GUDLAVALLERU ENGINEERING COLLEGE

(An Autonomous Institute with Permanent Affiliation to JNTUK, Kakinada)

Seshadri Rao Knowledge Village, Gudlavalleru – 521 356.

Department of Computer Science and Engineering

HANDOUT

on

SOCIAL NETWORKS

Vision

To be a Centre of Excellence in computer science and engineering education and training to meet the challenging needs of the industry and society.

Mission

- To impart quality education through well-designed curriculum in tune with the growing software needs of the industry.
- To serve our students by inculcating in them problem solving,leadership,teamwork skills and the value of commitment to quality,ethical behavior & respect for others.
- To foster industry-academia relationship for mutual benefit and growth.

Program Educational Objectives

- Identify, analyze, formulate and solve Computer Science and Engineering problems both independently and in a team environment by using the appropriate modern tools.
- Manage software projects with significant technical, legal, ethical, social, environmental and economical considerations.
- Demonstrate commitment and progress in lifelong learning, professional development, and leadership and communicate effectively with professional clients and the public.

HANDOUT ON SOCIAL NETWORKS

Class& Sem. :IV B.Tech – I Semester   Year : 2018-19

Branch   : CSE   Credits: 3

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1. Brief History and Scope of the Subject

Social networks have been at the core of human society since we were hunters and gatherers. People were tied together through their relations with one another and their dependence on one another. Kinship and family relations are social networks. Neighbourhoods, villages, and cities are crisscrossed with networks of obligations and relationships. Beyond kinship relations, people in modern societies are dependent upon one another for many things. It is well known that World Wide Web is the main driving force behind making new connections. Internet itself is an example of a huge network and changed the rules of social networks.

Social networks and their analysis is an inherently interdisciplinary academic field which emerged from social psychology, sociology, statistics and graph theory. Social network analysis can be applied to many substantive areas. Social network analysis is now one of the major paradigms in contemporary sociology, and is also employed in a no. of other social and formal sciences. Together with other complex networks, it forms part of the nascent field of network science. This course covers introduction to social concepts and social network analysis.

2. Pre-Requisites

- Familiar with the fundamental concepts of Graph Theory.

3. Course Objectives:

- To familiarize with the technological infrastructure of Social networks.
- To provide a conceptual overview of Social Network Systems.

4. Course Outcomes:

Upon successful completion of this course, students should be able to:

CO1: outline social concepts.
CO2: categorize network segments and their Characteristics.
CO3: analyze psychological foundations of Social networks.
CO4: evaluate network structure of organizations.
CO5: examine Network Influence and diffusion of ideas.
CO6: determine social currency of a social network system

5. Program Outcomes:

Graduates of the Computer Science and Engineering Program will have

a) an ability to apply knowledge of mathematics, science, and engineering
b) an ability to design and conduct experiments, as well as to analyze and interpret data
c) an ability to design a system, component, or process to meet desired needs within realistic   constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
d) an ability to function on multidisciplinary teams
e) an ability to identify, formulate, and solve engineering problems
f) an understanding of professional and ethical responsibility
g) an ability to communicate effectively
h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
i) a recognition of the need for, and an ability to engage in life-long learning,
j) a knowledge of contemporary issues
k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

6. Mapping of Course Outcomes with Program Outcomes:

	a	b	c	d	e	f	G	h	i	j	k
CO1	H										
CO2		M									
CO3			H								
CO4				M							
CO5										M	
CO6					H						

7. Prescribed Text Books

1. Understanding Social Networks: Theories, Concepts, and Findings By Charles Kadushin.

8. Reference Text Books

1. Social Networks and the Semantic Web By Peter Mika.
2. Social Network Analysis: Methods and Applications   By Stanley Wasserman, Katherine Faust.

9. URLs and Other E-Learning Resources

a. www.ischool.utexas.edu/~i385q/archive/sharma_social_networks.ppt
b. http://www.pr.com/press-release/214190cs.nyu.edu/~jchen/socialnetworks.ppt
c. http://en.wikipedia.org/wiki/Social_network
d. http://www.forrester.com

10.   Digital Learning Materials:

- https://onlinecourses.nptel.ac.in

11.   Lecture Schedule / Lesson Plan

Topic	No. of Theory Periods
UNIT –1: Basic social network concepts	
Basic social network concepts	4
Distributions	3
Multiplexity	2
Roles and positions	1
Embedded of the informal within instituted or named networks	2
	12
UNIT – 2: Network segmentation	
Network segmentation	2
Named and Unnamed Network segments	2
Segmenting groups on the basis of cohesion	2
structural similarity and structural equivalence	2
	8
UNIT – 3: Psychological foundations of social networks	
Psychological foundations of social networks	2

Safety	2
Effectiveness	2
Status	2
Limits on individual networks	2
	10
UNIT – 4: Organizations and networks Information	
Organizations and networks Information	2
Driven organizations	2
Bridging the gaps: Network size	3
diversion and social cohesion	**2**
	9
UNIT – 5: Networks, Influence and diffusion	
Networks and diffusion	3
Influence and decision making	4
Epidemiology and network diffusion	4
	11
UNIT – 6: Network as social capital	
Network as social capital	3
Individual level social capital	3
social capital as an attribute of social systems	3
	9
Total No. of Periods:	**59**

12.   Seminar Topics

- Social Networking
- The Small World Phenomenon
- Semantic Web
- Social Network Clusters
- Privacy and Security in Social Networks.

Unit I

Objective:

- To familiarize with the technological concepts of Social networks..

Syllabus:

Basic social network concepts

Basic social network concepts, Distributions, Multiplexity, Roles and positions, Embeddedness of the informal within instituted or named networks.

Learning Outcomes:

The student will be able to

- outline social concepts
- technological concepts of social networks.

Learning Material

1. Basic Social Network Concepts

1.1 Network

- A network contains a set of objects (nodes) and a mapping or description of relations between the objects or nodes.
- It is a set of relationships.
- A network with two nodes is called a "Dyad".
- The simple network of three nodes is called a "Triad".

1.2 Types of Relationships

1.2.1 Simple Relationship

- The simplest network contains two objects, 1 and 2, and one relationship that links them.
- Nodes 1 and 2, for example, might be people, and the relationship that' links them might be as simple as standing in the same room. If 1 is in the same room as 2, then 2 is in the same room as 1.
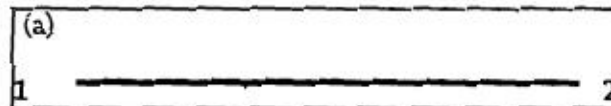- The relationship is in figure 1.2.a is not directional.

Fig 1.1: Simple Relationship

1.2.2 Directed Relationship

- There are also directional relationships (figure 1.2.b) such as 1 likes 2.

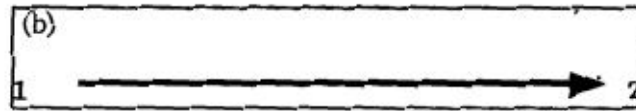- In directed relationship, the exchange of informationflows in a certain direction.

Fig 1.2: Directed Relationship

1.2.3 Symmetric Relationship

- In Symmetric relationship, the relationships are mutual.
- Nodes 1 and 2 like one another, or their liking is mutual.
- The liking network below (figure 1.2.c) is similar to the first one of standing in the same room together, but has a valence or a flow.
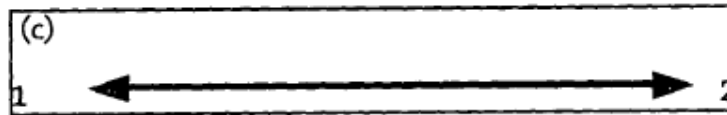- Mutuality is not easy to achieve, so mutual networks tend to be limited.

Fig 1.3: Symmetric Relationship

1.2.4 Multiplex Relationship

- In multiplex relationship, nodes have more that one relationship.
- For example, 1 and 2 might be in the same room and might also like one another. When there is more than one relationship, this is called a multiplex relationship.
- Relationships can be more than the sharing of an attribute or being in the same place at the same time,. There can be a flow between the objects or the nodes.
- Liking, for example, might lead to an exchange of gifts. Flows and exchanges are very important in network theory.

1.2.5 Relationship through an Intermediatory

- Consider a network (figure 1.1d) between pairs that operates via an intermediatory node.
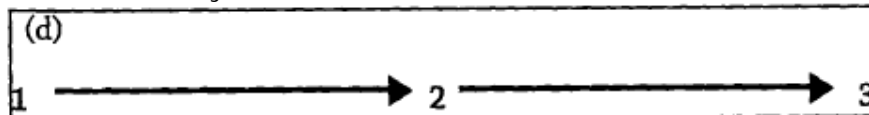

Fig 1.4: Relationship through an Intermediatory

- For example node 1 is connected to 3 via 2. The relationships shown above are directional and not reciprocal.
- If the relationship is transitive, it means that if 1 loves 2, then 2 also loves 3.
- Transitive relationships are more common in an official hierarchy.
- Node 1 gives a message to 2 who forwards it to 3.
- The network distance between pairs of nodes can be described in terms of the number of steps or links between them.

- There are obviously two steps between 1 and 3 - But if 1 also likes 3, as shown below (figure 1.2.e), the network is said to be transitive or balanced and mutual and, in this case, all three nodes are directly linked.
- The network depicted in figure 1.1.e is a "sociogram"—a term invented by Jacob Moreno, who is regarded as a key founder of modern network studies.
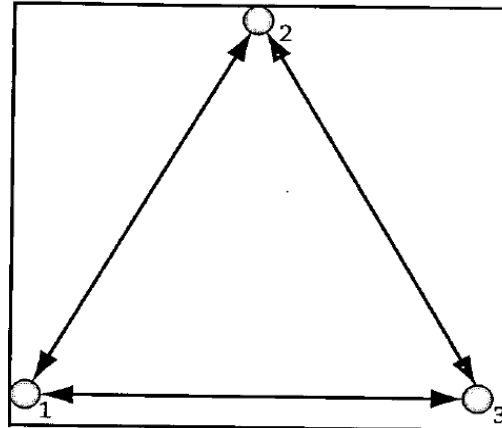

Fig 1.5: Sociogram of Three Nodes, All Mutually Related

- Graph Theory, a branch of mathematics, allows sociograms to be manipulated mathematically.
- The depiction of relationships gives insight as to what was going on in small, not overly complicated networks.
- Network Analysts use Adjacency Matrix to represent networks algebraically.

	1	2	3
1	-	1	1
2	1	-	1
3	1	1	-

Table 1.1 Adjacency Matrix that represents figure 1

- The numbers, 1, 2, and 3 on the top line and the first column identify the same nodes as in figure 1.2.e.
- The number 1 on the second line indicates a connection between the nodes. Node 1 "chooses" nodes 2 and 3. Node 2 "chooses" nodes 1 and 3. Node 3 "chooses" nodes 1 and 2.
- The dashes indicate that in this graph or matrix, self-choice is not at play, though in some networks self-choice can be an option. For example, candidates in an election can vote for themselves.

1.3 Types of Networks

- Social scientists have investigated three kinds of networks: ego-centric, sociocentric, and open-system networks.

1.3.1 Ego-Centric Networks

➢ Ego-centric networks are those networks that are connected with a single node or individual.
➢ For example, good friends or all the companies that do business with Widgets, Inc. (the favorite name of organizations studied in business schools).
➢ It is a network in which each individual is at least all connected with the person being supported.
➢ The support may include help with a job search, comfort during an illness, or a loan of money
➢ A person with a large number of good friends whom he or she can count on is commonly said to have a large "network."
➢ This network cannot be discussed in social network terms, however, unless we know whether and how these people are connected with one another.

1.3.2 Socio-Centric Networks

➢ Socio-centric networks are networks in a "box."
➢ Connections between children in a classroom or between executives or workers in an organization are closed system networks.
➢ These networks are most often studied in terms of the fine points of network structure.

1.3.3 Open System Networks

➢ Open system networks are networks in which the boundaries are not necessarily clear, for they are not in a box.
➢ For example, the elite of the United States, connections between corporations, the chain of influencers of a particular decision, or the adopters of new practices.
➢ These are the most interesting networks.

1.4 Connections

• Connections between one node (e.g., a person, an organization, a country) to another are result of social situations and some forces.

1.4.1 Propinquity

➢ Propinquity can be defined as being in the same place at the same time.
➢ Nodes are more likely to be connected with one another, other conditions being equal, if they are geographically near to one another.
➢ Individuals are more likely to be friends if they are geographically close.

- In a pioneering study of the propinquity effect, Festinger, Schacter, and Back (1950) demonstrated that in a new housing project for World War II veterans, persons who lived near to one another were more likely to become friends. Persons in corner housing units were more likely to be socially isolated than persons in units that lay between other units.
- A study of networks in the United States of people who serve together on several different corporate boards of directors (these are called "interlocking directorates") found that "[interlocks are concentrated in firms headquartered in the same locale". Being selected to serve on boards of directors has more to do with local upper class structure, being acquainted with people because one has run into them at the same clubs, than with simple friendship.
- Trade between countries, other things being equal, is more likely if the countries have common borders.
- There is a distinction between co-location and co-presence:
  - Co-Location puts people simply within range of one another,
  - Co-Presence implies a social relationship that is within the framework of a social institution or social structure.

1.4.2 Homophily

- Homophily is word from the Greek, which means "love of the same".
- It is a concept introduced into social theory by Lazarsfeld and Merton that embeds a folk proposition:."birds of a feather flock together."
- Common interests (e.g., music) and common arenas or foci for meeting (e.g., mothers at the playground) are another mode for drawing people together.
- If two people have characteristics that match in a proportion greater than expected in the population from which they are drawn or the network of which they are a part, then they are more likely to be connected .
- The converse is also true: if two people are connected, then they are more likely to have common characteristics or attributes.
- Over time, relationships tend to sort out so that they become more homophilous.
- The homophily principle, like propinquity, applies equally to groups, organizations, countries, or other social units.

i. Individual Level Homophily

- At the individual level, persons are more likely to have a connection, friendship, or association, if they have common attributes.

- Common attitudes can be based on patterns of relationships
- It is difficult to determine which characteristics, attributes, or activities are selected in a given situation to be salient candidates for homophily.
- Because of the principle of homophily, social network analysis involves the sociology of class, gender, ethnicity, and nationality as well as cultural values.
- Lazarsfeld and Merton distinguished between
  - Status-Homophily which can be ascribed (age, race, sex) or acquired(education, occupation).
  - Value-Homphily which is Homogenity itself (attributes, stereotypes).
- There are two kinds of causes of homophily:
  - Common norms or values may bring nodes with common attributes together, Common attributes and contacts may lead to common norms, and this holds true for both individuals and collectivities.
  - A second cause for homophily is structural location.
- People hang around together because they share similar habits, or they have become similar to each other while hanging around with one another.
- Two nodes may have the same attributes because both operate in the same arena, and vice versa.
- The availability of similar attributes is a function of social structure.
- It is more likely to find people interested in solving mathematical problems in a physics class than in a class on English literature.
- Individual preferences for like persons and common social location both produce homophily.
- There are four processes involved if people are in relationship:
  1) the same kinds of people come together;
  2) people influence one another and in the process become alike;
  3) people can end up in the same place;
  4) and once they are in the same place, the very place influences them to become alike
- The principle of homophily exemplifies the tendency of social networks to be "unfair" and makes "social engineering" to counter prejudice and segregation more difficult.
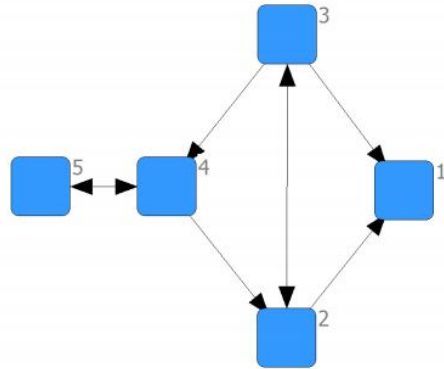
ii. Homophily and Collectivities

- Hypothesis about homophily are straightforward for individual persons, but somewhat more complex when it comes to collectivities.

- At the organizational level, whether similarity leads to a greater likelihood of a tie depends on the kind of a connection, as well as on the industry.
- Geographic co-location through the principle of "external economy" also leads to homophily via structural co-location.
- External economies, as the name implies, are "the economies that a-firm can obtain through the use of facilities or services 'external' to itself".
- This leads to the classic situation of "birds of a feather flocking together" to take advantage of readily available services and hence lower transaction costs.
- The being in the same place at the same time, at once a factor in homophily also makes relations with one another easier.
- Also firms that compete with one another and thus have very similar attributes are also geographically close.

1.4.3 Dyads and Mutuality

- ➤ A Dyad is a pair of nodes and the possible relations between them.
- ➤ There can be four possible relationships or none in directed graph or networks:
  - No relationship
  - A relates to B or B relates to A
  - A and B both relate to one another(Reciprocity or Mutuality)
- ➤ Dyads can be categorized as:
  1. **Null** - No link/relationship between nodes
  2. **Asymmetric** - Nodes are linked only in one direction or other
  3. **Symmetric/Mutual** - Nodes are linked in both directions
- ➤ The concept of mutuality implies that
  - if relations are reciprocal, they involve a give and take between the two parties;
  - power or asymmetry in the relationship is of little or no consequence.
- ➤ Mutuality is strongly affected by the social and cultural structure within which the dyads are embedded.
- ➤ Girls may be more socialized therefore develop more intimate friendships; whereas doctor-patient relationship even if close one is guided by professional norms.
- ➤ Mutuality begins early in life and is a key factor in human development.

$$\textbf{Dyad Based Reciprocity} = \frac{\text{no. of reciprocated dyads}}{\text{no. of adjacent dyads}}$$

All Possible Combinations		
1	2	Asymmetric
1	3	Asymmetric
1	4	Null
1	5	Null
2	3	Mutual
2	4	Asymmetric
2	5	Null
3	4	Asymmetric
3	5	Null
4	5	Mutual

Total no. of dyads = 10

Total no. of mutual dyads = 2

Total no. of adjacent dyads = 6

Dyad based Reciprocity = 2/6 = 33%

$$\textbf{Dyad based Reciprocity of each node} = \frac{\text{no. of mutual dyads it is in}}{\text{no. of adjacent nodes}}$$

Node 1	0/2 = 0%
Node 2	1/3 = 33%
Node 3	1/3 = 33%
Node 4	1/3 = 33%
Node 5	1/1 = 100%

1.4.4 Balance and Triads

- ➢ In Triad ['associations of three'] three elements, A, B, C, constitute a group.
- ➢ Network analysis begins with triads, for they are the beginnings of a "society" that is independent of the ties between a dyad.
- ➢ No matter how close a triad may be, there is always the occasion on which two of the three members regard the third as an intruder.

- In Simmel's view, the third can be non-partisan and a mediator, but can also be "the Tertius Gaudens (the third who enjoys).
  - The third can line up with one of the two others and thereby gain his or her own advantage or can act as a broker between them and make a broker's profit.
  - The most certain way of compromising a secret between two people is to add a third to the secret.
  - The addition of a third member to a dyad vastly increases the complexity of relationships.
- **Balance Hypothesis** is classic theory to achieve balance between the three members of the triad.
  - In the case of three entities, a balanced state exists if all three relations are positive in all respects, or if two are negative and one is positive.
  - If A dislikes C and B also dislikes C, then it follows by the balance hypothesis that A and B like one another.
  - Martin suggests that given two emotional states (love and hatred) and extremely rational participants, there must be strong institutional support for the balance to emerge, for the simple reason that the "laws" of balance assume a reactivity that is the opposite of what would consider rational.
- Take the principle, "my enemy's friend is my enemy. It is a poor sort of enemy who allows himself to be guided by this maxim".
  - Martin explains that if A and B are enemies, it is good strategy for A to try to make friends with B's friend C and all of B's friends, thus leaving B completely isolated.
- Triads are analogous to molecules in a periodic table of elements.
- While there are only a handful of elements found in nature, molecules combine to form complex chemical structures,
- The triad census is a periodic table of social elements' and similarly able to categorize and build social structures.

➢ In the case of triads, rules include balance, transitivity, homophily, and circles or foci, among others.

