sunbelt

XXIV International Social Network Conference

May 12-16, 2004 Hotel Bernardin, Portorož, Slovenia

Program and Abstracts

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Sunbelt XXIV

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May 12 – 16, 2004

Portorož, Slovenia

Organizing Committee

INSNA President
Bill Richards

Anuška Ferligoj (Chair)	Gregor Petrič
Vladimir Batagelj	Tina Kogovšek
Andrej Mrvar	Matjaž Zaveršnik
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Program Committee

Patrick Doreian (University of Pittsburgh), Chair
Anuška Ferligoj (University of Ljubljana)
Vladimir Batagelj (University of Ljubljana)

Contents

International Sunbelt Social Network Conference History

	Year	Location	Keynote Speaker	Organizers
I	1981	Tampa	no speaker	H. Russell Bernard, Alvin Wolfe
II	1982	Tampa	John Barnes	H. Russell Bernard, Alvin Wolfe
III	1983	San Diego	James Coleman	Douglas White
IV	1984	Phoenix	Harrison White	Brian Foster
V	1985	Palm Beach	Linton Freeman	H. Russell Bernard, Alvin Wolfe
VI	1986	Santa Barbara	J. Clyde Mitchell	Eugene Johnsen, John Sonquist
VII	1987	Clearwater	Everett M. Rogers	H. Russell Bernard, Alvin Wolfe
VIII	1988	San Diego	Charles Kadushin	John Sonquist, Eugene Johnsen, Sue Freeman, Linton Freeman
IX	1989	Tampa	Frank Harary	Jeffrey Johnson
X	1990	San Diego	Mark Granovetter	Everett M. Rogers
XI	1991	Tampa	James Davis	Katie Faust, Jeffrey Johnson, John Skvoretz, Alvin Wolfe
XII	1992	San Diego	Peter Blau	Phillip Bonacich, Sue Freeman
XIII	1993	Tampa	A. Kimball Romney	H. Russell Bernard, Alvin Wolfe
XIV	1994	New Orleans	Barry Wellman	Scott Feld, Jill Suitor
XV	1995	London	Patrick Doreian	Martin Everett, Keith Rennolds
XVI	1996	Charleston	Bonnie Erickson	Katie Faust, John Skvoretz
XVII	1997	San Diego	H. R. Bernard, P. Killworth	Pat Doreian, Sue Freeman
XVIII	1998	Sitges	Rolf Ziegler	Jose Luis Molina, Josep A. Rodriguez, Nuria R. Avila, Frans N. Stokman, Tom A.B. Snijders, Evelien P.H. Zeggelink, Stephen P. Borgatti, Alain Degenne, Thomas Schweizer
XIX	1999	Charleston	Nan Lin	John Skvoretz, Katie Faust
XX	2000	Vancouver	Linton Freeman	Bill Richards, Andrew Seary
XXI	2001	Budapest	Martin Everett	Endre Sik
XXII	2002	New Orleans	Philippa Pattison	Tuth Aguilera, Noshir Contractor, Scott Feld, Caroline Haythornthwaite, Shin-Kap Han, Ravi Madhavan, Stan Wasserman
XXIII	2003	Cancún	Alvin Wolfe	Jorge Gil-Mendieta, Narda Alcantara Velverde, Silvia Casasola Vargas, Jorge Castro Cuellar, Alejandro Ruiz Leon, Jose Luis Molina, Samuel Schmidt, Enrique Perez Garcia
XXIV	2004	Portorož	Frans N. Stokman	Patrick Doreian, Anuška Ferligoj, Vladimir Batagelj

Program

Monday, May 10 – Tuesday, May 11

Satellite Symposium

- Tom A.B. Snijders: ***Dynamics of Networks and Behavior***; Asteria / Histrion.

Wednesday, May 12

Workshops

- Vladimir Batagelj, Andrej Mrvar, Wouter de Nooy: `Pajek` *workshop* (9h-17h, Andante / Metropol).

- Stephen Borgatti, Martin Everett: ***UCINET workshop, Introduction to the Analysis of Network Data via UCINET and NetDraw*** (9h-17h, Allegro / Metropol).

