

Multimedia Information Extraction and Retrieval

Social Network Analysis

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Acknowledgements

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- With some extensions for Kite networks

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Everybody talks about Networks?

*Networked
Economy*

*Ego
Networks*

Networking

*Regional
Networks*

*Social
Networks*

*National
Innovation
Networks*

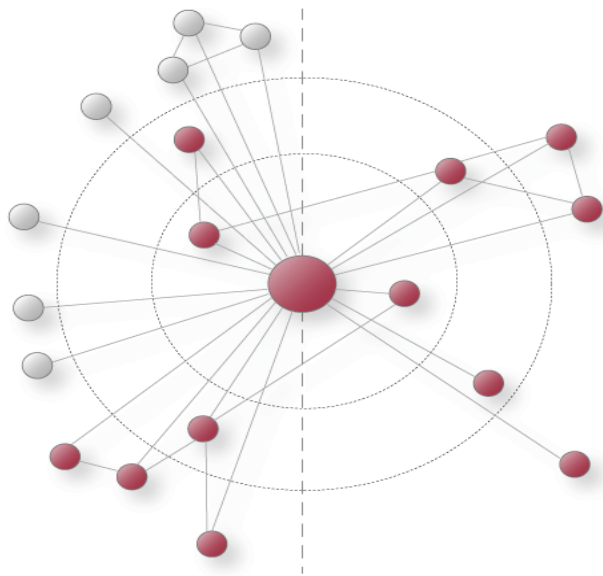
*Entrepreneurial
Networks*

*Immigrant
Networks*

*Infrastructure
Networks*

Social Networks

- How do you explain to say somebody what Social Network is? What Social Network Analysis is?

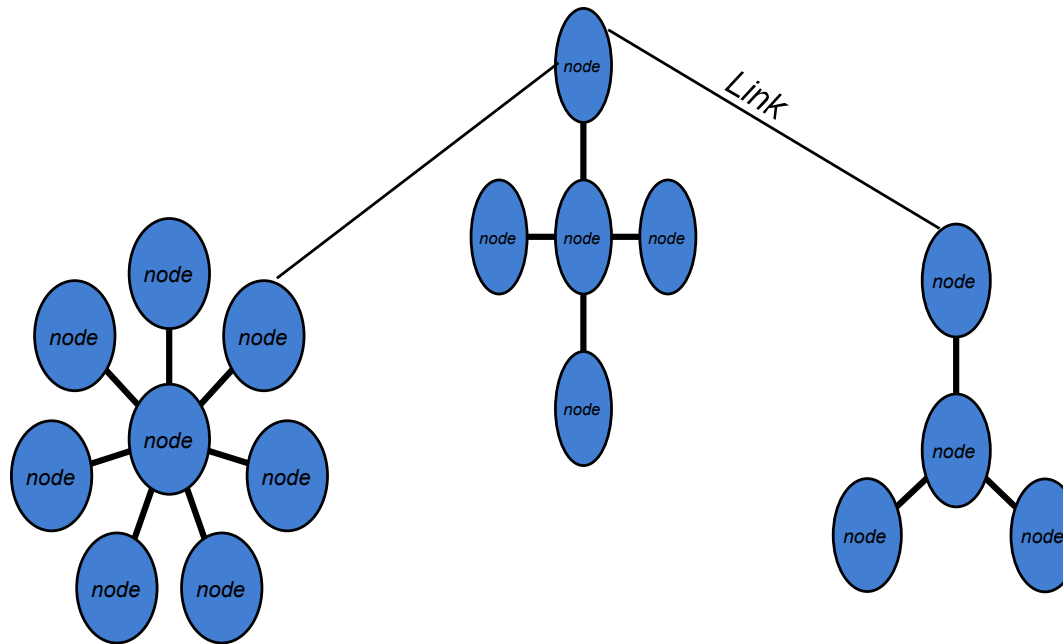


*Network Analysis is the keyword
for the 21st Century*

*Researchers , Politicians , People talk
about Networks around you.*

How do you explain what network is?

