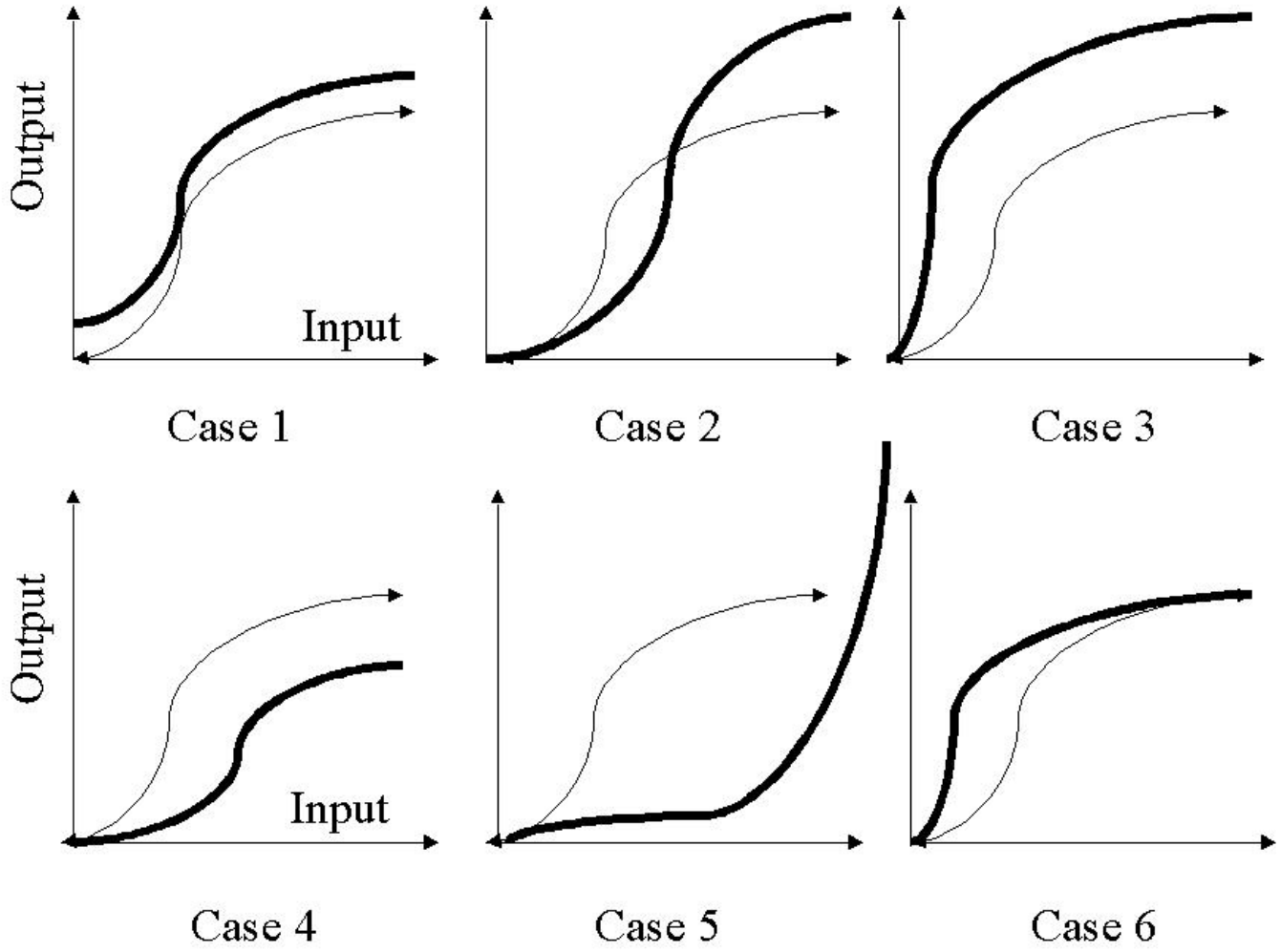
Technology

- ✔"applied science"
- ✔positive & negative synergies
- ✔positive & negative externalities
- ✔equity, Falling Through the 'Net and the "digital divide"
- ✔hypercom -> info -> technology as a loop or composite function

Length of Run

- ✔VSR (All inputs fixed)
- ✔SR (At least one input varies)
- ✔LR (All inputs vary)
- ✔VLR (All inputs vary & production function can change. Case of technological improvement)
  - – Suppose only production function varies

Technology & Production



Technology & Economics

- ✔ Production, & supply
- ✔ The demand side
- ✔ Market competitiveness
- ✔ Market efficiencies (welfare effects)
- ✔ Spillover effect on economic growth (Grossman 1991)
- ✔ Technology-information linkage (Economides 1996)
- ✔ Relative prices matter

Information

- ✔Hard to define (Braman), waste of time to define (Lamberton)
- ✔1. stock or flow, info accounting
- ✔2. processed resource or raw commodity. (Data are ore)
- ✔3. perception of pattern (Braman)
- ✔4. public good?