- Isidro Maya Jariego, José Luis Molina: ***Workshop in Spanish, IV Mesa Hispana para el análisis de redes sociales*** (15h-19h, Moderato / Metropol)

- Tom A.B. Snijders: ***Siena workshop, The Analysis of Longitudinal Social Network Data*** (9:30-16h, Asteria / Histrion)

- Barry Wellman: ***Barry's workshop, Networks for Newbies*** (15h-18h, Largo / Metropol).

18:00 WELCOME DRINK; Belltower of St. Bernardin's Monastery

Thursday, May 13, 8:30-10:35

Thursday	Allegro/Metropol	Nocturno/Metropol	Largo/Metropol	Moderato/Metropol	Tartini/Metropol
May 13	Policy Networks – 1	Network Dynamics – 1	Social Support – 1	Knowledge Networks Within and Between Organizations – 1	Methods – 1
Chair	V. Schneider	S. Drobnič	H. Iglič	D. De Lange	V. Batagelj
8:30-8:55		*Social Networks and the Problem of Time* Daniel A. McFarland Skye Bender-deMoll	*Tit-for-Tat and All That: Reciprocity among East Yorkers* Gabriele Plickert Rochelle Cote Barry Wellman	*The Relational Structures of Learning : Elementary Forms and Evolution of Advice Networks* Emmanuel Lazega Claire Lemercier Lise Mounier Ana Maria Falconi Philippa Pattison Tom A.B. Snijders	*A New Approach to Role Assignment* Jürgen Lerner Ulrik Brandes
8:55-9:20		*Social Networks and Group Affiliation: A Dynamic Analysis* Sonja Drobnič	*Social Support Networks of Individuals Living in Different Family Forms* Polona Dremelj Mateja Nagode	*Knowledge Transfer: Communication Networks and Individuals' Roles* Rick Aalbers Wilfred Dolfsma Otto Koppius	*The Complement Graph and Negative Data* Martin Everett Stephen Borgatti
9:20-9:45	*Inter-State Collaborations in Science and Technology in India A Network Analysis of Parliament Questions* Nirmal Haritash	*Affiliation within Boundaries: Niche Size, Shape and Positioning in the Blau-Space* Gabor Péli	*Life Stages, Network Structure, and Network Support in Urban Beijing* Gina Lai Rance P.L. Lee Danching Ruan	*Do Modern Systematic Design Methods Affect The Creativity of Engineering Design Teams?* Roger Th.A.J. Leenders Jan Kratzer Jo M.L. van Engelen	*Binary Choices on a Social Network* Moses A. Boudourides
9:45-10:10	*Prevention and Attention of the Domestic Violence through Policy Networks: A Study of Three States in México* María del Rosario Campos Beltrán	*Network Attrition, Membership Commitment and Parallel Ties* Ezra W. Zuckerman Stoyan V. Sgourev	*Transformations in the Support Networks of Older Persons in Taiwan and the Philippines* Emily Agree Elizabeth Costenbader	*Networks of Practice, Work Proximity, and Knowledge Transfer between Professional Groups* Elisa Mattarelli Maria Rita Tagliaventi	*An Exponential Family of Permutation Models for Comparison of Adjacency Structures* Carter T. Butts
10:10-10:35	*A Social Network Analysis among the Korean Provinces: Examining Relationship Between Information and Transportation Flows among Provinces* Han Woo Park Kang-Dae Lee George A. Barnett Jang-Hyun Kim	*Culture Wars and Dynamic Networks: A Hopfield Model of Emergent Structure* Michael W. Macy James A. Kitts Andreas Flache Steve Benard	*Social Networks of Elderly in Slovenia* Valentina Hlebec	*Social Networks and School Bullying: Patterns of Friendship and Victimization* Robert Faris Susan T. Ennett Karl E. Bauman Andrea Hussong Vangie A. Foshee	*The Bernard Estimator: A Simulation Study in Case of Overlapping Subpopulations* Silvia Snidero Dario Gregori

