

# Using measures of the social structure of science departments to shape emergent change strategies

Kathleen Quardokus, Charles Henderson  
Western Michigan University



## Rationale

The goal of this research is to develop knowledge about emergent change in higher education. This poster describes the role of the change agent and participants in emergent change, as well as implications of observed patterns in department activities and social networks during involvement in an emergent change initiative.

## Methods

### Data Collection: Social Networks Online Survey

- Your Name?
- Please use the drop-down menus below to identify the people in the physics department with whom you DISCUSS teaching-related issues at least once a month and how often you talk to them about teaching. (There are 7 available slots, if you have more than 7 people to identify, choose the 7 people with whom you have the most important conversations.)
 

| Name                    | Frequency during the 2012/2013 Academic Year |
|-------------------------|--|
| 1. Aristotle            | Monthly                                      |
| 2. Aristarchus of Samos | Weekly                                       |
| 3. Archimedes           | Nearly every day                             |
| 4. Aryabhata            |  |
| 5. Avicenna             |  |
| 6.                      |  |
| 7.                      |  |
- Please list any other people (outside of the physics department) with whom you DISCUSS teaching-related issues at least monthly. Indicate: 1) the person's name; 2) frequency of discussion during the 2012/2013 academic year (Nearly every day, Weekly, Monthly).
 

|    |  |
|----|--|
| 1. |  |
| 2. |  |
| 3. |  |
| 4. |  |
| 5. |  |
| 6. |  |
| 7. |  |
- During this academic year (2012/2013) how did the frequency of your teaching-related DISCUSSIONS compare to the previous academic year (2011/2012)?
 

| Increased significantly | Increased slightly | Stayed about the same | Decreased slightly | Decreased significantly |
|-------------------------|--------------------|-----------------------|--------------------|-------------------------|
|                         |                    |                       |                    |                         |
- In the physics department, whom do you go to for ADVICE about teaching-related issues? Please use the drop-down menus below to identify these people. (There are 7 available slots, if you have more than 7 people to identify, choose the 7 people with whom you have the most important conversations.)
 

| Name                    |
|-------------------------|
| 1. Aristotle            |
| 2. Aristarchus of Samos |
| 3. Archimedes           |
| 4. Aryabhata            |
| 5. Avicenna             |
| 6.                      |
| 7.                      |
- Outside of the physics department, whom do you go to for ADVICE about teaching-related issues? Please list these people below. Indicate: the person's name
 

|    |  |
|----|--|
| 1. |  |
| 2. |  |
| 3. |  |
| 4. |  |
| 5. |  |
| 6. |  |
| 7. |  |
- Please use the comment box below to add any other information that you think will help us better understand your responses.

### Data Collection: Semi-Structured Interviews

#### Interview Topics

- Timeline of events
- Challenges
- Successes
- Motivation
- Department Characteristics
- Sources of Support
- Sources of Resistance

#### Interview Participants

- Lead Change Agent
- Change initiative leaders
- Department Chairs
- Post-Doctoral Scholars
- Teaching Center
- Faculty
- Laboratory Coordinators
- Lecturers

## Social Network Analysis

### Individuals [1]

Hubs of knowledge – Individuals with the most connections.

Connectors – Individuals who bridge the gap between otherwise disconnected individuals.

### Subgroups [2]

Newman Communities – Identifies individuals who have many connections between them. These groups likely have shared opinions about teaching [3].