Economics of Information

- ✔ 5. Properties
  - Value
    - economic
    - epistemic
    - situational
    - existence
    - experiential
  - Search costs
    - Stigler (1960)
- ✔ Asymmetric Information
  - efficient markets hypotheses (Fama, 1970)
  - middlemen as information brokers (Heyne)
  - extensions of Baumol

Chapter 2: Why hypercom?

2.2 Network Economics & the "Unlimited" Cyber Frontier
2.3 Other Aspects of "Unlimited" Communication
2.4 Agribusiness in the Information Economy
2.5 Hypercom Originates from the Information Economy

Network Economics & the "Unlimited" Cyber Frontier

Economics

- ✔ Positive Externalities
  - sidebar
- ✔ Negative Externalities
  - sidebar
- ✔ Critical Mass
  - sidebar
- ✔ Internet (Varian, Mackie-Mason)

Popular View

- ✔ cyber frontier is unlimited
- ✔ US land frontier econ history
  - Shumpeter (1942) says NO
- ✔ Do trees grow to the sky?

Other Aspects of "Unlimited" Communication

- ✔ Unlimited data, boundless bandwidth
- ✔ Unlimited Complexity
- ✔ Unlimited audience? Rifle targeting
- ✔ Limiting infrastructure
  - land prices & location
- ✔ Unlimited time through time compression
  - Internet years are like dog years

Agribusiness Info Economy

- ✔Nursery & Greenhouse
- ✔Precision Farming
- ✔Logistics of shrinkage & transport
- ✔Agri-tourism and U-pick operations
- ✔Demand for weather, price info
- ✔Online trading and commerce

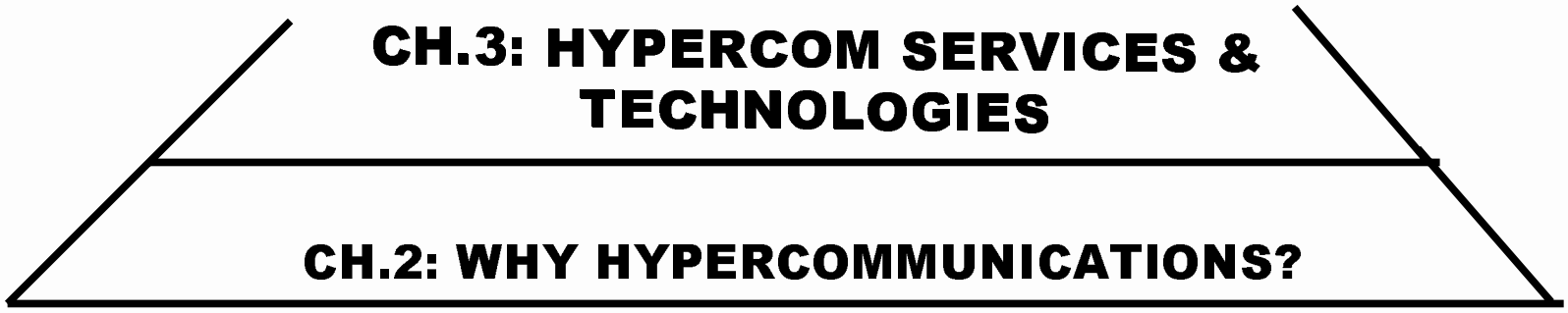
Implicit & explicit relationships of info economy & hypercom

- ✔FrontOffice vs.. BackOffice uses of hypercom
  - information cuts costs
  - lower hypercom prices cut costs further
- ✔Hypercom as Vector for Technological Improvements
  - direct technical improvements in internal firm communication
  - indirect technical improvements due to new information from telecom