Thursday, May 13, 11:00-13:05

Thursday	Allegro/Metropol	Nocturno/Metropol	Largo/Metropol	Moderato/Metropol	Tartini/Metropol
May 13	**Inter-Organizational Networks – 1**	**Network Dynamics – 2**	**Social Support – 2**	**Knowledge Networks Within and Between Organizations – 2**	**Methods – 2**
Chair	**M. Pahor**	**T.A.B. Snijders**	**M. Dekker**	**E. Lazega**	**S. Borgatti**
11:00-11:25	*Prominence in Inter-Organisational Communication Networks: The Weakness of Strong Ties* Stephen Pryke	*In Search of Stars: Efficiency, Equity and the Dynamics of Network Formation* Jakob Goeree Arno Riedl Aljaž Ule	*Recovery From Natural Disasters and "The Strength of Weak Ties"* Christine Avenarius Jeffrey C. Johnson	*The Two Network Structures That Facilitate Innovation in Large Organisations* Mats Lingblad	*"Natural" Groupings and Roles in Social Networks Based on Eigenvector Centrality* Geoffrey Canright Kenth Engo-Monsen Asmund Weltzien
11:25-11:50	*Conflict and the Structure of Interorganizational Social Networks* Katherine L. Woodard Patrick Doreian	*Kinship in Family Transition – A Network Approach to Kin Ties in "New" Family Forms* Anna-Maija Castrén	*Network Support and Psychological Distress in Two Chinese Cities: Beijing and Hong Kong* Rance P.L. Lee Gina Lai Danching Ruan	*The Network Structure of Knowledge Advancement* Gianluca Carnabuci	*Geometric MST Clustering of Text Network Collections* Steven R. Corman Marco Gaertler Dorothea Wagner
11:50-12:15	*Multiplex Embeddedness in Interorganizational Networks* Maurits de Klepper Peter Groenewegen Gerhard van de Bunt	*Four Years of Friendship: Preliminary Findings from the Notsoec College Social Network Study* Jenny Godley	*Risk Sharing Relations in Rural Zimbabwe: An Empirical Investigation Using Social Network Analysis.* Marleen Dekker	*Creativity in Complex Innovations: Using Social Networks to Create Knowledge* Arent Greve	*Eigen System Analysis of Hermitian Adjacency Matrices of Perturbed Star Graphs* Bettina Hoser Andreas Geyer-Schulz
12:15-12:40	*Evolution of Tie and Capability Based Roles in a Modular Business Network Structure An Experimental Study* Diederik W. van Liere Lorike Hagdorn Martijn R. Hoogeweegen Peter H. M. Vervest	*Linking, Jumping and Other Selection Strategies in Freshmen Networks* Chris Baerveldt Ronan Van Rossem Gerhard van de Bunt Marjolijn Vermande	*Levels of Multiplexity and Types of Support Providers: Personal Networks of Indian Immigrants in Argentina* Isidro Maya Jariego Lía de la Vega		*Eigen System Analysis of Hermitian Adjacency Matrices as a Tool to Explain Group and Subgroup Behavior over Time* Jan Schröder Bettina Hoser Andreas Geyer-Schulz
12:40-13:05	*Are Corporate Reputations Contagious? A Social Network Effects Theory of Corporate Reputation* Tim Williams			*Knowledge Sharing and Group Pressure* Dino Ruta Noshir S. Contractor	*Analysis of the Diffusion of a Software Client in a Social Network Based on Eigenvector Centrality* Asmund Weltzien Geoffrey Canright Kenth Engo-Monsen Fahimeh Pourbayat