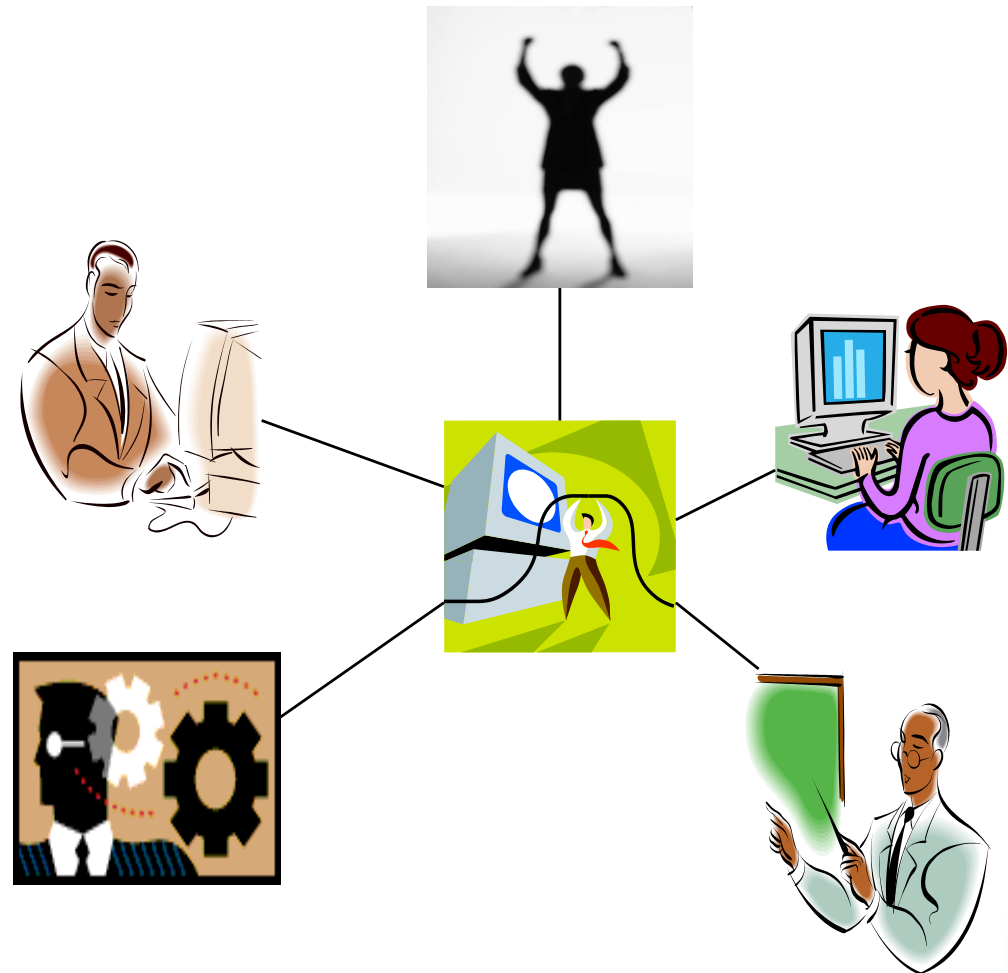
What is a Network?



Web Definition : A set of nodes, points, or locations connected by means of data, voice, and video communications for the purpose of exchange.

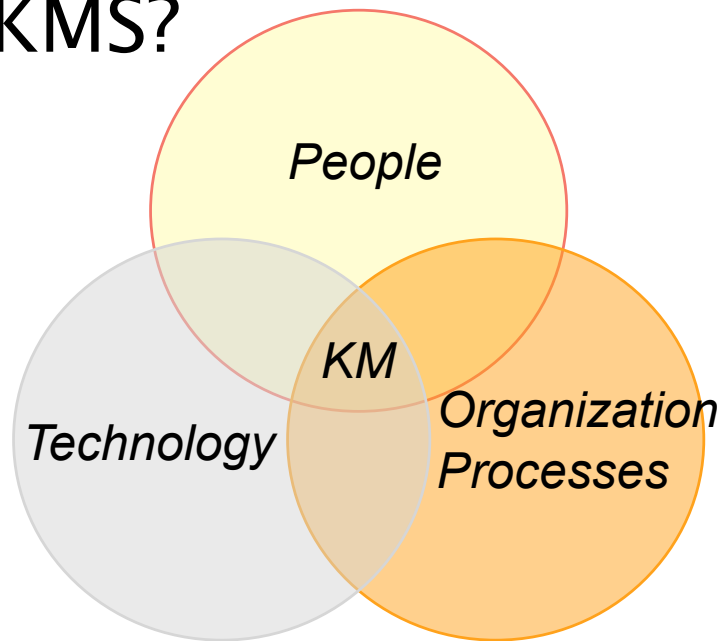
Social Networks

*A **social network** is a **description** of the **social structure** **between actors**, mostly individuals or organizations. It indicates the ways in which they are connected through various social familiarities ranging from casual acquaintance to close familiar bonds.*



Social Networks and KMS

- Why Social Networks in KMS?