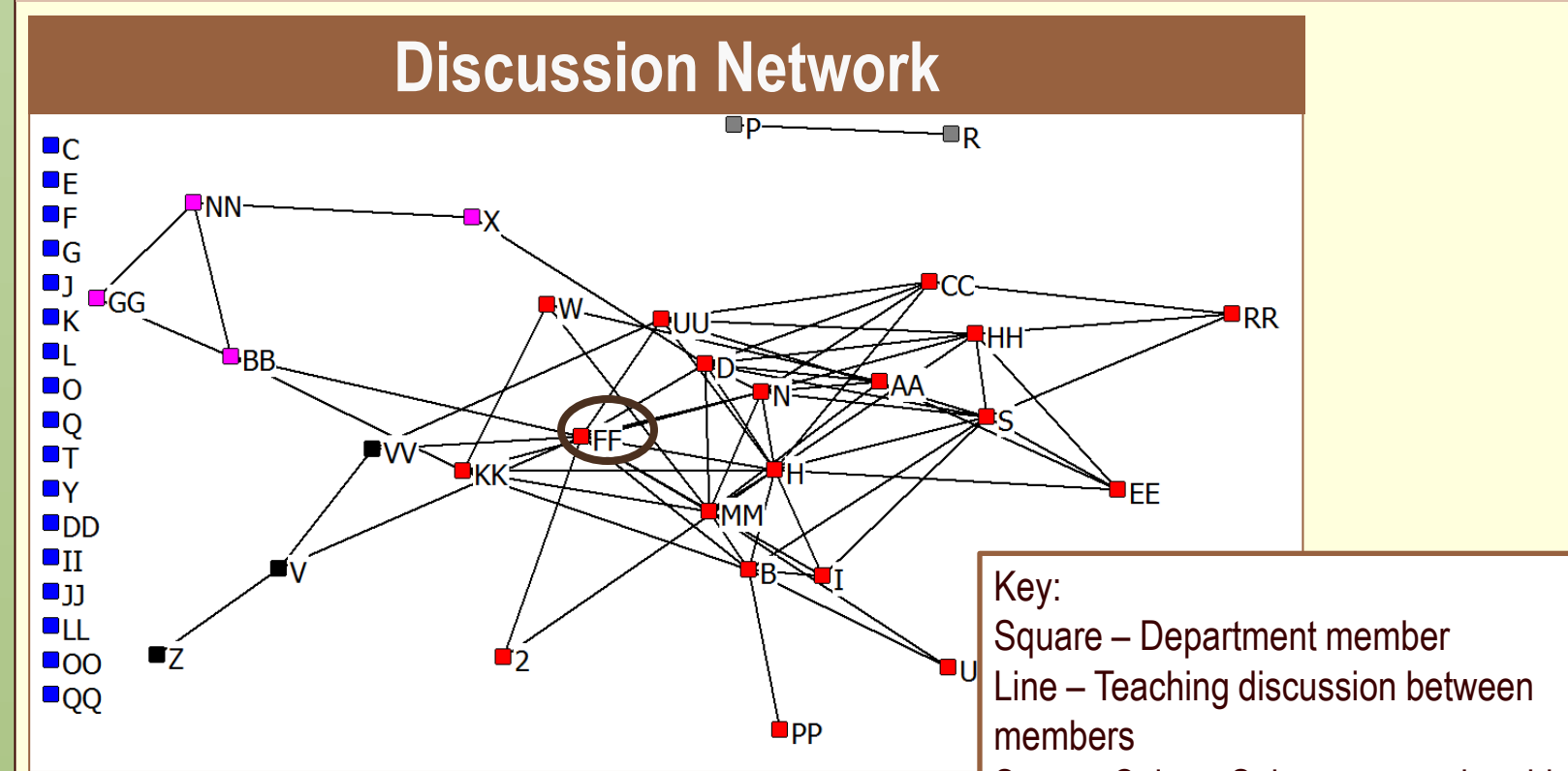
## Departmental Characteristics

### Role of the Department Chair

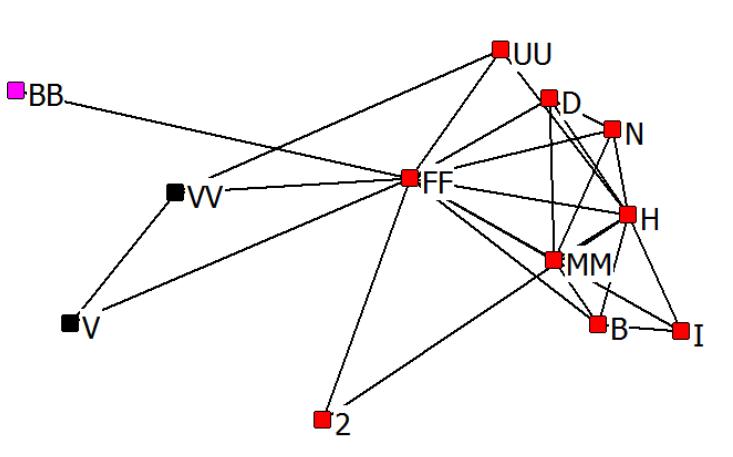
A well-connected chair will have many connections to individuals in diverse subgroups. These connections allow the chair to have access information in the network (such as ideas and goals) and to create connections between others in the network to add diversity.

