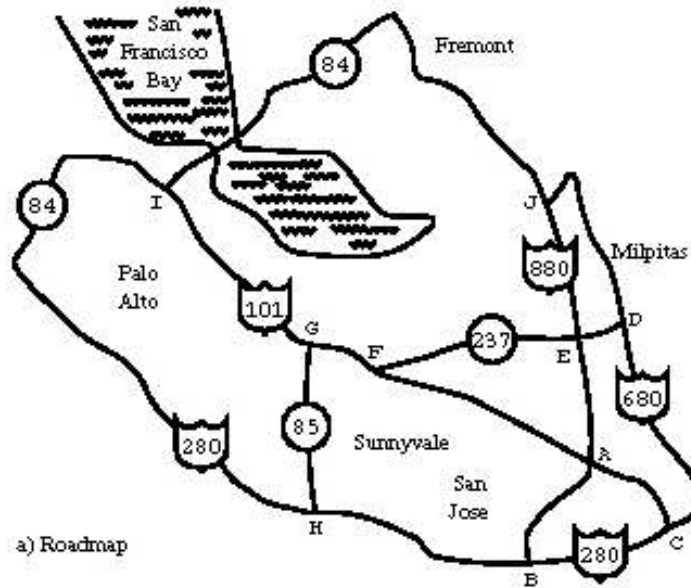# Graph
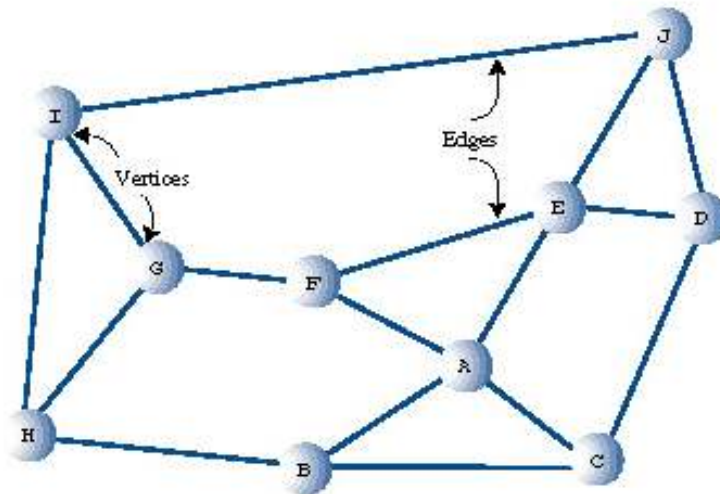

a) Roadmap
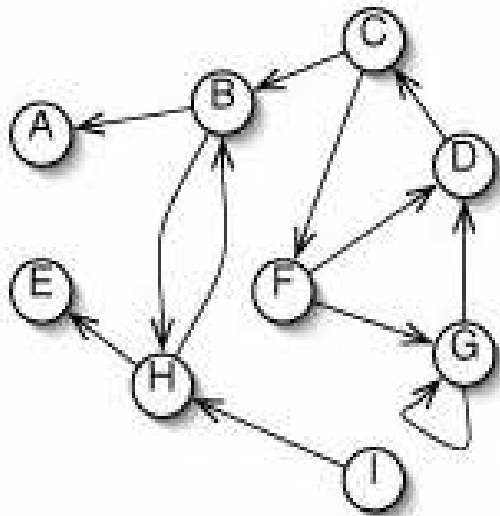

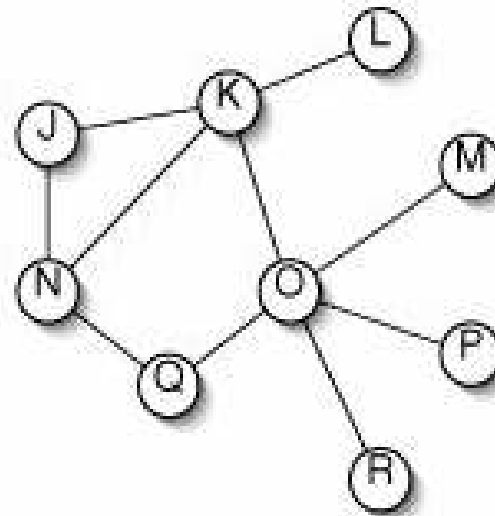b) Graph

Vertices (또는 Nodes) : 10

Edges (또는 Links) : 16

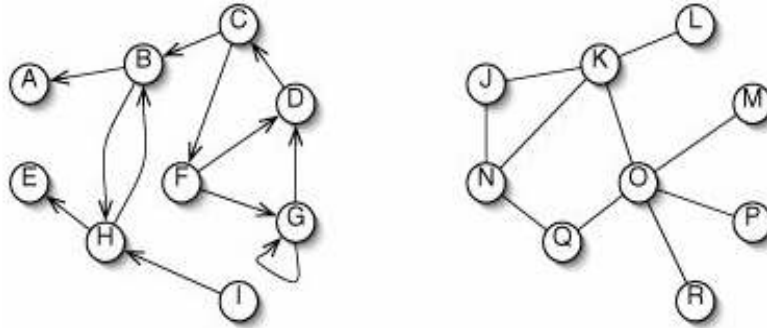- 그래프는 **vertices (nodes)** 와 **edges** 들로 구성.