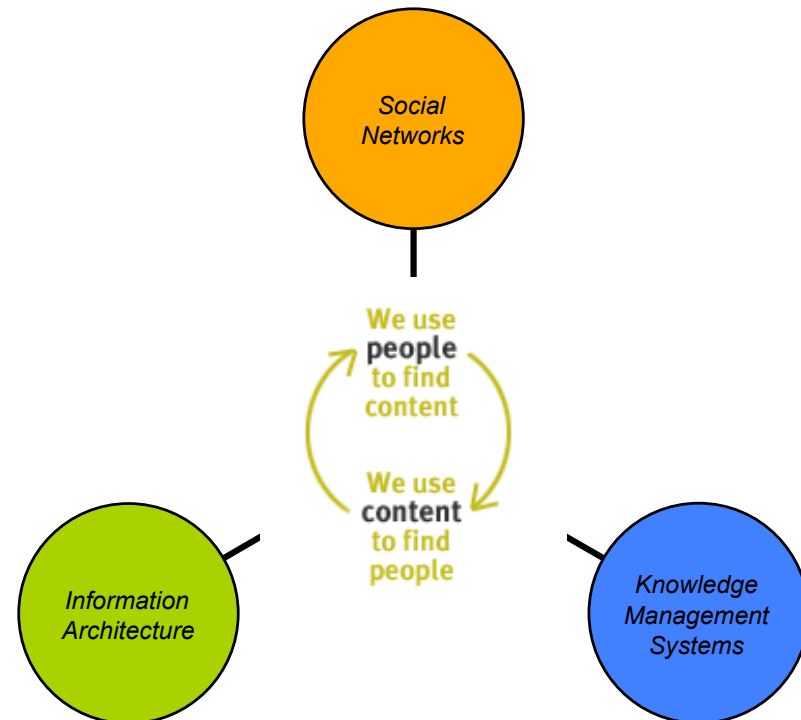


Knowledge Management involves people, technology, and processes in overlapping parts.

Social Networks and KMS

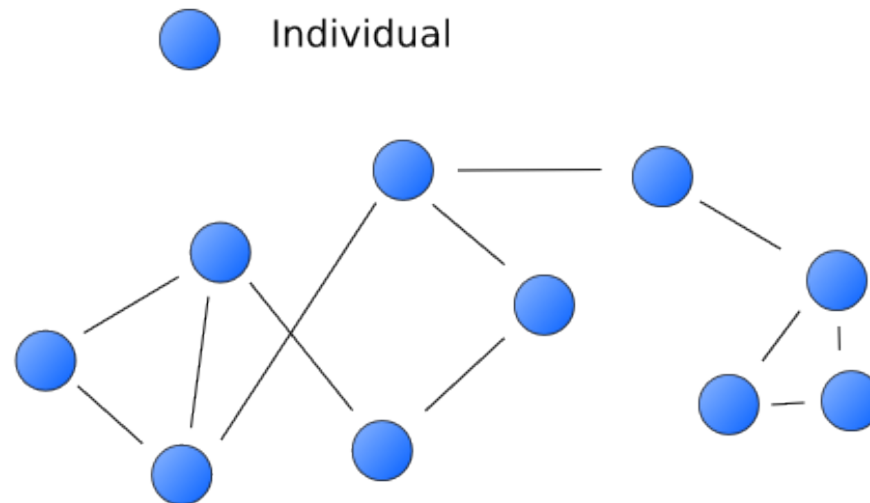
- Why are we studying Social Networks ?

What ties Information Architecture, Knowledge Management and Social Network Analysis more closely together is the reciprocal relationship between people and content.

