

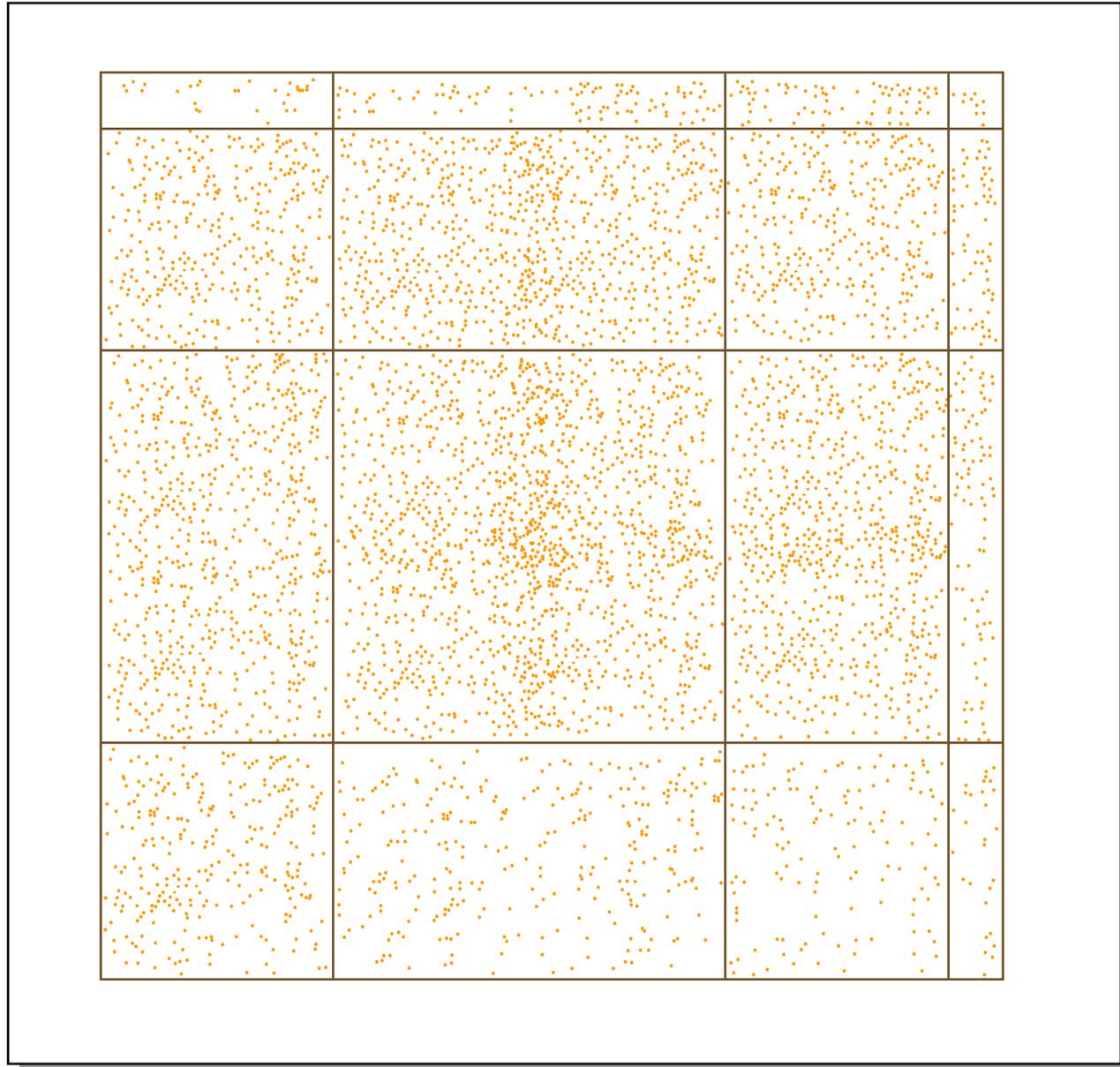


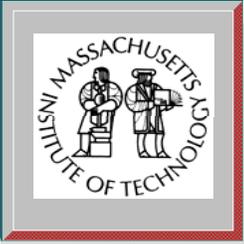
# Physical and Organizational Space

May 2, 2006

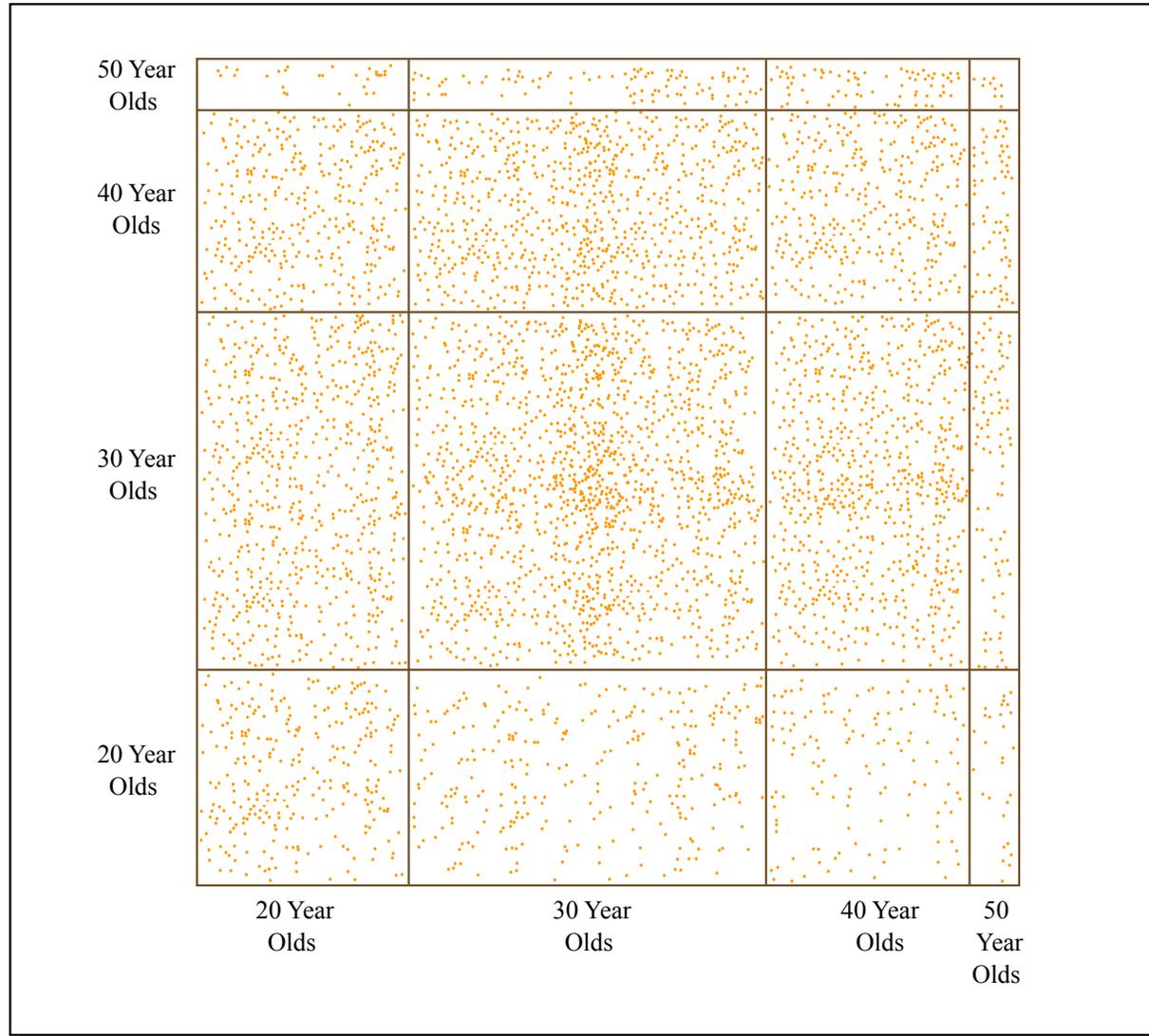


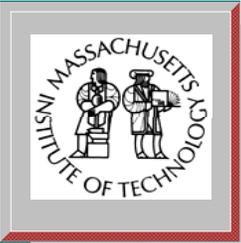
## Netgraph of Communication Among Software