- **In an <u>directed</u> graph, an edge is an arrow going from one <u>vertex</u> to another. In some situations, it is meaningful to have a <u>self-loop</u>, an edge connecting a vertex to itself (G).**

- **In an <u>undirected</u> graph, an edge is simply a line connecting two vertices.**


Directed graph   Undirected graph

- The <u>neighbors</u> of a vertex are those vertices that can be reached by moving along one edge. 위의 그래프에서 **N**의 neighbor는 **J, K, and Q.**

- The neighbors of H are E and B. 즉, directed graph에서 역으로 edge를 따라가며 neighbor 관계를 갖는 것은 불가함.

- A <u>path</u> from one vertex to another is a sequence of vertices, each a neighbor of the previous one. 위 그래프에서 **I** 에서 **A**로 가는 path (경로)는 **I → H → B → A.**

- The <u>length</u> of the path is the number of edges along the path, one less than the number of vertices. 따라서 위의 **I→H → B → A** path의 length는 3.

- The <u>distance</u> between two vertices is the length of the shortest path between them.

- A <u>cycle</u> is a path (of length one or more) from a vertex back to itself. In <u>Figure 15-4</u>, **F → G → D → C → F** is a cycle. In an undirected graph, a cycle may not follow the same edge more than once. Thus, **J → K → N → J** is a cyle, but not **Q → N → Q.**
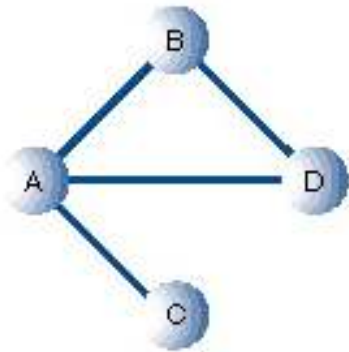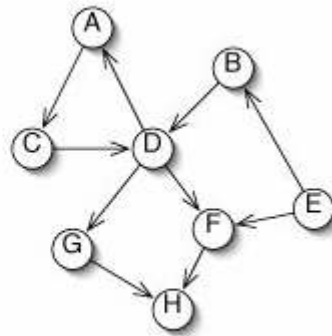
a) Connected Graph
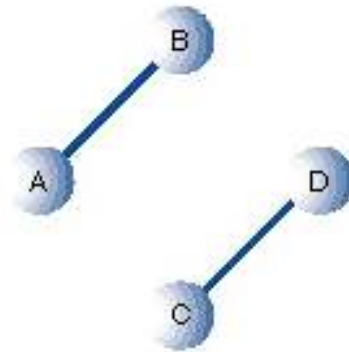
b) Non-connected Graph

A graph in which every pair of vertices is connected by a path (not necessarily an edge) is said to be connected. Not all graphs are connected.
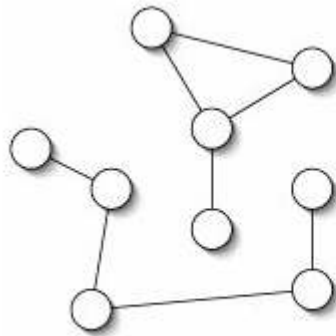
Non-connected Graphs
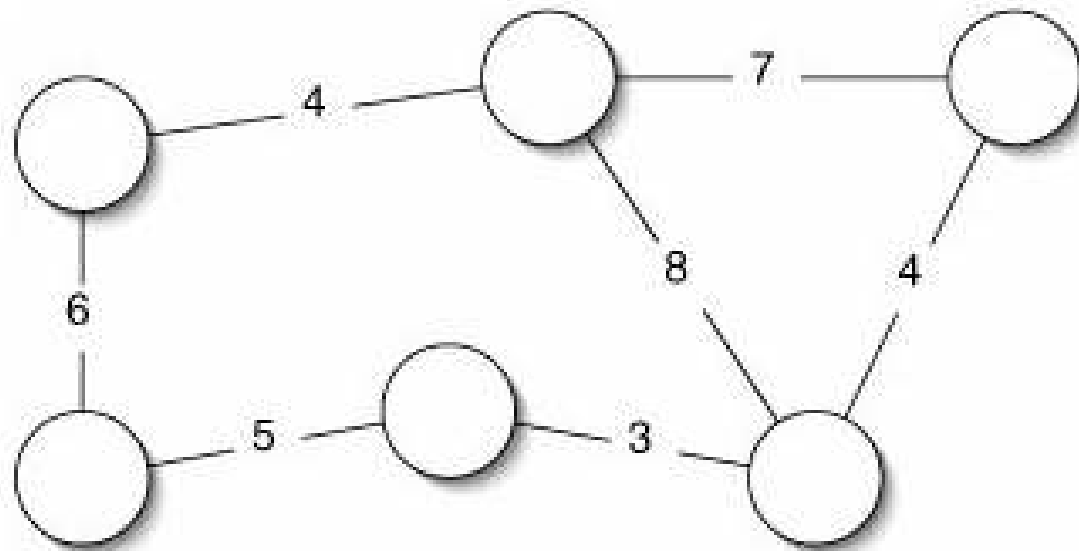
Weighted graph