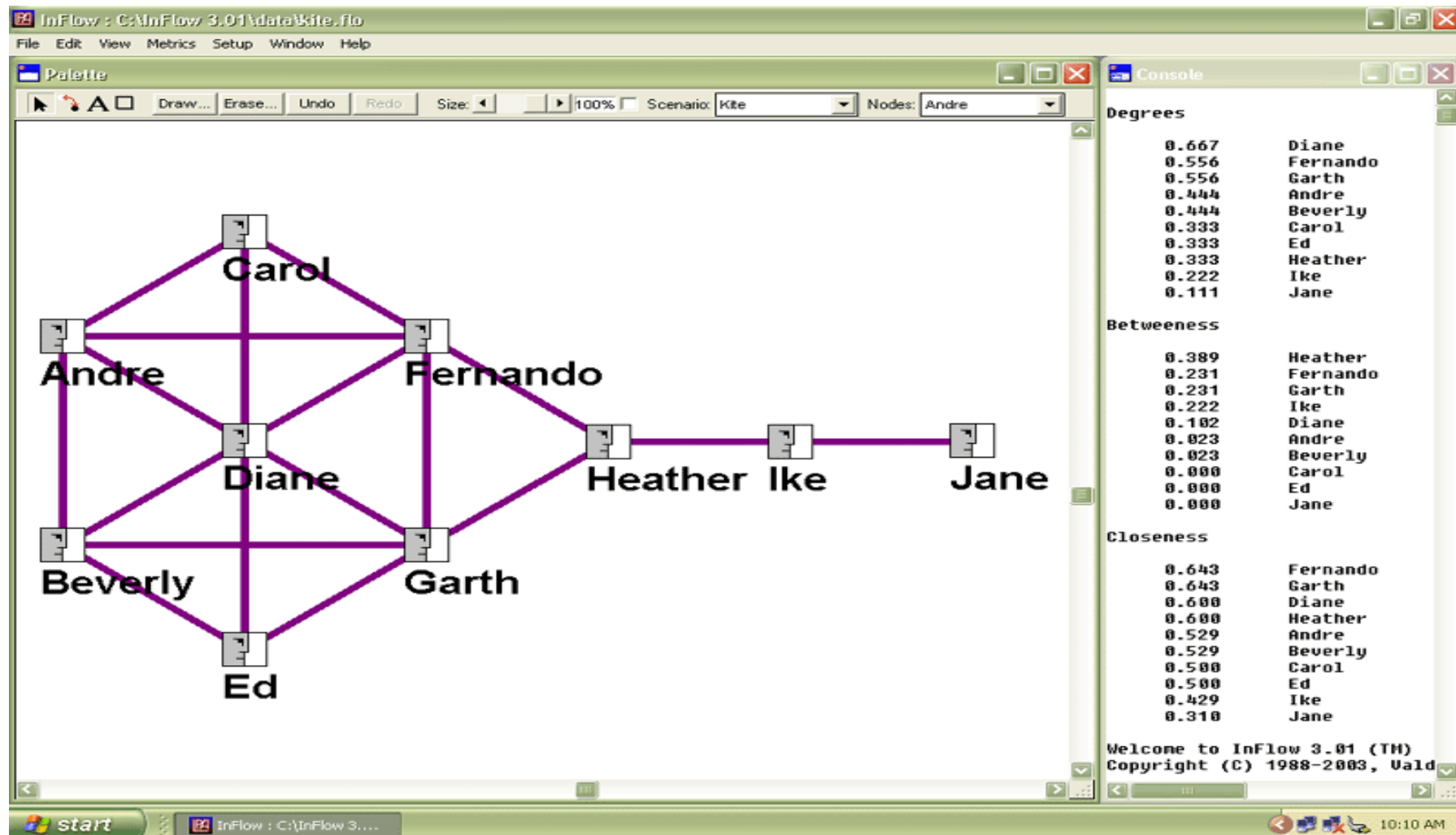


Social Network Analysis

- Social network analysis [SNA] is the mapping and measuring of relationships and flows between people, groups, organizations, computers or other information/knowledge processing entities.
- The nodes in the network are the people and groups while the links show relationships or flows between the nodes.



Exercise on SNA: Kite Network



By David Krackhardt

Exercise on SNA: Kite Network

- Who is the Connector or Hub in the Network?
- Who has control over what flows in the Network?
- Who has best visibility of what is happening in the Network?
- Who are peripheral players? Are they Important?

Social Network Analysis

1. Degree Centrality:

The number of direct connections a node has. What really matters is where those connections lead to and how they connect the otherwise unconnected.

$$C_D(n_i) = d(n_i) \quad C'_D(n_i) = \frac{d(n_i)}{g-1}$$

2. Betweenness Centrality:

A node with high betweenness has great influence over what flows in the network indicating important links and single points of failure.

$$C_B(n_i) = \sum_{j < k} g_{jk}(n_i) / g_{jk} \quad C'_B(n_i) = \frac{C_B(n_i)}{(g-1)(g-2)/2}$$

3. Closeness Centrality:

The measure of closeness of a node which are close to everyone else.

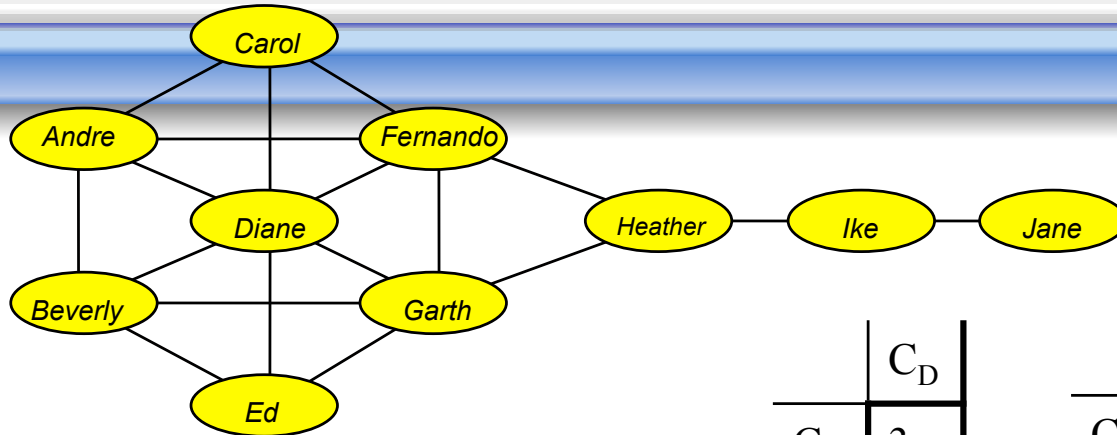
The pattern of the direct and indirect ties allows the nodes any other node in the network more quickly than anyone else. They have the shortest paths to all others.

$$C_C(n_i) = \left[\sum_{j=1}^g d(n_i, n_j) \right]^{-1} \quad C'_C(n_i) = \frac{g-1}{\sum_{j=1}^g d(n_i, n_j)} = (g-1)C_C(n_i)$$