Developers ( $N > 600$ )





# Netgraph of Communication Related to Age





# Netgraph of Communication Related to Organizational Structure

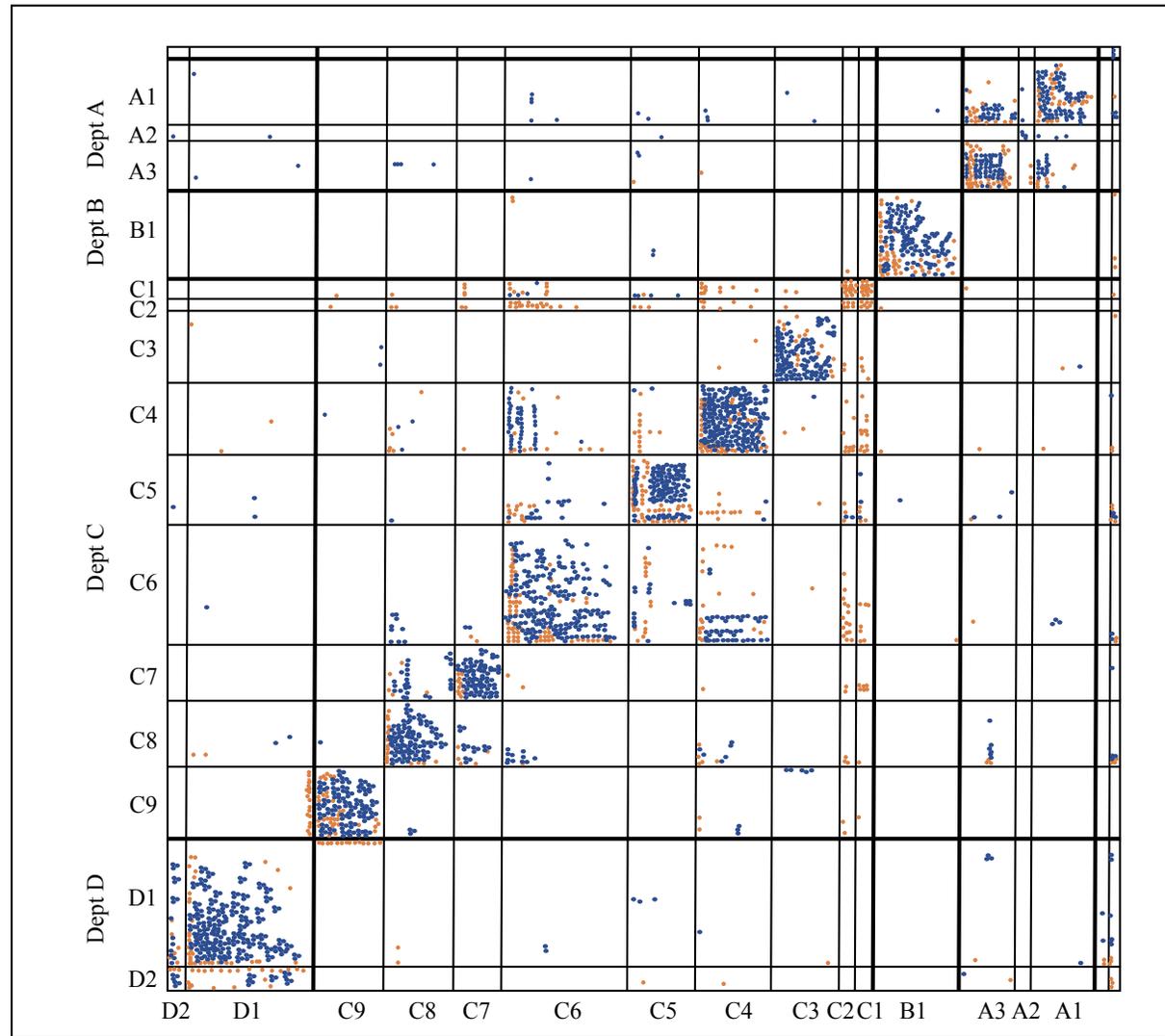
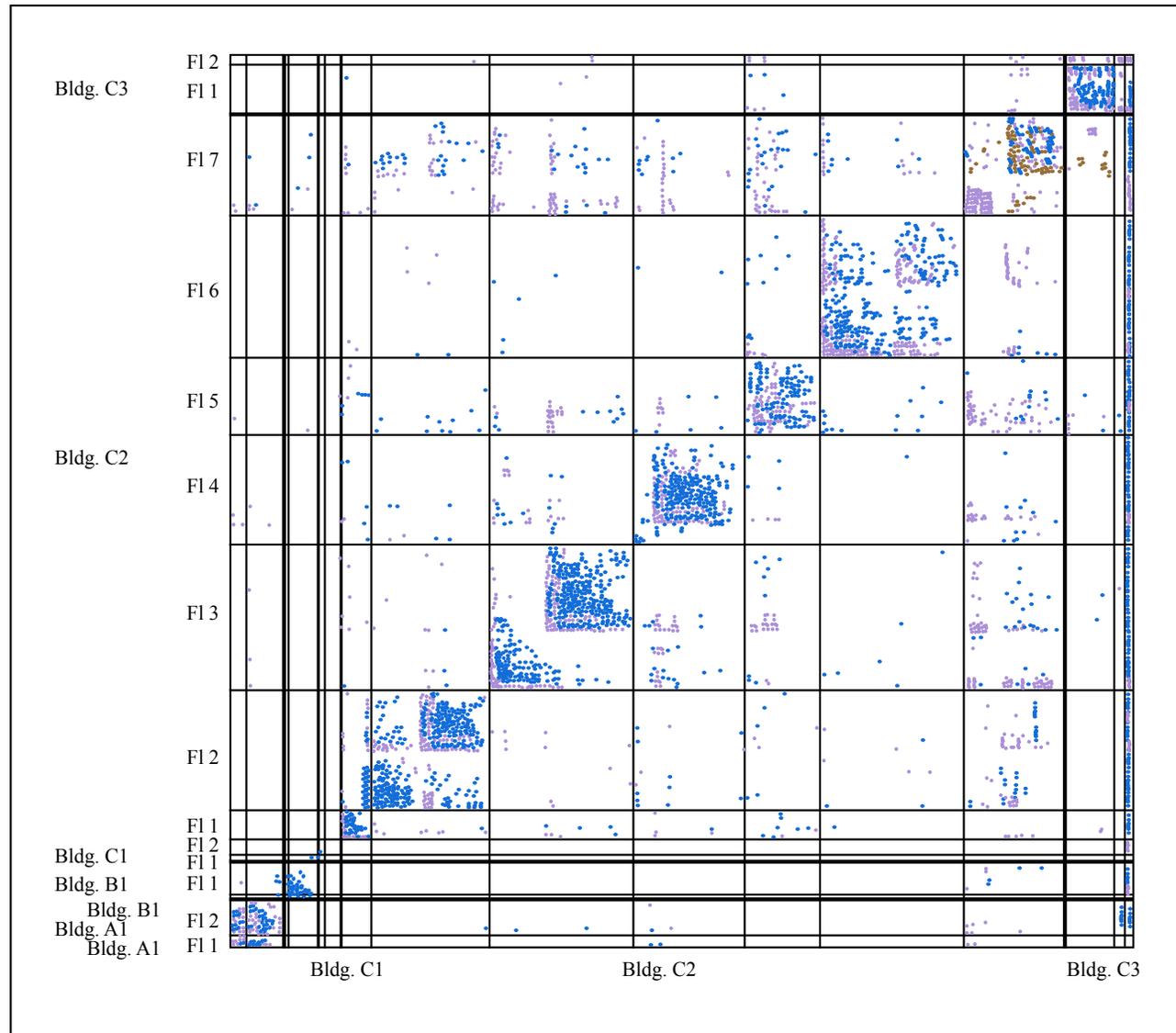
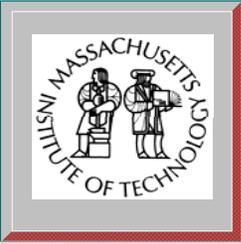


