



# Building Collaborative Networks for Innovation

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Network Centrality and Firm Innovation: A Social Network Analysis of the Monaghan Furniture Industry

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# Outline

- Motivation
- Research Questions
- Data and Methodology
- Empirical results
- Key findings
- Summary and Conclusions

# Motivation

- Innovation is a multi-directional and iterative process, involving multiple actors (Evangelista 2000; Tether 2000; Hewitt-Dundas 2009)
  - The interaction between these actors creates a flow of knowledge that is vital for innovation
- Innovation research dominated by high-tech industries (Balcerowicz et al. 2009; Palmberg 2001; Hirsch-Kreinsen et al. 2005)
  - The literature somewhat ignores some crucial aspects of innovation taking place in lower technology industries
- Little attention paid to the structure of the innovation network
  - The factors that explain the positions assumed within an inter-firm network (Klein et al. 2004; Borgatti and Foster 2003)
  - The effect of network positions on a firm's innovation activity (Srivastava and Gnyawali 2009; Tsai 2001; Boschma et al. 2005)

# Research Questions

- Do firms within a low-tech network interact with one another?
- How important is inter-firm networking for innovation among low-tech firms?
- What factors determine the network positions held by a firm?
- What effect does network centrality have on firm innovation within the context of a low-tech network?

# Monaghan Furniture Industry

- Mature low-technology sector
- Approximately 33 firms providing direct employment to around 350 people.
- Industry can be largely disaggregated in three groups:
  - Hard furnishings i.e. Bedroom and dining furniture
  - Soft furnishings i.e. Upholstery
  - Fitted furniture i.e. Kitchen and bar furniture
- After Dublin and Cork Monaghan wooden furniture industry accounted for the largest concentration of timber and wooden furniture firms throughout Ireland
- Problems began in the industry in mid 90s and at present the industry in severe decline

# Data and Methodology

- Survey population:
  - All furniture firms located within the region of County Monaghan
  - 33 firms identified in total and 22 responses received (response rate of 67%)
  - Non response bias was conducted using non-response testing, finding no significant relationship between response and firm age; size and innovation activity.
- Two stages of investigation
  - Stage One: Questionnaire and Social Network Analysis (SNA) of relational data
  - Stage Two: Semi-structured interviews with firms holding significant positions within the furniture network

# Social Network Analysis (SNA)

- SNA is a methodology used to detect, describe, and analyze relationships among a group of people or organizations (Reid et al. 2008)
- Key terms
  - *Network*: pattern of friendship, advice, or communication which exists among the members of a social system (Valente 1996; Crowley 2007)
  - *Nodes*: Actors within a network who engage in relationships with one another, i.e. individuals/organisations (Haythornthwaite 1996).
  - *Ties*: Relationships connecting nodes to one another (Coulon 2005)
    - Kinship; Communication; Information flow; Friendship
  - *Isolate*: Node that is not connected to *any* other member of the structure

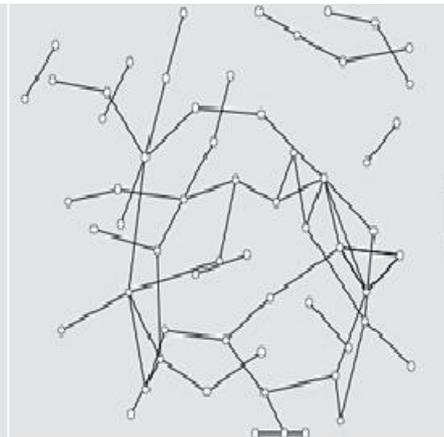
# Social Network Analysis (SNA)

## Measures

- Network Density
  - Group measure of “network completeness”
  - The proportion of network ties *present* relative to the number of *possible* links within the network population (Brieger et al. 2004; and Wellman 1983)
  - Measures are presented as proportions ranging between 0 and 1
    - (0 = no ties present; 1= all possible ties present)