Thursday, May 13, 15:30-17:35

Thursday	Allegro/Metropol	Nocturno/Metropol	Largo/Metropol	Moderato/Metropol	Tartini/Metropol
May 13	**Inter-Organizational Networks – 2**	**Networks and Development**	**Elites Networks, Democratic Transition**	**Knowledge Networks Within and Between Organizations – 3**	**Methods – 3**
Chair	**A. Rus**	**J. Boase**	**E. Sik**	**L. Mounier**	**B. Hoser**
15:30-15:55		*A Network Approach to the Analysis of Equity in Community Involvement in a Participatory Research* Frédéric Mertens Johanne Saint-Charles Donna Mergler	*Covering the Elite Structure of a Modern Western Society. The Case of Austria.* Doris Spielthenner Ruth Pfosser Christian Gulas Maximilian Ruhri Harald Katzmair	*Team's Social Capital and Knowledge Creation* Jar-Der Luo Wei-Sheng Hui	*Local Clustering in Bipartite Graphs: Theoretical Models and Some Empirical Comparisons.* Malcolm Alexander Garry Robins
15:55-16:20	*The Social Times of Network Spaces: Sequence Analysis of Network Formation and Foreign Investment in Hungary, 1987-2001* David Stark Balazs Vedres	*Comparing Sociometric and Egocentric Measures of Indirect Exposure to a Mass Media Family Planning Program in Ghana* Marc Boulay	*Elite Social Structure and Democratization* Andrew D. Buck	*Social Network Structures in Knowledge Based Team: The Importance of Social Capital for Job Performance* Filip Agneessens Daniëlle De Lange Hans Waege	*Islands* Matjaž Zaveršnik Vladimir Batagelj
16:20-16:45	*The Banks in the Mexican Corporate Network* Alejandra Salas Porras Jorge Castro Jorge Gil-Mendieta	*A Social Network Analysis of Contraceptive Use by Women in Rural Bangladesh* Kaberi Gayen Robert Raeside Michael Pearson	*Political Capital, Party-Bloc Homophily, Sociopolitical Cleavages in Hungary* Róbert Tardos	*The Effect of Social Interaction on the Creation, Development and Success of New Ideas in R&D Labs* Bob Kijkuit	*Centrality Indices, Graphs, Matrices, Matrix Norms, and Statistics* Geoffrey Tootell Amy Vu
16:45-17:10	*The Evolution of Interlocking Directorates* Johan Koskinen Christofer Edling	*Disseminating HIV/AIDS Knowledge in Rural Namibia* Kim Witte Rachel Smith Merissa Ferrara Nithya Muthuswamy Erna Keulder	*Social Networks and the Process of "Spontaneous" Privatization in Post-Communist Hungary* Larissa Adler Lomnitz Diana Scheinbaum	*Correlating Temporal Communication Patterns of Online Communities With Innovation* Peter A. Gloor Rob Laubacher Scott B.C. Dynes Yan Zhao Gregor Schrott	*Recent Advances in the Application of the Galileo System for Social Networks* Joseph Woelfel George A. Barnett Raymond Hsieh Hao Chen Varsha Tickoo
17:10-17:35	*Adding Information about Relationships to Traditional Social Network Measures: Does It Add to the Prediction of Behavior?* Karl E. Bauman Robert Faris Susan T. Ennett Andrea Hussong Vangie A. Foshee	*Social Network Analysis Techniques for Monitoring and Evaluating Headquarters-Level, Collaborative International Development Activities.* Harold D. Green, Jr.	*Network Capital Dependent Path Dependency* Endre Sik Andras Lapos	*Friends Don't Go Downhill: Informal Contacts and the Performance of Innovation Teams* Jan Kratzer Tamas Bartus	*Network Autocorrelation Analysis to Loosely Coupled Interactions by using Presence Memos on Mobile Internet Phones : A Study for Personal Network Assistance* Satoru Watanabe Yoichiro Higuchi
18:00-19:00	**Smaragdna/Bernardin: Keynote lecture**: Frans Stokman, *What Binds Us When With Whom? The Importance of Microfoundations for Social Network Analysis*				
20:00 –	**Smaragdna/Bernardin: BANQUET**				

