CS 6474/CS 4803 Social Computing: Sociological Foundations II

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Social structures, creativity, and innovation

SOTH ANNIVERSARY EDITION

THE STRUCTURE OF SCIENTIFIC REVOLUTIONS

THOMAS S. KUHN WITH AN INTRODUCTORY ESSAY BY IAN HACKING Structural Holes and Good Ideas

THINK TANK; Where to Get a Good Idea: Steal It Outside Your Group

By MICHAEL ERARD MAY 22, 2004

Got a good idea? Now think for a moment where you got it. A sudden spark of inspiration? A memory? A dream?

Most likely, says Ronald S. Burt, a sociologist at the University of Chicago, it came from someone else who hadn't realized how to use it.

"The usual image of creativity is that it's some sort of genetic gift, some heroic act," Mr. Burt said. "But creativity is an import-export game. It's not a creation game."

Mr. Burt has spent most of his career studying how creative, competitive people relate to the rest of the world, and how ideas move from place to place. Often the value of a good idea, he has found, is not in its origin but in its delivery. His observation will undoubtedly resonate with overlooked novelists, garage inventors and forgotten geniuses who pride themselves on their new ideas but aren't successful in getting them noticed. "Tracing the origin of an idea is an interesting academic exercise, but it's largely irrelevant," Mr. Burt said. "The trick is, can you get an idea which is mundane and well known in one place to another place where people would get value out of it."

Mr. Burt, whose latest findings will appear in the American Journal of Sociology this fall, studied managers in the supply chain of Raytheon, the large electronics company and military contractor based in Waltham, Mass., where he worked until last year. Mr. Burt asked managers to write down their best ideas about how to improve business operations and then had two executives at the company rate their quality. It turned out that the highest-ranked ideas came from managers who had contacts outside their immediate work group. The reason, Mr. Burt said, is that their contacts span what he calls "structural holes," the gaps between discrete groups of people.

Summary

- Role of social network structure on access to social resources
- Burt's observations:
 - Opinions and thoughts within groups are homogenous
 - People who extend themselves across the 'structural holes' between groups are exposed to diverse ways of thinking
- Brokerage across structural holes between groups can lead to greater accumulation of "social capital" – quantitatively defining the *network constraint* measure, that uses the size, density, and hierarchy measures of an individual's egonetwork
 - Hypothesis is tested with a case study of the network structure of managers in a supply chain company

Summary

- Managers asked to come up with an idea to improve the supply chain
- Then asked:
 - whom did you discuss the idea with?
 - whom do you discuss supply-chain issues with in general
 - do those contacts discuss ideas with one another?
- 673 managers (455 (68%) completed the survey)
- ~ 4000 relationships (edges)

Structural Holes (Figure 1 from Burt 2004)



Network Constraint

- Measure of the extent to which the people a respondent knows are tied to each other
- High constraint means the network is redundant and recycles information
- Low constraint = bridging between groups = good ideas

Four levels of brokerage

- Level 1
 - Make people on both sides aware of the interests and difficulties in the other
- Level 2
 - Transferring best practices from one group to another
- Level 3
 - Draw analogies between groups ostensibly irrelevant to one another (difficult for people who have spent a long time in a group because they use differences to justify continuing their behavior on the basis that the other group is a different context)
- Level 4
 - Synthesis
- A setting dependent on formal chains of command for communication is a setting rich in opportunities to coordinate directly across the formal chains

TABLE 1 Predicting Performance

The results show a strong effect of network constraint on salary, evaluation and promotion, independent of the job/age characteristics related to human capital explanations.

	1 Salary		2 Salary		3 Evaluation		4 Promotion		
Manager 1	-31,099**	(2,882)	-35,707**	(3,498)	973	(.678)	.689	(.670)	
Manager 2	-16,652**	(2,745)	-19,892**	(3,479)	863	(.631)	1.165	(.648)	
Manager 3									
(reference)									
Sr. manager	19,638**	(3,782)	15,484**	(4,143)	.116	(.843)	635	(.885)	
Executive	65,394**	(4,522)	61,930**	(4,835)	.423	(1.01)	.221	(1.08)	
Purchasing	754	(1,351)	1,811	(1,884)	.410	(.313)	.478	(.345)	
Age	338**	(52)	300**	(71)	085**	(.013)	084**	(.013)	
Bachelor	1,610	(1,003)	200	(1,401)	211	(.237)	.118	(.240)	
Graduate	734	(864)	-451	(1, 155)	208	(.203)	.182	(.204)	
Hightech	3,516**	(880)	3,150*	(1,189)	.087	(.209)	.162	(.210)	
Lowtech	-6,927**	(1, 481)	-6,607*	(2, 375)	351	(.342)	409	(.378)	
Urban 1	3,613**	(1,046)	3,947**	(1, 456)	.423	(.247)	152	(.252)	
Urban 2	5,049**	(1,010)	5,585*	(1,427)	564	(.238)	052	(.243)	
Network constraint	-7	(25)	-1	(38)	014**	(.004)	022**	(.006)	
Mgr2 × constraint	-19	(35)	-47	(58)	.004	(.008)	008	(.009)	
Mgr3 × constraint	-47	(38)	-159*	(59)	007	(.009)	.003	(.009)	
SrMgr ×									
constraint	-214*	(75)	-216*	(84)	005	(.017)	.010	(.019)	
Executive ×									
constraint	-681**	(124)	-697**	(132)	011	(.028)	.024	(.030)	
N	673		398	398		673		638	