Image by MIT OCW.

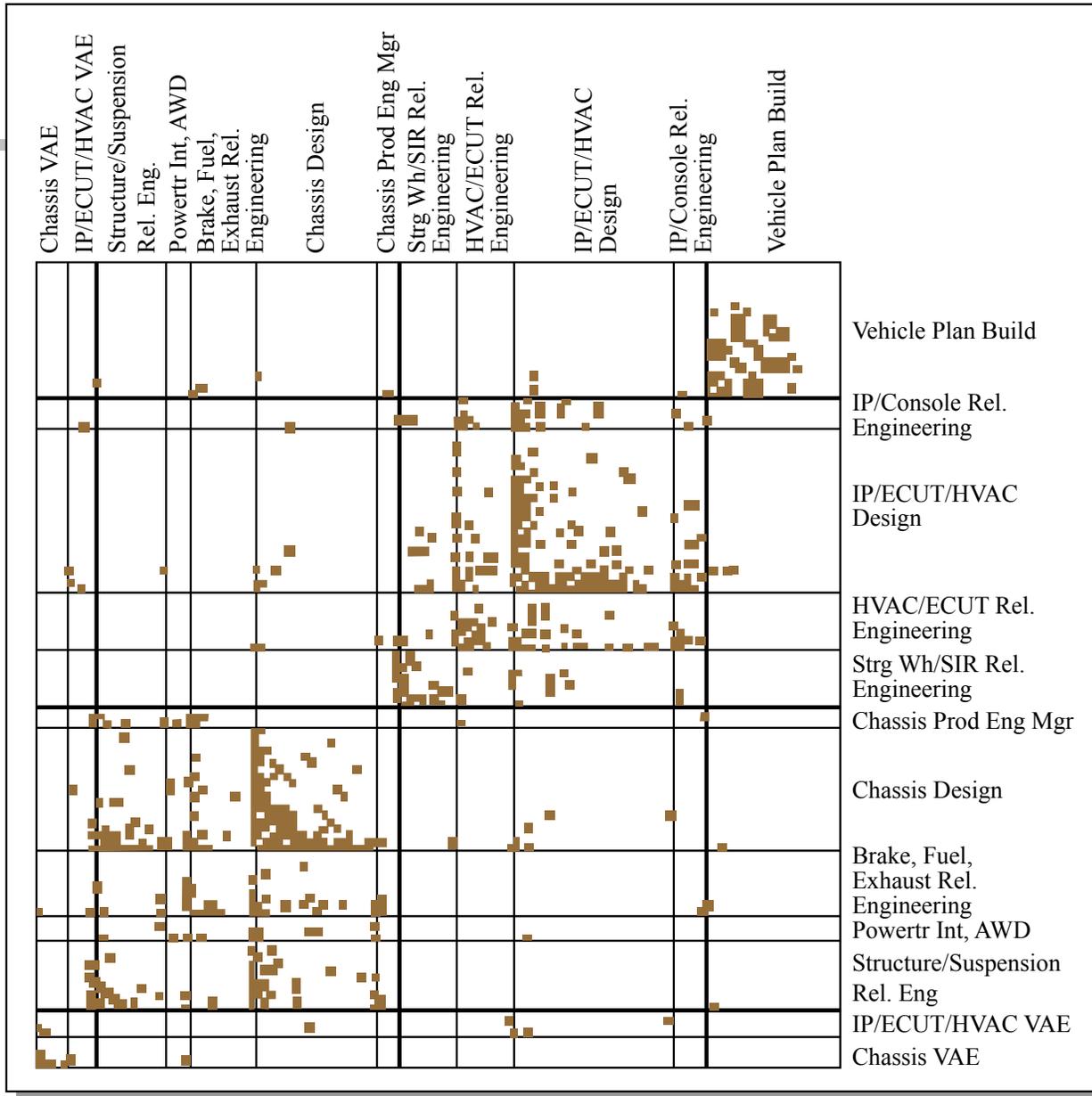


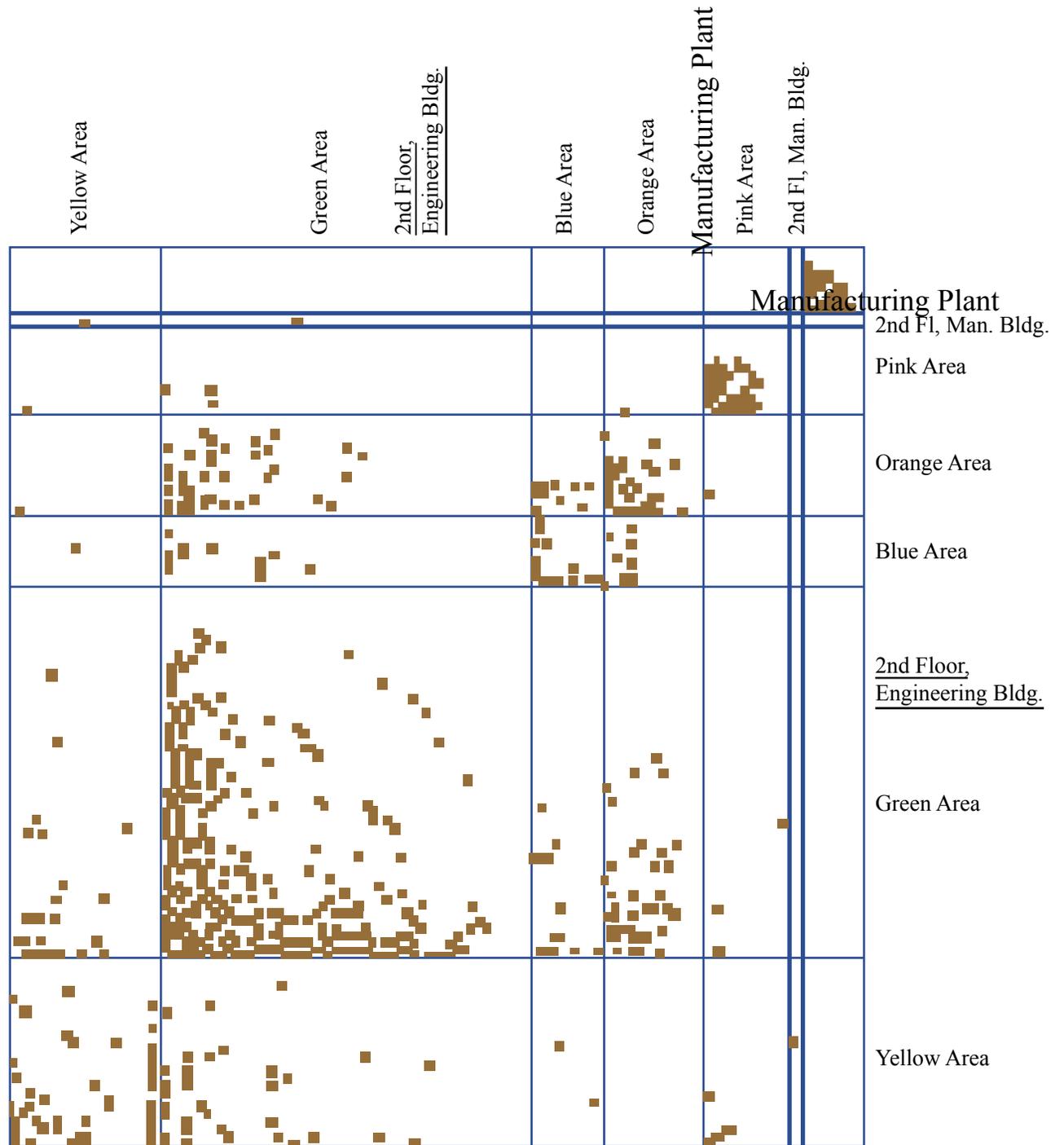
# Netgraph of Communication Related to Physical Location