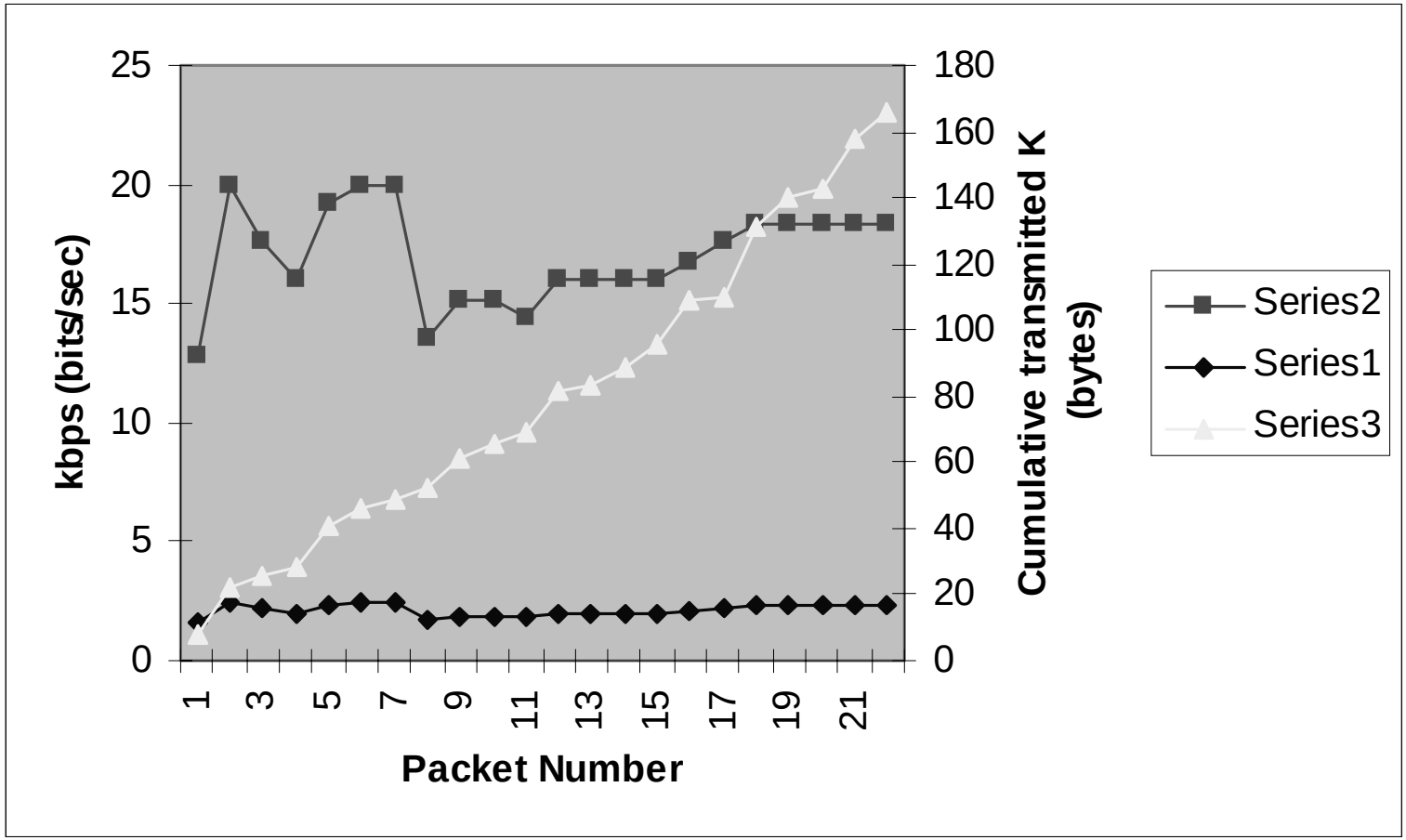
Chapter 3: What is hypercom?

Definitions

- **Bandwidth**
- **Digital, Digitization**
- **Packet (cell) vs..**
  - **Circuit Switching**
- **OSI Layer**



Bandwidth (not shown)