Legend

- g = size of graph (number of nodes)
- $d(.)$ = (in)degree
- g_{jk} = number of minimal paths between nodes j and k
- $g_{jk}(n)$ = number of minimaps paths between nodes j and k that contain n
- $(g-1)(g-2)/2$ = number of paths not containing node n
- $d(.,.)$ = distance between two nodes

Kite-Network II



$$C_B(n_i) = \sum_{j < k} g_{jk}(n_i) / g_{jk}$$

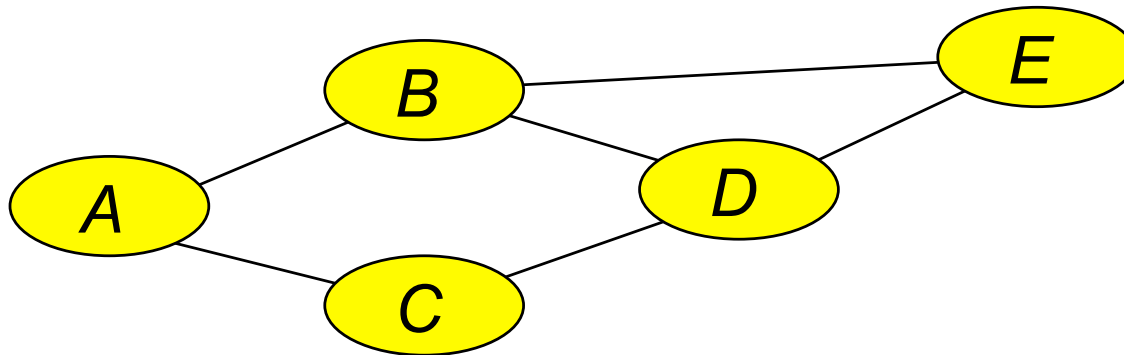
$$C_C(n_i) = \left[\sum_{j=1}^g d(n_i, n_j) \right]^{-1}$$

$$C_D(n_i) = d(n_i)$$

	C_D
C	3
A	4
F	5
D	6
B	4
G	5
E	3
H	3
I	2
J	1

[illegible]

Example III



	A	B	C	D	E
A	0	1	1	0	0
B	1	0	0	1	1
C	1	0	0	1	0
D	0	1	1	0	1
E	0	1	0	1	0

Adjacency

	C_B	C_C	C_D
A	1	1/6	2
B	3	1/5	3
C	1	1/6	2
D	3	1/5	3
E	0	1/6	2

	A	B	C	D	E
A	0	1	1	2	2
B	1	0	2	1	1
C	1	2	0	1	2
D	2	1	1	0	1
E	2	1	2	1	0

Distance

	A	B	C	D	E
A	0	A	A	BC	B
B	B	0	AD	B	B
C	C	AD	0	C	D
D	BC	D	D	0	D
E	B	E	D	E	0

Paths

SNA and KMS:

SNA helps in analyzing the following facts in a KMS:

- Bottlenecks – Central nodes that provide the only connection between different parts of the network.
- Number of links – Insufficient or excessive links between departments that must coordinate effectively.
- Average distance – Degrees of separation connecting all pairs of nodes in the group.

SNA and KMS (2)

- Short distances transmit information accurately and in a timely way, while long distances transmit slowly and can distort the information.
- Isolation – People that are not integrated well into a group and therefore, represent both untapped skills and a high likelihood of turnover.
- Highly expert people – Not being utilized appropriately.
- Organizational subgroups or cliques – Can develop their own subcultures and negative attitudes toward other groups.

Application of SNA:

- Realizing 9/11 Al- Qaeda Network.
- Build a grass-roots political campaign.
- Determine influential journalists and analysts in the IT industry.
- Map executive's personal network based on email flows.
- Discover the network of innovators in a regional economy.
- Analyze book selling patterns to position a new book and many more.....

Technology

Various technologies that help in creating Social Networks are:

- 1) Email
- 2) Blogs
- 3) Social Networking Software like Orkut, LinkedIn etc.

Technology : LinkedIn

- **What is Your Network?**

When your connections invite **their** connections, your Network starts to grow.

Your Network is your connections, their connections, and so on out from you at the center.

- **How do you classify users?**

Your Network contains professionals out to “three degrees” — that is, friends-of-friends-of-friends. If each person had 10 connections (and some have many more) then your network would contain 10,000 professionals.

- **How do you see who is in your Network?**

LinkedIn lets you see your network as one large group of searchable professional profiles.

Technology: LinkedIn (1)



Technology: LinkedIn (2)

The screenshot shows the LinkedIn 'Find People' search page in a Microsoft Internet Explorer browser window. The address bar displays the URL: https://www.linkedin.com/search?trk=tab_srh. The page features a navigation bar with links: Get Clients, Hire Employees, Find Sales Leads, Locate References, Reach Business Partners, and Find Experts. Below this, there are two main search panels: 'Search by Keywords' and 'Search by Name'.