#### Department D: Central Chair

The chair is FF. The chair is well-connected in the overall network. The chair's ego network includes members of every subgroup. The chair promotes education goals in faculty meetings.



#### Chair (FF) Ego Network



#### Chair (FF) Network Characteristics

| Measure          | Rank |
|------------------|------|
| Hub of Knowledge | 2    |
| Connector        | 1    |

#### Discussion Network Summary

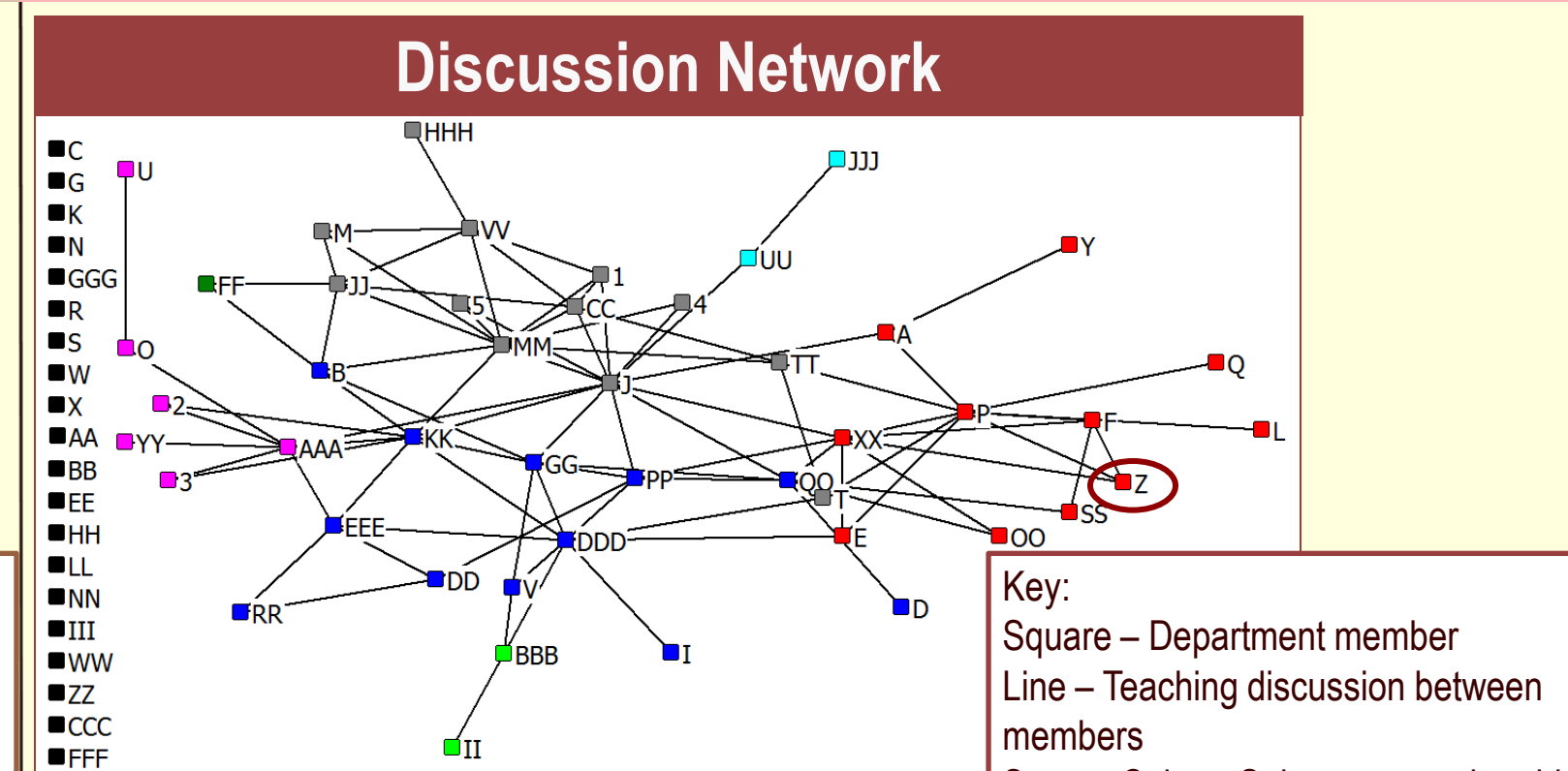
- Hub of knowledge – quick access to knowledge in the network
- Connector across subgroups – adds to transfer of ideas
- Member of largest subgroup – connected to key individuals