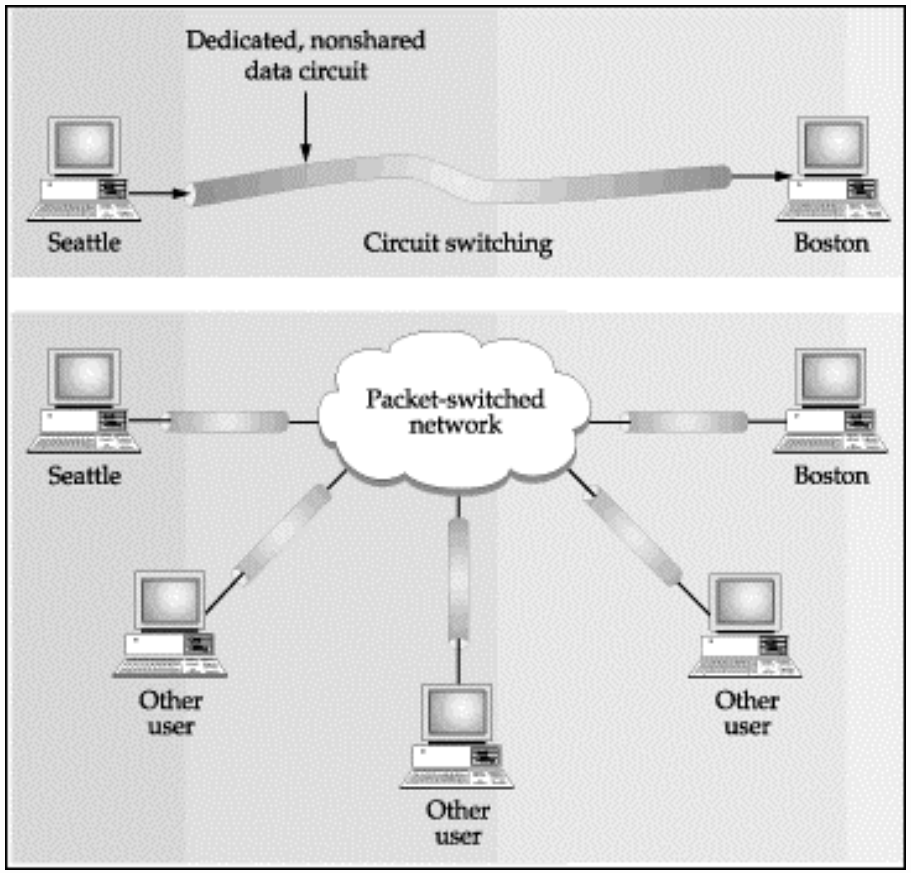
Y=cume, B=kBytes/s, Pk = kbps

Digital, Digitization

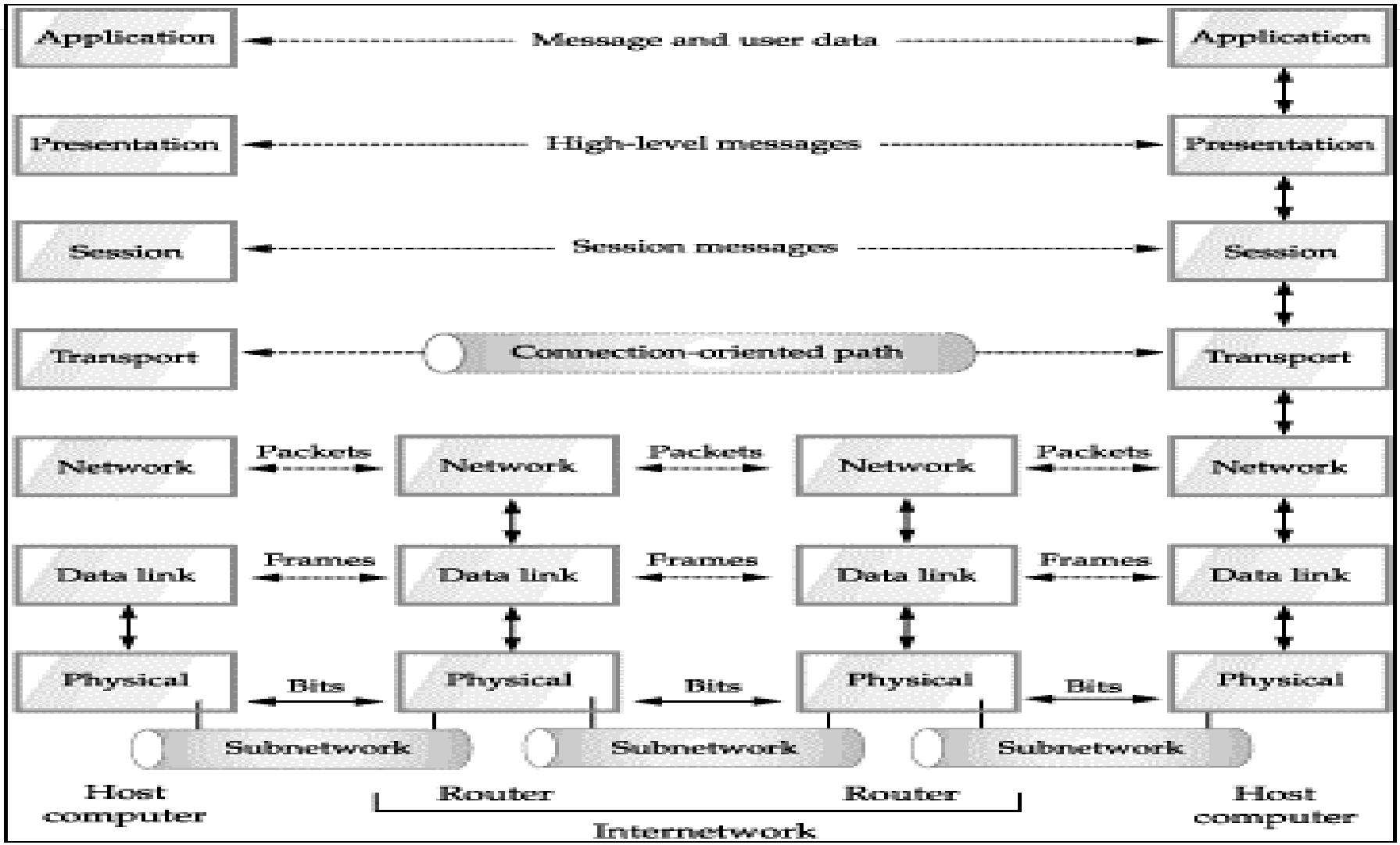
- ✔ Digital vs.. Analog "Info"
  - analog variables take on a continuum of variables
  - digital variables are discrete: Integers, binary integers (I.e. bits), bit-mapped graphics
- ✔ Digital vs.. Analog Signaling
  - signal = continuous values
    - analog "info" may need transducer
    - digital "info" sent by modulating analog carrier
  - signal = discrete states
    - analog "info" requires approximation
    - digital "info" sent directly

Packet (cell) vs.. Circuit Switching

- ✔ Circuits are dedicated connections that require session establishment
- ✔ Packet (cell) connections are dedicated to the "cloud" where they are shared with other users



OSI Layer


Application
Message and user data
Application
Presentation
High-level messages
Presentation
Session
Session messages
Session
Transport
Connection-oriented path
Transport
Network
Packets
Network
Packets
Network
Packets
Network
Data link
Frames
Data link
Frames
Data link
Frames
Data link
Physical
Bits
Physical
Bits
Physical
Bits
Physical
Subnetwork
Subnetwork
Subnetwork
Host computer
Router
Router
Host computer
Internetwork