Search by Keywords:

- Keywords: (ex: retail; purchasing; Linux)
- Title:
- ☒ Current titles only
- Company:
- ☒ Current companies only
- Industry:
 - Any industry
 - Agriculture
 - Dairy
 - Farming
 - Fishery
 - Ranching
- Location: (Anywhere)
- Country: (United States)
- US ZIP: (78705) [ZIP lookup](#)
- Interested in: (All users)
- Joined your network: (At any time)
- Sort by: (Degrees away from you)
- [Reset](#) [Search](#)

Search by Name:

- Name: (First Name Last Name)
- Additional criteria (optional):
 - Company:
 - Location: (Anywhere)
 - Country: (United States)
 - US ZIP: (78705) [ZIP lookup](#)
- [Reset](#) [Search](#)

How to find people you need ?

Technology : LinkedIn (3)

Finding Jobs

The screenshot shows the LinkedIn Jobs Home page in a Microsoft Internet Explorer browser window. The address bar displays the URL: https://www.linkedin.com/jobs?displayHome=&trk=tab_jobs. The page features a navigation bar with links for Home, Find People, Find Jobs, Find Services, My Profile, and My Contacts. Below this, there are tabs for Jobs Home and Job Search, with buttons for SEEKING and HIRING?.

The main content area includes a graphic illustrating the job search process: "You" (represented by a person icon) connects to "The people you know" (represented by a group of people icon), which then connects to "The company where you want to work" (represented by a building icon). This is accompanied by the text "Find your next job through LinkedIn" and a "See How It Works" button.

Below the graphic is a "Search for Jobs" section with the following fields and options:

- Keywords:** A text input field.
- Location:** A dropdown menu set to "Anywhere".
- Country:** A dropdown menu set to "United States".
- US ZIP:** A text input field with "78705" entered, and a "ZIP lookup" button.
- Job Function:** A dropdown menu with options: "Any Job Function", "Accounting / Auditing", "Administrative", and "Advertising".
- Advanced Search:** A button.
- Search Jobs:** A button.
- Show jobs in my network first:** A checked checkbox.

Below the search section, it says "Powered by simplyhired".

On the right side, there is a "Recent Jobs Posted" section with a list of job postings:

- [VP, New Product Marketing](#) | Baxter
- [Market Analyst and Business Strategy Consultant](#) | Inspirior
- [SR. HARDWARE ARCHITECT/DESIGNER \(LAPTOP SYSTEM\)](#) | Apech Inc.
- [DESIGN VERIFICATION & TEST MANAGER](#) | Apech Inc.
- [Software/Web Architects](#) | Apech Inc.

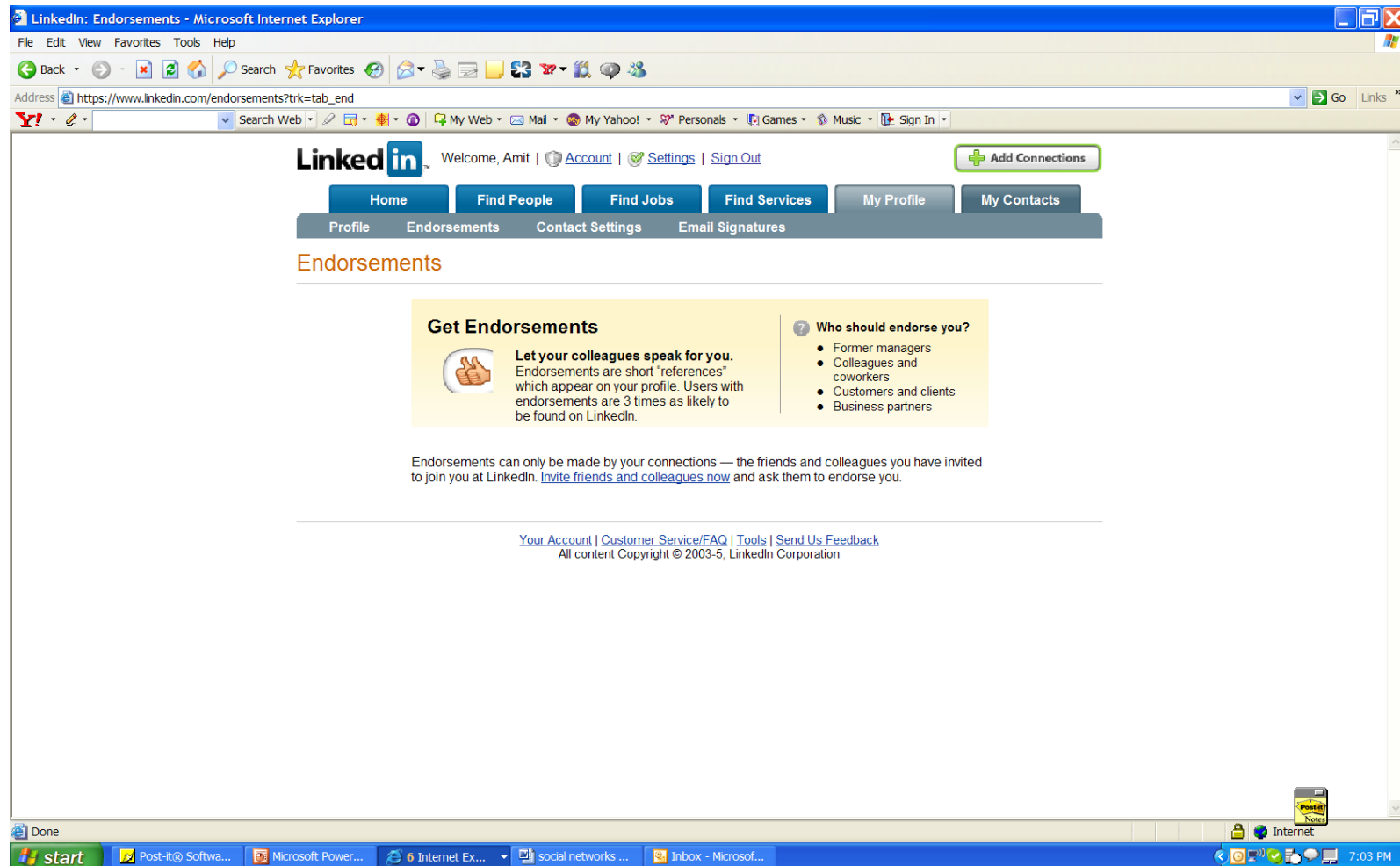
Below the job listings is a "New job-seeking tools" section with the text "Uncover your inside connection to jobs listed on Monster, Hotjobs, or craigslist!". It includes buttons for "Download Jobs Insider now:" and "for Explorer" and "for Firefox".