#### Interview Summary

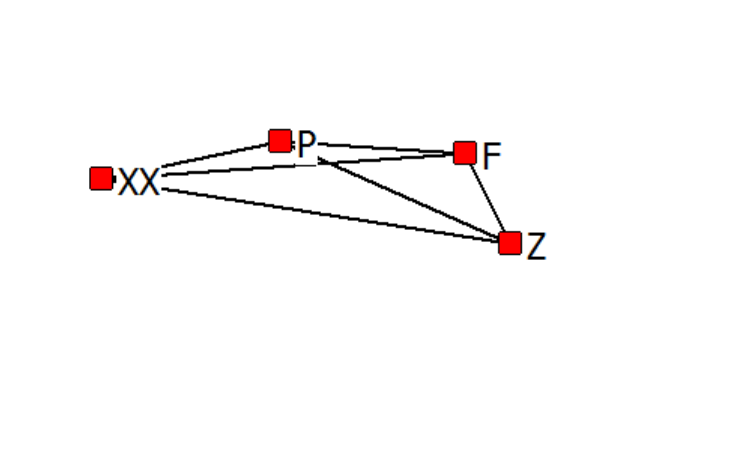
- Draws attention to teaching topics during faculty meetings
- Was actively involved in educational change before becoming chair
- Acts as Co-PI on the change initiative

#### Department A: Periphery Chair

The chair is Z. The chair is on the periphery of the network. The chair's ego network includes a single subgroup. The chair is uninvolved in education reform efforts.



#### Chair (Z) Ego Network



#### Chair (Z) Network Characteristics

| Measure          | Rank     |
|------------------|----------|
| Hub of Knowledge | 19       |
| Connector        | Unranked |

#### Discussion Network Summary

- Low ranking hub of knowledge – not involved in discussions about teaching
- Single subgroup – limited diversity in contacts

#### Interview Summary

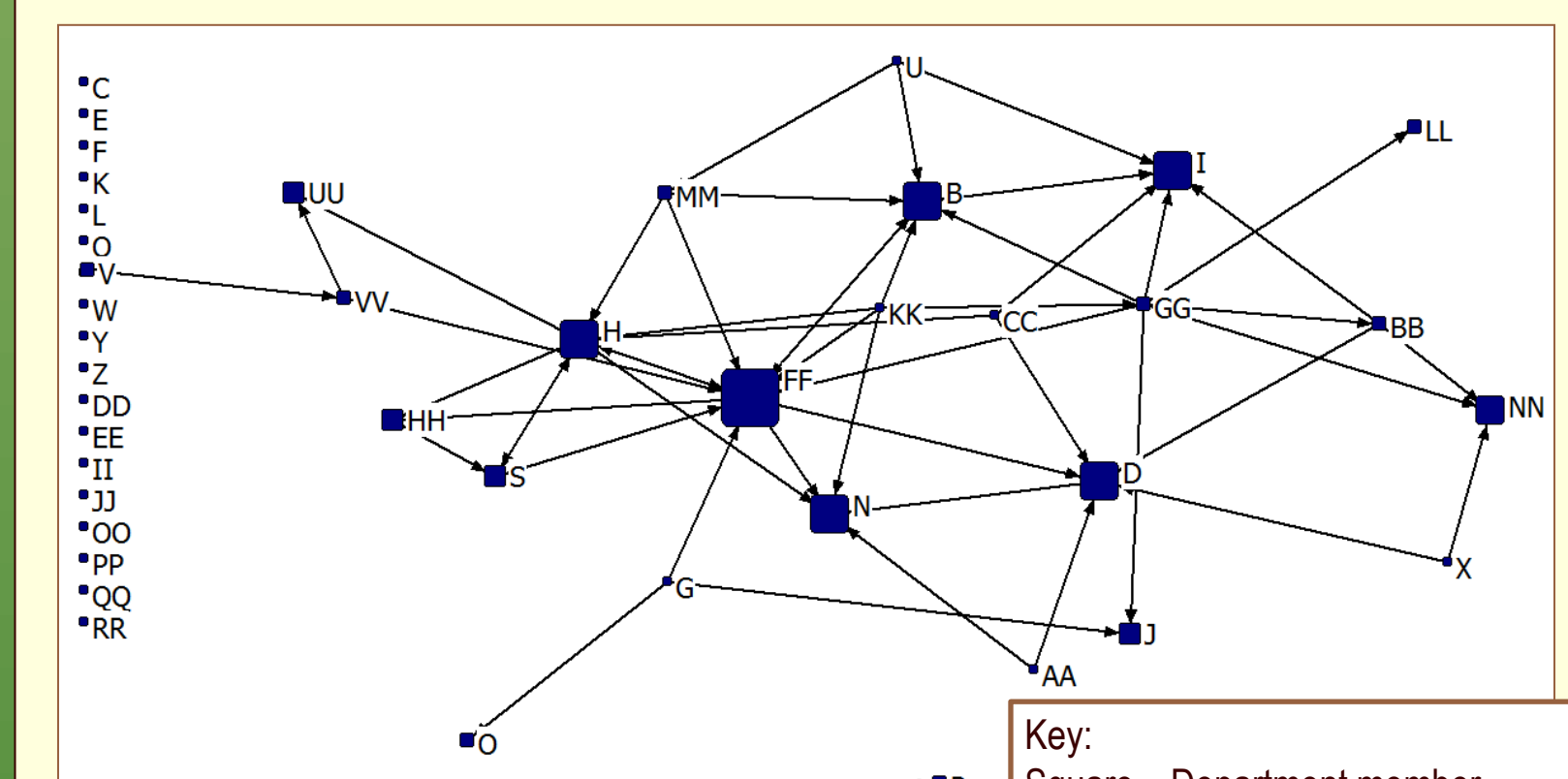
- PI of change initiative (J) is a member of the department and acts as main education resource
- Faculty involved in education change tend to work independently