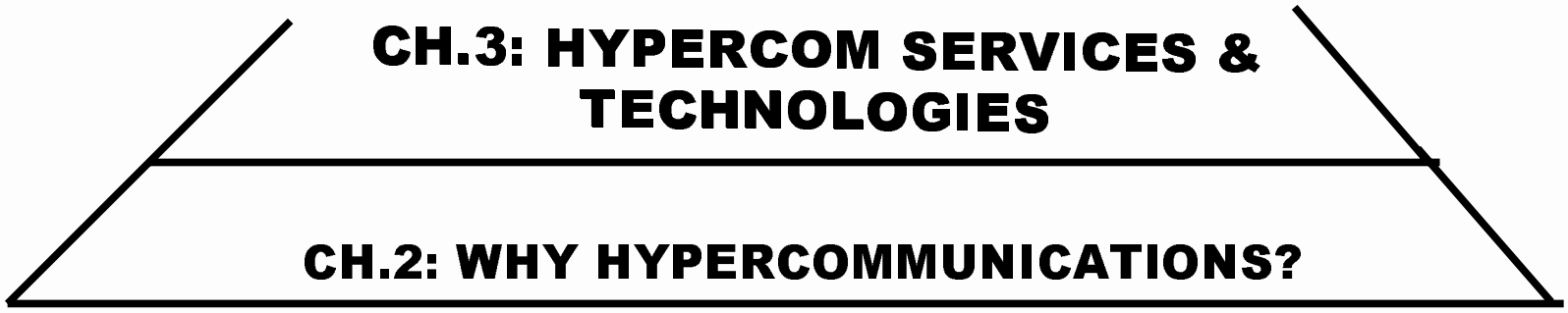
Chapter 3: What is hypercom?

Hypercommunications Technologies
Wireline technologies
Wireless technologies

Chapter 3: What is hypercom?

Hypercom Services Taxonomy

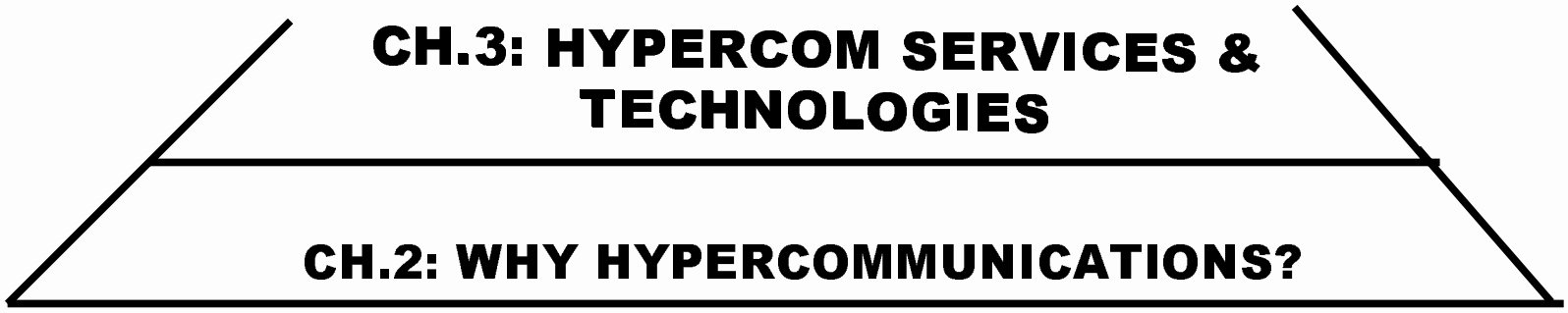
1. Traditional Telephony (POTS)
2. Enhanced Telecom (PSTN)
3. Private "Data" Networking: ATM, frame relay, B-ISDN, Intranet, Extranet