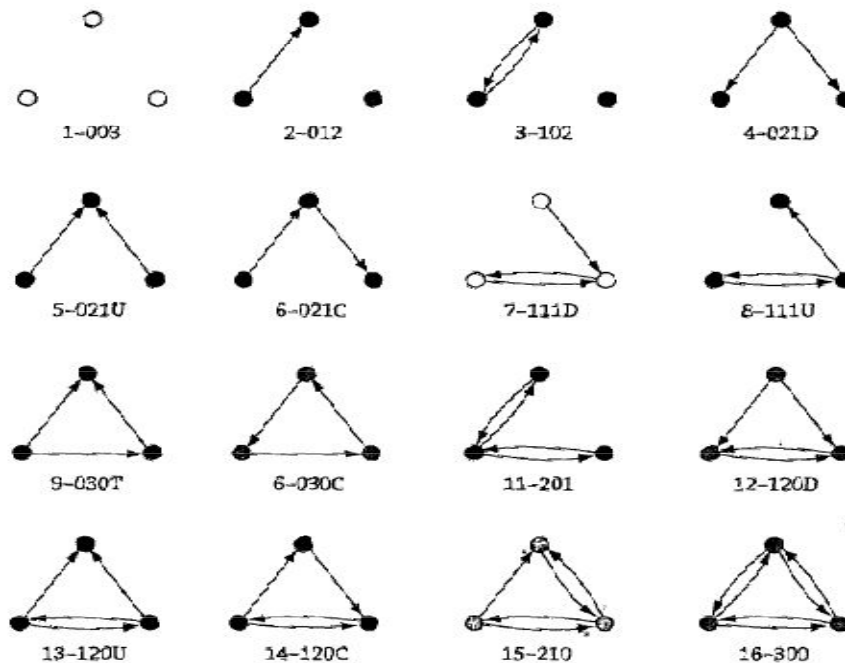➢ There are actually 16 possible configurations of triads, as shown in figure 1.2.

Figure 1.6 sixteen possible configurations of Triads

➢ The first character in the triad name gives the number of mutual dyads. For example there is one in triad number 3.

➢ The second character gives the number of asymmetric dyads, for example, 1 in triad number 2.

➢ The third character gives the number of null dyads, that is, no connection between pairs, as in the very first triad in which none of the nodes are connected.

➢ The fourth character, if present, distinguishes between triads which are otherwise identical. For example, there are two 030 triads, number 9 and number 10. Number 9 is Transitive and number 10 Cyclical. Numbers 7 and 8 look alike except that in 7 the asymmetric pair has a downward arrow or connection sign, and 8 has an upward arrow.

➢ From the balance hypothesis, it follows that friends are likely to agree about a third party—if one of them likes a third party, both will like that person. And close friends agree more strongly about a third party than friends who are not particularly close.

➢ Configurations (numbers 7 and 8) that conform to this hypothesis are more frequent in a social network than configurations that do not.

➢ This balance tends to be supported in a wide variety of social networks in which the nodes are people.

➢ Another property of triads related to the balance hypothesis is transitivity: if actor-P chooses actor O, and actor O chooses actor X, then P is likely to choose X. For example, triad number 9 contains one transitive relationship, triad 12 contains two, and triad 16 contains six transitive relationships.

➢ In contrast, triad 6 is intransitive which are very rare.

➢ Homophily and its extensions are another cause of connections and, though related to balance, homophily takes account of the social and cultural structures in which a network is embedded.

➢ Social circles and foci of activities are other reasons for relationships.

2. Distributions

2.1 Dyads and Triads

• Distributions of network properties are the first set of key descriptors and include the number of dyads and triads in the network.

• Distributional concepts help illuminate the sociogram that follows.

• Anthropologist Wayne Zachary (1977) carefully observed a small group of karate club comprised of 34 members for more than two years.

• The sociogram below depicts the network of friendships among the club members.
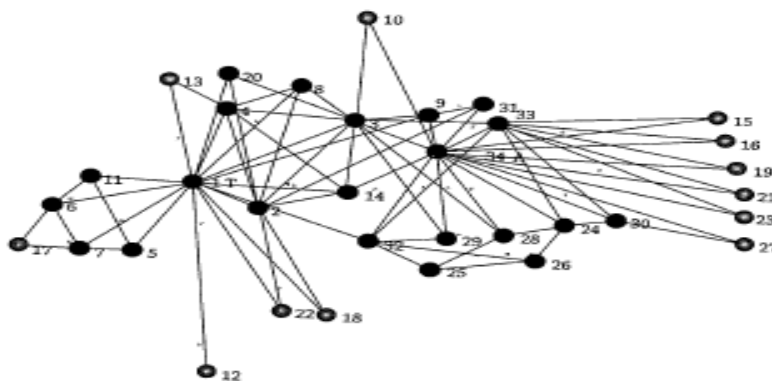

Figure 2.1 Friendship network among Karate Club Members

• It is a symmetric graph: the assumption is that if you are my friend, I am your friend.

• There are 1,575 symmetric dyads in the network (triad type 3-102 in figure 1.6).

• A computer program randomly shuffled the network of 34 people and the 156 symmetric connections between them, called "edges" in graph theory.

- In each shuffle, the program counted the number of symmetric dyads.
- The number of dyads was much greater than would have been found by chance.
- In terms of full triads, club member number 17 on the far left is directly connected with 6 and 7; they constitute a symmetric triad. Another is 6,7, and 1. Also, 11,5, and 1 is a symmetric triad. There are 45 such triads in the entire network (triad type 16-300 in figure 1.6), also far more than expected by chance.

2.2 Density

- Density is defined as, the number of direct actual connections divided by the number of possible direct connections in a network.
- The karate club network is densely connected. The overall density is 0.139 with 156 connections out of 1,122 possible connections.
- There seem to be at least two parts to the network—the right side and left side—and within each part the density is obviously greater than the average. In the karate club sociogram, nodes 1 and 34 are the key linkers.
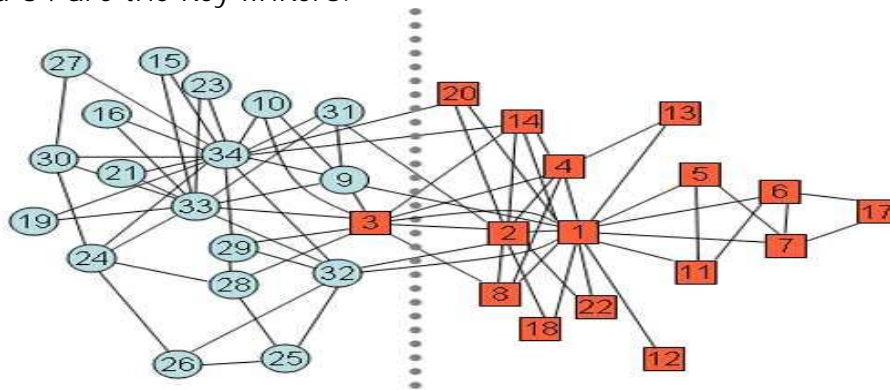
Figure 2.2 Karate Club Network and its parts

- Density is at the heart of community, social support, and high visibility (when people in a network can see what others are doing and monitor and sanction their behavior).
- Density facilitates the transmission of ideas, rumors, and diseases.
- The greater the density, the more likely is a network to be considered a cohesive community, a source of social support, and an effective transmitter.
- Classic agricultural communities or villages have greater density than modern cities, and people tend to know one another in many contexts—as relatives, coworkers, church attendees, and so forth.
  Effect of size on Density
- Given the human limitation on the number of sustainable connections, smaller networks will have greater density.

- It is easier to know everyone in a small group than in a large community.
- Size has to be taken into account while comparing different networks in terms of density.

2.3 Structural Holes

- Structural Hole focuses on the lack of connection.
- Consider the following network (figure 2.2), which illustrates this point: There are two obvious clusters: 5, 6, 7 and 2,3, 4.
- Each cluster is totally connected, i.e., each of their members is said to be structurally equivalent to each other.
- However, the members' only link to one another is "Ego."
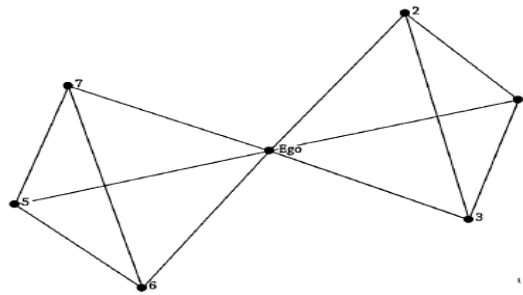
Figure 2.3 Example of a Structural Hole

- Ronald Burt calls the situation in which Ego connects individuals who are themselves connected but who, without the presence of Ego would have no connection with one another, a "structural hole." '
- In the karate club sociogram, nodes 1 and 34 are the key linkers, and their actions are the least constrained by others in the network.

2.4 Weak Ties

- Weak Ties also focuses on holes in the network.
- Our acquaintances ("weak ties') are less likely to be socially involved with one another than are our close friends ("strong ties").
- Thus the set of people made up of any individual and his or her acquaintances will constitute a low-density network (one in which many of the possible ties are absent), whereas the set consisting of the same individual and his or her *close* friends will be densely knit (many of the possible lines present)
- Interesting consequences of weak ties are:
  1. facilitates the flow of information from otherwise-distant parts of a network
  2. helps to integrate social systems
- Reasons for difficulty in Analysis of weak ties:

1. **Slippery Definition**: Is it the length of time one knows someone else, the frequency of interaction, the subjective "closeness" one feels, or whether the others one is connected with are defined as relatives, friends, or acquaintances?
2. **Critical Function**: The importance of weak ties is asserted to be that they are disproportionately likely to be bridges as compared to strong ties, which should be underrepresented in that role.
3. **Information Flow**: Passing along information should not be too costly to the weak tie that constitutes the bridge.

2.5 Popularity or Centrality

- Popularity can also be known as "Centrality".

2.5.1 Degree Centrality

➢ The sheer number of connections is called "Degree."
➢ Person 1 has a degree of 16 and person 34 a degree of 17.
➢ It is obvious in the karate club that persons 1 and 34 have great centrality. Many lines radiate from them (or go to them, because friendship is reciprocal).
➢ When the network is directed (not reciprocal), there is an indegree, number of "votes" received, and an outdegree, number of choices made.
➢ Almost all networks have nodes or persons with higher degrees than other members of the networks, whether the topic is friendship or corporate connections to banks.
➢ An interesting variation on the focus on the number of votes is the source of the votes.
➢ A node is more popular or powerful if it receives nominations, or indegrees, from nodes that themselves have high degree.
➢ In the karate club, where nodes 1 and 34 have the highest degree and the most power, nodes 3 and 33, because they receive nominations from 1 and 34 and others with high degree, also score fairly high on power.

2.5.2 Betweenness Centrality

➢ An inspection of the network shows that 1 and 34 are in the middle of things.
➢ One can get to other members via these leaders. This is called "betweenness".
➢ There are various methods for measuring betweenness, but all are based on the idea of a switching point.
➢ The person or organization that serves as a connector or a switching point can be very important, above and beyond their "popularity."
➢ In the structural hole diagram, Ego has high betweenness.

➢ In the karate club, although 16 and 34 each have almost the same degree, 1 has a higher betweenness score. Node 1 connects the cluster on the extreme left with the rest of the club, making node 1 a bridger or broker.

2.5.3 Closeness Centrality

➢ When a network was shaped in a "wheel" pattern—so called because individual persons, the spokes, were coordinated by a central person—the organization was efficient, but only the person E in the center of figure 2.4 below had high satisfaction.
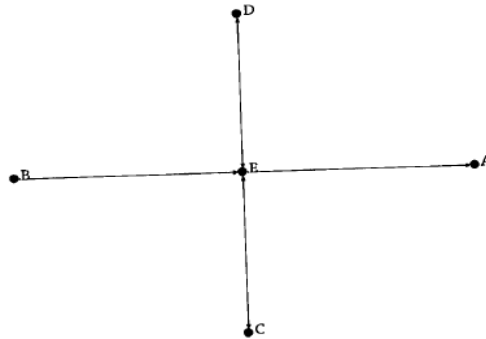
Figure 2.4 Example of a Wheel Pattern

2.6 Distance

• The distance between two nodes is defined as the length of the shortest path via the edges or binary connections between nodes. This is called **Geodesic Distance**.
• Shortest paths are efficient, but there are also consequences to inefficient or redundant paths in which there are many ways to get from one node to another.
• Redundancy, as noted in connection with density, makes sense in the diffusion of norms, attitudes, or values.
• One might have to hear the same thing from several different sources until it takes root. Then too, in terms of diffusion, we might want to discount a source that is several steps removed because messages might get garbled as they pass from one node to another that is not transitive.
• So one might count the first step as important, the next step as less important, and so on.
• On the other hand, some things, such as computer viruses (not "social" in the human sense), spread unadulterated through many steps.
• The set of nodes directly linked to any given node is called the **First-Order Zone**. The term "**Interpersonal Environment**" is often used for first-order zone. In graph theory, this is called the "**Neighbourhood**."

- The nodes two steps removed from a focal node are called the **Second-Order Zone**, and so on.
- These interpersonal environments can vary considerably in their size.
- The friends of the friends in the first-order zone are reached in only two steps. If the first-order zone is large, then many friends of friends can be reached (one of the principles of Facebook).
- Information gathered from a sample of respondents through the use of "**Name Generators**" which helps to study the members of first-order zone produced ego-networks.
- In a widely utilized data set, the General Social Survey in 1985 asked respondents to name up to five others with whom they "discussed important matters."
- In these types of surveys, information about each of these "others" is sought from the survey respondent on such topics as how they came to know the other, for/how long, some of the social attributes of the other, and the extent to which each of the others knew each of those named in the first-order zone.
- The data so generated becomes the source to measure the density and the social characteristics of the ego's interpersonal environment, that is, the dyadic relationships between ego and each of the persons mentioned.
- Snowball Technique can be used separately to study the persons mentioned.

2.6.1 Size of the Interpersonal Environment

- ➢ The number of individuals in the interpersonal environment or the first-order zone varies from about 100 to 5,000 persons, depending on how it is measured (for example, people you know by name) and the type of society in which the focal person is embedded.
- ➢ In classic village societies "everyone knows everyone else," so the number of steps from one person to any other is minimal.
- ➢ Village societies are also relatively small and confined so that the first-order zone may be no more than about 500 local persons, thus limiting the number of persons who can be directly reached.
- ➢ In contemporary urban societies, professionals and middle-class people have a larger first-order zone than blue-collar and lower class people.
- ➢ On the other hand, in these societies there may be serious barriers across class and ethnic lines, making for greater distances between persons in different classes and ethnicities.
- ➢ Organizations too have first-order, second-order, and tertiary zones - those aspects, of an organization that it relies upon to survive and thrive but which are not formally a part of the organization.

➢ The network of part suppliers for automobile manufacturers is part of their external economy, but so is the absorption of the costs of carbon emissions by the rest of society.

2.6.2 The "Small World" Phenomenon

➢ If there were no overlap in people's personal networks, then one could reach the entire population of the United States in two or three steps.

➢ Suppose everyone in the United States knew 500 other people and that each set of 500 was unique—none of the people you know are known by, say, your brother or sister. Then, each of the 500 people you know in turn knows 500 unique others, and they each know 500 others, and so on. Five hundred people raised to the power of three is 12,500,000, much greater than the size of the U.S. adult population age 18 and over in 1977 (154,776,287).

➢ To the extent that the same people are encountered in the interpersonal environment of different nodes, that is, to the extent that personal networks overlap, more steps will be needed to reach the entire population of the United States.

➢ Under such circumstances, getting out of one's immediate circle becomes more difficult.

➢ Social structure reduces the number of unique individuals in the iteration of steps; and therefore, the expansion to a large population takes more steps or links.

➢ Despite the theoretical number of two to three steps between any two persons in the United States, experiments done by Stanley Milgram and his students in the 1960s estimated the actual number of steps to be six, reached through five intervening persons, hence the popular phrase, "**Six Degrees of Separation**."

➢ The "six degrees of separation" does not take account of variation in people's skills at making connections.

➢ In Milgram's original experiments, most people were not able or were unwilling to make the requested connections.

➢ A recent experiment using the internet found that few of the chains were actually completed and concluded that, although in principle people were connected, the actual successes depended on their motivations and incentives.

➢ In Milgram's experiments, people were asked to reach a target person in a distant city by means of a person most likely to know the target person on a first-name basis.

➢ The experiment worked like a chain letter. The number of steps was higher than the theoretical number because there were social structural barriers to network linkages.

➢ In the first experiment, Milgram reported that links between men and women were much less frequent than same-sex linkages, a finding repeated in the recent experiment.

➢ Similarly, there were barriers between social classes.

➢ Hence, personal agency or motivation became a factor in establishing linkages.

➢ Organizations, too, vary in the extent to which they actively seek to relate to other organizations and are skilled in this endeavour.

3. Multiplexity

- When people were in more than one kind of relationship with one another, their relationships were multiplex.

- In the example of the members of karate club could relate to one another in eight different contexts such as going to the same classes or hanging out together in a bar across the street from the campus.

- In most situations, there are multiple connections between nodes.

- Multiplexity is related to the concept of homophily, for the bundling of particular kinds of ties is hardly random and follows the laws of homophily of position.

- Multiplexity has been used in the network literature in two related senses: Role Multiplexity and Content Multiplexity.

3.1 Role Multiplexity

➢ Role Multiplexity refers to the possibility that two nodes occupy more than one position that ties them together.

➢ It can be the situation in which two nodes have an organizational relationship, say "supervisor" and "assistant" (to the supervisor), but are also friends.

➢ Classically, this occurs in village societies in which people are simultaneously kin, workers on the same farm, members of the same religious cult, and the host of shifting roles common to village economies in which tasks are largely filled by part-time specialists in which the blacksmith may also be the head of a clan, the godfather to a number of persons, and a local intellectual sage.

➢ Boissevain offers this proposition: "Because the activity fields in this small community overlap and the same actors play different roles to the same audience, we may also expect high multiplexity".

➢ In complex non-village societies, roles may become bundled in a somewhat different way.

➢ Merton calls attention to "**Role Sets**," the set of relationships that ensue because one occupies a given role (what he calls status).

➢ A school teacher relates to students, parents, a school administrator, the Board of Education, and so on. This is the role set that goes with the status of teacher.

3.2   Content Multiplexity

➢ As a result of having a given role relationship, there are a number of different flows between a pair of persons, for example, advice, friendship, and work on common tasks between coworkers. This has been called "**Content Multiplexity**".

➢ The same tie can have a number of different kinds of ideas flowing through it: a solution to a problem, a reformulation of the problem, information about solutions to the problem, reaffirmation of an already identified solution, and the credibility of a proposed solution.

➢ Attention here is directed to the different consequences of these multiple flows and how they link or conflict under different circumstances.

3.3   Importance in Sociological Theory

1. Multiplexity is an important indicator of the presence of *folk* or village society forms of organization and even rural-urban difference in modern America.

2. Multiplexity has an important role in theorizing about economic forms. The extent that access and trust are available to bolster economic relations is a consequence of multiplex relationships of different types.

3. A very substantial proportion of the literature on organizations is concerned with the relationship between ties based on formal positions in the organization and those based on informal relationships. The consequences of formal and informal modes of relations within organizations hinges on the how these multiplex relations are construed in different settings. Informal relations were first identified as loyalties that impeded production.

3.4   Consequences

• There can be two opposite consequences of multiplexity:

1. Multiple flows between positions as well as multiple simultaneous positions can enhance a relationship and build trust, for example, friendship between supervisor and assistant or between political leaders.

2. On the other hand, depending on the circumstances, the same friendship can create a conflict of interest or even the possibility of fraud.

4. Roles and Positions

- The type of relationship between nodes can be called as **Role** or **Position**.
- Roles and Positions are studied in Sociology and Anthropology.

4.1 Named Positions and Relationships

- ➢ Networks always "involve at minimum two nodes or positions and a relationship between them.
- ➢ The concept of "**Role**" is often used both for the position as well as for the relationship between positions.
- ➢ **Named Roles**, especially kinship relationships such as "father," generally specify not only the meaning of the position but also the content of the relationship, i.e., the mutual obligations and expected behaviours of "father" to other named positions such as "son.
- ➢ Not only do named roles indicate the expected relations with other roles, but also the patterning of other relationships—the expected network past the first-order zone.
- ➢ Primary roles can be cumulated into chains defining compound roles; for example, the sister of my father's father and the subordinate of my boss' protégée.
- ➢ The logical complications of kin relationships can be quite complex, and formal network mathematics can help to specify the implications of such matters as bilateral cross-cousin marriages in which "one's wife is also both Mother's Brother's and Father's Sister's Daughter".
- ➢ Anthropologists have tended to gather networks of named relationships in almost all-of their fieldwork, in part because they can do so with only a limited knowledge of the local language.

4.2 Informal Relations and Hierarchies

- ➢ Named relations are of course far from being the whole story, for anthropologists have gathered massive data about the official names of the positions, but not necessarily systematic data about the actual relationships between the positions.
- ➢ Named or instituted relationships are said to be **Formal Relationships**.
- ➢ Unnamed or unanticipated relationships are called **Informal Relationships**.
- ➢ In network analysis, formal system is compared and contrasted with informal system - comparing the network mandated by culture and the social system to networks created and negotiated by people in the process of trying to manage and work the "system."