- **This graph has 55 vertices, 70 edges, and 3 connected components. One of the connected components is a tree (right). The graph has many cycles, one of which is highlighted in the large connected component (left). The diagram also depicts a spanning tree in the small connected component (center). The graph as a whole does not have a spanning tree, because it is not connected.**

Strength of weak ties (약한 연결의 힘) : http://www.analytictech.com/networks/weakties.htm

Motivation for Granovetter's Theory

• Careers, job changing. Why is it that people so often get jobs from weak ties?

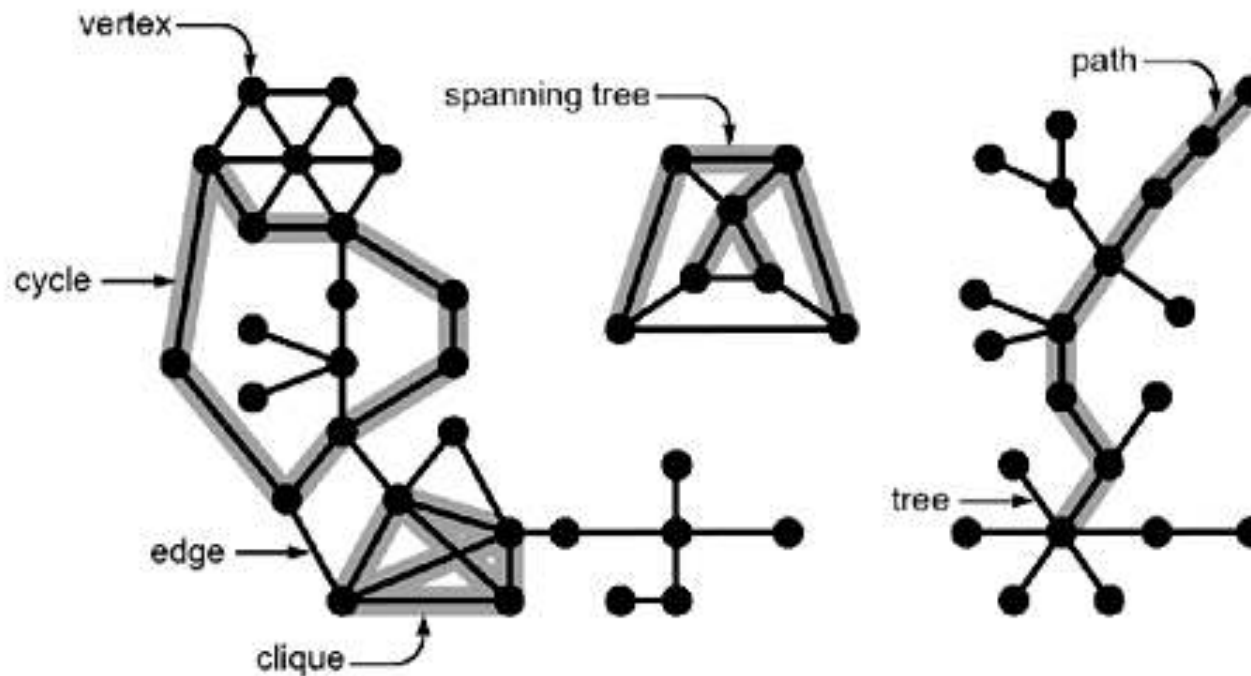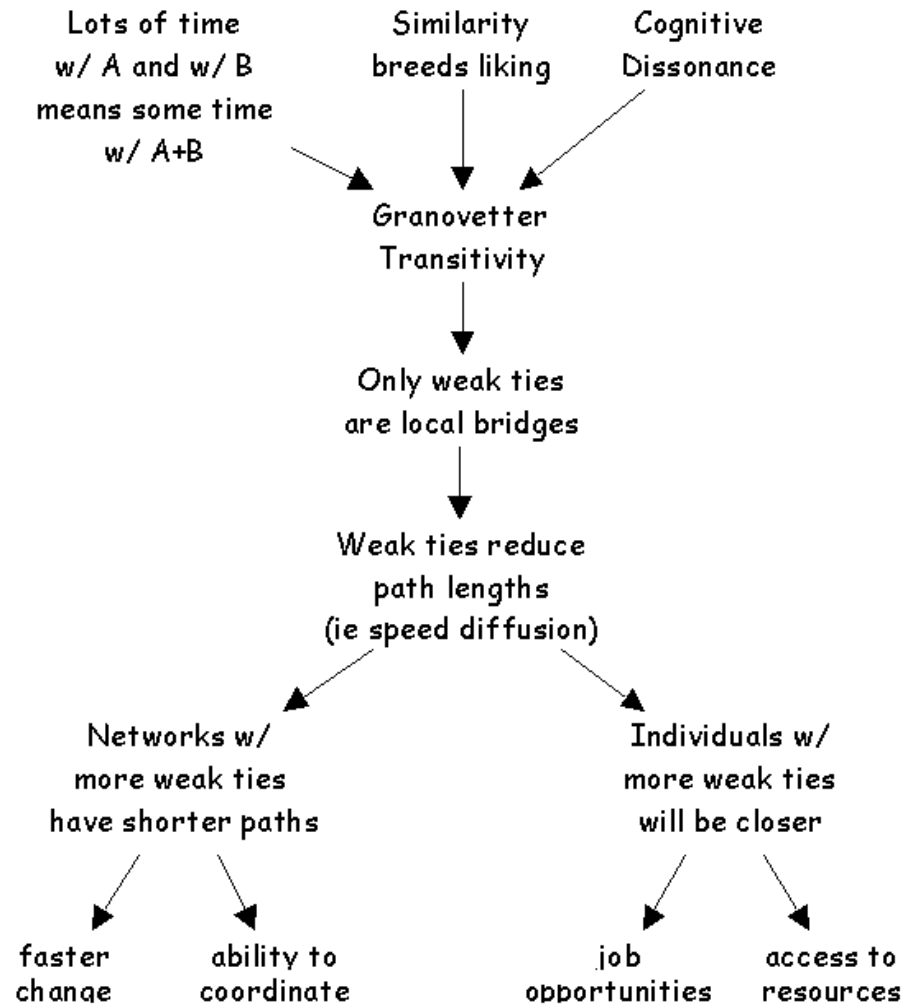• How do large groups coordinate to make things happen, for example to meet a threat from outside