# Netgraph of Communication Related to Organizational Structure

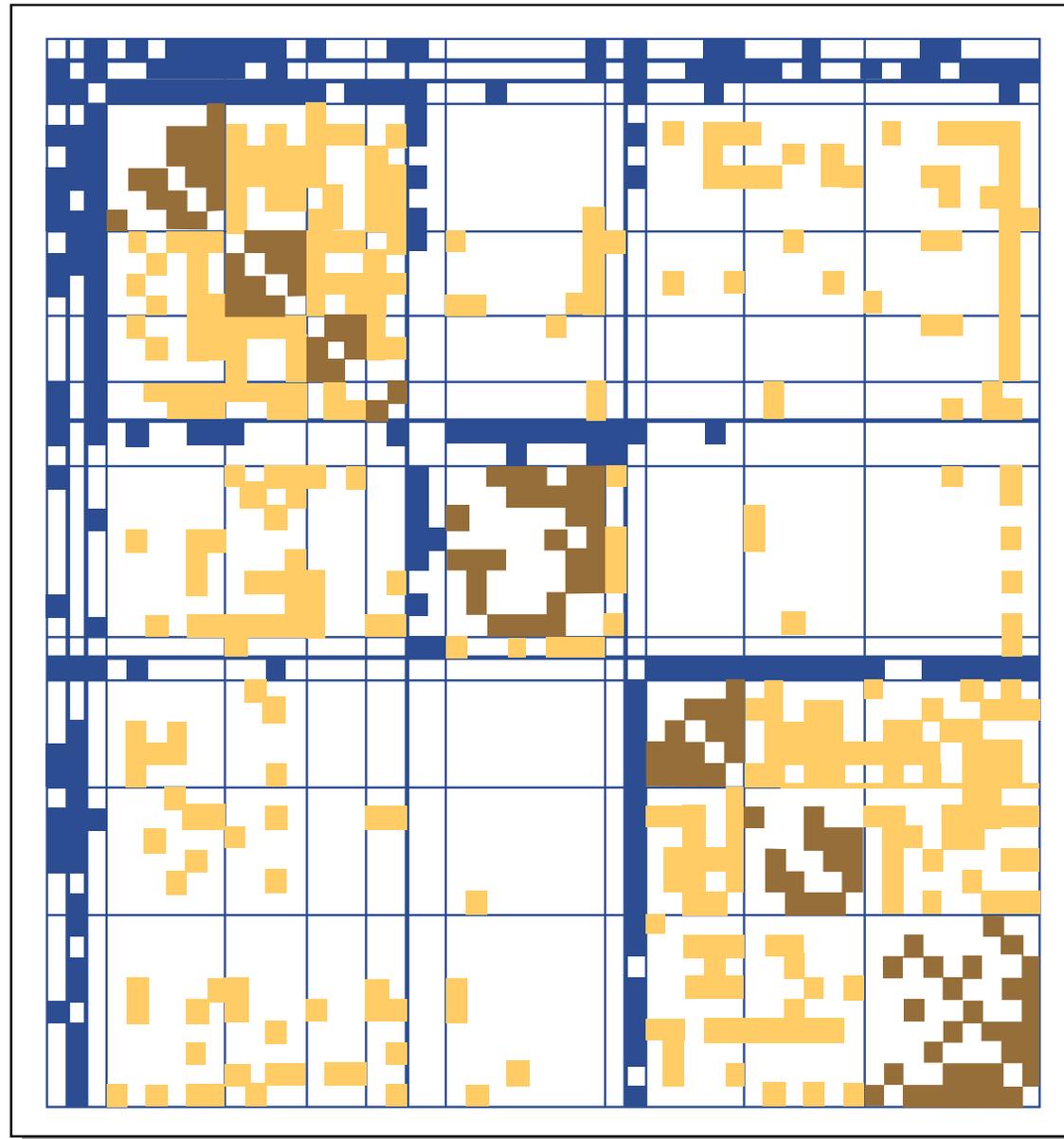






# Communication Mapping

Order by  
location