➢ The informal exists in reference to, or in opposition to the formal relationships.
➢ Formal relations constitute an organized society. But instituted relations are always negatively taken into account – a good example is, formal hierarchy, a feature endemic to organized society.
➢ Hierarchy in networks can be seen as a transitive tree or pyramid structure as in figure 4.1 below.
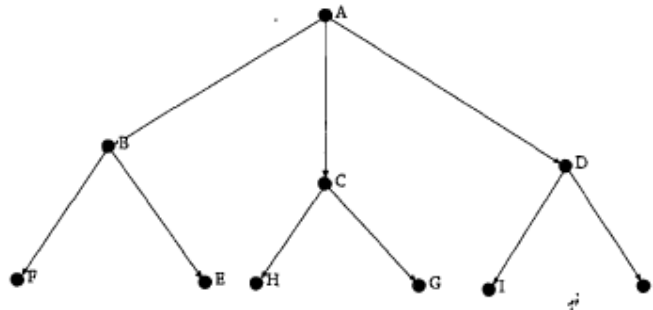
Figure 4.1 Example of a Pyramid Structure

➢ The relationships are transitive in a power structure because A can command or instruct B, who can command F. A's command, of B is binding on F.
➢ They are asymmetric because B cannot command or instruct A.
➢ The inequality of the three levels in the pyramid—A; B, C, D; and F, E, H, G, I, J—is exogenous or external to the network.
➢ The inequality may stem from the organization's rules or structure, from a social class system or some other system of ranking.
➢ The tree structure as depicted has no horizontal connections—B, C, and D, for example, are not connected.
➢ In real-world networks, there are often horizontal connections so that rank or status can "leak" or flow by the principle of homophily—a node can acquire the prestige of those she or he hangs out with, as any social climber knows.
➢ Also, in real-world trees there may not be symmetry of command, but there may be symmetry of information because information may flow up and down the levels.
➢ Figure 4.1 would look different if information flowed up and down: we would draw arrows at both ends of the lines connecting the nodes.

4.3   Embeddedness of the informal within instituted or named networks.

➢ Embeddedness means a number of different things to different students of networks.
➢ Networks are influenced by and related to cultural and social structural frameworks. And the converse holds true as well.
➢ All enacted relationships or networks are embedded within formal arrangements.

- Information and ideas are affected not only by relations between pairs, but are also responsive to being part of dense networks that amplify and transmit the ideas and the information.
- In a large manufacturing organization, there were formal hierarchical relationships that defined the positions in the organization—the "organizational chart" similar to the stylized hierarchical chart shown above.
- When critical decisions were made, individuals often "skipped levels" and enlisted support above the level of their immediate superior. This is an "informal system" for making decisions.
- But the person chosen as the one higher in rank than the one supposedly entrusted with the decision was hardly picked at random.
- The choice could be predicted from the organizational structure – it didn't follow directly from the "rule book" but was surely related to it.
- A good example of embeddedness is the constant struggle to determine how power in America actually works. In American national politics, channels for creating legislation are prescribed by law. But certain committee members and lobbyists count for more than others and are the ones who critically determine what a new law is likely to look like.
- One needs to study all these systems carefully—-the kinship, the organizational, and the national legislature—to uncover the informal connections.
- Nonetheless, these connections are related to the mandates and functions of the formal institutional structure that the informal one elaborates.
- This is an obvious point, but one which is often neglected when we become entranced by the continuous re-enactment and creation of structures.

4.4   Observed Roles

- Anthropologists distinguish "emic" and "etic" concepts:
    - "**Emic**" ideas are those that "insiders" to a culture use, and
    - "**Etic**" ideas or concepts are those that observers impute to the culture or find useful in describing it.
- Unnamed positions or roles are those that observers ascribe to a structure which may or may not be so described and noted by the "natives."
- A "leader" found through network analysis may or may not be recognized as such by the members of the network.
- The relationships between the individuals and the central role played by the coordinating figure in the "wheel" communications structure were imposed by the design of the experiment.
- Yet in the wheel configuration, most experimental subjects, when asked about "the organization of your group," were able to

describe it. On the other hand, subjects in other configurations were not able to do so.

➢ Positions that have "structural similarity," can be described as occupying a role or a status, though this may not be so noticed or conceptualized by participants in the structure.

➢ Roles, statuses, or positions that have names are much more likely to have a longer life than roles or positions that have been ascribed to a structure as a result of network analysis.

➢ Persons in an organization who occupy a position discovered through network analysis that allows them "structural autonomy"—that is, the ability to act as brokers between persons who otherwise would not be linked - are not very likely to hold that position a year later.

➢ In contrast, a person who holds a named position is more likely to continue in that position.

➢ Network relations can be prescribed by values, organization, and institutions.

➢ Relational names are very important in predicting the forms that networks take.

➢ Under many conditions, the elaborations become instituted and so become prescribed, and another round of elaboration begins.

➢ Since most people know the prescriptions, one "charm" of network analysis occurs when the additional elaborated relationships are revealed.

➢ Even the prescribed relationships are sufficiently complex so that participants in society see only the relationships that immediately surround them in the first-order zone and are rarely aware of the implications of second-order zones.

➢ Participants are unable to visualize, much less model, the entire system.

➢ Networks have been compared with traffic jams—you can see the cars that surround you, but it takes a helicopter to get above the mess and see the entire picture.

UNIT-I
Assignment- Cum- Tutorial Questions
SECTION-A

I. Objective Questions

1. The term Sociogram is invented by _____
2. _____ is used to represent the network mathematically.
3. The phrase "A Friend of my friend is a friend of mine" is example of_____.
4. As per the well-known history of Karate club, in the end, the club got divided into how many communities   [   ]
   a) 1   b) 2   c)3   d) 4
5. A Person with higher degree than others has   [   ]
   a)high centrality   b) low Centrality
   c) small distance   d) None of these
6. Networks in which boundaries are not clear   [   ]
   a)Ego Centric Network   b)Socio Centric Network
   c)Open System Network   d)None of these.
7. When nodes are more likely to be connected based on geographical proximity, it is called as   [   ]
   a) Propinquity   b) Homophily
   c) Mutuality   d)Balanced
8. Homophily refers to the friendship between people   [   ]
   a) Who are similar to each other
   b) Who are dissimilar to each other
   c) Who are introduced to each other because of a common friend
   d) Who have different ethnicity but live at the same place
9. Identify the type of dyad in the figure below   [   ]

   a) Null   b) Asymmetric   c)Mutual   d) None
10. In social networks, friends and acquaintances respectively lead to: [   ]
    a) Strong Ties,Weak Ties   b) Weak Ties, Strong Ties
    c) Both lead to Strong Ties   d) Both lead to Weak Ties
11. Identify the network group in which a person receives support for job search   [   ]
    a)EgoCentric Network   b)SocioCentricNetwork
    c)OpenSystemNetwork   d)None of these.
12. Diameter of a network is defined as?   [   ]

a) The number of nodes on the longest path between the two most distant nodes in the network.

b) The number of nodes on the shortest path between the two most distant nodes in the network.

c) The number of edges on the longest path between the two most distant nodes in the network.

d) The number of edges on the shortest path between the two most distant nodes in the network.

13. The Famous allegation "six degrees of separation" demonstrates
    a) The Theoretical no.of steps between any two persons in India.
    b) The original no.of steps between any two persons in India.
    c) The Theoretical no.of steps between any two persons in US.
    d) The original no.of steps between any two persons in US.[   ]

14. Citation Network is which type of network?   [   ]
    a)Directed   b)Undirected   c) Weighted   d)none of the above

15. Co-authorship Network is which type of network?   [   ]
    a)Role Multiplicity   b) Position Multiplicity
    c) Content Multiplicity   d)None

16. _____ were first identified as loyalities for accomplishment of tasks   [   ]
    a) Formal relations   b) informal relation
     c)complex relations   d)multiple relations

17. Dynamics of friendships formation and behaviour of people in a network is   [   ]
    a) Impacted by neither - selection and social influence.
    b) Impacted by both, selection as well as social influence.
    c) Impacted by selection but not social influence.
    d) Impacted by social influence but not selection.

18. Weak ties are important because: [   ]
     a) They might later become strong ties.
     b) They provide connections across communities.
     c) They connect nodes with difficult-to-reach parts of the network.
     d) both b and c

19. Triadic closure implies that: [   ]
    a) Two people having a common enemy have more probability of becoming friends with each other.
    b) Three people having a common enemy have more probability of becoming friends with each other.
    c) Two people having a common friend have more probability of becoming friends with each other.

d) Two people having a common person as a distant acquaintance have more probability of becoming friends with each other.

20. Which of the following triangles follows the social belief that `Enemy of my enemy is my friend'?   [   ]

(a)
A
B + + C
+

(b)
A
B + - C
-

(c)
A
B - - C
-

(d)
A
B - + C
+
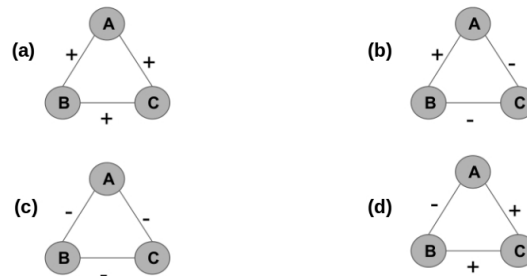
SECTION-B

II.   Descriptive Questions

1. Define Network. What are different relationships between nodes of a network?
2. Mention different kinds of networks investigated by social scientists?
3. What is Propinquity Effect?
4. What is Density? What does Density facilitates?.
5. Define Geodesic Distance.
6. How to illustrate lack of connection between nodes of a network?
7. Briefly discuss about Individual-Level Homophily.
8. Point out the importance of Centrality in a Network
9. Explain how size of Interpersonal Environment effects Reach or Connectedness between nodes of a network.
10. What is Multiplexity? Discuss the Multiplexity uses in the network.
11. Identify Dyad based Reciprocity in the network below:
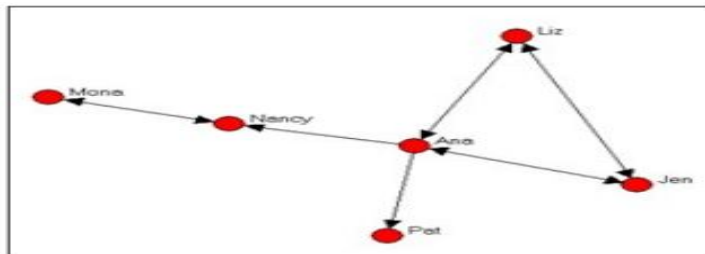
12. Compare and Contrast Formal and Informal relations in a network .

Unit-II
Network Segmentation

Course Objective:

- To familiarize with the concepts Network Segmentation.

Syllabus:

Network Segmentation-Named and Unnamed Network segments-segmenting groups on the basis of cohesion-structural similarity and structural equivalence.

Course Outcomes:

Student will be able to

- ➢ Define Network Segmentation.

- ➢ Apply names to the Network Segments through emic or etic groups.

- ➢ Outline Structural Similarity and Structural Equivalence.

- ➢ Design various block models for a given network.

Learning Material

1. Network Segmentation

1.1 Introduction

- One of the major tasks of network theory and analysis is to develop ways of describing and analyzing clusters or groups and to separate whole networks into smaller meaningful *segments*.
- We can look at institutional-sector networks such as the networks of banks and see that there are different clusters of banks and that they have clustered relationships with corporations. If we examine systems of government, the networks that compose them are clearly segmented and clustered.
- In short, people, organizations, institutions, countries any social unit one can imagine are not uniformly related to one another but tend to come clustered into groups or sets.

1.2 Named and Unnamed Network Segments

- As per the network positions, basically networks are classified into two types
  - a)emic Clusters or groups or positions or Networks
  - b)etic Clusters or groups or positions or Networks
- *emic Positions*: Networks that correspond to names given by the participants in the network. Examples are teacher, father, and president.
- *etic Positions*: etic positions are those that are found by network analysts and observers. for example, "high centrality".
- Emic groups are named and recognized by the "natives."

1.3 Primary Groups, Cliques, And Clusters

1. *Primary Groups* is typically a small social group whose members share close personal enduring relationships these groups are marked by members concern for one another, in shared activities and culture. **Example:** Group including family friends and childhood friends.
2. *Cliques* is a term of everyday language, it also has a mathematical definition—a maximal complete sub graph of three or more nodes (i.e., more than triad).
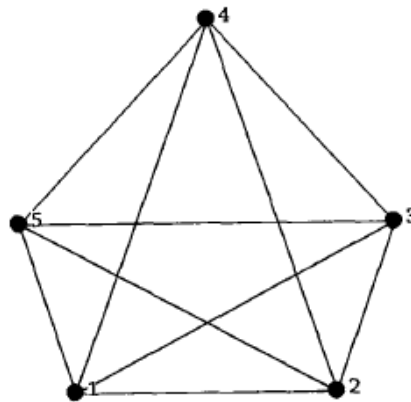
Figure 2.1 Clique of 5 nodes

3. *Clusters*, a formal term, have some of the structured characteristics of named groups or organizations, and there may be a clear hierarchy of positions within the cluster. In most formal analyses, clusters do not overlap.

2. Segmenting Network from the Point of View of the Observer

➢ Most of the work on partitioning and segmenting networks has been done from the point of view of the observer or network analyst.

➢ The aim is to take what appear to be continuous networks and break them down into more meaningful units for analysis.

➢ There are two "master ideas" or principles about social relations in networks.
- a) Cohesiveness or "closure".
- b) Structural similarity.

2.1   Segmenting Network on the Basis of Cohesion

- Cohesiveness defines "cliques."
- The mathematical definition of clique is – "A Maximal Complete Sub Graph of three or more nodes (i.e.,more than triad)".
- In a maximal complete sub graph all members of the graph "choose" or are linked to one another.
- In clique interaction, since all persons interact with one another, the persons cannot be distinguished from one another. They are mathematically equivalent to one another.
- The following example shows the concept of cliques each of these having five persons. i.e., clique1 on left side has 5 persons 6,7,8,9,10, and clique2 on right side has 5 persons 1,2,3,4,5 .Each of these five person cliques is totally connected and Mutual.
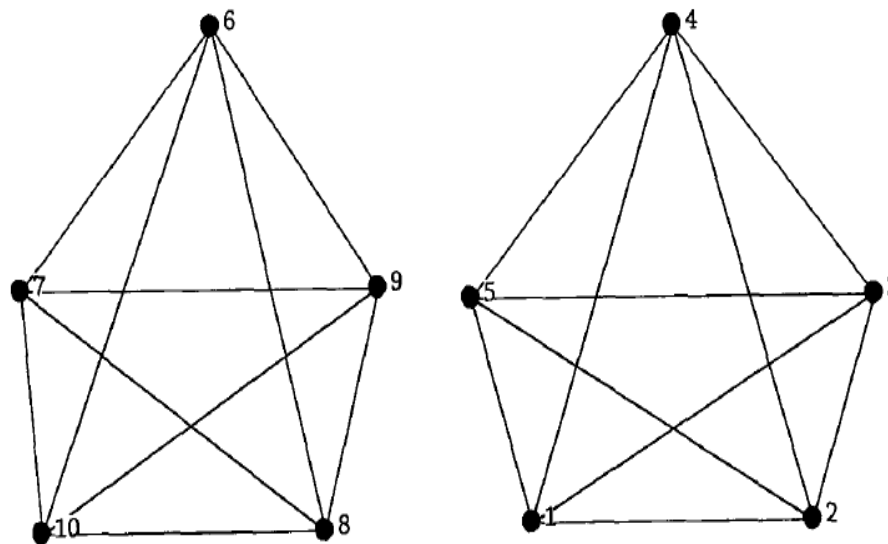
Figure 2.2 Two Totally Connected and Mutual 5 person Cliques

2.2 Resistance to Disruption

- A collectivity is structurally cohesive to the extent that the social relations of its members hold it together.
- A group is structurally cohesive to the extent that multiple independent relational paths among all pairs of members hold it together.
- The strongest cohesive groups are those in which every person is directly connected to every other person(cliques), though this level of cohesion is rarely observed except in small primary groups.
- The cohesiveness of a group can be measured by looking at two processes that are the opposite of one another.
- First, a group is cohesive to the extent that the members are pulled together when attacked with disruptive forces.
- On the other hand, cohesiveness can be estimated by seeing what happens to the disconnectedness of a group when one or more members (nodes) are removed or, keeping the same number of nodes, when one or more paths or connections between the members or nodes are removed.
- The former is called **Cohesion** and the latter **Adhesion**.
- These two measures are equivalent. It is obvious to the naked eye that in the karate club example, the removal of "T" or "A" or the connections to them would disrupt the group. Other disruptions maybe more subtle and require a computer algorithm to find them.
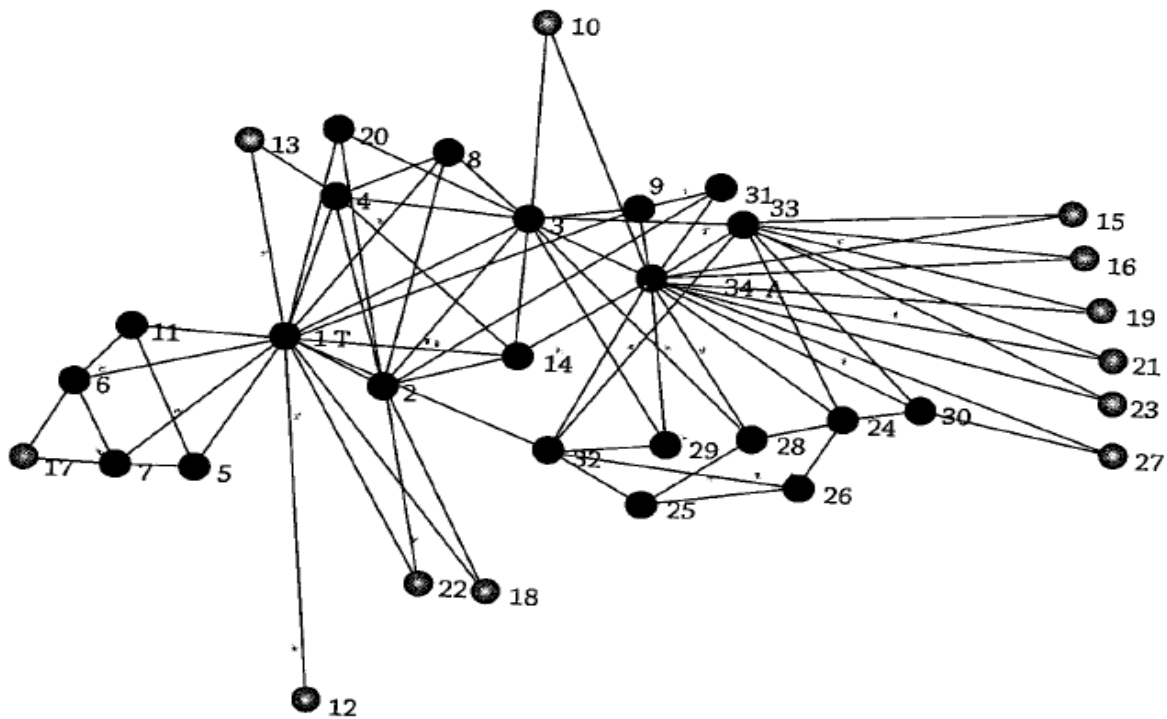
Figure 2.3 Friendship Network among Karate Club members

2.3   Structural Similarity and Structural Equivalence

- The other way of partitioning or segmenting networks utilizes the master idea of reaching out to other nodes and examining the pattern of a node's relations with the other nodes in the network, rather than looking for cohesion in terms of relations between the nodes.
- Nodes that have similar patterns of relationships with other nodes are grouped together. This idea is called *Structural Similarity*.
- **Example:-**Managers may have similar patterns in their relations to employees in their units.
- *Structural Equivalence*, a more strict formulation, is defined as nodes that are connected to the same other nodes in identical ways is said to be structurally equivalent
- **Examples**:- Two managers would have to have the same relationships to the same employees, an unlikely situation.
- Since identical relations are relatively infrequent, there are ways of modeling "ideal" patterns and then assessing how well these patterns fit the data or how similar they are.

2.4   Block Model

- The method "block modeling" was first developed by White, Boorman, and Breiger (1976).
- Block models partition networks into non-overlapping segments.
- Clusters or blocks can be represented by a matrix of 1's and 0's.
- In the following example (table 2.1), there are two blocks, A and B, each consisting of a number of nodes.
- The I's represent the presence of a relationship; the 0's represent the absence of a relationship.
- The tables are read in terms of the rows relating to the columns. In the first row, block A relates to block A and to block B. In the second row, B relates to A but not to itself.
- Remember, these are not individual nodes, but clusters of nodes.