## Distribution of Advice Connections

A network with diverse sources of information will have multiple hubs of knowledge in the advice network. Connections to the department chair in the advice network will encourage transfer of visions and goals to the formal leadership.

#### Department D: Multiple Hubs

The chair (FF) is the primary hub of knowledge. Multiple secondary hubs of knowledge exist (I, B, H, N, D).

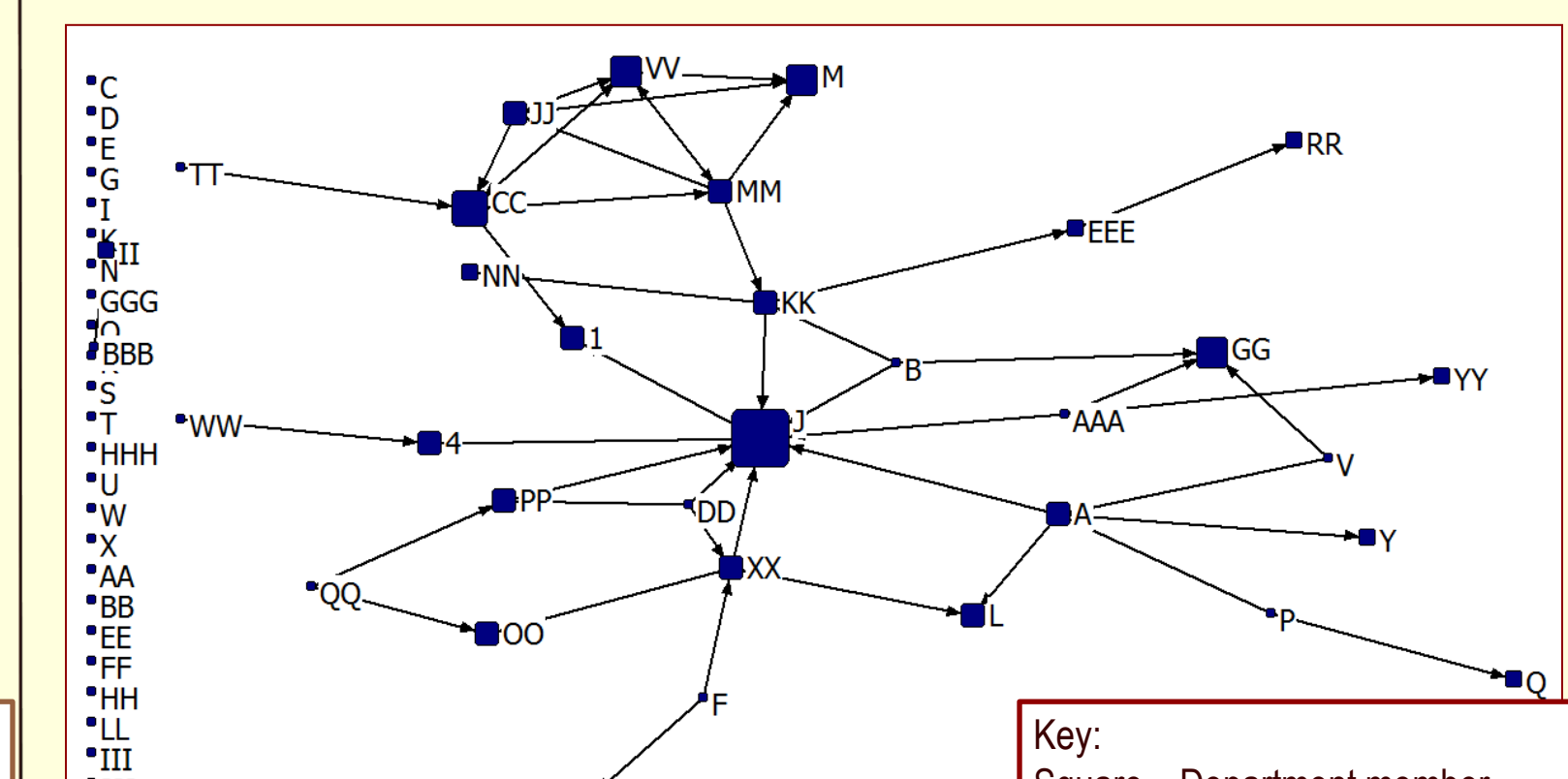


#### Interview Summary

- Co-teaching of courses has kept multiple individuals involved in change

#### Department A: Single Hub

The chair (Z) is not a hub. Faculty member (J) is the major hub. Secondary hubs are in a periphery subgroup (MM, XX, JJ, VV, M).



#### Interview Summary

- Faculty member (J) has a special interest in teaching and learning and is the leader of the multi-department change initiative

## Major Findings

### Department D

- The chair of Department D promotes change by providing a platform for discussion in faculty meetings.
- The chair of Department D has access to ideas that flow in the network due to her many connections. This is important to gain knowledge of goals and vision of the network.
- The Advice network's hubs of knowledge are distributed among multiple people. This provides variation of ideas.
- The advice networks connection to the chair encourages transfer of goals and ideas to the formal leadership.
- Co-teaching assignments may be a source of tension in the network leading to distributed ties in the advice network.

### Department A

- The department chair remains on the periphery of the discussion and advice network. Person J is central but has less access to a platform (faculty meetings) to promote goals.
- Independently working on education change makes it difficult for network members to share ideas with the department as a whole.
- Most of Department A has a single source for advice which means it will be difficult for new ideas to emerge.