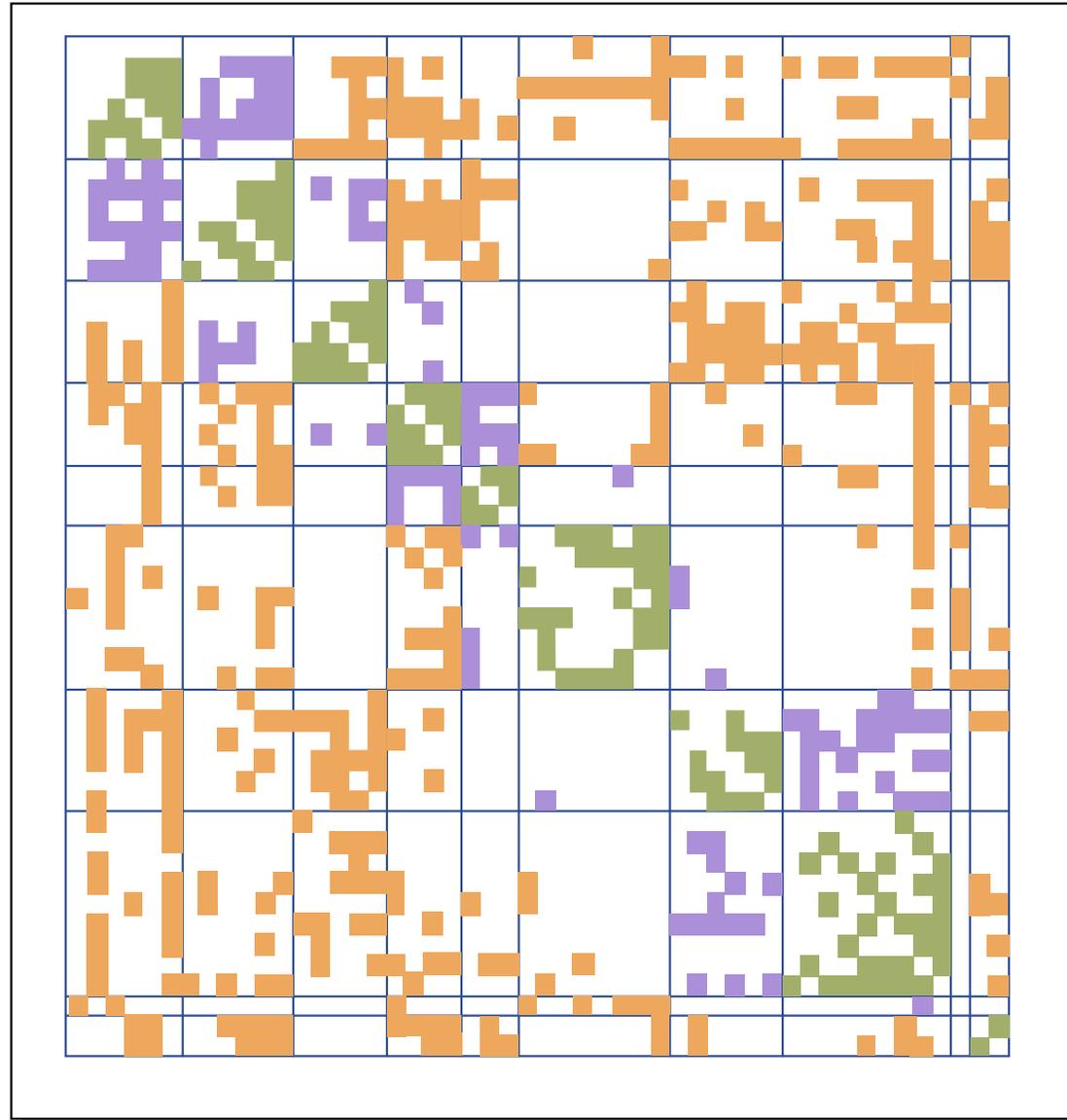
# Communication Mapping

Order by

Project

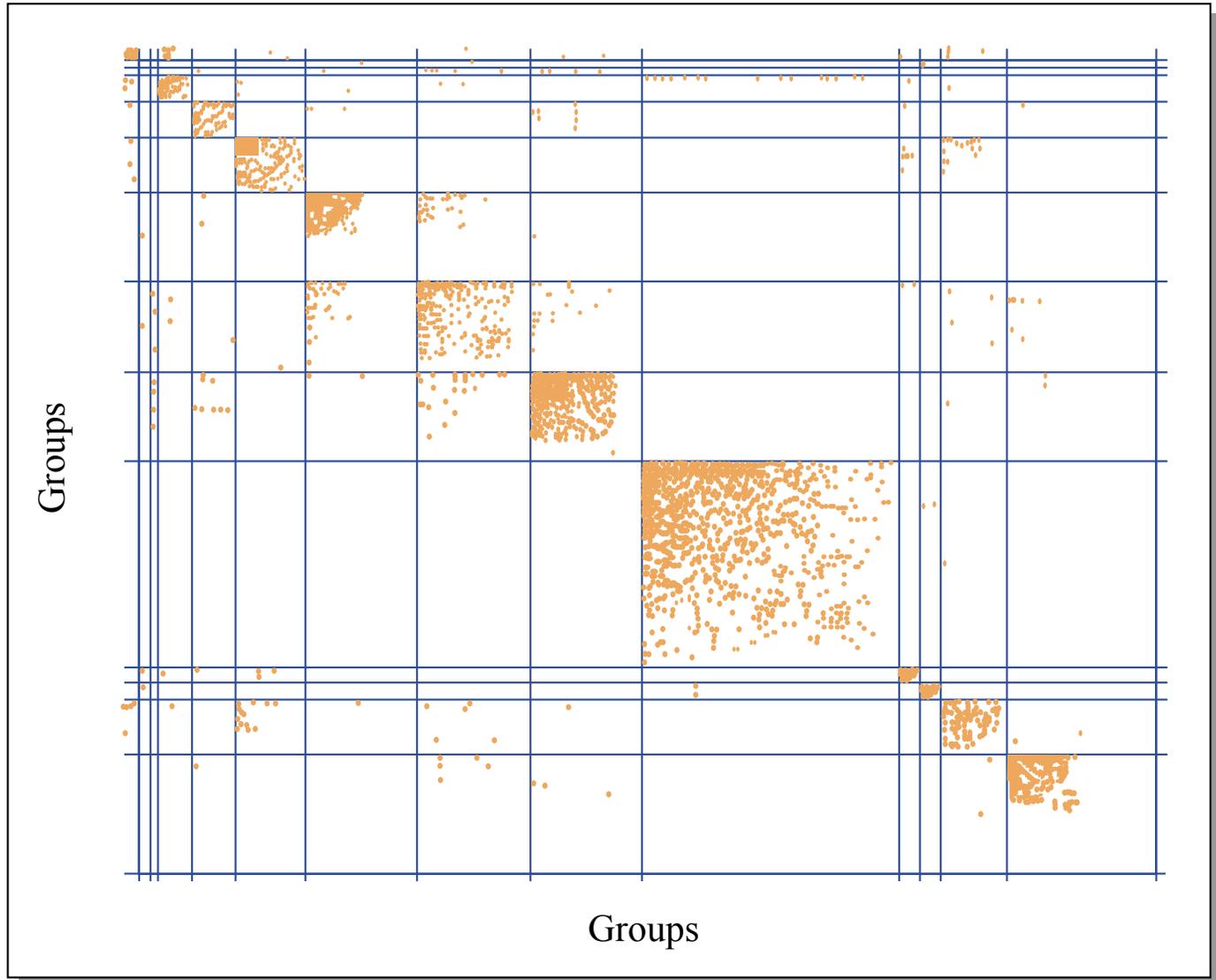
Development

Process





## Netgraph Showing the Low Level of