Example of a Blockmodel

	A	B
A	1	1
B	1	0

Table 2.1 Example of a Block Model

2.5   Core/Periphery Structures

- Core/periphery structures are the simplest forms of network segmentation.
- The reason core/periphery structures are so familiar to us is that we have all experienced them, starting from our days in a playground. There were kids who were on the inside while others were on the outside. This patterning continues through grade school, high school, and, dare I say, throughout life.
- Generally Core nodes are all connected to each other, while Periphery nodes have less no. of connections.
- Consider the following example of a symmetrical network (figure 4.3), adapted from Borgatti and Everett (1999).
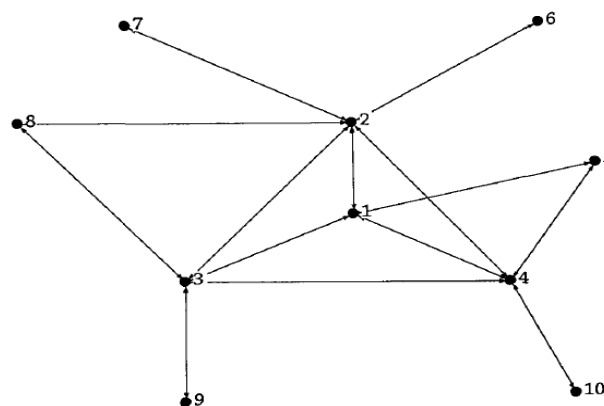
Figure 2.4 Example of a Symmetric Network

- The adjacency matrix, table 2.2 below shows an adjacency matrix is equivalent to figure 2.4 above.
- It describes how the node relates to other nodes.
- If the intersection of the row and the column depict a relationship, the adjacency matrix (table 2.2) has a '1' the matrix has a '0' if there is none.
- In this matrix, nodes are not related to themselves, so the diagonal is blank.

Blocked Adjacency Matrix

	1	2	3	4	5	6	7	8	9	10
1		1	1	1	1	0	0	0	0	0
2	1		1	1	0	1	1	1	0	0
3	1	1		1	0	0	0	1	1	0
4	1	1	1		1	0	0	0	0	1
5	1	0	0	1		0	0	0	0	0
6	0	1	0	0	0		0	0	0	0
7	0	1	0	0	0	0		0	0	0
8	0	1	1	0	0	0	0		0	0
9	0	0	1	0	0	0	0	0		0
10	0	0	0	1	0	0	0	0	0	

Table 2.2

- In terms of block models (table 2.3, below), nodes <1,2,3,4> can be abstracted as block A, and nodes <5, 6, 7, 8, 9, 10> abstracted as block B.
- The blocks' abstract relationship to one another is depicted as the ***core/periphery*** model encountered above.

Core/Periphery

	A	B
A	1	1
B	1	0

Table 2.3

- There are several other kinds of elite cores.
    1. Caucus.
    2. Groucho Marx
    3. deference
    4. meek
    5. Polarization

Caucus

➤ In Caucus, those active in block A run the community and do not pay much attention to the others who do not have political relationships (though they might have other kinds of relationships) with each other or with the core.

➤ The core does-not take account of the periphery, and the periphery has no relationship with the core or with others.

➤ Breiger (1979) suggests that this type of cluster can be applied to the **community power literature**.

➤ The block model, table 2.4 below depicts a "*caucus*".

Caucus	A	B
A	1	0
B	0	0

Table 2.4

Groucho Marx

➤ It is a situation in which Block A relates to A, B relates to A, but A does not relate to B nor does B relate to itself (table 2.5).

➤ This is a diffusion model from a core: The core has what other nodes want, so they look to it.

➤ Unlike a trading situation, the core does not want anything from the periphery.

➤ The relation is not symmetric.

Groucho Marx Core	A	B
A	1	0
B	1	0

Table 2.5

Deference

➤ There can be a situation, shown in table 2.6 in which A remains the elite in that relates only to other A's, but B also has some density of relating to other B's, and also to A.

➤ Breiger calls this situation one of "*deference*."

➤ A wants nothing from B, but the B's have something to offer to one another.

Deference	A	B
A	1	0
B	1	1

Table 2.6

Meek

➢ This simply turns the caucus or the elite core blockmodel on its head, assuming that the B block has fewer power attributes.
➢ This model is empirically absent in reality.
➢ The "*meek*" block model (table 2.7), however, suggests a proposition about core/periphery networks.

The Meek		
	A	B
A	o	o
B	o	1

Table 2.7

Polarization

➢ It is a situation that relate to themselves but not to one another.
➢ This has not yet been examined.
➢ In terms of the network relations in the political arena, there could be a situation of two clusters or caucuses polarizing the community (table 2.8).
➢ They relate to themselves but not to one another.

Polarization		
	A	B
A	1	o
B	o	1

Table 2.8

UNIT-II
Assignment-Cum-Tutorial Questions
SECTION-A

Objective Questions

1. Identify which type of elite core suggest type of cluster can be applied to the community power literature   [   ]
   a) Groucho Marx Core   b) Caucus
   c)Deference   d) Meek
2. Seperating the whole network into smaller meaningful parts known as   [   ]
   a)Groups   b)Cliques   c)Clusters   d) Segments
3. Networks that correspond to names given by the participants in the network
                                                                   [   ]
   a)emic Networks   b)etic Networks
   c)Local Networks   d) None of the above
4. A small social group whose members share close personal enduring relationships
                                                                   [   ]
      a) Clusters   b)Cliques   c)Primary Groups   d) Segments
5. A maximal complete sub graph of three or more nodes   [   ]
   a)dyad   b)triad   c)Clique   d) None of the above
6. Group of thing or persons close together is known as   [   ]
   a) Clusters   b)Cliques   c)Primary Groups   d) Segments
7. Higher density of node in a network can be identified by
   a) A Node has more Likes   b) A Node has less likes   [   ]
   b) A Node has no likes   d) None of the above
8. Nodes that have similar patterns of relationships with other nodes are grouped together   [   ]
   a)Structural Equivalence   b) Structural Similarity
   c)Clusters   d)Cliques
9. Identify which of the following block model is suitable for "Block A relates to block A and to block B, B relates to A but not to itself".   [   ]

a)

b)

c)

d)

10. Identify which abjacency matrix represents symmetric relation

[   ]

a)   A   B   b)   A   B

0	1
1	0

1	0
0	1

c)   A   B   d)   A   B

0	1
0	0

0	0
1	0

11. There can be a situation in which A remains the elite in that relates only to other A's, but B also has some density of relating to other B's, and also to A. Breiger calls this situation.

[   ]

a)The Meek   b)Deference   c)Polarization   d)Cacus

12. Which of the following block model comes under polarization   [   ]

a)   A   B   b)   A   B

1	0
0	1

0	0
0	0

c)   A   B   d)   A   B

0	1
1	0

0	0
1	0

13. Identify the two master ideas about social relations in network   [   ]
   a) Cohesiveness,Structural Similarity
   b)Structural Similarity,Structural Equivalence
   c) Cohesiveness,Structural Equivalence
   d)None of these.

14. Nodes can be removed or added to the network the former and latter is called

[   ]

   a)adhesion,cohesion   b)cohesion,adhesion
   c)adhesion,disruption   d) None of these

15. For the following Karate club member networks which pairs of nodes has highest Density   [   ]
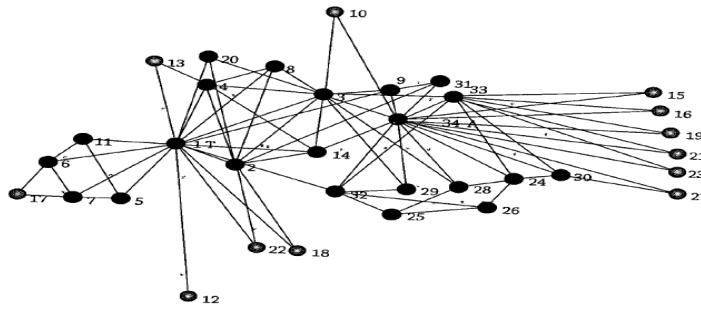
FIGURE 3.1 Friendship Network among Karate Club Members

a)1,34   b)10,22   c)4,33   d)25,31
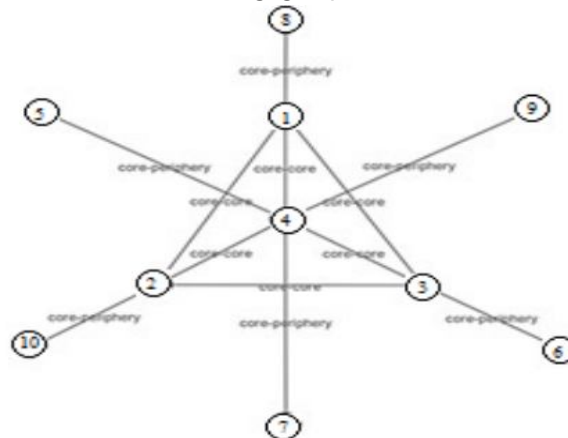
16. Name the following network   [   ]

a)Dyad   b) Triad   c)Clique   d) Primary Group
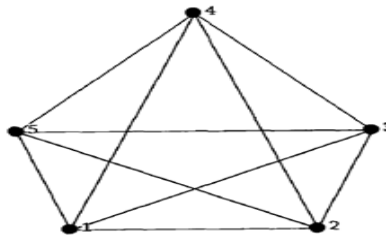
17. In a core-periphery structure   [   ]

a) Low status people are linked in densely connected core while the high status people atomize around this core as periphery of the network.

b) Core and the periphery occupy interchangeable positions in the network.

c)The notion of a node being in a core or in a periphery does not depend on the social status or the wealth of a node.

d)High status people are linked in densely connected core while the low status people atomize around this core as periphery of the network.

18. The average clustering coefficient of a complete graph with 100 nodes will be?

                                                                                  [   ]

a) 0   b)1   c)100   d) 0.01

19. What will be the clustering coefficient of the central node in a Star Graph having 10 nodes?   [   ]

a) 1   b) 0   c) 10   d) 9

20. If four nodes form a complete graph, then what will be their clustering coefficient?

a)1/4, 1/4, 1/4, 1/4   [   ]

b) 0, 0, 0, 0

c) 1, 1, 1, 1

d) 4, 4, 4, 4

SECTION-B

SUBJECTIVE QUESTIONS

1. Define Network Segmentation.What are it advantages.
2. Discuss in detail about Structural Similarity
3. State the Mathematical definition of Cliques.
4. Differentiate between Structural Similarity and Structural Equivalence.
5. Discuss in detail about Named and Unnamed Network Segments.
6. Explain the concept of Resistance to Distruption
7. Illustrate various block models involved for the symmetric network.
8. Write a short note on
   a) Clusters
   b) Primary Groups.
9. Assume that there are two blocks in a network: block A having nodes 1,2,3,4 and block B having the nodes 5,6,7,8,9,10. Compute the Adjacency Matrix and various core/periphery structures of the following graph.

10. Assume that there are two blocks in a network: In block A having nodes 1,7,8,9 and block B having the nodes 2,3,4,5,6. Compute the Adjacency Matrix and various core/periphery structures of the following graph.

Unit III

The Psychological Foundations of Social Networks

Course Objective:

- Familiarize with the psychological foundations of Social networks.

Syllabus:

Psychological foundations of social networks: Introduction, Community and Support, Safety: Safety and Social Networks, Effectiveness: Effectiveness and Social Networks, Safety and Effectiveness, Status: Cultural Differences in Safety, Effectance, and Rank, Cognitive Limits on Individual Networks.

Course Outcomes:

Student will be able to:

- Recite the psychological foundations of Social Networks.
- Differentiate Safety and Effectiveness.
- Know Cultural Differences in Safety, Effectance, and Rank.

1. Psychological foundations of social networks

1.1 Introduction

- The two kinds of basic human motivations are:
  - o first, **to feel safe** and
  - o second, **to reach out**.
- These correspond to two basic and complementary aspects of social networks.
  1. The connections between some of the elements of a network and
  2. The holes or non connections between other elements.
- One motivation is to stay within one's social cocoon.
- The connections between people and social units lead to feelings of safety, comfort, and support.
- Another motivation is to reach out and make connections where there were none.
- A broker is a professional manipulator of people and information who brings communication for profit. Of course, the "profit" is not in terms of cash delivered but in the collection of favours that can be "cashed in" when needed.

1.2 Community and Support

- Networks are not only about getting things done but about "community", "social circles" and the "social support" one receives from these communities.

- When examining community and support, one first checks for the presence of ties embedded in the social system. One looks in particular for cohesion, close relations, and harmful connections rather than holes or the absence of ties.

- Because of the seeming disconnectedness of modern society - cohesion, support, and diffusion have strong effects on people.

- Ties and connections are found in communities that do not necessarily have geographic proximity.

- Mutual connectedness is more important than organisation.

- However, both brokerage and social density (no. Of interactions) are matters of fundamental necessity in any network situation.

- The distinction between feeling safe and reaching out becomes confused in modern society.

- Cohesion and support become even more important in modern society than in traditional systems because community and propinquity are often the consequences of particular actions rather than the passive results of the social environment.

- One of the major interests of the founders of modern sociology, perhaps a major factor in the creation of sociology as a discipline, was to explain **the shift from traditional to modern societies** that seemed to come to a head in the nineteenth and early twentieth century societies.

- In order to better understand the fundamental duality of cohesion and brokerage, we need to understand theories of motivation within networks. These motivations are "hard wired" into the original human network of an infant and her mother and father or other household members called "The Human Group."

2. Safety

2.1 Safety and Affiliation

- Safety is fundamental because "people will not risk either new kinds of behaviour or new kinds of experience unless they feel safe enough to do so. The importance of feelings of safety is one of the strongest findings that has emerged from a century of psychoanalytic investigation".

- Safety is an Affiliative drive: "The workings of the safety drive invariably move people closer to their objects".
- The safety drive aims at feelings of physical, intellectual, and psychological relaxation, the safety drive moves us closer to other people.

2.2 Safety and Social Networks

- In network terms, safety or supportive systems are usually equivalent to density in networks, a condition that has been generally associated with "social support," "cohesion," and "embeddedness."
- Dense social networks are characterized by the sense of "trust" i.e., it is assumed that if you act in a certain way toward the other, the other will in turn satisfy your needs.
- Note that the relationship takes place in time. The self moves toward the other, and then the other reacts, that is, you build up "credit" with the other.
- In the perfect case of trust, there is no need for long-term credit. What self gives is what self gets back in return, often because the time fall is negligible.
- In the simplest case, in a dyadic relationship, it is assumed, for example, that if you give the bus driver the money for a fare, he will accept that money and not throw you off the bus.
- In general, trust takes place in a situation of relatively high density and visibility, and over a short time span. This situation is frequently described as one of "cohesion" and "social support".
- Cohesion and support can be varied. Cohesion can be understood as visibility of the network and its shape, while support as the discounted value of the exchange.
- The balance of power in the exchange can be altered so that one or both sides of a transaction are less motivated to trust one another.

3. Effectiveness

3.1 Effectiveness and Structural Holes

- Effectiveness describes the need to do and to learn how to do.
- Effectiveness is characterized by a sense of self-sufficiency, autonomy and individuation.
- Effectiveness needs pull one away from other people.

- Culture, as a broad vibration of human needs for relatedness, is vital because it serves our need for safety, for being fixed in a secure structure. But effectiveness is constrained because it often pushes against the norms of social living.
- The drive for effectiveness is as natural as the drive for safety.

3.2 Effectiveness and Social Networks

- We can turn the concept of density in social networks on its head, and look to the holes in the network, the lack of connectedness, rather than to cohesion.
- By focusing on the holes rather than the connections, we concern ourselves more with efficacy than safety.
- In competitive situations, other people's cohesion can be a disadvantage.
- Persons embedded in a dense cohesive network have the same information. Each is constrained by the other but, at the same time, cannot be played off against the other.
- In this dense system of mutual relationships, no one can gain advantage.
- On the other hand, if a person is a bridge between more dense parts of a network not directly connected with one another and thus characterized by structural holes, the person gains information from diverse clusters.
- Players with relationships free of structural holes at their own end and rich in structural holes at the other end are structurally autonomous. These players are best positioned for the information and control benefits that a network can provide.

3.3 Both Safety and Effectiveness?

- Since both safety-affiliation-trust-density and effectiveness-competition-structural holes situations are inherent human motivations and present in all social networks, when does the one or the other become more relevant.
- Effectiveness motivates situations with many structural holes rather than situations of high cohesion.
- These motivations are necessary when the costs of acting as well as the return on investment are high, when the visibility is low, when the discount rate on future returns is high and when one may not be in moral command. In such situations, actors attempt at least to continue with, and at best excel, others with whom they are structurally similar.

- The main difference between effectiveness networks and safety networks as ideal types is the location of trust.
- In safety networks, trust tends to be an attribute of the entire network, not just of the "player's" side. In effectiveness networks, trust is present only to a limited degree between the player and the other who is the object of play.
- Furthermore, since total visibility in effectiveness networks can be low, actors need not be consciously aware of these structurally similar others to behave as if they were trying to keep up with them.
- Although effectiveness and control are both basic human motivational needs/drives, effectiveness is dependent on prior conditions of safety and systemic support.
- As Greenberg points out, "The safety and effectance drives operate continuously and both pulls are always present, although one or another is likely to dominate conscious experience at any particular moment".
- To be autonomous, which is an early, deep-seated drive, one must also feel safe and supported. This is an ultimate paradox of human existence.

4. Status

➢ There are two aspects to this motive, one set by the network and the other by the social and cultural system with in which the network is embedded.

➢ The network creates two situations. One situation is the similarity created by structural isomorphism.

➢ Here one "keeps up with the Joneses" because they occupy a similar position in a network.

➢ The interesting thing about this kind of need to copy or keep ahead of is that it is not a conscious process in which one knows directly whom one has to keep up with.

➢ One need not have a clear picture of the network and participants rarely do for the emulation of others to occur.

➢ A person need not even be directly aware of the Joneses or that he or she is competing with them or trying to emulate them. This would seem unreasonable, yet there is a great deal of consistent data that suggests that this is true.

➢ A more visible network structure that creates the motivation to keep up with or exceed the other is the authority pyramid. The occupational- or economic- class pyramid also generates motivations to get ahead.

- These situations generate the conditions for deferring to authority and for social climbing.
- The motive to associate with those of higher rank and gain their resources is not unbounded.
- One is more likely to compare oneself and to try to associate with those others who are not too far removed from one's own rank.
- Authority and rank pyramids therefore create the situation for desire and copy and, at the same time, limit the targets for both.

4.1 Cultural Differences in Safety, Effectance, and Rank

- Some cultures give importance to safety, others effectance, and still others status or rank.
- Markus and Kitayama have engaged in a series of studies "a person is an **autonomous** entity defined by a somewhat distinctive set of attributes, qualities, or processes."
- In contrast, "the **interdependent model** of the person gives priority to social structural and interpersonal frameworks such as families, work, work groups, social roles, positions, or relationships defining the person."
- Asian cultures tend to elaborate this interdependent model of personality.
- The interdependent model is more consistent with density and support, whereas the autonomous model is more consistent with structural holes and effectance.
- Markus and Kitayama specified two models of business:
  - the "**disjoint**" (people follow their own goals, are independent of others, and the emphasis is on "efficacy"); and
  - "**conjoint**" (relationship focused and obeying feelings may include unity and relatedness).
- These models correspond to what we have called efficacy and brokerage on the one hand, and closure and support on the other.
- By and large, persons and collectivities that are in agreement with the dominant culture/personality mode will be more valued.
- Going "outside the box," however, as we saw with the Sicilian academic, can be dramatically effective if there is also a cultural prescription that allows for such relatively unusual behaviour.
- Motivation for rank may also follow cultural modes, though this may not directly follow as a consequence of an interdependent or autonomous personality.

- A cross cultural experiment suggested the following order in **sensitivity to rank**: Hong Kong, Turkey, the United States, Sweden/Finland. These are results from one experiment.
- It might be that cultures that highlight honour generate stronger sensitivities about rank.
- The motivation to "keep up with the Neighbour" may be more frequent in advanced market economies.