High density network

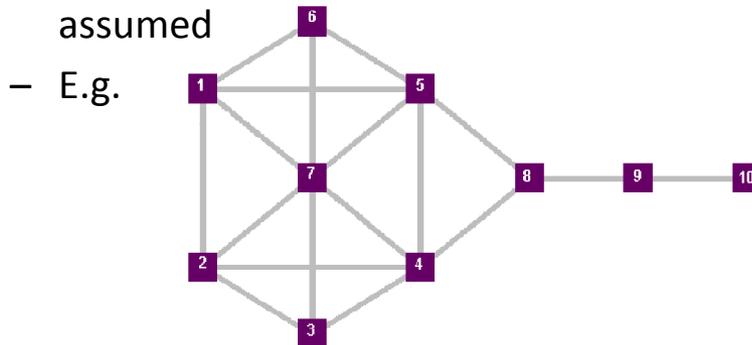


Low density network

# Social Network Analysis (SNA)

## Measures

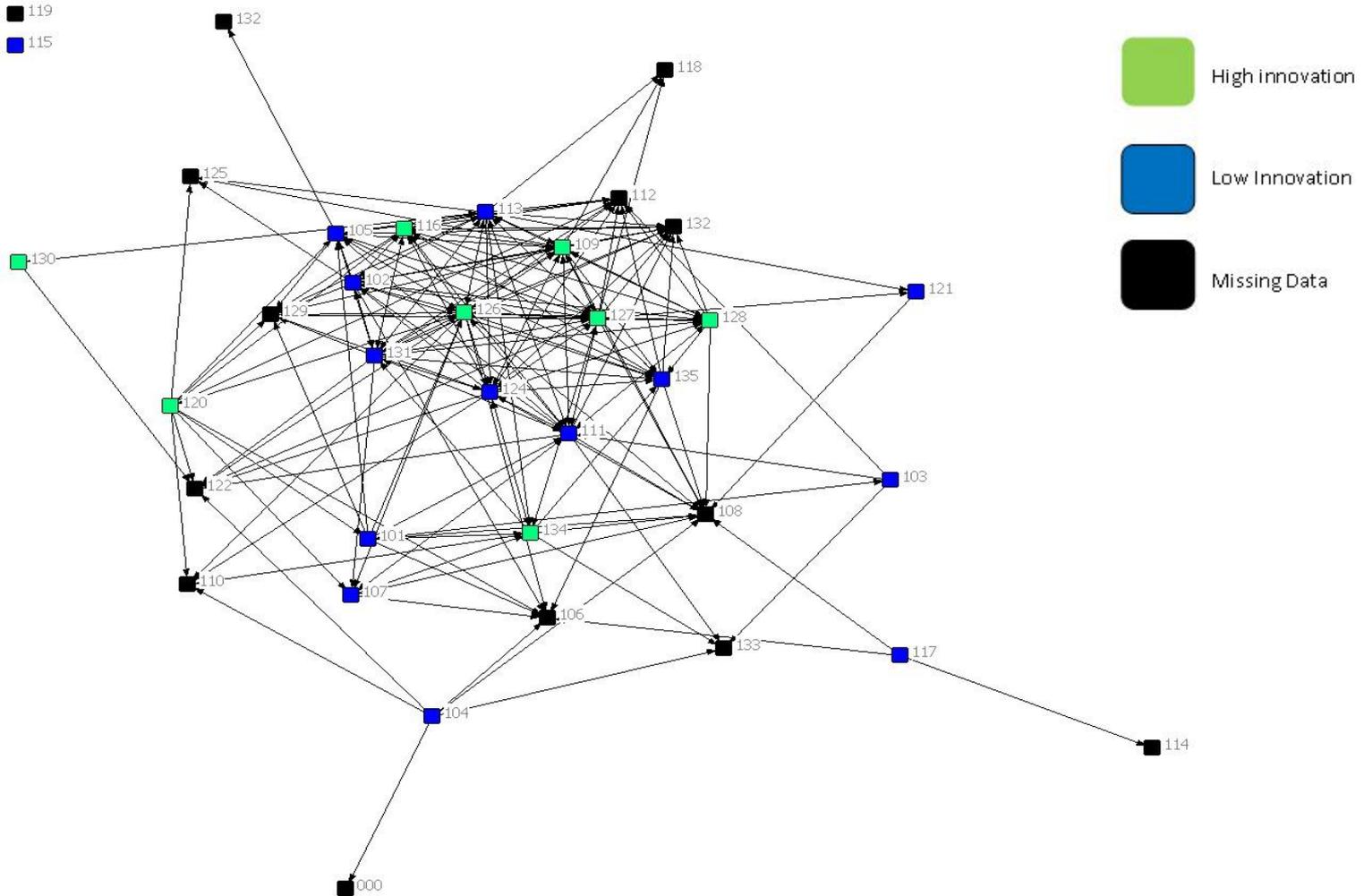
- Network centrality
  - One of the most commonly used measures in social network analysis
  - Actor level measure of structural importance or prominence in the network (Ehrlich and Carboni 2005 ; Borgatti et al. 2009)
  - Degree network centrality is a measure often used in SNA research
    - Calculated by counting the number of nodes in direct contact with the focal unit
    - The greater the number of direct connections, the more central the position assumed