• Since then it has developed into a larger perspective known as embeddedness, which holds that all economic action, including that by organizations, is enabled and constrained and shaped by social ties among individuals

Lots of time w/ A and w/ B means some time w/ A+B

Similarity breeds liking

Cognitive Dissonance

→ Granovetter Transitivity

→ Only weak ties are local bridges

→ Weak ties reduce path lengths (ie speed diffusion)

Networks w/ more weak ties have shorter paths
- faster change
- ability to coordinate

Individuals w/ more weak ties will be closer
- job opportunities
- access to resources

Strength of weak ties (약한 연결의 힘) 의 의미

• Individuals with more weak ties have greater opportunities for mobility

• Coser's theory of autonomy (built on Simmel): lots of weak ties provide "seedbed of individual autonomy". People with many weak ties [Toennies' Gesellschaft] live up to the expectations of several others in different places and at different times, which makes it possible to preserve an inner core — to withhold inner attitudes while conforming to various expectations. People with strong ties [Gemeinschaft] share norms so thoroughly that little effort is needed to gauge intentions of others

• Relates difference to Basil Bernstein's distinction between restricted and elaborated codes of communication. Elaborated are complex and universal. More reflection is needed in organizing ones communication to very different people. [weak ties]

• In elaborated speech there is high level of individualism, as it results from the ability to put oneself in imagination in the position of each role partner.

• Social structure of poor is strong tie based, which does not encourage complex role set that in turn develops intellectual flexibility and self-direction.

• Weak ties --> complex role sets --> cognitive flexibility --> ability of communities to organize. Complex voluntary orgs may depend on a habit of mind permits one to assess the needs, motives actions of a variety of people simultaneously.

• Adoption of innovation: made difficult by strong ties

• Mobilizing for change in response to environmental jolts:

• Italian community of the west end in boston in 1962 were unable to fight "urban renewal" process which destroyed it. Gans attributes to working class culture (but other working class neighborhoods have succeeded).

• Divided into kinship and lifelong friendship cliques that were relatively closed. Unable to connect across cliques. People's work was outside the community, so no sources of informal ties.

• More weak ties, more capable of acting in concert. Strong ties breed local cohesion and macro fragmentation