5. Cognitive Limits on Individual Networks

- In **traditional societies**, the infant becomes aware of the extended family as a network and begins to absorb the meaning and relationships implied by terms that have always surprised this student of kinship.
- In **contemporary industrial societies**, children go to schools and acquire a network of persons outside their nuclear families. This acquisition of an ever larger network continues to develop, even as aided by internet devices such as Facebook.
- But, there is a limit to the size of the safety and effectance networks than any individual can manage or remember, though of course there is considerable variation in this ability.
- In addition to their motivations to engage in network behavior, the size of the network that humans can cognitively manage is the other important psychological foundation of social network theory.
- Network behavior is in the first place subject to limitations on the extent of human actions. But specifying this limit is not so simple, because it depends on both biological and cultural mobilization and tends to be cyclical.
- All humans have a limit or ceiling of actions. Below this ceiling, an accustomed level of mobilization is established. Periods of mobilization above par of the accustomed level tend to be followed by mobilization below par, and vice versa.
- The quality of the actions can vary, not to mention the physical stamina of the actors including sleep patterns and the ability to multitask (the teenager who listens to music while doing her homework), all of which have some cultural components.
- Also, there is a limit on the size of the networks humans can manage and remember. The size of this personal circle or network is a critical social and cultural phenomenon.
- Bernard and Kill worth (1979) pointed out that size is a major determinate of social and cultural evolution. They assume that with a given technology, a hunting and

gathering group's population size gradually increases until it has to split so that it can continue to exploit its environment. Thus far this is the conventional view of human evolution as seen from the point of view of Steward's school of cultural evolution.

➢ Bernard and Kill worth mentioned that if groups are constructed randomly, then the upper limit to their size is about 140, beyond that they have to split so that individuals can comprehend their position in the group and function effectively without a formal system of coordination.

➢ In addition, they show that the Emits of informal networks of networks or groups is probably around 2,500—after which some formal institutions must be developed.

➢ Recent analyses, using data from the Kill worth studies, suggest that the mean size of one's circle of acquaintances may be as high as 650 for men and 590 for women.

➢ In an urban setting, persons of higher social class have a wider circle than persons lower in class. Also there are variations between village and urban societies.

➢ Variation in size is related to talent, cognitive abilities, and motivation. Some politicians such as Bill Clinton seem to have a mental electronic database capable of instantly retrieving at least 5,000, if not more, individuals by name and face.

➢ There are even some training programs that claim to enlarge one's ability to recall and manage personal networks.

➢ Whatever the limits, the size of one's directly reachable and knowable network is finite and has a strong biological component.

Unit-IV
Organizations and Networks

Course Objective:

- Make them learn about Organizations of Networks.

Syllabus:

Organizations and networks Information-Driven Organizations-Bridging the gaps: Network Size, diversion and social cohesion

Course Outcomes:

➢ Evaluation of Various Organizations of networks.

Student will be able to:

➢ Understand Challenges in organizations of a network.

➢ Apply Emergent Networks in organizations.

➢ Design various Information driven organizations.

➢ Analyze various tradeoffs between network size, diversity and social cohesion.

1. Organizations and Networks

1.1 Introduction

➢ Organizations are social structures designed to get things done through the cooperation of individuals.

➢ Organizations face four related challenges:

  ➢ **First**, motivating people to do what the organization wants them to do.

  ➢ **Second**, deciding what should be done.

  ➢ **Third**, accomplishing what needs to be done.

  ➢ **Fourth**, acquiring the needed resources.

- Additionally, the borders of an organization are not necessarily clear, and organizations have numerous stakeholders who must be placated and/or convinced to cooperate.
- All of these challenges involve utilizing a chain of authority or command to force people to perform—in other words *Networks*.
- While deciding what to do may involve individual creativity, most ideas are not original and come from others and the cultural milieu (back ground).
- Organizations use internal and external networks to develop ideas that help them decide what to make and/or what services to provide and how to do it.
- Networks help raise capital to provide organizations with resources.
- A Formal organization consists of a designed chain of authority.
- All formal or external systems breed informal networks that are grafted onto them.
- By way of the motivations of safety, effectance, and status achievement, the informal networks develop leaders that match the norms and culture of the informal network and these may or may not match the norms and culture of the host organization.
- Further, Modern organizations originated in Western democratic societies in which coercion as a motivating force is available only under special circumstances, for example in jails and in the armed forces.
- Even in these situations, pure coercion is rarely if ever successful, as (Sykes 1958) demonstrated for jails and Etzioni (1961) reviewed for combat organizations.
- The official leaders of formal organizations are appointed and not elected.
- In modern publically held corporations, executives are beholden not to the employees and their informal networks but to the quarterly report, government agencies, or nonprofit boards.

1.2   The Contradictions of Authority

➢ Modern organizations are *rational-legal systems*, based on *universalistic principles* and are supposed to be "*fair*".

➢ In contrast, emergent social networks are based on *particularistic principles*. To the extent that friendship, homophily, and propinquity play roles, these networks are fundamentally "*unfair*".

➢ In a *rational-legal system*, the position, not the person, is obeyed because the subordinate believes the system is legitimate, consent is given by the subordinate rather than enforced by the leader.

➢ Thus, according to Chester Barnard, an important early thinker about formal organizations, authority "*Lies with persons to whom it [an order] is addressed, and does not reside in persons of authority*" (Barnard 1938).

➢ The paradox is that we live in a democratic society of representative government in which leaders are elected according to the principle of one person, one vote.

➢ Yet we spend most of our lives in non-democratic organizations in which the leaders are appointed by those with financial power or other fiduciary power, and we are expected to obey them.

➢ Barnard's solution to this paradox is to insist that even these appointed leaders govern

Only with the consent, or more likely, the indifference of the governed.

➢ Barnard thus laid the groundwork for a social network-based theory of management.

➢ A formal designed network does not imply blind obedience to any whim of the person in a leadership position.

➢ As Max Weber (1946) pointed out, a designed network not only specifies the relations between the members of the network, but also specifies the boundaries of each position in the network, in other words the formal role relations each has with the other. It is not a personal fiefdom.

- This leads to Barnard's "*zone of indifference*": "The person affected [by an order] will accept orders lying within this zone and is relatively indifferent as to what the order is".

- Barnard (1938) and Simon (1947) characterized this phenomenon as an "*Area of acceptance* ". Within which requests are accepted as fitting and legitimate but outside of which they are not.

- In the modern contract between a male supervisor and a female subordinate, for example, a request to find an item in a database is legitimate, but a request to fetch coffee is not.

- Formally designed networks also include elements that are not strictly social authority arrangements, such as the factory production line, but nonetheless imply authority.

- In the *continuous production system* designed by Andrew Carnegie's chief engineer, railroad cars with coal and iron ore entered one side of a steel mill and rolled steel eventually emerged on railroad cars at the other end of the mill.

- The entire process was governed by a complex network flow that involved workers, supervisors, and blast furnaces, not to mention a railroad (Chandler 1977, 261).

- This system, which appeared to be entirely "technological," actually relied on a human supervisory network to ensure coordination between the various processes.

- "Production lines" and the organization of work through mechanical means are not confined to factories. Bureaucracies have them too.

- In a classic study by Peter Blau (1955), the permanent placement of boxes with job orders on the desks of interviewers responsible for finding jobs for unemployed workers in one section of a state employment agency and the movement of boxes from one desk to another in a different section of the agency had important consequences for the flow of interaction and the extent of competition between the interviewers.

1.3   Emergent Networks in Organizations

➢ The *factory floor*, *assembly line*, *and repetitive forms* of production are designed to maximize control of the workers and minimize their opportunities for informal interaction.

➢ Western Electric studies of mechanical production situations, and their reanalysis by George Homans, that formal relations in what he called the "*external system*" were elaborated by the "*internal system*" into an emergent network of relationships.

➢ All interaction, that prescribed by management as well as any other interactions that emerged, was accompanied by "*sentiment,*" and sentiment led to further interaction in *circular fashion*.

➢ Workers also brought their own cultural values and attitudes into the situation. Among those values, as we will see, was the working-class fear of unemployment.

➢ The challenge for management is to ensure that leadership and authority is granted by subordinates to leaders appointed by management and/or that the emergent leaders accept the values of management.

➢ The opposite challenge is faced by trade unions when they attempt to organize workers in the face of resistance by management.

➢ A union wants their members to take their cues from the union shop stewards, not management. These challenges have been especially cogent (strong) in factory floor situations.

➢ In the "*Bank Wiring Room*," an entire social system emerged from the designed network that linked wirers, solderers, and inspectors in a layout of workbenches forming an *assembly line*.

➢ Workers in the Bank Wiring Room frequently traded jobs However, emergent informal network diagrammed by the researchers as shown in the following (Figure4.1) they also helped one another and formed *friendship cliques*. In the diagram, W refers to wirers and S to solderers.
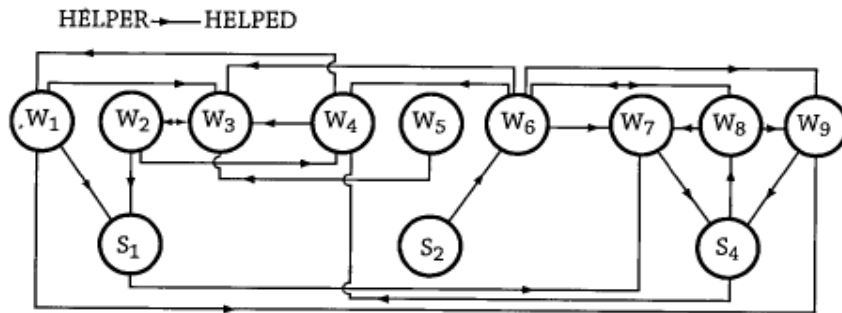
HELPER ← HELPED

Figure 4.1 Helping Network in the "Bank Wiring Room".

- Helping is another form of "deciding how to do it." The formal design of the system did not allow for helping. Yet, innumerable studies have shown that no assembly line works entirely as planned and that without improvisation by workers in modifying the line or improving it, production breaks down.

- The Previous Helping Network depicts

    1. Total 14 Workers (9 wiremen, 3 sholdermen and 2 Inspectors) collaboratively work together.
    2. Segregated work area.
    3. No Management visits.
    4. Supervision remains the same.
    5. Observer would record the data-no of interactions with workers.

2 Information-Driven Organizations

- Factory assembly lines and other organization systems that involve repetitive standardized mechanistic activity continue to be important, but most organizations now focus on knowledge creation and symbol or idea manipulation rather than creating physical objects and are constantly changing (or trying to change) in the face of environmental pressures, even when they do have a mechanistic component. They are called ***organic systems*** (Tichy and Fombrun 1979; Burns and Stalker 1961).

- *Examples of Organic Systems*:-Law offices, health delivery systems, R&D, high-tech firms, financial firms, media production firms, high fashion firms, and many nonprofit organizations.

- Though automobile firms, for example, have a factory floor that fits the description of a mechanistic system, their economic health depends on the design and engineering units that are information driven.
- Even though informal networks or emerging networks can change the flow of work on the factory floor, they nonetheless tend to conform to the planned network structure, especially in mechanistic systems.
- This is true because all social networks are draped on or embedded within instituted social systems that constrain and define the nature of the interaction; mechanistic systems constrain interaction more than organic systems that are characterized by less restricted and more flexible interaction
- Some built-in constraints stem from the authority structure— superiors and subordinates obviously tend to interact.
- Proximity is an important factor even in the age of the internet. It is much easier to interact with someone on the workbench next to you than with someone several buildings away.
- Higher levels in any organization tend to be more concerned with symbol manipulation and therefore tend to have some characteristics of organic systems.
- In order to get a job done, communications, advice, and friendship networks in these kinds of systems, no matter what the official design, tend to skip levels and cross over into other divisions or units.
- There are also politics: departmental interests that may conflict with the overall aims of the organization. These concerns also create informal networks.
- When an outsider asks about an organization chart, executives say, "*What organization chart?*" implying that of course they generally work outside of the formal channels.
- The extent, to which they do this, whether they skip levels in the organization or skip across to another unit or division, depends on the situation and the history of the organization.
- From a theoretical point of view, two network concepts are involved:

1. The **Density** of interaction within the basic work unit
2. **Brokerage or Structural holes** bridged by the interaction, that is, the connections that are made between positions and individuals who would not otherwise be directly connected.

➢ Betweenness is perhaps the most familiar situation in which a particular position serves as a gatekeeper for flows of information and power, vertically as well as laterally.

➢ A reminder here of how betweenness relates to power: our view of power emphasizes two-way communications, consistent with Barnard's zone of indifference. A "**power score**" can be constructed using this idea. The score has two aspects.

1. *Betweenness* calculates the extent that the position falls on the shortest paths (the geodesic) between other pairs of actors in the network; that is, to get from one part of the organization to another, one has to go through that position..
2. Next, and similar to betweenness, is C*loseness* or distance of each position or node; that is, how near or far a given node or position is from all the other nodes in the figure 4.2.

➢ The Krebs Centrality Power Score (Krebs 2004) is a function of both these measures, and in this case we simply use the average of the two.

➢ While there are other measures of power or prestige in a network, the Krebs measure is easy to grasp and captures the idea of the extent to which a position is linked to others and the extent to which others have to go through this position to communicate with the rest of network.

➢ Note that at this point we are talking about *communication* and *information*. Power is of course also giving orders, though as noted, the recipient has to be willing to obey. But in keeping with organic organizations, for the moment we focus on *communication as power*.

➢ People often note that the executive secretary to the CEO is a gatekeeper and that he or she has more power than the position

officially warrants. Figure 4.2 illustrates the way that the position might be drawn on a chart of a multidivisional organization.

➢ The lettered boxes represent **divisional leaders**; the numbered boxes are units, in the divisions. The secretary is drawn to the side of the CEO, as conventional for support staff rather than line executives.

➢ The CEO has the highest **Krebs Power Centrality Score (0.192)** and the divisions heads lower ones. B has more units reporting, and so is higher in Power than A and C.

➢ The units 1 through 8 have the lowest scores, but those units reporting to B have higher scores because they also interact with one another.

➢ The scores are normalized so that for each chart they add up to 1.0 with the lowest score being 0.
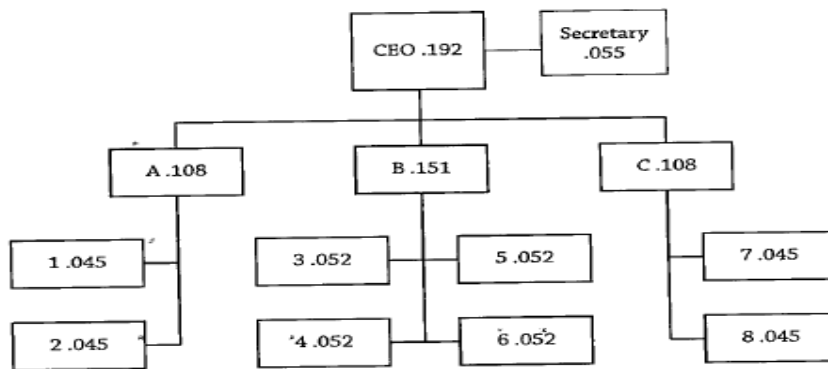
Figure 4.2 Power Scores in Multi-Level Organization.

➢ But the following organization chart is hypothetical example is the way communications actually function between the divisions and the CEO.

➢ The figures in the position box are the Krebs power scores of the position. The score shows what is intuitively obvious.

➢ The **secretary** has a key **gate keeping position** and the CEO, the nominal leader, has a lower Krebs power score because to get to the CEO one has to go through the secretary.

➢ The scores of the other positions have not changed because their pattern is the same as in the figure 4.3.
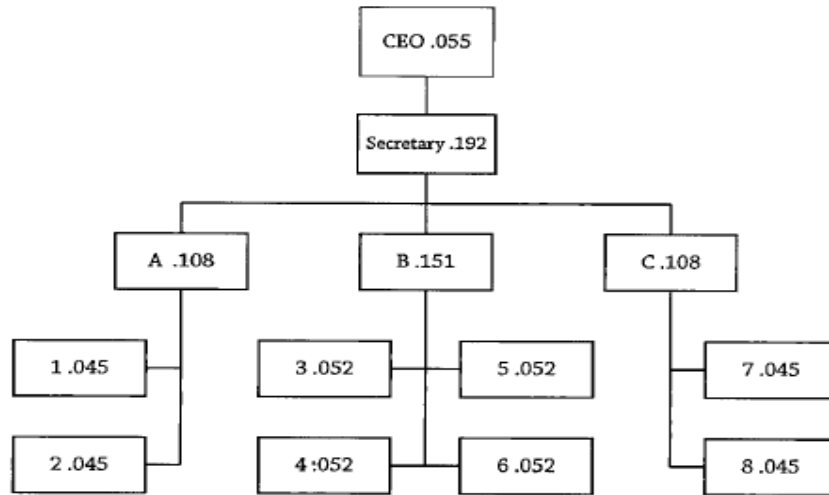
Figure 4.3 Power Scores in Multi-Level Organization II.

➤ There is another critical aspect to life in complex organizations, and that is the "*chimney*" or "*silo*" problem.

➤ To manage complexity, to develop expertise in a given field, and to decrease the span of control, as well as to preserve organizational secrets(Oliver and Liebeskind 1997) most large organizations develop separate divisions or units that specialize in particular areas.

➤ Designing engines requires a different talent and expertise than styling cars, though to be sure, one does affect the other.

➤ In the classic organizational multidivisional structure shown in stylized form earlier, units (3,4) reporting to B have to go up the chain of command and then down again through A if they wished to note, say, a design change that will affect the work in 1 and 2.

➤ Observations of design engineering in a major U.S. automobile company, even within the general category of engines, unit 2 that might be involved in designing engine-hose layouts would have to redo their work if say, the engine-block designers in 3 and 4 relocated the carburetor.

➤ The efficient way of working was for someone in 4 to contact a friend in unit 2 and directly work out the problem, as shown in figure 4.4.
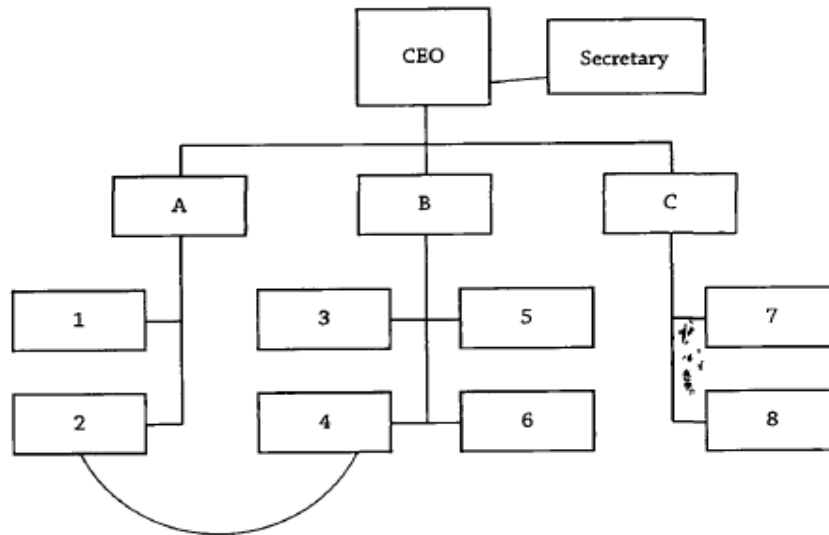
Figure 4.4 Example of Working Across a "Silo" .

➤ The Following figure4.5 shows the effect of this interaction on power centrality between Conventional and Silo. X axis represents *persons*, Y axis represents *Kerbs power centrality score*.
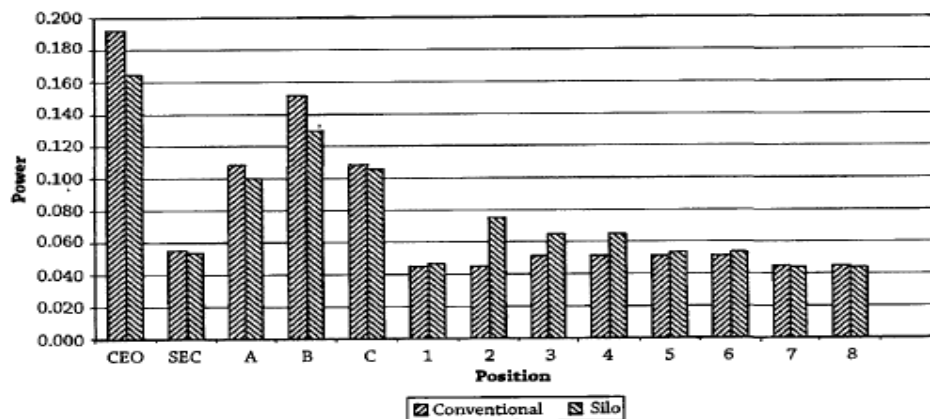

Figure 4.5 Power Centrality of Positions: Conventional and Silo.

➤ One can see why management may have mixed feelings about informal networks, even though a major design bottleneck has been removed: the CEO and the division managers have had their power reduced while units 2, 3, and 4 have seen it increased. And this through only one informal connection.