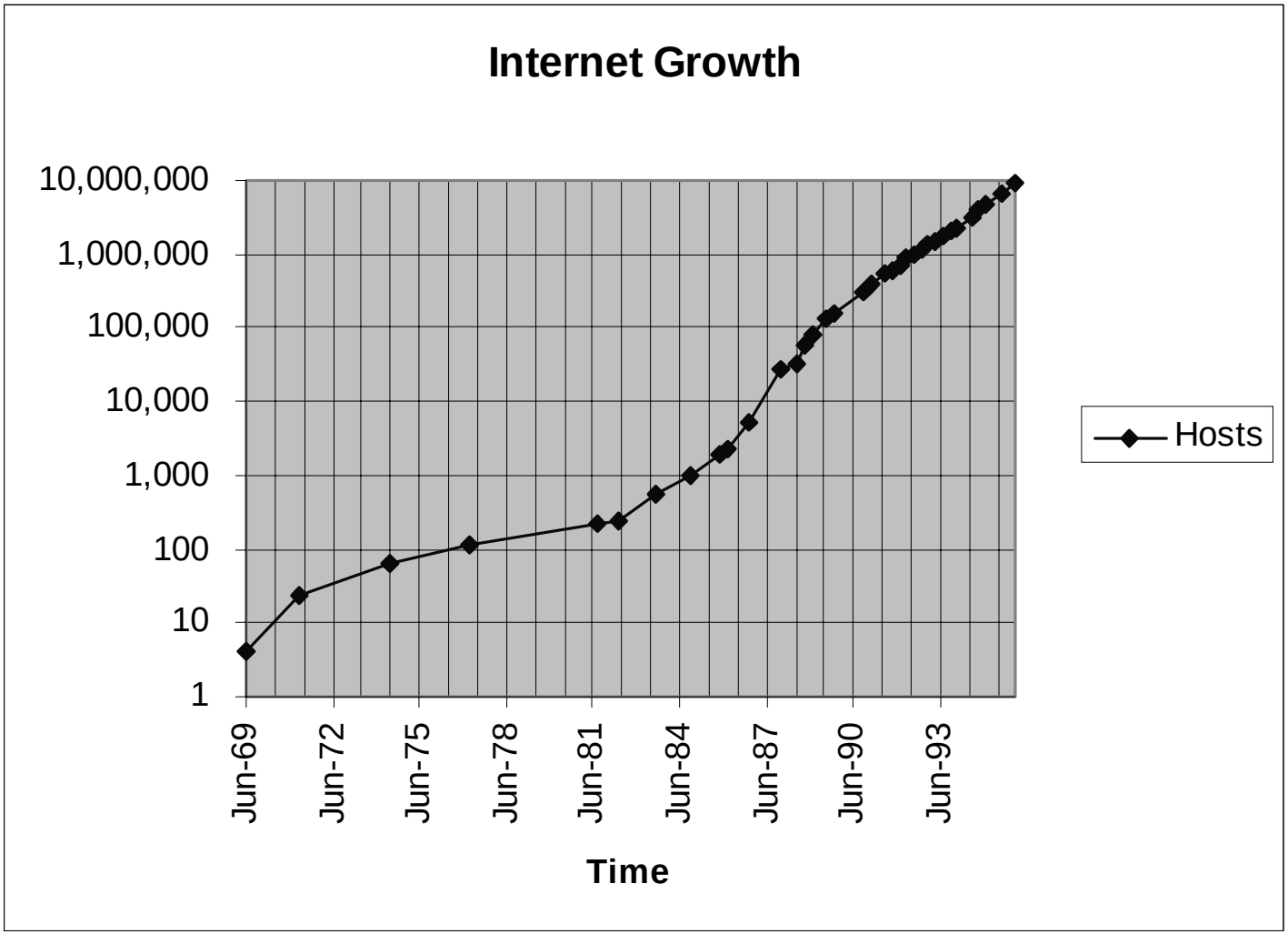
Chapter 3: What is hypercom?

Hypercom Services Taxonomy (cont)

4. Internet
5. Content & Broadcast
6. Protocols & Standards



Internet Host Growth (log scale)



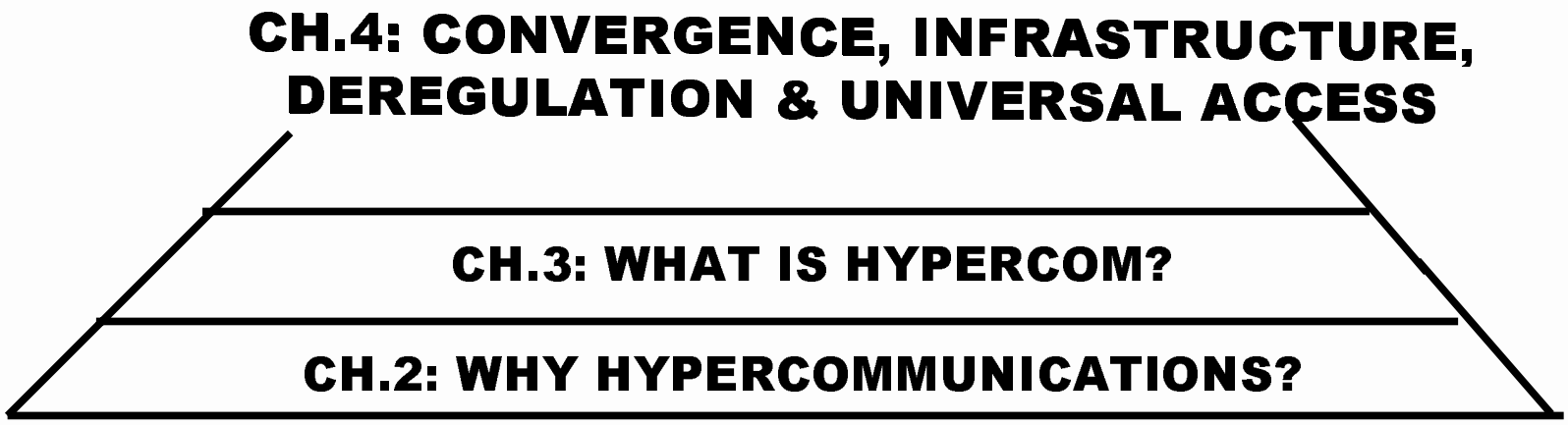
Chapter 4: Where? How?

