ICS 132: Organizational Information Systems

Networks and Telecommunications

where are we?

- project
  - should be beginning interviews…
  - use Lofland and Lofland as a guide
- meantime…
  - returning to Alter
  - this week: telecommunications

telecommunications

- digital communication over distance
  - person-to-person
  - machine-to-machine
- technology isn't at issue here
  - it'll all change anyway
  - what aspects won't change?
    - how organisations put telecommunications to use
    - what factors affect development and deployment

why telecomms?

- why do we study telecomms in ICS 132?
- telecomms are about:
  - integration
  - centralisation
  - control and decision-making
- the interrelationship between technology and practice
  - technology simultaneously *constrains* and *enables*

bandwidth progress

1844	5 bps	telegraph
1876	2 Kbps	telephone
1915	30 Kbps	transcontinental
1940	7.6 Mbps	coax telephone
1956	1.3 Mbps	transatlantic
1962	0.8 Mbps	telstar
1983	45 Mbps	fiber trunk
1996	2.5 Gbps	fiber long dist.
1997	100 Gbps	Ciena
1997	3000 Gbps	research prototype

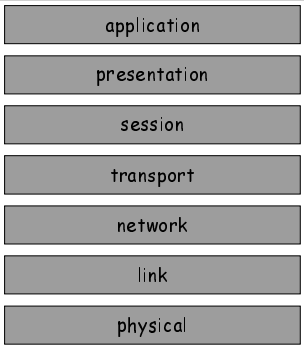
bandwidth progress

- 1987: 2Mb UK channels, 384 transatlantic
- 1989: 56k trunk, 38.4k transatlantic
- 1992: 64k trunk, 256k transatlantic
- 1997: 128/128 (ISDN)
- 1998: 384/384, 10Mbps internal
- 2001: 1.5M/384k, 11Mbps internal

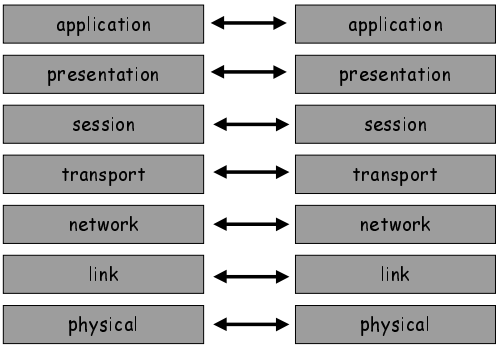
performance variables

- functional
  - capacity, speed, price/performance, reliability, operating conditions
- ease of use
  - user interface, proficiency, portability
- security
  - interception, cost of security
- compatibility
  - conformance
- maintainability
  - modularity, scalability, flexibility

ISO reference model



ISO reference model



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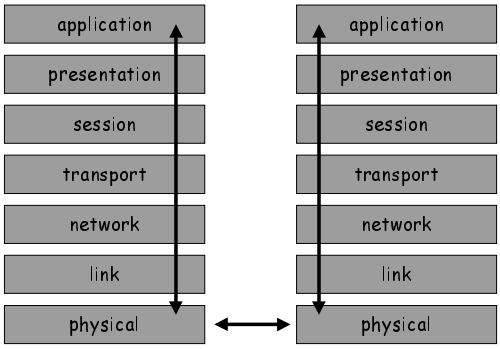

technical concerns

- network topologies

technical concerns

- packet switching and circuit switching

technical concerns

- switching versus broadcast

integration

- in many companies, key sales point
- integrating what?
  - hardware and software
  - information, service, physical equipment
  - distributed processes
- two aspects
  - putting things together
  - keeping it all coordinated
  - telecomms is about enabling distant coordination

integration

- is integration always good?
  - upsides
    - convenient for the consumer
    - compatibility and interoperation
  - downsides
    - revealing information
    - creating dependencies
    - ceding control

standardisation

- the Open Systems era
  - telecomms is now about *interoperability*
- two ways to handle interoperability
  - pairwise
  - reference model
- standards
  - "the nice thing about standards is that there are so many to choose from"
    - ISO, ANSI, BSI, CEC, IETF, ITU, CCITT, IEEE, IEE...
      - POSIX, the Open Group, the Jini Community

standardisation

- the inherent tension
  - we develop standards to *enable progress*
    - ensure interoperability, promote technology diffusion, etc.
  - standardisation *codifies existing practice*
    - standard-setting is not a technology development exercise
  - technology is a moving target
    - the risk is that the standard is obsolete before it's finished
- TCP/IP versus ISO OSI

standardisation

- he who controls the standard, controls the market
  - this is not just a technical concern
  - standards set an agreed-upon level of "quality"
    - governments and organisations mandate compliance
- so, standardisastion is a political process
  - ATM and IP
    - how long are your wires?
    - engineering versus adaptation
  - the saga of ISO Lisp
  - IETF instant messaging

standardisation

- so who are the players?
  - governments and regulatory authorities
    - most standardisation agencies are governmental
    - promoting scientific progress
    - limiting monopoly powers
  - incumbent players
    - trying to protect their investments
  - new players
    - trying to open up the market to greater competition
  - users and consumers
    - the least likely people to be represented!

telecomms and org. structure

- the introduction of telecommunications
  - telegraph
  - railways
- these weren't new organisational forms…
  - extending the reach of the old ones
    - hierarchy maintained
    - centralised decision making
    - distributed effect

organisational structure

- telecomms enables:
  - integration
    - making disparate information systems work together
  - coordination
    - overcoming geographical or organisational distance
- central issues for organisations
  - decision-making
  - control

architectures

- mainframe/terminal
- client/server (and three-tier)
- distributed/peer-to-peer
- 132-style questions
  - which is easiest to control
  - which is easiest to adapt
  - which is easiest to monitor

centralisation

- need to think of this in two ways
  - technical – physical configuration, location of services, etc.
  - social – who governs, who makes decisions, how are decisions enforced?
- centralisation involves the exercise of power
  - that's why it's almost always political
  - centralised structures concentrate decisions
  - decentralised structures distribute decisions
- not simply opportunity -- *authority*

centralisation

- information systems and centralisation
  - IT leads to decentralisation
    - not quite – often the opposite!
  - IT causes the centralisation issue to disappear
    - again, no – distinguish *technical* from *social*
- the general shift
  - Mainframe Era: IT as centralizing and enslaving
  - Internet Era: IT as decentralizing and liberating
  - in practice, neither of these are true

centralisation

- four major arguments
  - computerisation leads to centralised decision making
  - computerisation leads to decentralised decision making
  - there is no inherent relationship between computerisation and centralisation
  - the design of computer systems reflects organisational norms of centralisation

a current example

- napster
  - peer to peer architecture
    - technical features
      - every client is also a server
      - decentralised operation (largely)
    - advantages
      - exploit distributed storage
      - harder to regulate
      - harder to shut down
    - disadvantages
      - need scale and redundancy for consistent information
      - harder to measure
      - harder to optimise

a current example

- the rhetoric of emancipation
  - "information wants to be free," they cry
    - although probably not their credit card bills...
- peer-to-peer in general
  - peer-to-peer for credit exchange?
  - peer-to-peer for web/information access?

summary

- telecomms is central to IS strategy
- telecomms is about integration & coordination
  - technology and organisational structure
- standardisation
  - enabling interoperability/limiting innovation
  - the politics of the process

next time

- planning and maintenance
- read Alter ch 11 & 12