- Now suppose in this stylized example, position 2 does not like a particular decision made in the unit and bypasses her boss A to directly approach the CEO and "*re-legislate*" the outcome.
- The result is shown in figure 4.6. Supervisor A loses power while position 2 gains in power; the CEO actually experiences a slight gain since she now has direct access to position 2.
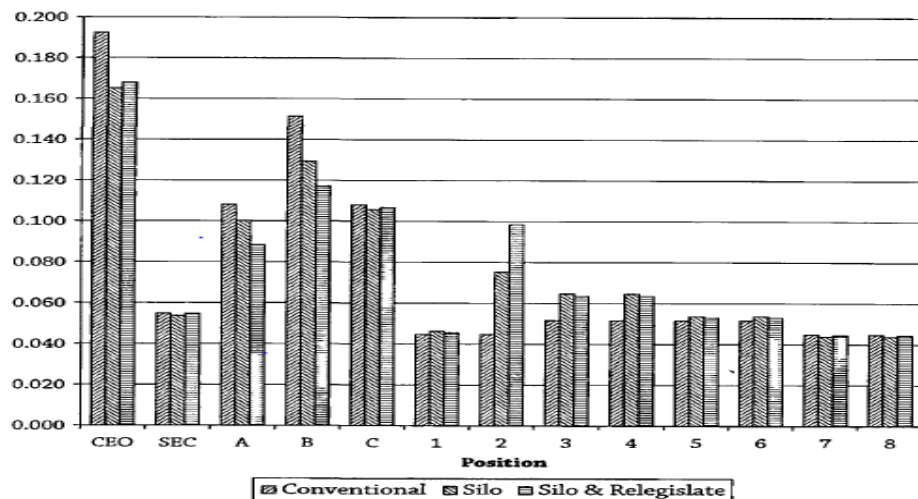

Figure 4.6 Power Centrality of positions: Conventional, Silo and Re-Legislating

3 Bridging the gaps: Tradeoffs between Network Size, Diversion and Social Cohesion

- Organizations without borders highlight the issue of bridging between different units of an organization and between organizations that are networked together.
- The type of bridging that links units that otherwise would not have mutual connections is associated with the concept of *structural holes*.
- To reiterate, a structural hole is a lack of connection inherent in the structure of a situation.
- We quoted from Burt (1992, 45), "Players with relationships free of structural holes at their own end and rich in structural holes at the other end are *structurally autonomous*.

➢ These players are best positioned for the information and control benefits that a network can provide." Autonomous players connect networks that would not otherwise be connected while their own base is well connected or not dependent on connections.

➢ The CEO in figure 4.3 is obviously unconstrained and connects Divisions A, B, and C. The secretary and those in positions at the bottom of this hierarchy are highly constrained.

➢ The CEO is in a know-it-all position. In this case, measures of constraint and power centrality essentially tell the same story because the figures do not deal with cohesiveness or density within the positions.
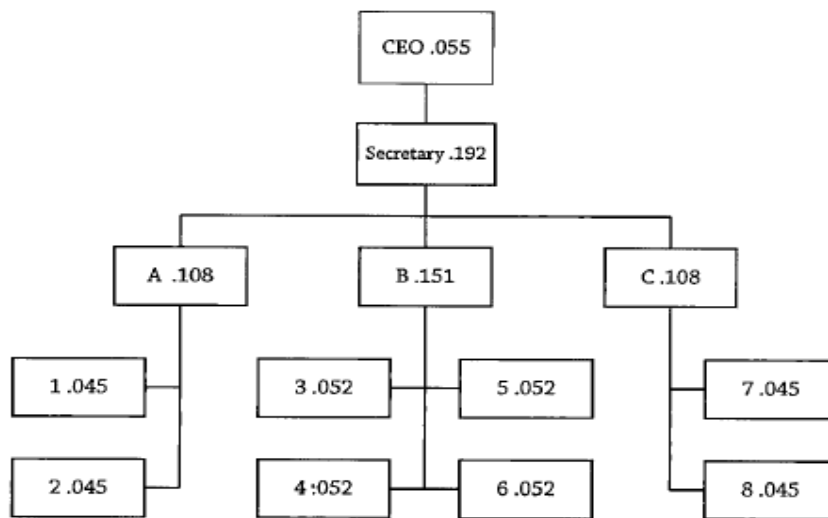

Figure 4.3 Power Scores in Multi-Level Organization II.

➢ But in figure 4.5, suppose A, B, and C, in addition to being division heads, also interacted regularly in a meeting of division heads. This could add to the organization's consistency and cohesiveness but also would increase the constraints.

➢ The division heads would no longer have exclusive connections to their subordinates, and this would also somewhat increase the CEO's constraints because he or she could not play off one division head against the other, though he or she would still be less constrained than the division heads.

➢ On the other hand, the CEO's power centrality would decrease and the division heads power centrality increase.

- There are obviously tradeoffs to the organization and the individuals involved between cohesion and structural holes. Is this "good" or "bad?" It obviously depends on other matters going on in the organization. This leads to a general consideration of *tradeoffs between structural holes and cohesiveness* in organizations.
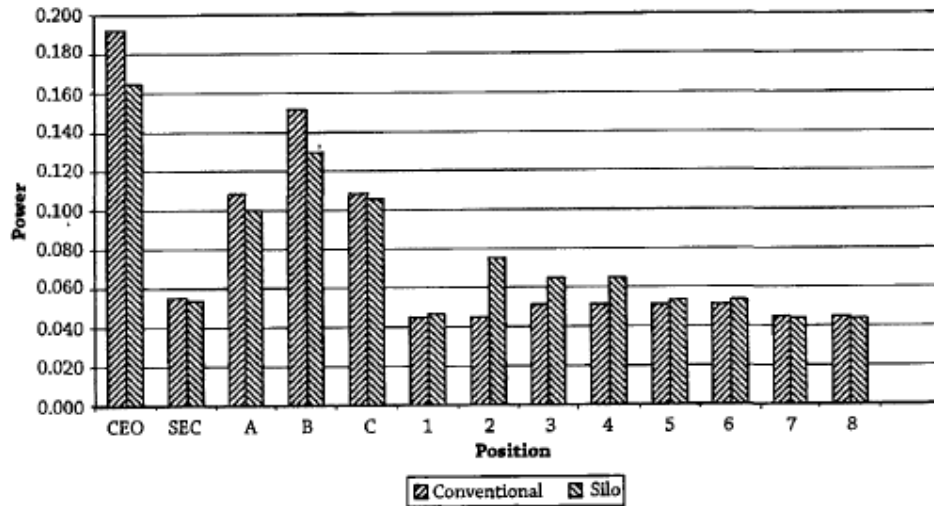

Figure 4.5 Power Centrality of Positions: Conventional and Silo.

- While some studies show that persons who are less constrained and who benefit from structural holes are more likely to advance in an organization
- The issues of tradeoffs in an organization are neatly explicated in a recent study of an executive recruiting firm.
- Characteristic of modern organizations, networked or within a box, the key "raw material" processed by the organization is *information*.
- The researchers concluded that there was a tradeoff between the *network diversity* that structural holes (less network constraint) offer, and the rich "*bandwidth*" (the volume of email averaged over the number of ties at a given time) that clustered relations offer.
- People have to be *motivated to share*, and this motivation is increased in socially cohesive situations.
- Social cohesion increases bandwidth as people discuss all sorts of things, whereas weak ties decrease it. There is more than one way to achieve *diversity of information*.

- ➤ ***Network diversity*** contributed to performance even when controlling for the positive performance effects of access to novel information. The usual demographic factors such as age, gender, industry experience, and education, did not predict access to diverse information; rather the network structure itself was the key factor.

'

- ➤ ***Network diversity*** contributed to performance even when controlling

Unit-IV
Assignment- Cum- Tutorial Questions

Objective Questions

1. Modern organizations are ***rational-legal systems***, based on ***universalistic principles*** and are supposed to be

   [   ]

   a) Fair   b) unfair c) None of the above d) Both a &b

2. Workers also brought their own cultural values and attitudes into the situation. Among those values, as we will see, was the working-class fear of   [   ]

   a) Employment   b) Un-Employment c) profession d) hiring

3. The Network "Bank Wiring Room" is an example of   [   ]

   a) Helping Network b) Organizational Network   c) Both a&b   d) None of the above

4. Organizations are social structures designed to get things done through the cooperation of   [   ]

   a)Individuals   b) Groups   c)Clusters   d)None of these

5. The organization systems like "The Law offices, health delivery systems, R&D and many nonprofit organizations" comes under

   [   ]

   a)In-Organic Systems   b)Organic Systems c)Both a& b   d)None of the above

6. The situation in which   "Requests are accepted as fitting and legitimate but outside of which they are not" is Characterized by

   [   ]

   a) zone of indifference   b)Area of acceptance   c)both a &b   d)None of these.

7. In Multilevel organization there is a situation in which if one individual of one group can collaboratively work with other individual of another group.   [   ]

   a) Re-legislate b) Both a&c   c) Silo Problem   d) None of the above

8. In Multilevel organization there is a situation in which if a position does not like a particular decision made in the unit and bypasses her

boss to directly approach the CEO

[   ]

a) Re-legislate b) Silo Problem c) Both a & b d) None of the above

9. Identify the statement "Lies with persons to whom it [an order] is addressed, and does not reside in persons of authority" is an example of [   ]

a)Informal Organization b)Formal Organization c)Both a&b d)None of the above.

10. The extent that the friendship, homophily, and propinquity play roles, these networks are fundamentally "**unfair**" [   ]

a) Because these networks are based on Universalistic principles.

b) Because these networks are based on rational legal systems.

c) Because these networks are based on particularistic principles.

d) All the above.

11. The Networks like factory floor, assembly line, and repetitive forms of production are designed [   ]

a) To maximize control of the workers and minimize their opportunities for informal interaction.

b) To minimize control of the workers and minimize their opportunities for informal interaction.

c) To maximize control of the workers and maximize their opportunities for informal interaction.

d) To minimize control of the workers and minimize their opportunities for informal interaction.

12. Consider the given Multi-level Organization chart, Identify which position has highest Krebs power score [   ]
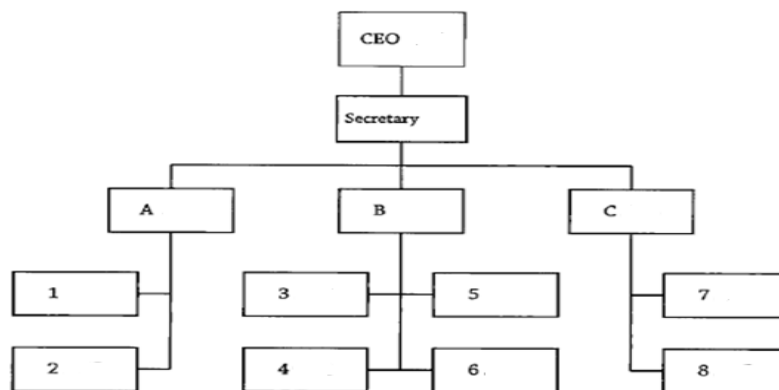
a) Division Leaders b) Secretary c) CEO d) Units.

13. Choose the best possible answer for the given statement "People have to be motivated to share, and this motivation is increased in socially cohesive situations". This is because   [   ]

   a) Social Cohesion increases bandwidth whereas Weak Ties decreases it

   b) Social Cohesion decreases bandwidth whereas Weak Ties decreases it

   c) Social Cohesion increases bandwidth whereas Weak Ties increases it

   d) Social Cohesion decreases bandwidth whereas Weak Ties increases it

14. Consider the network situation in which "Players with relationships free of structural holes at their own end and rich in structural holes at the other end" is

   a)Structurally Equivalent b)Structurally Autonomous c)Both a & b d)None of the above   [   ]

15. Identify the type of networks used by organizations "To develop ideas that help them decide what to make and/or what services to provide and how to do it".

   a)Internal Networks   b)External Networks   c)Both a &b   d)Etic networks[   ]

16. All formal or external systems breed informal networks that are grafted onto them. By way of the motivations of   [   ]

   a)Safety b)Effectance c)Safety and Reflectance d) Safety, effectance, and status achievement.

17. Identify the system in which subordinate believes the system is legitimate, consent is given by the subordinate rather than enforced by the leader.

   a)Traditional systems   b)Rational-Legal Systems   c)Both a &b   d)None of the above[   ]

18. Consider the given Multi-level Organization chart, Identify which position has highest Krebs power score   [   ]
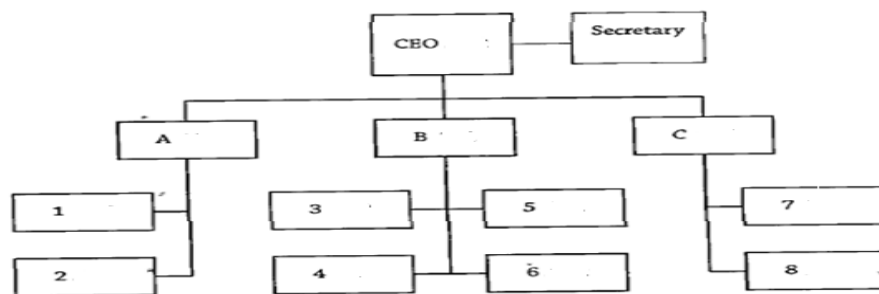
   a) Division Leaders b) Secretary c) CEO d) Units.

Descriptive Questions

1. Define the term organization in social network and explain about formal oraganization.
2. Write briefly about Contradictions of Authority.
3. Outline "Bank Wiring Room" helping network and list various constraints involved

(Or)

Discuss briefly about Emergent Networks in organizations
4. Illustrate Barnard's zone of indifference.
5. What organization chart? Explain with suitable example.
6. Compare traditional system with rational-legal systems related to organizations.
7. Describe briefly about continuous production system in an organization.
8. Explain in detail about Information-Driven organizations
9. Discover a silo problem in Multi level organization..
10. Relate chimney problem in Multi-Level organization with Re-legislating.
11. Discuss about Network diversity.
12. Determine various bridging gaps between different units of organizations.

Unit V

Networks, Influence and Diffusion

Course Objective:

- Make them learn about Network Influence and Diffusion.

Syllabus:

Network Influence and Diffusion, Influence and Decision making, Epidemiology and Network diffusion

Course Outcomes:

Student will be able to:

➢ List different sources of diffusion.

➢ Define models of diffusion.

➢ Identify influentials.

➢ Relate diffusion and epidemiology.

1. Introduction

- The distribution and transmission of culture and social systems across geographic areas is called as "**Diffusion**".

- The distribution and transmission of culture and social systems across times, and generations is called as "**Tradition**".

- Something may be transmitted or diffused through

  1) contact that involves some form of influence, persuasion, or coercion-—for example, someone teaches me something or influences me to do something, to think a certain way, or provide me with a new tool;

  2) contact that involves some kind of emulation—e.g., my friend has an idea or a tool that I think it would be useful to have; or

  3) adoption or emulation without direct social contact —for example, I hear or read about something that I like.

- Several types of diffusion are:

  1) **Demic Diffusion**: Diffusion through migration of a population that had already adopted the innovation is termed as Demic Diffusion.

  2) **Cultural Diffusion**: Diffusion through presumed imitation or adoption of what must have been considered a superior system is termed as Cultural Diffusion.

3) **Biological Diffusion**: Diffusion and spread of diseases through direct contact is termed as Biological Diffusion. Epidemiology is the study of biological diffusion.

- The key concepts of diffusion are:
    a) **Tipping Point –** A tipping point occurs when an epidemic or an innovation "takes off" and needs no further stimulation from outside forces or influences.
    b) **Threshold –** A threshold occurs when a balance between acting and not acting is overcome in response to a combination of internal propensities and the influence of external events, such as the perception that "everyone is doing it".

1.1 Models of Diffusion

➢ Diffusion is a process through which elements are transferred, borrowed, or adopted into a social system.

➢ Disease, ideas, opinions, values, traits, physical objects, or practices are examples of these elements.

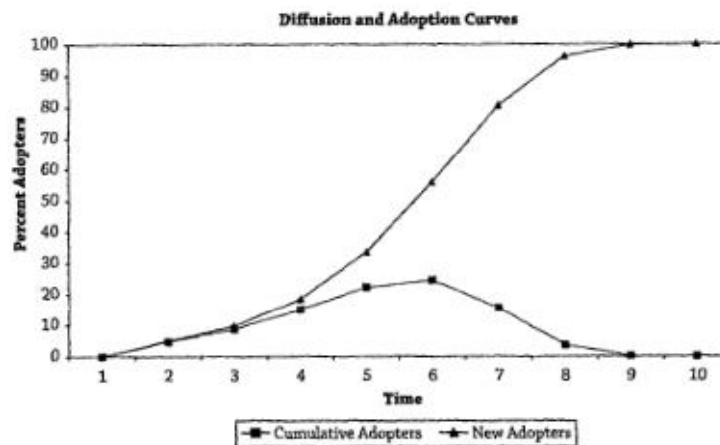➢ A **Stylized Model of Diffusion** is shown by figure 5.1 below.

Figure 5.1 Diffusion and Adoption Curves

➢ The figure assumes that a few people will adopt a new idea or practice during the first period. Then they interact randomly with the rest of the population and persuade a constant small proportion in the next period.

➢ This scenario is repeated over a number of periods. The proportion who have adopted with each period increases, until everyone has adopted the idea or practice.

➢ The proportion of new adopters rises as more people are available to transmit the innovation, but then falls as there become fewer who have not already adopted the innovation.

➢ This produces the classic **"S" shaped curve** of diffusion.

- The stylized model can be altered by conditions that have an impact on the nature of the network.
- The shape depends in part on the characteristics of the transmitters as well as those of the receivers and the possible links between them. Since the processes take place over time, historical and other macro factors also affect the curve.
- The S-shaped diffusion curve assumes that a network connects potential adopters; i.e., potential adopters "imitate" previous adopters.
- There are several processes that can produce an S-shaped curve - simple epidemic or contagion diffusion that depends on the aggregate adoption rate. It is particularly sensitive to macro effects rather than the individual characteristics of potential adopters or the connections between them.
- Models of information cascades or "bandwagon" effects also produce an S curve. In this process, adopters at early stages evaluate the utility of an innovation. Later adopters imitate what they see as the successful adoption by the initial users, as with those who strive to "keep up with the Joneses."
- Further, an S-shaped diffusion curve can be produced by the population ecology model that is driven by density and competition between firms.
- Otherwise, if the potential adopters hear about an innovation from a central source that reaches some fixed proportion in each time period, a **Modified Exponential Curve** describes the process and does not have the initial convex segment.
- As figure 5.2 shows, the exponential (non-network) model A reaches half the population much sooner than the diffusion model B, which eventually takes off at a much faster pace than the central source model.
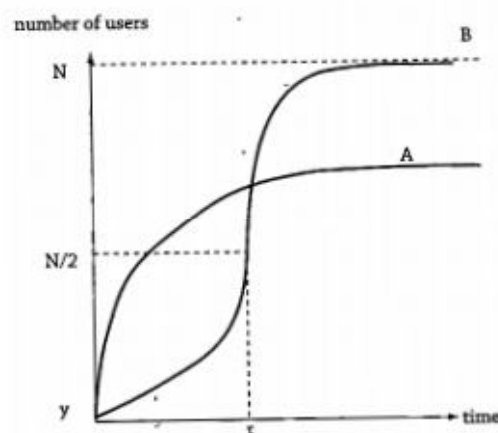

Figure 5.2 Plots of the modified exponential (A) and logistic (B) diffusion functions

- ➢ Another complex model is **Probit Regression Model** which explains the differences in time of adoption by considering individual characteristics of the receivers, including their values, goals, needs, and resistances.

2. Influence and Decision Making

- Diffusion does not occur unless some people learn or adopt a new artifact, behavior, or idea.
- The theory of diffusion, depends on how people learn or decide to do something.
- Adoption was first applied to consumer buying - **Mass Advertising** influenced the decision-making processes. Kornhauser and Lazarsfeld reviewed a number of studies of buying behavior and proposed that they could be broken down to the characteristics of the individual such as the state of his/her knowledge at the time, his/her motivations, and the situation—the attributes of the product, the way it was sold, as well as various influences on the individual.
- The **Researchers** also made influence, personal and otherwise, an explicit part of the situation.
- Lazarsfeld was interested in accounting for the reasons why people acted the way they did.
- One way of doing this was to lay out the elements that went into the decision and ask respondents to weigh the alternatives. He applied this method to acts such as buying soap or, voting.
- Lazarsfeld attempted to sort out the relative impact of the perceived attributes of a soap or a candidate, the impact or influence of media messages about these attributes, as well as the impact of other persons in the actor's environment who attempted to influence the decision.
- If the researcher simply asked, "Why?" without further specification, she or he might get an answer that addressed only one of these dimensions, whereas in fact they all were involved.
- After ascertaining the relevant factors that entered into the decision-making, the actor was asked to evaluate which was the most important.
- This technique developed into the idea that influence flowed from media to "influentials" and thence to the consumer or voter and was called the **"Two-Step Flow" of communications.**
- Elihu Katz (1957) reviewed the history, logic, and findings of early social network diffusion studies of the Lazarsfeld school and some of the limitations of the method.