Definitions

Infrastructure

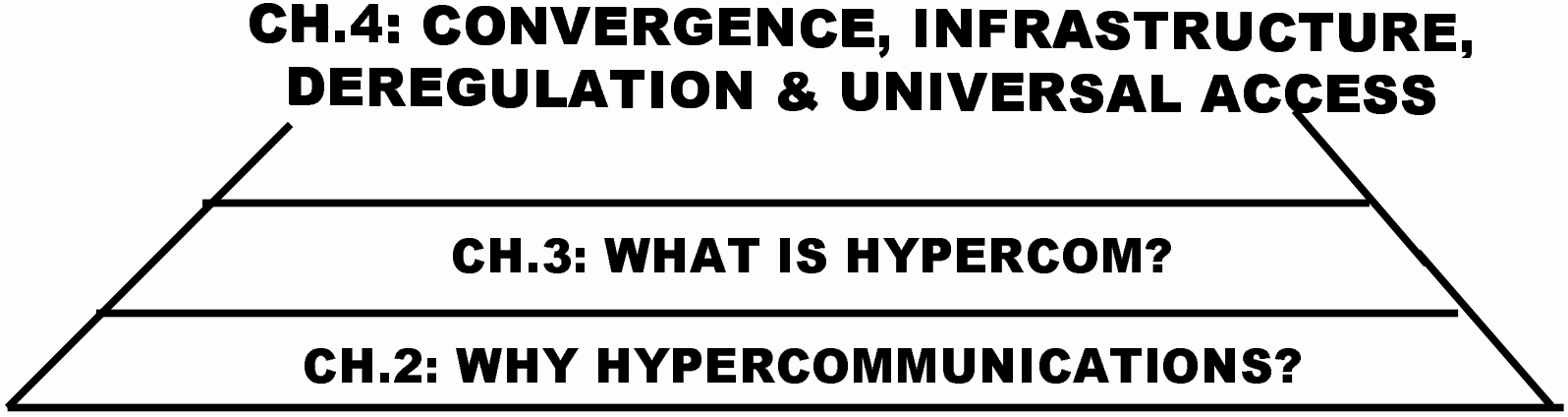
Universal Service & Access

Bundling



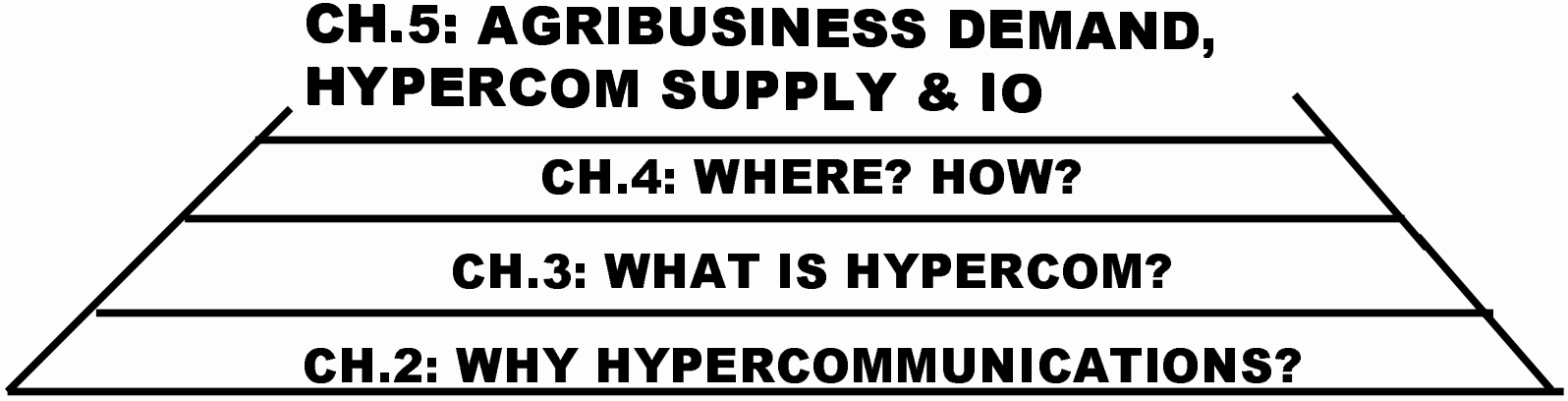
Chapter 4: Where? How?