- Department A seeks advice from person J. A change agent may disrupt patterns by having more individuals responsible for education concerns.

## Theoretical Framework

### Emergent Change: Complexity Leadership Theory [4]

#### Overview

- Change cannot be *controlled*; change can be *enabled*.
- Interaction within the social networks of groups is the source of change.
- Correlation between people creates tension; tension leads to change.
- Too "loosely" correlated systems will allow change at the micro level that never reaches macro level change.
- Too "tightly" correlated systems will resist change at the micro level, but if change does occur it is likely to transform the macro system.

#### Role of the Change Agent [4,5]

- Promote broader vision and goals by providing language and platforms to discuss them.
- Promote and foster networks within the department.
- Promote individuals or ideas that embody the vision of the department.
- Disrupt existing patterns to create tension.

#### Role of the Participants [4,5]

- Develop and maintain interactions with others across the network.
- Share ideas and seek support from individuals within the network.
- Attend workshops and other opportunities for exposure to new ideas.
- Collectively determine the goals and vision for the future.

#### Role of Department Chair

- Be well connected in the network in order to have access to goals and vision of the department.
- Promote goals and vision (e.g. recognize teaching excellence during faculty meetings).
- Create diverse connections (across subgroups) in the department to promote emergence of ideas.

#### Distribution of Advice Connections

- An advice network with multiple hubs of knowledge provides diverse knowledge which encourages the emergence of ideas.
- An advice network with connections to the department chair promotes transfer of goals and vision to the formal leadership.

## References

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## Acknowledgements

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