- The early problems of the rural sociology and the personal influence schools are:
  1) One is the difficulty of tracing the influence process over time: the practical problems of finding the influencers, the theoretical problems of modeling the source and nature of the influence, and distinguishing between the effects of media and the social environment and specific individuals who might inform or persuade (or both).
  2) The other key challenge is establishing causality. **Cross-Sectional Analysis** can establish a difference in adoption by those exposed to a given medium or individual influence and those who are not. Note that those who are favorable to a position or an idea are more likely to expose themselves to media that promotes it. Those favoring a particular candidate in an election, for example, are more likely to listen to that person's speeches. This produces an association between the media and the action, but the association is as much caused by the actor's predispositions as it is by the effect of the content of the media.
- When it comes to personal influence, the homophily principle holds: individuals are more like to associate with others who share their views or social.
- Again, a correlation between friends and opinion may reflect differential association (the tendency of like-minded people to associate with one another—the homophily principle) but not the direct influence of the friends.
- It is not easy to generalize experiment results because the social elements of the real-world situation are an inherent part of the diffusion process.
- Assessing the role of influence and homophily remains a key intellectual problem in studies of diffusion.
- Lazarsfeld often resorted to **Qualitative Assessment** of those who had adopted or taken an action, asking a respondent to evaluate the impact of the different sources of influence and potential reasons and motivations elicited in an interview. This can be difficult and time consuming, especially for complicated decisions.
- For example, in attempting to understand why people chose to undergo psychotherapy, a decision that may have taken place over a number of years, self-help books and the mass media were a factor, but the role of other people, especially significant others, was very important to defining one's self as having a psychological problem and critical in finding a place to seek treatment.
- However, the influence of others was less important in the final decision to show up for treatment. In addition, being embedded in a circle or network of friends

knowledgeable about psychotherapy and psychoanalysis was extremely important in the decision.

2.1 The Current State of Personal Influence

➢ The three possibilities in the process of personal influence includes:

(1) the recipient solicits the influencer(s) for advice;

(2) the influencer actively attempts to persuade the recipient to take the action or make the decision or simply informs the recipient;

(3) the influencer serves as a model—uses the product or has an opinion about it but is not directly connected to the recipient.

➢ The first two possibilities actually form a four-fold table as in table 5.1 and clearly has different consequences.

Typology of Influence		
	Solicit Advice from Others	
Was Persuaded by Others	No	Yes
No	Passive	Informed
Yes	Persuaded	Convinced

Table 5.1

➢ The third possibility, often called as "Opinion Leadership", is product endorsement by authorities or celebrities, is a frequent tactic of marketers. This does not require a direct connection between the recipients and the influencers.

➢ Burt finds that contagion or diffusion through cohesion or actual personal contact and diffusion through structural similarity have complementary functions.

➢ **Opinion leaders** are more precisely opinion brokers who carry information across the social boundaries between groups.

➢ They are not people at the top of things so much as people at the edge of things, not leaders within groups so much as brokers between groups.

➢ The familiar two-step flow of communication is a compound of two very different network mechanisms: contagion by cohesion through opinion leaders gets information into a group, and contagion by equivalence generates adoptions within the group.

➢ Valente (2010) offers a new model that allows both cohesion and structural similarity to be measured with the same network methods. This examination suggests that direct ties or cohesion and similar position or structural similarity are of about equal importance.

- Opinion leaders are not necessarily the earliest adopters of innovations. Typically the earliest adopters are innovative and often on the margins of the community, they innovate because they are different.
- The opinion leader then translates this innovation for the rest of the community. This is their skill, they are admired by many and are good at scanning the environment because they are connected to lots of people.
- The effective influence of Opinion leaders is because:
  1. being proactive or seeking solutions is a value;
  2. the innovation is not trivial so being shown "how to do it" is required; and
  3. persuasion rather than merely making information available is important.

2.2 Self-Designated Opinion Leaders or Influentials

- Diffusion is a matter of tracing the flow of a new idea, product, or practice, network-based methods are clearly the best way to assess the place of personal influence in the chain of events.
- Celebrities are used as de facto opinion leaders or at least as role models.
- There are Survey scales used to assess how influential they are
  1. PS (Personality Strength) scale
  2. Engagement Scale
- Those high on the PS scale tend to read higher quality publications and say they are more likely to be asked for advice. Those high on the scale are said to be "the 'multipliers,' the trend-setters, the source for guidance and advice, the human transmitters of mass-mediate climate of opinion, issues, and agendas"
- Engagement scale is used to assess political behaviors .
- The key communicative mechanism of opinion leadership embodies both information-seeking and information-giving behaviors.

2.3 Characteristics of Opinion Leaders and Influentials

- **Slightly Higher Status but not much higher -** people like to look up to others that are like themselves, only a little better.
- **Greater Centrality -** an opinion leader has to be well connected to potential followers.
- Central individuals embedded in a system of strong ties not only have a high potential for transmitting ideas, but can also send messages to those who share those ideas or practices.

- Another kind of centrality is the betweenness that links groups that might otherwise not be connected. The less "constrained" broker or person who bridges structural holes can be a very effective opinion leader.
- **Early Adopters -** New ideas are also more likely to come from the periphery or a network and are likely to be unconventional, especially in the early stages of the diffusion of a new idea or practice.
- **Elites -** people in elite circles who influence one another and whose ideas "trickle down" to the public. These circles affect national policy along with corporate fashion, and set the current agenda of ideas. Elites in different domains such as politics, business, media, and intellectuals tend to pay attention to other elites in their circles and form opinions and policy views in reaction to others in their circles.

2.4 Group Influence

- Peer Group Influence is considered a major factor among adolescents in forming aspirations and values, often in contrast to those advocated by parents and schools.
- Fashions, ideas, as well as drugs, alcohol, and delinquent behaviors are spread through peer groups.
- Facebook is now ubiquitous among teenagers and produces virtual peer groups.
- Delinquency is a situation of minor crime or misdeed committed by young people. Peer group influence is a major factor for youth delinquency.
- The delinquency-peer association exists and remains robust regardless of controls for numerous other factors.
- A cohesive network of delinquents leads to greater delinquency on the part of the focal person.
- The extent to which friends in high school influence one another was found in the Adolescent Health study's complete friendship sociometry of about 15,000 students over three waves of data coEection. This allowed for clumping or segmenting groups of friends in each high school studied. These clumps, clusters, or positions are a key to the influence process.
- Though the idea of an adolescent gang is a popular one, it overstates the extent to which social structure in high schools is formalized.
- In his pioneering network study of high schools, Coleman suggested several social categories which had a familiar ring—"nerds," "jocks," and "the leading crowd."

These categories clustered students' relationships to one another and therefore their orientation to high school life.

➤ Beyond social categories—named either by the participants or by observers—are circles formed on the basis of common interests, activities, or places to hang out. These circles create bases for interaction which, in turn, further create or solidify the circles.

➤ The circles are characterized by direct or indirect interaction though a friend of a friend. These circles are not a formal structure, group, gang, or even a clique, but they nonetheless exert a strong influence on "members."

➤ In high school settings, a local position was defined as "a group of adolescents who, by virtue of their coursetaking, share a social and academic space in school".

➤ This "position" or circle would affect students' choice of taking courses in mathematics: adolescent peers who are not directly friends but are "members" of such a position were "influential because they provide important information or opportunities (for example, knowledge about the nature of a math course or advice on performing well in it)."

➤ Groups, circles, and social positions thus may be more effective in social influence and diffusion than single individuals,

3. Epidemiology and Network Diffusion.

- The Center for Disease Control (CDC) defines epidemiology as "the study of the distribution and determinates of diseases and injuries in human populations".

- The distribution is the result of two factors:
  1. **Incidence -** the number of new cases in a given period; and
  2. **Prevalence -** the number of total cases that are present in a given population at a given time.

- In an epidemic, there is a sharp rise in the incidence of the disease.

- Epidemiologists have traditionally modeled epidemics as S curves (see figure 5.1).

- The terminology of epidemiological models is slightly different from the adoption of innovation models because epidemiology typically models "**SIR**" (**SusceptibEity, Infection, Recovery**).

- The "recovery" part in innovation consists of adopting the innovation and removing the adopter from the population at risk for "infection" or adoption.

3.1 Social Networks and Epidemology

➤ **Incidence** means no. of new cases.

➤ Incidence is caused by contagion—colloquially, one person "catches it" from another.

➤ Social network theories and methods should be a natural tool for epidemiology that leads to preventive policies.

➤ For example, differential prevalence of a disease in a population may be related to differential diffusion through a social network.

➤ This characteristic is notable in HIV-AIDS. The disease is partly spread by contagion through shared needles. Reducing needle sharing by distributing free needles is an "obvious" intervention that has a strong effect on incidence of the HIV, but has not proven easy to achieve in the current social and political climate.

➤ Shared sites of drug or alcohol usage (e.g., taverns and crack houses), have been implicated as sites of M. tuberculosis transmission. Potential factors are close person-to-person proximity, repetitive exposure, and poor ventilation.

➤ Social networks principles were used in tracing a syphilis epidemic in a community of teenagers.

3.2 Transporting Disease – Large Scale Models

➤ **Air-Transportation-Network** properties are often responsible for the global pattern of emerging diseases.

➤ This network is the origin of the heterogeneous and seemingly erratic spreading on the global scale of diseases such as severe acute respiratory syndrome [SARS].

➤ The timing of the arrival of diseases worldwide can be effectively modeled using transportation connection data and small world theory and models.
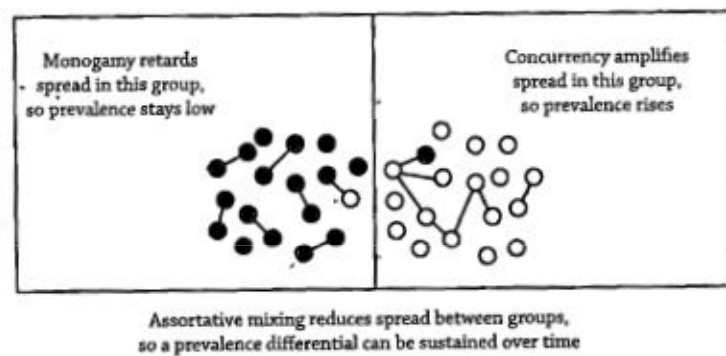

Figure 5.3 Assortative Mixing and Concurrency

- ➤ **Restricting travel** between municipalities could have a beneficial effect on the speed of transmission of a highly contagious disease, geographically and in absolute numbers. This is true for a wide range of plausible values of the inter-municipal infectiousness. Even in scenarios of compliance as low as 70%, travel restrictions are effective.
- ➤ The traditional public health method of **Quarantine** is validated. On the other hand, quarantine is difficult to enforce.
- ➤ Similarly, models show that decreasing the size of day care centers from 16.7 to 13.4 children predicts a reduction in the spread of strep pneumonia by as much as 85% in Norway (Karlsson et al. 2008). **Small class size** has implications beyond facilitating learning.
- ➤ There are some interesting findings about **Vaccination Strategies** for flu. An obvious strategy, but as it turns out a wrong one, is vaccinating individuals who are sociometric stars. The less obvious strategy follows from small world theory: vaccinating people who are tightly knit with one another is less effective than vaccinating people at random.
- ➤ If a tight knit group is immunized, then because of assortative mixing, the effects are less likely to spread out of the group.
- ➤ Random vaccination reaches a wider group because those immunized are weakly connected to a chain of others who are not connected with each other.
- ➤ The immunized person can break a chain of infection.

3.3 Tipping Point and Threshold

- ➤ A tipping point occurs when a trend, an idea, or an infection appears to take off on its own.
- ➤ The growth curve begins slowly and then, as shown in figure 5.1, a certain point is reached in which the proportion that is infected or adopts the idea seems to shoot up—the tipping point—eventually leveling off as almost everyone adopts the idea or becomes infected.
- ➤ The classic S or sigmoid growth curve is illustrated by figure 5.4.
- ➤ It is a logistic (based on logarithms rather than straight lines) distribution. The mathematical "inflection point" is at x=0, on the vertical line. It can be observed that -2 is the point where the curve appears to take off, and +2 where it appears to level off.
- ➤ Contagion or Imitation results in the observed S curve.
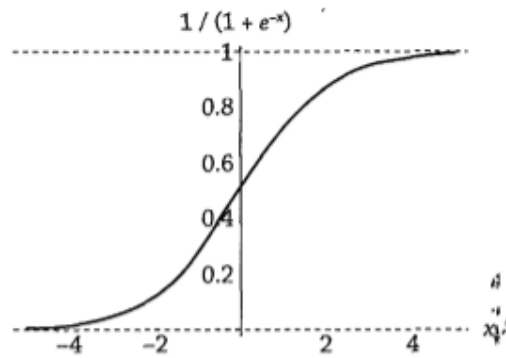
Figure 5.4 Classic S or Sigmoid Growth Curve

➤ Influence makes people to adopt an idea or introduces a new disease into the population.

➤ After it is introduced, the idea or the disease takes off on its own as a result of imitation or contagion. It results in a Tipping Point.

➤ Another example has a tipping point at 1, where t is the time period and x the proportion adopting or infected (figure 5.5).
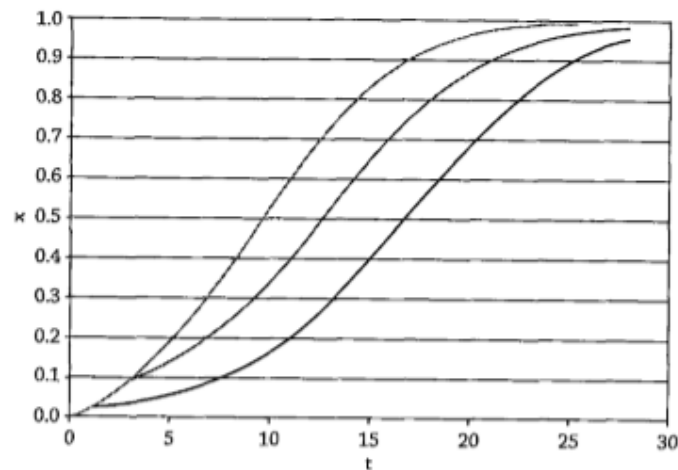
Figure 5.5 Tipping Points

➤ The middle curve (in grey) shows the effect of cutting off external influences or advertising at the inflection point. The growth is slower than the top curve (in light grey) where external influence was continued. The bottom curve (in black) tests the inflection or tipping point. It is slower than the middle curve because external influences were cut off two periods before the inflection point.

➤ A variant on this model adds a price multiplier such that later adopters are more sensitive to price or the cost i.e., they will adopt only if the price is lowered.

➤ Threshold is often used interchangeably with tipping point.

- The tipping point is that magic moment when an idea, trend, or social behavior crosses a threshold, tips, and spreads like wildfire.
- Individuals as well as groups can experience tipping points in which enough influence or perception of what is taking place in the environment leads people to make a decision or to take an action. Usually this is called a threshold.
- Threshold is the final "reason" that leads to the action, and the concept ties individual decision-making and action to collective phenomena.
- The source of the threshold can be self-interest, conformism, or any other motivation.
- Individuals are innovative with respect to their personal network or the social system.
- Those with high network thresholds who adopt early relative to the social system are only innovative relative to the social system, not relative to their personal communication network.
- Low network threshold adopters are individuals who adopt early relative to their personal network yet may (though not necessarily) adopt late relative to the social system.
- Valente (1996) reanalyzed three classic studies: doctors and new drugs, Korean village contraceptive adoption, and Brazilian farmer hybrid corn adoption. By and large in the three cases investigated, individuals who adopted early relative to their local network were also likely to adopt earlier than most of the entire network
- Adoption is maximized when agents' neighbors include both some agents with rather different thresholds and a core group of similar others.
- If the agents are extremely dissimilar, adoption levels are relatively low.
- On the other hand, in these models it is possible for an agent with a high threshold to adopt earlier than those with a low threshold because that agent is surrounded by actors with diverse thresholds, whereas some agents with low thresholds are trapped in a pocket of others with low thresholds.
- Diversity and balance help in diffusion. For example, in the growth of Christianity in the Roman Empire, moderate levels of contact with non-believers may have been beneficial to Christianity's diffusion. During recruitment dinners in the Unification Church, new prospects are always surrounded by old members.
- The **Snob Effect** is another kind of threshold related to level of adoption. One does not want to adopt something that has become too popular.

UNIT-V
Assignment-Cum-Tutorial Questions
SECTION-A

Objective Questions

1. The process through which elements are transferred, borrowed, or adopted into a social system is referred as _____.

2. Diffusion occurs through   [   ]
   a) Contact that involves some form of influence, persuasion, or coercion
   b) Contact that involves some kind of emulation
   c) Adoption or emulation without direct social contact
   d) All of the above

3. Diffusion through presumed imitation or adoption of what must have been considered a superior system is termed as   [   ]
   a) Cultural Diffusion   b) Demic Diffusion
   b) c) Biological Diffusion   d) None

4. Epidemiology is the study of Biological Diffusion.   [True/False]

5. The Contagion Model of diffusion produces _____ shaped curve
                                                                              [   ]
   a) S-shaped   b) U-shaped   c) V-shaped   d) Z-shaped

6. Decision making process is generally influenced by   [   ]
   a) Mass Advertisements   b) Researchers
   b) c) Friends   d) All of them

7. Potential factors for diffusion of diseases are   [   ]
   a) close person-to-person proximity   b) repetitive exposure
   c) poor ventilation   d) All of the above

8. Vaccinating people who are tightly knit with one another is   [   ]
   a) Assortative Mixing   b) Concurrency   c) Both a &b   d) None

9. Probit Regression Model which explains the differences in   [   ]
   a) time of adoption   b) time of imitation
   b) c) time of influence   d) None

10. Later adopters who are more sensitive to price or the cost will adopt only if
                                                                              [   ]
    a) Prices are lowered   b) Prices are hiked
    c) Prices are stable   d) no price

11. The process of Qualitative Assessment includes   [   ]

a) Evaluating the impact of the different sources of influence

b) Evaluating the relative impact of the perceived attributes

c) Evaluating the influence of media messages

d) All of the above

12. Those whose lower threshold has been exceeded are called _____ and those whose upper threshold has been exceeded are called _____

[   ]

a) Adopters, Snobs

b) Influentials, Imitators

c) Snobs, Adopters

d) Imitators, Influentials

13. "Bandwagon effect produces S-shaped diffusion curve". In this process, people involved are   [   ]

a) Early adopters who evaluate the utility of an innovation

b) Later adopters who imitate the successful adoption by the initial users

c) The population ecology model driven by density and competition between firms

d) All of the above

14. Which of the following phenomenon results in Diffusion   [   ]

a) Diversity   b) Balance   c) Both a & b   d) None

15. Low Network Threshold adopters are early adopters relative to _____ and High Network Threshold adopters are early adopters relative to _____

[   ]

a) Social System, Personal Network

b) Personal Network, Social System

c) Personal Network, Personal Network

d) Social System, Social System

16. Potential factors for diffusion of diseases are   [   ]

a) close person-to-person proximity   b) repetitive exposure

c) poor ventilation   d) All of the above

17. The concept of "Keep up with the Joneses" is related to   [   ]

a) Effectiveness by adoption   b) Effectiveness by imitation

c) Effectiveness by influence   d) not related to any

18. Adoption is maximized when agents' neighbors include   [   ]

a) agents with similar thresholds and a core group of similar others

b) agents with different thresholds and a core group of dissimilar others

c) agents with different thresholds and a core group of similar others

d) agents with similar thresholds and a core group of dissimilar others

19. The concept that ties individual decision-making and action [   ]

   a) Peak   b) Threshold   c) Tipping Point   d) None

20. The speed of transmission of a highly contagious disease can be controlled by restricting   [   ]

   a) Travel   b) Class size   c) both a&b   d)none

SECTION-B

SUBJECTIVE QUESTIONS

1. Discuss briefly about Network Influence and Network Diffusion.

2. Discuss different types of diffusion.

3. Explain different models of diffusion.

4. What is Personal Influence?

5. Define Group Influence.

6. Explain the characteristics of opinion leaders and influentials.

7. Explain briefly about Social Networks and Epidemiology

8. Differentiate between Tipping Point and Threshold.

9. Illustrate how people learn or decide to do something.

10 Demonstrate how Air-Transportation-Network properties results in global pattern of emerging diseases.

Unit VI

Networks as Social Capital

Course Objective:

- Make them learn about Networks as Social Capital.