Communication Among Groups in Laboratory 'K'.



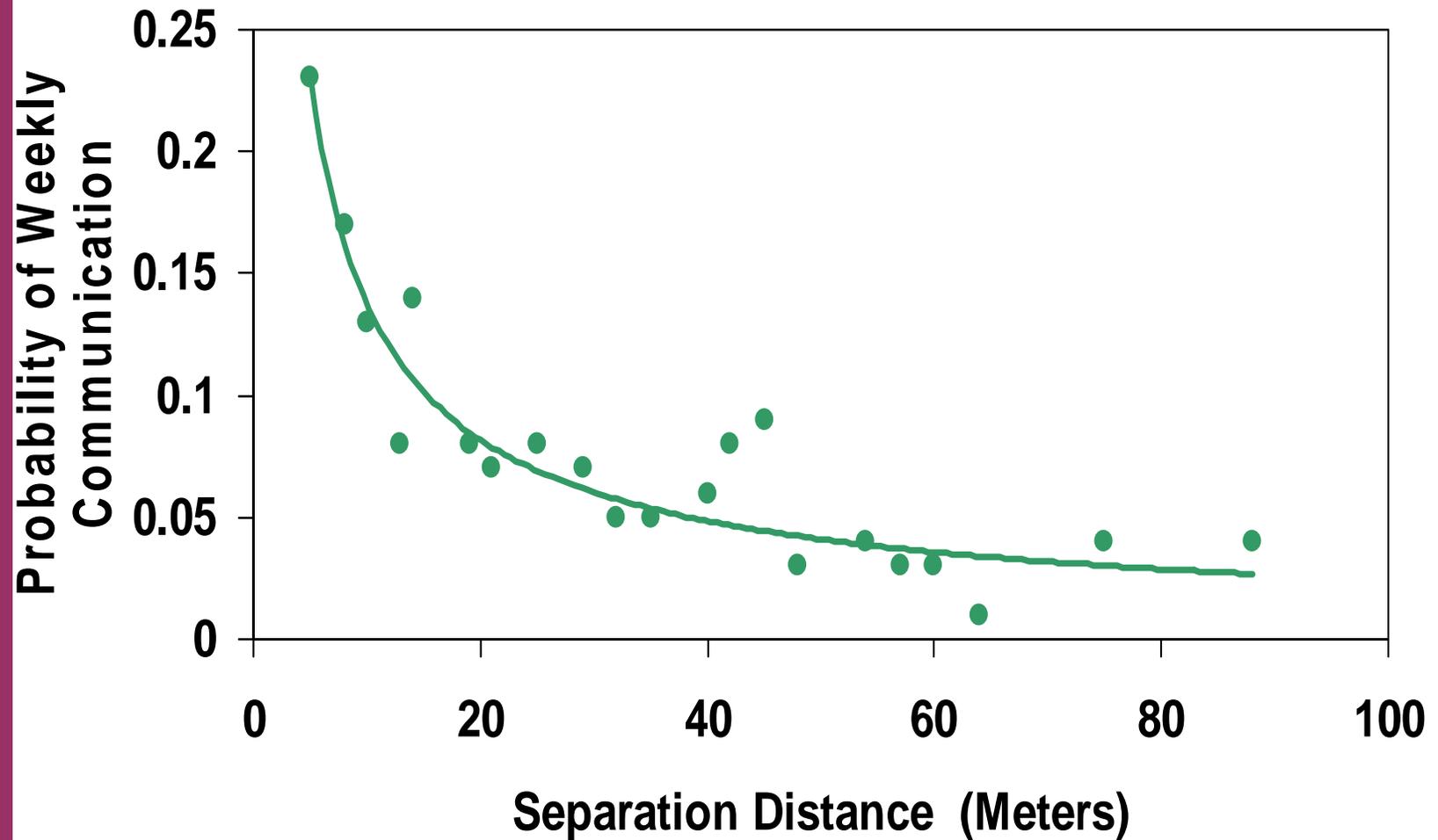


# Technology Transfer

April 6, 2006

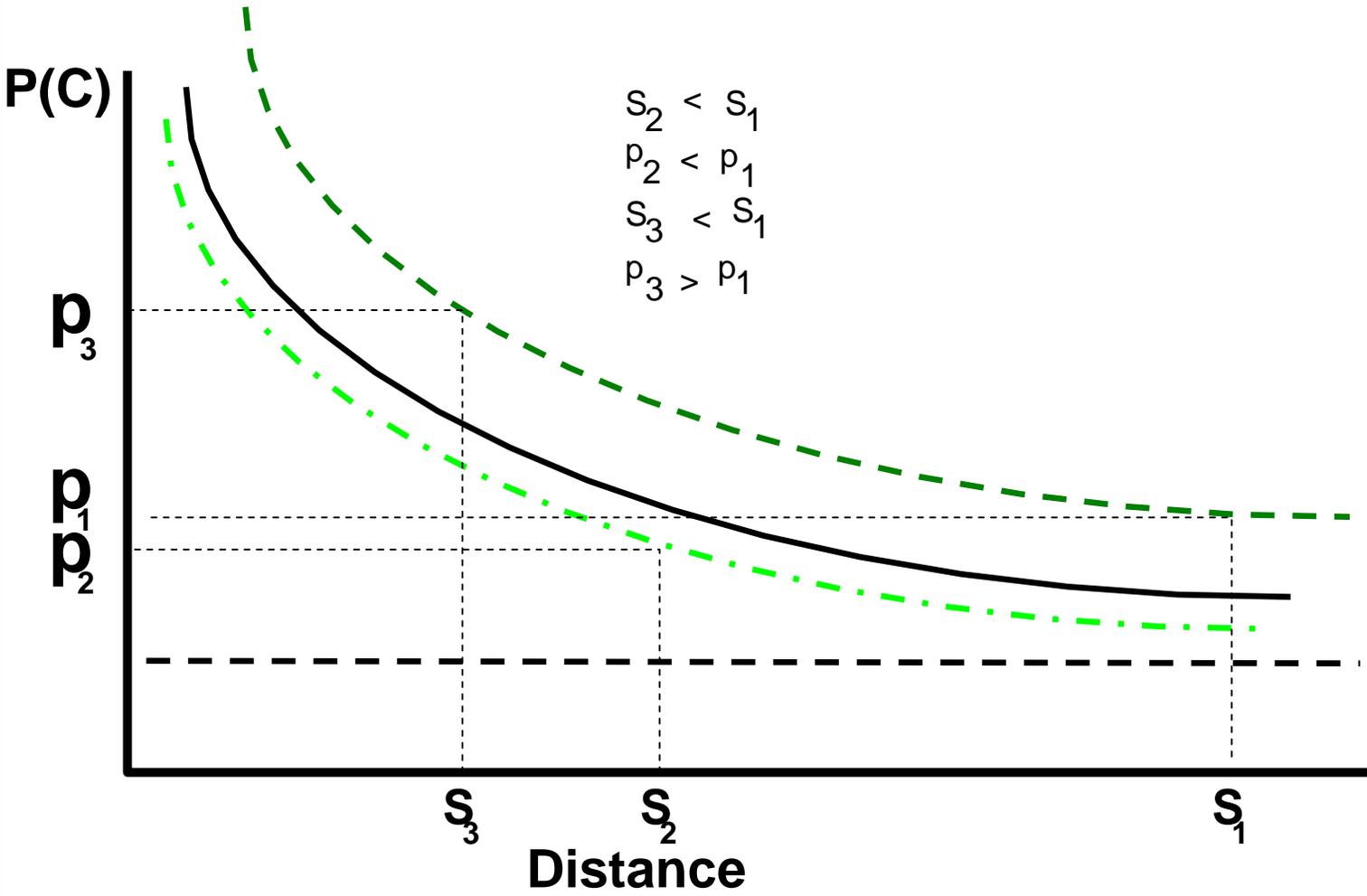