Most central = node 7 with 6 direct connections

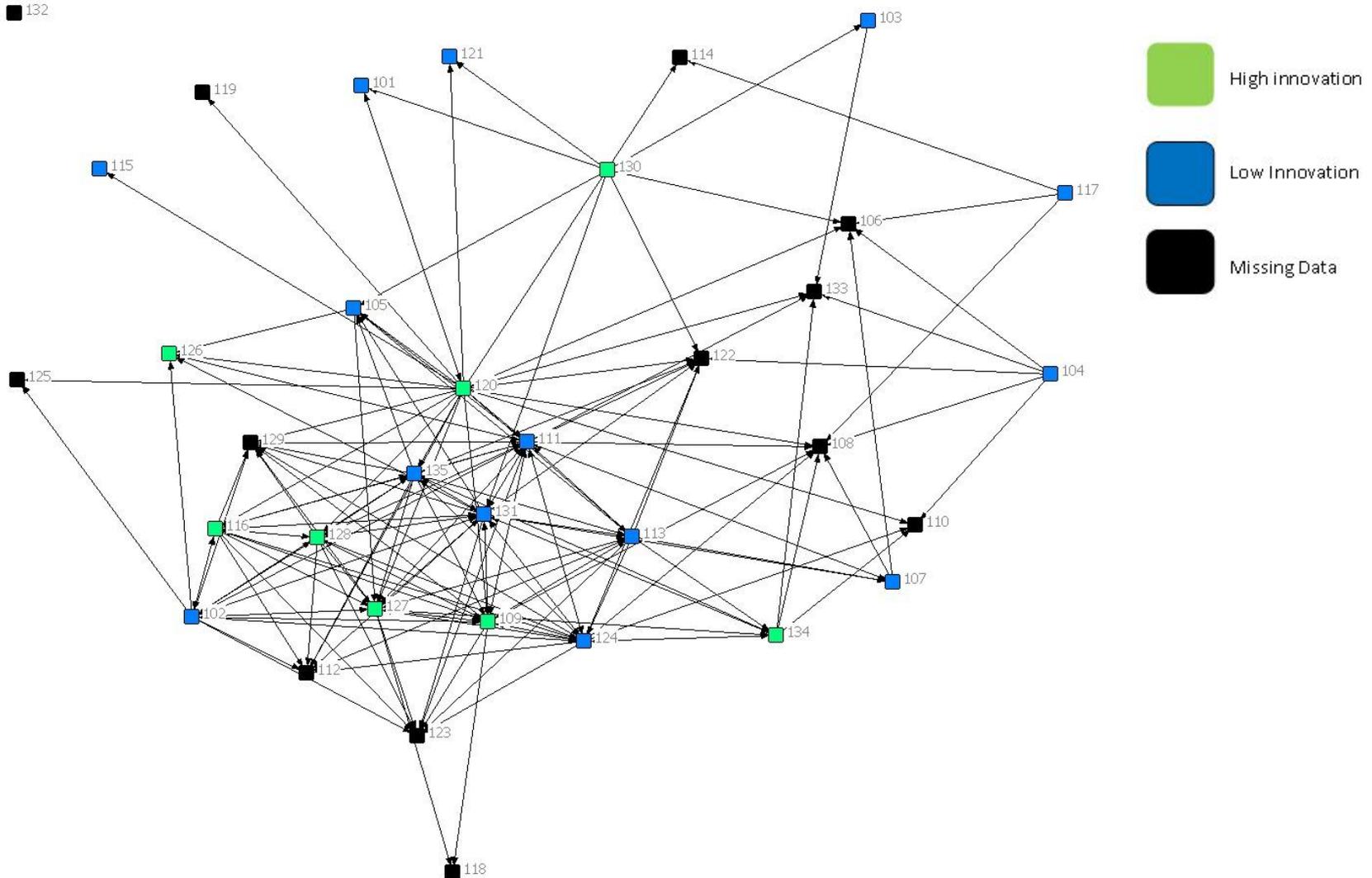
Least central = node 10 with only 1 direct connection

# Empirical results



Formal communication network of furniture manufacturers in Monaghan

# Empirical results



Informal communication network of furniture manufacturers in Monaghan

# Empirical results

Company	Degree Centrality
101	9
102	15
103	4
104	6
105	14
106	8
107	7
108	13
109	16
111	18
112	11
113	19
114	1
115	0
116	14
117	3
118	3
119	0
120	11
121	3
122	8
123	12
124	17
126	21
127	19
128	14
129	13
130	2
131	17
132	1
133	4
134	10
135	15