Deregulation
Re-regulation
Universal Service
Universal Access
"Rural" hypercommunications policy



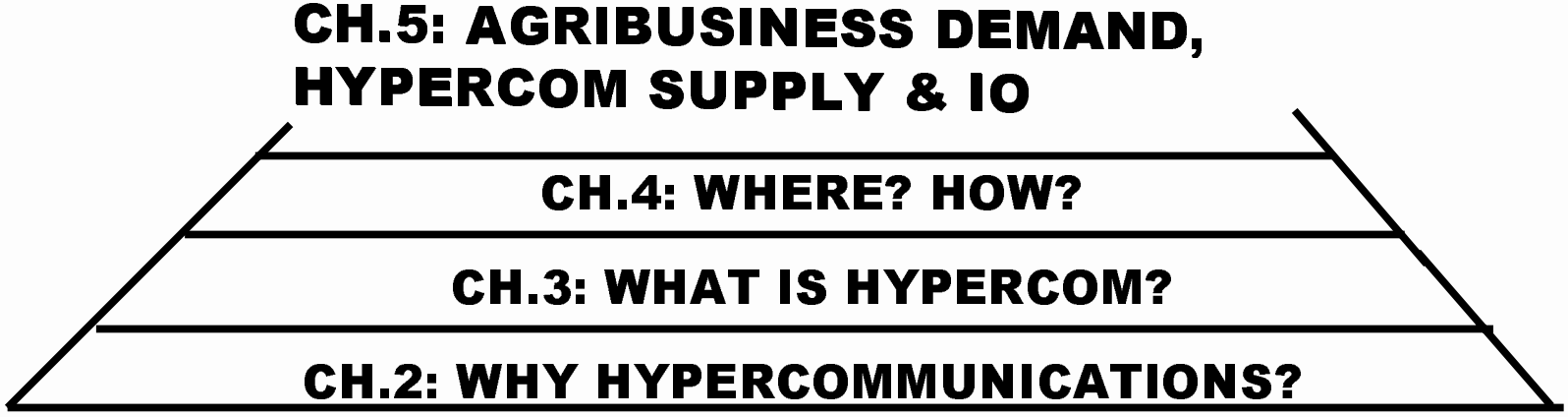
Chapter 5: How come? How much?

Derived demand for hypercommunications
Strategic rationale for agbiz hypercom
Finding direct MR and MC number
The "indirect" affect
Competitive Affects of Infrastructure



Chapter 5: How come? How much?

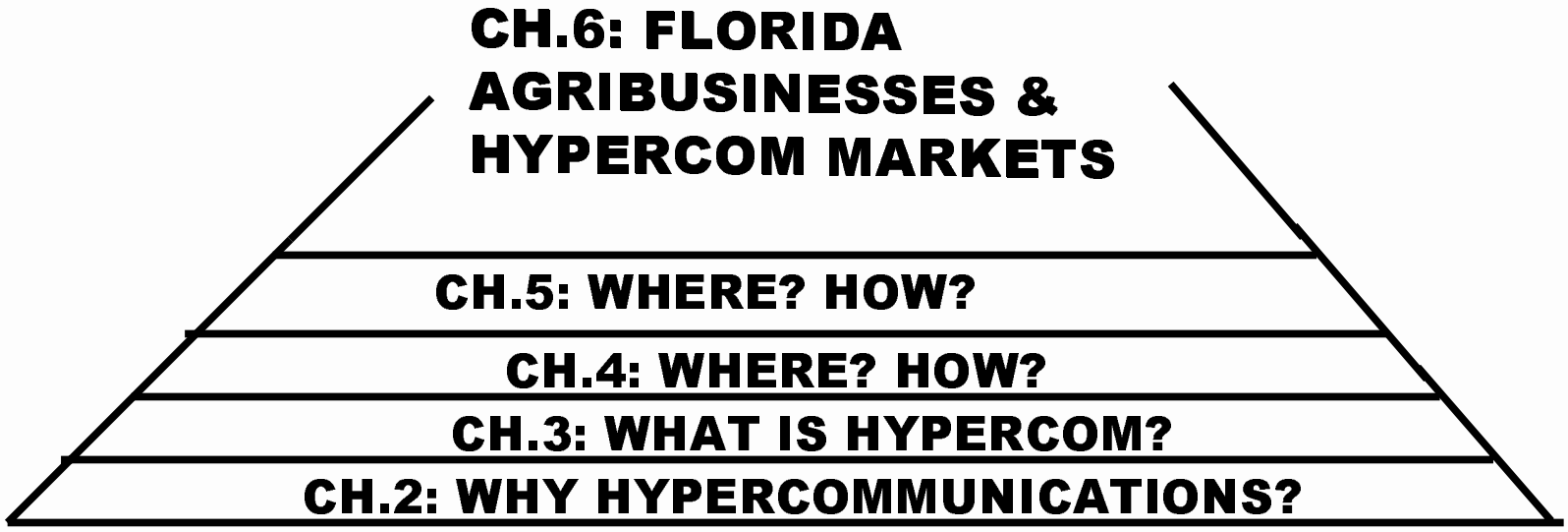
Hypercom supply: QOS production functions
Hypercom Structure, Conduct & Performance
Scale, Scope, Convergence
Trends in Number & Size of FL carriers



Chapter 6: When? Who? With Whom?

When will high-speed infrastructure arrive? Has it already?

Who among agbiz sub-sectors will benefit most? (Nursery, High per unit, specialty)



Chapter 6: When? Who? With Whom?

With Whom?

- What to look for in a provider/partner
- Pitfalls to avoid (LR contracts, etc.)
- Is one-stop the best way to shop now?
- Is cheaper better? (QOS & bundling)