At the bottom of the page, there are links for "Your Account", "Customer Service/FAQ", and "Tools". The footer text reads: "All content Copyright © 2003-5, LinkedIn Corporation. LinkedIn Jobs: Let us know what you think! [Send Feedback](#)".

The browser's taskbar at the bottom shows the Start button and several open applications: Post-it@ Softwa..., Microsoft Power..., 6 Internet Ex..., social networks ..., and Inbox - Microsof... The system clock in the bottom right corner shows the time as 7:01 PM.

Technology: LinkedIn (4)

ENDORSEMENTS: A New and Useful Feature

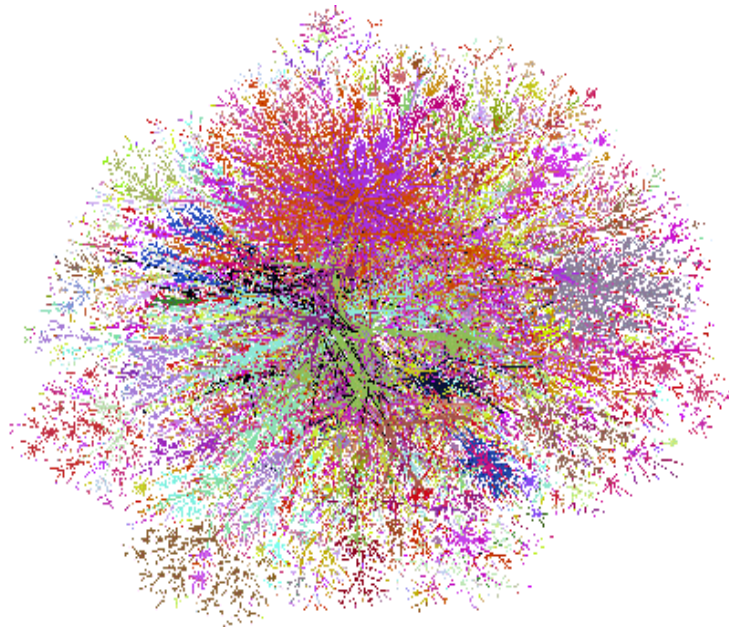


Future of SNA

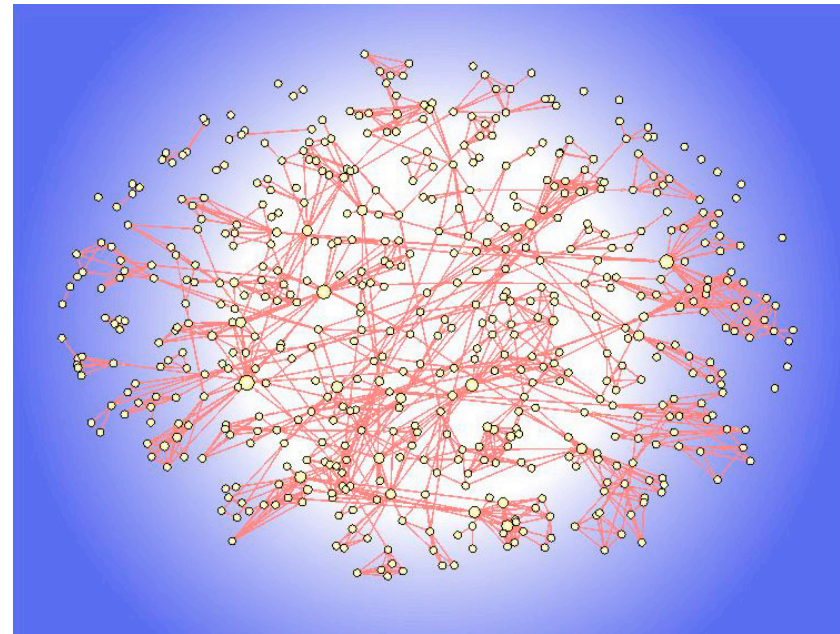
- SNA could help us in following ways in future:
 - 1) Reducing Complexity
 - 2) Visualizing using Geographic Information Modeling