Syllabus:

Network as social capital –Individual level social capital-social capital as an attribute of social systems.

Course Outcomes:

Student will be able to:

- Define Social capital.
- how Social capital is an investment.
- individual level Social capital.
- recent findings on social system and its consequences.

1. Introduction

➤ Social capital is a fitting topic for summarizing the field of social networks.

➤ The consequences of social networks are mainly positive but sometimes negative.

➤ It brings us back to the fundamental premises of social networks, the trade off between the comfort and support individuals derive from dense networks of social relationships and the benefits achieved by going beyond local circles and forging bridges to wider universes.

➤ Networks in social systems may be nested, for example, organization networks within industry networks. There are also individual actor networks.

➤ Social capital operates on several levels. At each level, social capital has two main consequences:
  1. Social Capital Investment and
  2. Individual Social Capital.

➤ Social capital investment, as is the case for financial capital, can lead to even greater social capital. For example, high voluntary organization participation increases community voter turnout.

- Individual social capital increases individual well-being typically, physical and/or mental health, or adjustment and a sense of well-being.
- Individual social capital can also lead to financial well-being and social and/or occupational upward mobility.
- Further, social capital has cross-level consequences. For example," high community-level social capital can lead to individual well-being.
- According to Putnam the concept of social capital was introduced as early as 1916. Yet the term "social capital" has come into widespread use relatively recently.
- **Social capital is everything psychological and sociological about a person.**
- There are precedents for poorly defined key sociological concepts, for example, anomie.
- In some ways, **Anomie** as a negative concept is the mirror image of positive social capital and is also a two-level concept.
- Anomie at the societal level is sometimes defined as a lack of moral standards in a society, or at the individual level, as a personal state of isolation and anxiety resulting from a lack of social control and regulation.

1.1 The General   Idea of Social Capital

- In the middle of baking a cake, I run out of sugar. I can, however, go to my neighbour next door to get some. It was worth being nice to that neighbour even though I did not particularly fancy her. Do I have to give back to her an equivalent amount of sugar? Maybe she can borrow my lawn mower the next time she needs to mow her lawn and that will count as a return of the favour. Maybe the value of the sugar is trivial enough not to require repayment. Now I need a recipe for a new cake. My neighbour has just the right recipe for me. But there is really nothing to return except for good will because in giving me a copy of the recipe my neighbour retains one for herself.

- The same day a guy three houses down the street who I do not know has heard from my neighbour that I know something about computers and asks me to help him. I am busy but feel obligated to at least try to help because we all live in the same neighbourhood. Someday I may have to ask that neighbour, maybe a different one, for help in fixing that darn lawnmower. What goes around comes around. In fact, I am really in a bad mood because the cake wasn't very good, the new recipe was of no great help, and besides, my lawnmower is broken.

- A long-term friend just happened to call me up on the telephone, and I let loose some of my frustration on him. He told me a bunch of silly jokes and made me feel much better.
- The concept of "social capital" is said to cover all these situations.
- I don't have to have the sugar because my neighbour has some.
- I may even be able to return the favour not with sugar but with something of equal value.
- I did "invest" in that relationship by being nice to my neighbour in the past.
- The guy down the street counts on my help even though he hardly knows me because we live in the "neighbourhood," and we therefore have something in common.
- And I "cast my bread upon the waters" in helping him, because I believe someone in the neighbourhood may eventually help me.
- This is a Neighbourhood rich in resources—for example, sugar, recipes, mechanical knowledge of small engines, and computer savvy.
- Not only do I personally have "social capital" but so does the neighbourhood through its collective resources.
- Finally, social capital does not have to be accessible solely through geographic propinquity.
- Glanville suggest that social capital may also imply the presence of trust at the individual level.
- My neighbour does not believe I intended to rob her, and collectively, this is a neighbourhood in which people trust one another and share values from the importance of home baking to respect for others.
- Social networks have value because they allow access to resources and valued **Social Attributes** such as trust, reciprocity (exchanging things for mutual benefit), and community values.

1.2 Social Capital As An Investment

- Social Capital is an analogue to financial capital.
- Marx's theory of "surplus value" represents the price of the product extracted by misuse of workers, the cost necessary to keep them alive.
- It has two components:
  1. the current revenue that can be used to repeat the current production process and sustain the consumption style of the capitalists, and

2. one that is saved for future investment, there by incrementing the valued resources.

- The first of these is called "capital".

- Smith considered "productive" labour as that which increases the stock of "capitals" versus "unproductive" labour which does not.

- Everyone agrees that entrepreneurs try to estimate what they can earn if they suspend current resources and invest them in factors that support production of still more resources rather than consume them immediately.

- There are many ways of calculating this "surplus value," determining its sources and who should be the recipient of it, evaluating how surplus value relates to labour and consumption, and identifying the entrepreneurs.

- There are also differing views about how investments are discounted, who sets the discount rates, and the consequences of different savings rates for the total economy.

- If all this were clear, we might not have had the financial meltdown of 2008, and we would have better ideas about how to quickly create a turnaround.

- The crisis reminds us that the investment process is embedded in a social system, for like social capital, financial capital depends on social structure.

- Communities, and organizations and concentrate on individual persons as "entrepreneurs."

- The idea of denying immediate satisfaction in favour of an eventual return is clear in the concept of "human capital," a term developed by economist Becker (1964) who was awarded a Nobel Prize, in part for this idea.

- According to his theory, workers can invest in skills and education that would enable them to negotiate for higher wages and thus gain for themselves some of the surplus value created in the production process.

- The social capital compared to human capital is that investment in networked resources gives an actor advantages in the market.

- Acquiring general education or technical or manual skills can be difficult and costly.

- While these human capital gatherings are being acquired, an actor delays immediate returns in favour of future gains.

- The extent to which individuals actually invest in social relations in expectations of future gains is more problematic.

- In my example, I was nice to my neighbour not because I might eventually get something from her, but because of general social norms.
- Social climbers, those engaged in office politics and civil politics, may consciously invest in social relations in the anticipation of eventual personal gain. This investment is sometimes regarded as ungraceful, as the negatively tinged "social climber" suggests "The action or process of making use of a network of people for the exchange of information, etc., or for professional or other advantage."
- The extent to which most individuals consciously invest in social relations in anticipation of some material or symbolic gain may be limited. The analogue to financial capital of deferred gratification-may also be somewhat overstated in human capital theory.
- They investigated a firm that gave bonuses to existing workers for referring potential employees: "The firm's $250 investment yields a return of $416 in reduced recruiting costs".
- From the employee's perspective, persons with better jobs were more likely to refer others and thereby get the benefit of the bonus. The authors argue that it is likely that the instrumental value of getting the bonuses was discovered after employees discovered themselves in these better positions, hence "it is misleading to think of occupancy of these positions as *investments.*

2. Individual-Level Social Capital

2.1 Social Support

- One important aspect of social capital is social support.
- As the Beatles song framed it, social support entails "a little help from my friends".
- Social support was not called social capital.
- Indicators of social support favoured by social network researchers mainly rely on "**Name Generators**".
- A name generator is a question used in a survey that asks respondents to name people they are related to in particular ways, people whom they feel close to, people they can call upon for particular help.
- Most famously the question, "Who are the people with whom you discussed an important matter with?" has been used in the General Social Survey.
- With the names in hand usually just initials or a first name the survey asks about the characteristics of those named, such as gender, age, education, how

the respondent came to know them, and which of those named know one another.

- The last question can be used to construct a network of those persons who surround the respondent, technically called the ego network.

- **Individual-Level Social Support**, not only has a "feel good" aspect, but even affects basic biological mechanisms related to the rate of disease in population and mortality: "For example, higher levels of social support improve global immune functioning."

- They report that "in the case of spouses, there is compelling evidence that the health of one member of a dyad can affect the health of the other".

- The quality of social support as well as the size of the networks of support may be associated with lower risk of coronary heart disease and cancer.

- For elderly populations, support from a spouse and wider community social networks may be associated with better health.

2.2 Individual Networked Resources: Position And Resources Generators

- The "**Position Generator**" is an indicator of access to networked resources.

- As developed by Lin and Dumin (1986), the theory begins with the proposition that given the nature of social satisfaction:
  - Valued resources are more likely to be found in the higher reaches of the occupational structure.
  - Second, the success of an instrumental action is more likely if higher valued resources can be accessed by an actor.
  - Third, the higher the position one is able to reach, the greater the likelihood of accessing valuable resources, such as recommendations for a job.

- Hence, those who can access higher positions either through inheritance or achievement should be able to secure better jobs.

- The strength of weak ties proposition suggests that those whose relatives or close ties do not have high status can however achieve higher status through mere casual mutual dealings with high status individuals.

- A wide range of positions could also lead to positive instrumental gains because lower statuses might have access to skills and knowledge that higher statuses might not possess and thus an mutual dealings with a wide range of statuses

may result in cultural cosmopolitanism(all humans belong to single community) which could prove valuable in some higher status occupations.

- The same kinds of challenges faced by efforts to measure temperature are also characteristic of the "position generator."
- The challenge is to find a wide range of occupations about which to inquire and which are immediately recognizable by respondents in various societies.
- The formulation of the question depends on the goals of the study.
- For example, the question, "Among your relatives, friends, or contacts are there any in the following kinds of work?" obtains a wide range of ties from weak to close.
- Whereas the request, "Please think of people you know by name and by sight well enough to talk to" concentrates on strong ties.

2.3 Correlates of Individual Social Capital

- Social capital can be defined as access to networked resources.
- It has many observable correlates.
- Getting a good job is a correlate of network diversity and/or the prestige of the positions an individual can access.
- The way this works may differ by society. Strong ties, for example, are more useful in China than the weak ties found by Granovetter in the United States. In the Netherlands, "The better a person's access to occupations rich in economic capital, the higher the economic capital of the person's occupation".
- More diverse networks lead to a wider range of interests and information, which is in turn related to political activities, as well as different opinions.
- Diverse networks are associated with membership in voluntary organizations, though the direction of causality is not clear.
- Social networks are **exclusionary** and **unfair**. Since people tend to associate with others like themselves (the homophily principle), the networks that they form tend to be with people who have the same characteristics.
- If people have lower prestige, socio-economic status, or are the target of discrimination, then their networks will tend to be composed of people with lower prestige, socio-economic status, and who are otherwise disadvantaged.
- It can be implied that the networked resources available to the disadvantaged in any society will be less strong than the networked resources that can be accessed by the advantaged.

- This can be put in a positive way that lends further influence to the utility of the concept of social capital: "We find that, even after controlling for demographic characteristics, including supervision, occupational class, and income, access to social capital still significantly contributes-to current status".

2.4 Other Indicators Of Networked Resources

- Networked resources work in different ways depending on the context.
- Some examples are:
  1. Teams working in investigative product development completed their projects more quickly if they had a social network structure composed of many non redundant external ties; teams exploit existing knowledge took longer to complete with this same type of network structure mainly because external ties not needed for the task had however to be maintained.
  2. In investment clubs, the number of instrumental ties that members had with one another prior to joining the club was positively and directly related to a club's financial performance. This is a cross-level analysis in which the social capital of the individuals increases the group-level social capital.
  3. In the emerging software industry in Israel, both network centrality and geographic propinquity were related to engaging in similar strategies.
  4. In a large health organization in Finland, employees with sparse networks (structural holes) were more likely to name a person who could solve a problem for them who was not directly connected to them. Employees thus acquired some instrumental benefits from sparse networks, but work units benefited from internally cohesive networks by having greater trust.
- Indirect networks reduce the flow of information and critical in making decisions.
- Neither maximally sparse prior maximally dense social networks lead to optimal outcomes.
- Developing an optimal level of cohesion appears to be complicated. "Forms of social capital that are valuable in one environment may be useless or even harmful in another".
- Individuals with more education generally have access to more resources. But this relationship does not hold in all situations. For example, in a cyclone, the less educated relied more on relatives and received more informal support.

3. Social Capital as an Attribute of Social Systems

➤ Social capital is an attribute of social system.

➤ The network structure of the social system may provide the system with important benefits, though it may also have negative consequences.

➤ This focuses on social capital at the group level with discussions on

(1) how certain groups develop and more or less maintain social capital as a collective asset, and

(2) how such a collective asset enhances group members' life chances".

➤ At the group level, there are propositions about how one aspect of social capital enhances other assets of the group. In other words, social capital can create more social capital.

➤ **Group-Level Social Capital** is an idea specified in various ways by such great theorists.

3.1 Theorists Of Social System Social Capital

- **Pierre Bourdieu** was the first social scientist who presented definitions of social capital that were structural.

- He interpreted them as networked resources both for collectives and individuals.

- As he stated, social capital is "the aggregate of the actual or possible resources which are linked to control of a durable network of more or less institutionalized relationships of mutual recognition"

- Bourdieu explained that social capital is "made up of social responsibilities which are adaptable in certain conditions to economic capital and may be institutionalized in the form of a title of nobility".

- **James Coleman** offered the functional definition: "Social capital is defined by its function. It is not a single entity, but a variety of different entities having two characteristics in common: They all consist of some aspect of social structure, and they facilitate certain actions of the individuals who are within the structure"

- Social solidarity is the most general aspect of social capital at the group level.

- The theory is that mutual trust and commitment arise from group norms, from repeated interaction, or both.

- Since the development of trust and values is a process that takes place over time and feeds back into the development of social networks, it is a process that generally cannot be directly observed.

- In **Glanville** and **Bienenstock's** simulation, indirect or generalized reciprocity tends to increase over time.
- Generalized reciprocity means that helpful acts to others are performed as a collective responsibility not in the expectation of an immediate reward.
- Generalized reciprocity is an important consequence of social unity and the development of trust. Social capital is therefore seen as the basic join of society and community.

3.2 Social System Social Capital And Its Consequences

- Research since the influential *Bowling Alone* has tried to unpack the **Community-Level Social Capital** syndrome with varying degrees of success.
- The Social Capital Community Benchmark Survey, used by Son and Lin, is a useful example because it includes a number of separate individual- and aggregate-level indicators that are subjected to various types of scale analyses with the selection of key independent and dependent variables.
- Community- level consequences of social capital requires complex multilevel analyses.
- Such analyses simultaneously examine both aggregate and individual data something *BowlingAlone* and most of the studies based on it did not do.
- Some research has built directly on James Coleman's ideas. One of Coleman's hypotheses about social capital was that "closure" among parents and children promoted the well-being of the children.
- Using indicators similar to those of Coleman in data from the Mother-Child Data of the National Longitudinal Survey of Youth examined the effect of **Family Social Capital Investment** in their children as compared with the effect of **School Social Capital** on the behavioural problems of first- through eighth-grade children.
- Family investment in social capital included how many of their children's friends they knew by name, how often they knew who their children were with when they were not at home, child church attendance, and parental usual hours of work per week.
- The principal of each school judged additional measures such as the extent to which the child's parents were involved in advising the school, participated in program design, engaged in policy decisions, and volunteered in after-school programs.

- Family Social Capital and School Social Capital are indirect indicators of investment in two kinds of aggregate social capital with a return to individuals.
- Family social capital was negatively related to behavioural problems, but school social capital was not.
- The study findings seem to back Coleman's original claim about the importance of family social capital, though other studies favour school social capital over family social capital.
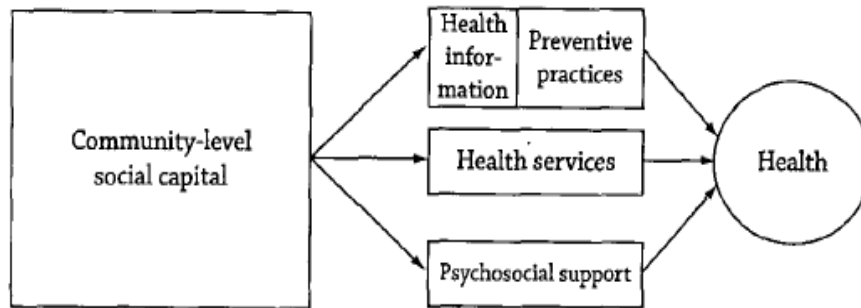
Figure 6.1 Pathways between social capital and health

- The model hypothesizes given in figure 6.1 shows that community-level social support

  (1) increases the level of available information on treatment and preventive measures.

  (2) lowers the effort required to organize politically and therefore bring more health facilities into the community. and

  (3) makes social support more accessible.
- These three outcomes of community-level social capital, which is not directly measured but implied, in turn lead to better health.

Objective Questions

1. The trade off between the comfort and support of individuals derive from which networks   [   ]
   a) Sparse networks   b) Dense networks
   c) None of the above   d) Both a &b

2. High community-level social capital can lead to individual well-being

                                                                 [True/False]

3. Anomie at the societal level can be_____   [   ]
   a)   Structural holes   b) Lack of moral standards
   b)   c) Strong ties   d) None

4. Social Capital does not have to be accessible solely through which of these

                                                                 [   ]

   a)Weak ties   b) Structural holes
   c) Geographic propinquity   d) None of these

5. The price of the product extracted by misuse of workers, the cost necessary to keep them alive is known as   [   ]
   a) Dissipate value   b) Surplus value
   c) both a &b   d)None of these.

6. Which of the following will increase the stock of the capitals?   [   ]
   a) Un productive labor   b) Management
   c) Productive labor   d) None of the above

7. Personal state of isolation and anxiety resulting from a lack of social control and regulation. Relate the above statement to suitable one

                                                                 [   ]

   a) Individual level social capital   b) Individual level anomie
   c) only b   d) Both a & b

8. The statement "High voluntary organization participation increases community voter turnout." is an example of   [   ]
   a) Individual level social capital   b) Social capital investment
   c) Both a&b   d) None of the above

9. "Financial meltdown of 2008, and quick turnaround". The crisis related to which of the following social system aspect   [   ]

a)Network resources   b) Social attributes

c) Social capital as an investment.   d) None the above.

10. Identify which of the following people will try to estimate what they can earn if they suspend current resources and invest them in long term resources

[   ]

a) Team leaders   b) Entrepreneurs

c) Project leaders   d) None of the above

11. "The aggregate of the actual resources which are linked to control of a durable network". In the above statement durable network consists of

[   ]

a) Social relationships of individual recognition

b) Institutionalized relationships of mutual recognition

c) Both a&b

d) None of the above.

12. In the emerging software industry to engage similar strategies identify which of the following are related.   [   ]

a)Network diffusion and Effectance

b) Network centrality and geographic propinquity

c) Both a &b

d) None of the above

13. Choose the incorrect statement in the following.   [   ]

a) Indirect networks reduce the flow of information

b) Cohesive networks having greater trust

c) Sparse networks give optical outcomes than dense networks

d) Dense networks give optical outcomes than sparse networks.

14. A firm that gave bonuses to existing workers for referring potential employees: "The firm's $250 investment yields a return of $416 in reduced recruiting costs". Correlate the above statement to suitable social aspect

[   ]

a)Social system   b)Legal system

c)Social investment   d)None of the above

15. Choose the incorrect statement related to community level social capital from the following figure   [   ]
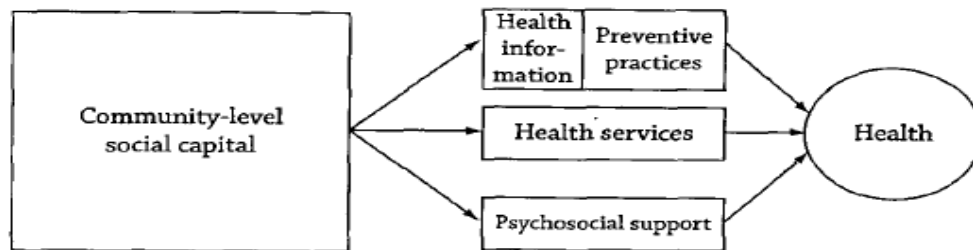
a) Decreases the level of available information on treatment and preventive measures

b) lowers the effort required to organize politically and therefore bring more health facilities

c) makes social support more accessible.

d) Increases the level of available information on treatment and preventive measures

SECTION-B

SUBJECTIVE QUESTIONS

1. Define the term Social Capital.

2. Describe briefly about Individual-Level Social Capital.

3. Discuss about Position and Resources Generators.

4. Write the ecological fallacy attributes correlations.

5. What is Social Support? Why social support called fuzzy? Explain it.

6. Explain different situations in which social capital be as an investment.

7. State about the theorists of Social System Social Capital.

8. Discuss about social capital and its consequences

9. Write the general idea of Name Generators.

10. What is community - level social support system? Sketch flow diagram pathways.