Formal communication network centrality scores

Company	Degree Centrality
101	2
102	13
103	2
104	5
105	8
106	5
107	5
108	8
109	14
111	18
112	8
113	13
114	2
115	1
116	12
117	3
118	2
119	1
120	22
121	2
122	8
123	9
124	16
126	5
127	15
128	12
129	10
130	7
131	18
132	0
133	5
134	8
135	15

Informal communication network centrality scores

# Key findings

- Firms within the furniture network do interact with one another but to a limited degree (indicated by comparatively low density scores)
  - Confirming suggestions in other research that firms within the Monaghan furniture sector are largely independent and non-cooperatively minded (Heanue and Jacobson 2002)
- Interview data suggests that whilst engaging in some degree of inter-firm networking many within the network are non-cooperatively minded and perhaps wary of such activities
  - *“Why should I come up with a good idea and share it with another boy?”*
  - *“We are all in competition at the end of the day...therefore as much as you would like to help and assist you are not going to give everything away”*
  - *“No kitchen man in the same business as us would talk to each other”*
  - *“On the local level some of the guys don’t engage with others at all, they keep it very close to their chest, so there is a different level of people that will interact with you”*

## Key findings (cont)

- Empirical evidence indicating a relationship between the assumption of a central network position and the following:
- Firm size:
  - Larger firms assume the more central positions within both communication networks
  - Results are similar to those produced by others i.e. Bougrain and Haudeville (2001) and Roper (1998)
- Firm age:
  - Older firms assume more central positions in the informal communication network
  - Similar to other research age appears to have no effect on network centrality within the formal communication network (Boschma and ter Wal 2007 and Powell et al. 1998)
- Absorptive capacity:
  - Firms with higher absorptive capacities assumed more central network positions
  - Giuliani and Bell (2005) and Walker (1995) found a similar positive relationship
- Business strategy:
  - Firms regarding networking as strategically important assumed more central positions whilst those adopting a more self-reliant approach were located on the periphery
  - Similarly Lee and Tsang (2002) found a negative relationship between self-reliance and the number of network partners maintained by entrepreneurs

## Key findings (cont.)

- Correlation tests indicate a significant and positive relationship between network centrality and firm innovation
- Evidence suggesting that the assumption of a central network position enables firms to overcome the following barriers to innovation:
- Inadequate access to resources and knowledge
  - Firms in central network positions indicated good access to strategic resources and knowledge required for innovation development
  - This confirms other research in which network centrality was found to provide firms with better access to resources and opportunities for shared learning, knowledge transfer, and information exchange (Tsai 2001; Gisling and Duysters 2008)
- Inability to monitor the market and identify opportunities for innovation
  - Central firms in with many connections within the network were able to monitor the market, identify and respond to opportunities for innovation development more effectively
  - Similar results are also produced by Gisling and Duysters (2008) and Ahuja (2000)
- With such barriers eased these firms are in a better position to engage in innovation activities and so are more innovative as a result

## Key findings (cont.)

- The research also found that many of those within the network regarded public sector support within the sector as insufficient
- Cumbersome application process resulting in many refraining to seek support that may benefit their capacity for innovation and networking
  - *“A lot of the times they make it far too hard to get [the support] as well. Forms upon forms upon forms and it has to be done this way and it has to be done that way and it has to be done the other way. They do forget that we have a business to run and that we are working solid 5 days maybe 6 days a week and then they ask us to fill in a load of non-sense forms. I did not grow up filling in forms, the younger generation might but our generation did not”*

# Summary and Conclusions

- Firms within the low-tech furniture network interact with one another but to a limited degree
- Evidence indicates that firm size; absorptive capacity; and business strategy influence the assumption of a central position within this network
  - Confirming other research findings and
- A positive relationship exists between network centrality and innovation performance at the level of the firm
- The results generated in this research are similar to those produced in other investigations exploring different networks, within different industries and regions, strengthening the reliability and generalizability of these results.
- Public sector support in terms of improving innovation and networking activity within the sector is limited. In addition a cumbersome application process is discouraging many from availing of the support that is available.

## Further research

- Explore the relationship between tie strength and firm innovation within the Monaghan furniture sector networks
- Replicate the investigation within a network of high-tech firms
  - Film and television production firms located in Northern Ireland
- Enable comparisons to be made between the research results generated within a low and high-tech industry network
- Important insights into the increasingly important creative industry of NI



# Thank You

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