Reducing Complexity

Our Social Networks can be understood at one glance

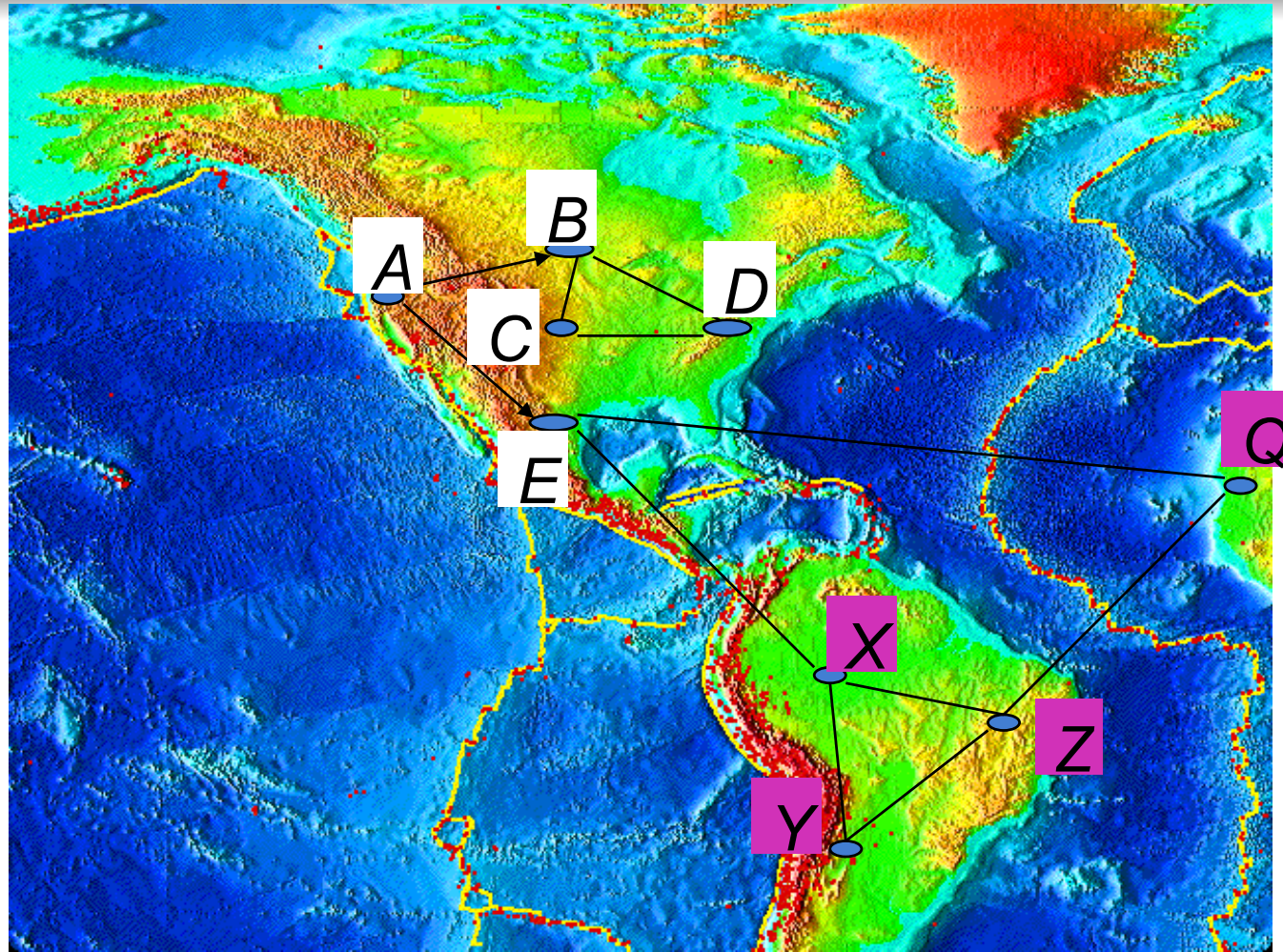


Organization on Web



*Reduced Complexity through
Simulation Analysis and Complex
Theory for solving graphs*

Geographic Information Modeling



● — *Key Players*

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