## Probability of Technical Communication as a Function of Distance Between Work Stations





# Some Obvious Points





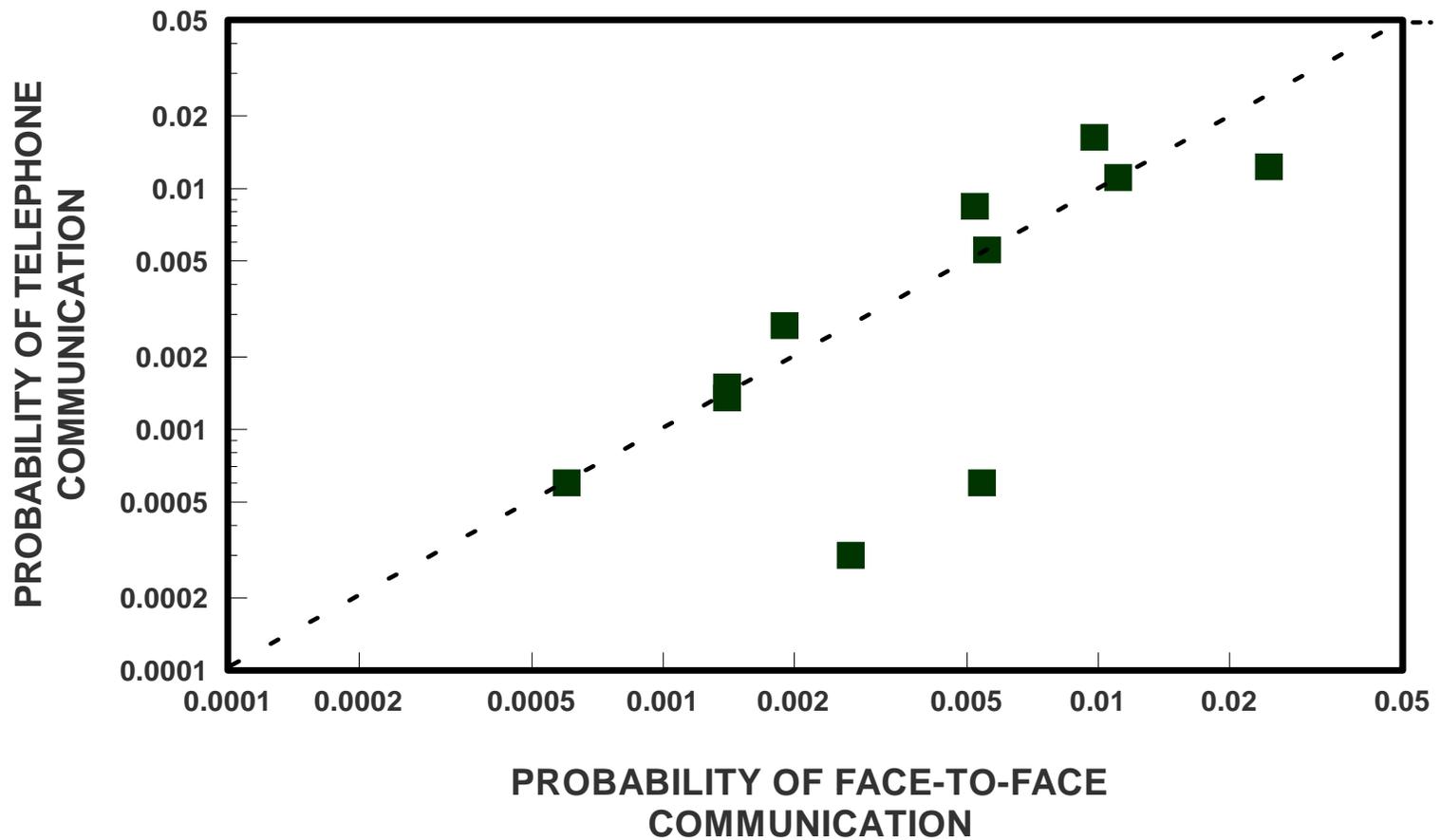
# Telecommunications?