NOTE. —Coefficients in models 1 and 2 are change in salary dollars with a unit increase in row variable (respectively .80 and .83 squared multiple correlations; network effect plotted in fig. 4). Coefficients in model 3 predict three levels of evaluation for an ordinal logit model (114.8 χ^2 with 17 *df*; network effects are plotted in fig. 4 holding age constant). Coefficients in model 4 are for a logit model predicting whether the employee was promoted in the year after the network survey or received an above average raise (100.5 χ^2 with 17 *df*; network effect is plotted in fig. 4 holding age constant). SEs are given in parentheses. * P < .05.

** P<.001.

Summary

- Main finding interconnected groups give rise to "better ideas" compared to densely intraconnected groups
- Other findings 1) organizations that collaborate with partner firms show greater financial growth; 2) higher ranked, high tech, and managers in urban settings came up with better ideas; 3) managers who brokered connections across structural holes were rewarded for brokerage in terms of compensation, performance evaluations, and promotions

Class Exercise I

To what extent are the findings on the importance of brokerage and structural holes affected by the case studies considered?

To what extent are the findings on the importance of brokerage and structural holes affected by the case studies considered?

Traditional organizations, Self-reported network structure, Hierarchical role of managers and their teams, "Good ideas" solicited from high ranked managers, The study is from more than 10 years ago, Unclear if the good ideas were implemented What are some of the variables that should have been considered/controlled for in the study?

What are some of the variables that should have been considered/controlled for in the study?

Composition of the groups, Group size, Type of organization, Company culture Can a structure (and related structural holes) be too large or small to realize the benefit of brokerage?

Recruiters with larger personal rolodexes generate no more or less output

	Revenue \$	\$ for completed searches	Completed searches	Multitasking	Duration	Duration controlling for multitasking
Size of rolodex	-10.2	-22.9	0.000	0.000	-0.013	-0.013
(Q50)	(60.3)	(32.6)	(0.001)	(0.001)	(0.021)	(0.016)

* p < 0.10, ** p < 0.05, *** p < 0.01, Standard err in paren.

Instead, a larger private rolodex is associated with:

- Less information sharing
- Less DB proficiency
- Lower % of e-mail read
- Less learning from others
- Less perceived credit for ideas given to colleagues
- More dissembling on the phone

Source: M. van Alstyne, S. Aral. Networks, Information & Social Capital (formerly titled 'Network Structure & Information Advantage'), http://papers.ssrn.com/sol3/papers.cfm?abstract_id=958158

Networks of higher degrees drive performance by providing access to novel information

- network structure (having high degree) correlates with receiving novel information sooner (as deduced from hashed versions of their email)
- getting information sooner correlates with \$\$ brought in
 - controlling for # of years worked
 - job level
 -



Non-Redundant Information Received By Ego

Source: M. van Alstyne, S. Aral. Networks, Information & Social Capital, http://papers.ssrn.com/sol3/papers.cfm?abstract_id=958158

Networks and innovation

- fully connected network converges more quickly on a solution, but if there are lots of local maxima in the solution space, it may get stuck without finding optimum.
- linear network (fewer edges) arrives at better solution eventually because individuals innovate longer



source: Lazer, David and Friedman, Allan, The Parable of the Hare and the Tortoise: Small Worlds, Diversity, and System Performance: http://ssrn.com/abstract=832627

Email structure matters

New Contract Revenue Coefficients ^a					Contract Execution Revenue Coefficients ^a				
	Unstandardized Coefficients				Unstandardized Coefficients				
	B	Std. Error	Adj. R ²	Sig. F 🏄	В	Std. Error	Adj. R ²	Sig. F 🍇	
(Base Model)			0.40				0.19		
Best structural pred.	12604.0***	4454.0	0.52	.006	1544.0**	639.0	0.30	.021	
Ave. E-Mail Size	-10.7**	4.9	0.56	.042	-9.3*	4.7	0.34	.095	
Colleagues' Ave. Response Time	-198947.0	168968.0	0.56	.248	-368924.0**	157789.0	0.42	.026	
 a. Dependent Variable: Bookings02 b. Base Model: YRS_EXP, PARTDUM, %_CEO_SRCH, SECTOR(dummies), %_SOLO. 					a. Dependent V b. N=39. *** p<	ariable: Billings02 01, ** p<.05, * p<.	2 1		

Sending *shorter* e-mail helps get contracts and finish them.

Faster response from colleagues helps finish them.

Source: M. van Alstyne, S. Aral. Networks, Information & Social Capital (formerly titled 'Network Structure & Information Advantage'), http://papers.ssrn.com/sol3/papers.cfm?abstract_id=958158

Class Exercise II

Cite a case example where the structural hole phenomenon can explain a specific characteristic of online social networks.