# Lecture 15: Social Network Analysis and Communities of Practice

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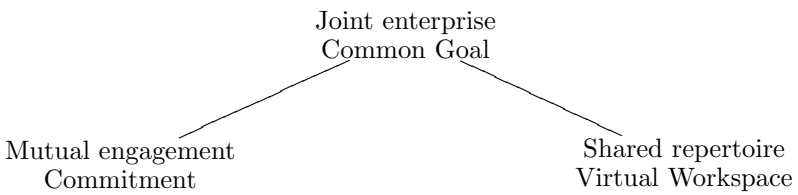
## 1 Communities of Practice

**Communities of practice**

**Definition 1** (Community of practice)**.** A group of people with common identity, professional interests, and who share, participate and establish a fellowship.

- CoP may share electronic or virtual workspace, such as a part of the organisation's intranet.
- CoP can be facilitated by e-mail lists, user groups, discussion boards, wiki, community yellow pages and other forms.
- Many organisations have CoPs

**Common Characteristics of COP**




**Joint enterprise** : personal and community's goals

**Mutual engagement** : based on trust, interest, credibility, professionalism, ethics

**Shared repertoire** : shared workspace and knowledge repository

**Types of CoPs**

CoPs can be described by

- A common function (e.g. profession, industry, long-standing problem)
- Goals (e.g. development of standards, benchmarking)
- Self-organised or sponsored
- Recognition: unrecognised, bootlegged, legitimised, supported, and institutionalised
-

**Roles and Responsibilities in CoPs**

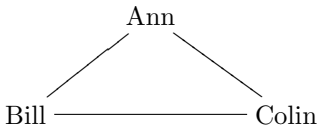
- Kim (2000) lists the following key roles:
  - visitor
  - novice
  - regular
  - leader
  - elder
- Nickols (2000) defines the following roles:
  - champion
  - sponsor
  - facilitator
  - practice leader
  - knowledge service centre or office (KSO)
  - member.

# 2 CoPs and Social Network Analysis

**Social Network Analysis and Graphs**

- Social network analysis (SNA) is aimed at measuring and mapping the relationships and information flows between people in CoPs.

- Social network can be represented as a *graph*, in which nodes (vertexes) represent *actors* and links (edges, arrows) represent their *interdependencies*




**Graphs**

**Definition 2** (Graph)**.** $G = (V, E)$ is a set $V = \{v_1, \ldots, v_n\}$ of *vertexes* (or nodes) and a set $E = \{e_1, \ldots, e_m\}$ of *edges* (or links) between the vertexes.

**Definition 3** (Path)**.** A sequence $(v_0, \ldots, v_l)$ of vertexes, such that each $(v_k, v_{k+1})$ is an edge in $G = (V, E)$.

**Definition 4** (Distance)**.** $d(v, w)$ between two vertexes $v$, $w$ is the number of edges in the shortest path $(v, \ldots, w)$.

**Definition 5** (Connected graph)**.** if there is a path $(v, \ldots, w)$ between *each* pair of vertexes $v$, $w$.

**Example: Collaboration graphs**

- If two persons $v$ and $w$ have collaborated, then there is an edge $(v, w)$ the collaboration graph $G = (V, E)$.
- Movie actors appearing in the same film are linked in the collaboration graph, known as the *Hollywood graph*
- Mathematicians who have co-authored a paper are linked in the *Erdös graph*. See

  `http://www.ams.org/mathscinet/collaborationDistance.html`

**$k$-Regular Graphs**

**Definition 6** (Degree)**.** of vertex $v \in V$ of the graph $G = (V, E)$ is a number of vertexes $w \in V$ connected to $v \neq w$.

**Definition 7** ($k$-Regular graph)**.** if each vertex $v \in V$ is connected to $k$ other vertexes (i.e. has degree $k$)

**Definition 8** (Complete graph)**.** if there is an edge $(v, w) \in E$ for each pair vertexes $v$, $w \in V$.

**Question 1.**
- *What is the distance between $v$ and $w$ in a complete graph?*
- *Is a complete graph regular?*
- *What happens if you remove a vertex from a complete graph?*

### Centrality of an Actor (Node) in a Social Network

**Degree** : counts the number of links with other nodes (actors)

**Closeness** : the inverse of the total (sum) distance of the node to other nodes.

**Betweenness** : counts the number of shortest paths $(v, \ldots, w)$ that pass through the node.

**Bridge** : an edge $(v, w) \in E$ such that deleting it makes $v$ and $w$ be in different components of the graph.

### Directed Graphs

**Definition 9** (Directed Graph)**.** $G = (V, A)$ is a set $V = \{v_1, \ldots, v_n\}$ of *vertexes* (or nodes) and a set $A = \{a_1, \ldots, a_m\}$ of *arrows* (ordered pairs) between the vertexes.

**Definition 10** (In- (Out-)Degree)**.** of vertex $v \in V$ of the directed graph $G = (V, A)$ is a number of arrows $(w, v) \in A$ ending at $v$ ($(v, w) \in A$ starting $v$).

**Definition 11** (Sources and Sinks)**.** A *source* is a vertex $v \in V$ in directed graph $G = (V, A)$ with zero in-degree. A *sink* is a vertex with zero out-degree.

### SNA Tools

Some common tools and software:

- AllegroGraph `http://www.franz.com/agraph/`
- CFinder `http://www.cfinder.org/`
- C-IKNOW `http://ciknow.northwestern.edu/`
- Idiro SNA Plus `http://www.idiro.com/`
- NodeX foe Excel `http://nodexl.codeplex.com/`
- NetMiner `http://www.netminer.com/`
- SocNetV `http://socnetv.sourceforge.net/`

### Additional Reading

1. Wey, Blumstein, Shen, and Jordán (2008)

   Social network analysis of animal behaviour: a promising tool for the study of sociality

2. Abbasi, Altmann, and Hossain (2011):

   Identifying the effects of co-authorship networks on the performance of scholars: A correlation and regression analysis of performance measures and social network analysis measures

# References

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Kim, A. (2000). *Community building on the web*. Berkeley, CA: Peachpit Press.

Nickols, F. (2000). *Community of practice start up kit. the distance consulting company.* Available at http://home.att.net/ñickols/.

Wey, T., Blumstein, D. T., Shen, W., & Jordán, F. (2008). Social network analysis of animal behaviour: a promising tool for the study of sociality. *Animal Behaviour*, *75*, 333–344.