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- But this is face-to-face. What about the modern media?
  - E-mail?
  - Telephone?
  - Video conference?
- The use of all of these is strongly correlated with face-to-face contact.



# Face-to-Face and Telephone Communication





# 'Bandwidth' Limitation

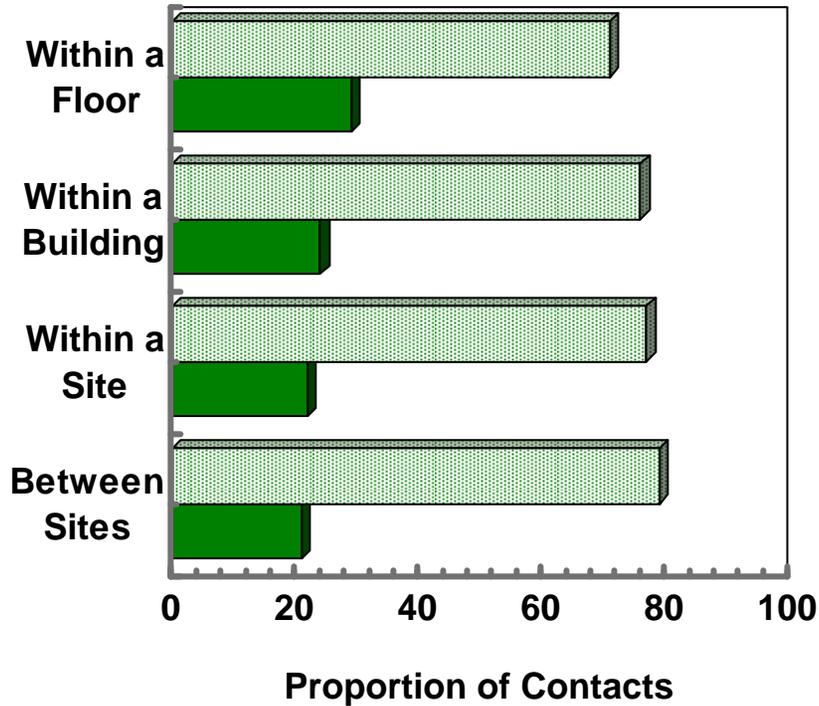
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- More important, still, is the fact that all of these media are 'bandwidth limited', in more than the physical sense.
  - It is very difficult to discuss a complex problem or an idea by e-mail or telephone.
    - We phone or e-mail to make the appointment and then visit face-to-face.



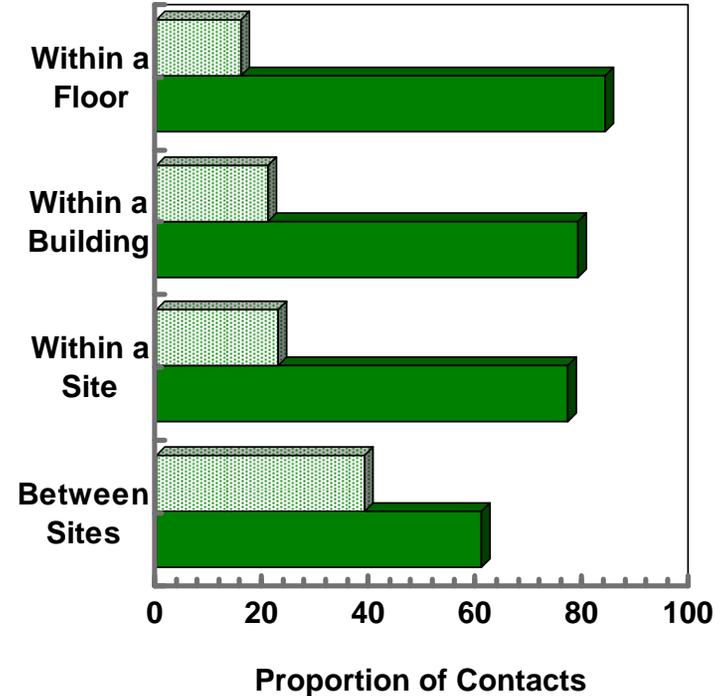
# 'Bandwidth' Limitation

Low Complexity Information



■ Face-to-Face ■ Telephone

High Complexity Information



■ Face-to-Face ■ Telephone



# Communication Between Floors

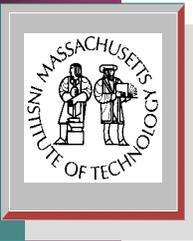
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- Vertical separation is disastrous for communication.
  - We are captured psychologically by the floor that we are on. That floor becomes for us ‘the building’.
  - Visual contact can offset this effect.
    - Atriums



## Probability of Weekly Communication Between People Located on Different Floors in a Building

Organization/Situation	P(C)
Agricultural Research Institute (Maximum Building 3 Floors)	0.04
Computer Company (Maximum Building Height 6 Floors)	0.01
Decker Building, Corning Glass Works (Building Height 3 Floors with atrium)	0.14



## Vertical Separation in the Sears Tower

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Yet some of the company's motivations were subtler. According to the official, Sears had found that the Tower inhibited communications between different departments that had been the company's hallmark in its heyday on Chicago's West Side. There it operated out of low-rise buildings that literally sprawled for blocks. Each floor in the Tower had its own culture. The presence of outside tenants likewise restrained candid exchanges of ideas by headquarters personnel in the hallways or elevators of the Tower.

From *The Wall Street Journal*

Image by MIT OCW.



# A Building Example

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- A physical structure for the product development matrix
  - Patterns physical space on the needs of the product development matrix.
  - Enables visual contact between floors.