Friday, May 14, 8:30-10:35

Friday	Emerald I	Mediteranea I	Mediteranea II	Adria	Emerald II
May 14	**Inter-Organizational Networks – 3**	**Civil Society and Public Sphere – 1**	**Networks and Trust**	**Knowledge Networks Within and Between Organizations – 4**	**Network Modelling – 1**
Chair	**K. Woodard**	**S. Muetzel**	**T. Kogovšek**	**S. Zaccarin**	**C. Butts**
8:30-8:55	*Alliance Formation in the Software Industry During the Period 1992-2000* Francois Collet	*Network Dependence of Political Entrepreneurs* Dimitrios C. Christopoulos	*Trust and Cognitive Social Structure as Drivers of Relational Changes* David Dekker Philip-Hans Franses David Krackhardt	*Social Network Analysis as a Method for Expert Localisation and Sustainable Knowledge Transfer* Tobias Mueller-Prothmann	*Neighbourhood-Based Models for Social Networks: Model Specification Issues* Philippa Pattison Tom A.B. Snijders Garry Robins
8:55-9:20	*Network Analysis as Means of Planning for the Formation of International Strategic Alliances – The Example of The Austrian Railway Cluster* Gerhard A. Wührer	*Transactions, Social Bonds, and Controls in Civic Networks* Delia Baldassarri Mario Diani	*Personal Networks and Trust* Hajdeja Iglič	*IT-Supported Monitoring and Analysis of Social Networks in Virtual Knowledge Communities* Matthias Trier	*New Transitivity Specifications for Exponential Random Graph Models: Avoiding Near-Degeneracy.* Garry Robins Tom A.B. Snijders Philippa Pattison
9:20-9:45	*Evolution of Organizational Rationality in Social Complexity Interorganizational Networks in Environmental Biotechnology Industry* Hyung Sam Park	*Destabilization of Terrorist Networks: A Comparative Study* Maksim Tsvetovat Kathleen M. Carley	*Investigating the Relationship Between Social Capital and Trust in a Social Network Context* Ralph Matthews Sandra Enns Todd Malinick Brian Elliott	*Chances of Innovative Cooperation in Computer Supported Team Working Processes* Gerit Götzenbrucker	*Network Evolution Models with Actor-Dependent Random Coefficients* M. Schweinberger Tom A.B. Snijders
9:45-10:10	*Social Network Dynamics and Entrepreneurship: the Relevance of Complementary Assets* Joan Solé Jaume Guia	*Creating Society: Networks of Organized Civil Society in Spain* Fredesvinda Mérida José L. C. Bosch Josep A. Rodríguez	*Social Networks and Pro-Social Behaviour: Preliminary Results From Cross-Cultural Economic Experiments* Abigail Barr Jean Ensminger Jeffrey C. Johnson	*Managing the Boundary of an "Open" Project* Siobhán O'Mahony Fabrizio Ferraro	*Pseudolikelihood Estimation of Biased Net Models* John Skvoretz
10:10-10:35	*Exploration and Exploitation Clusters in the Internet Industry* Koen Dittrich Bob Kijkuit		*Who do You Call in a Crisis? Reliability vs. Capability for Trusted Communication* Denise Anthony Eleanor Lewis	*The Role of Time and Social Structure Dynamics in the Formation of a Collective Mind: An Empirical Investigation* Santi Furnari Giuseppe Soda	*Analysis of Large Genealogies with Pajek* Andrej Mrvar Vladimir Batagelj

Friday, May 14, 11:00-13:05

Friday	Emerald I	Mediteranea I	Mediteranea II	Adria	Emerald II
May 14	**Inter-Organizational Networks – 4**	**Civil Society and Public Sphere – 2**	**Networks and Identities**	**Research Networks: Non-Academic**	**Network Modelling – 2**
Chair		**D. Christopoulos**	**W. de Nooy**	**M. Trier**	**J. Skvoretz**
11:00-11:25	*From Words to Numbers to Graphs: A Suggestion on How to Analyze Inter-Organizational Networks Using Archival Sources* Joerg Raab	*Some Patterns of NGO Networking in A High-Growth Industrial Region: A Case Study of the Kryviy Rih Region of Ukraine* Oleh Dyachenko	*Balance and Classification* Wouter de Nooy	*Collaboration in Networks of Public Funded Coordinated Programs* Jürgen Guedler Lothar Krempel	*Widening the Boundaries: A Review of the Past Fifteen Years of Agent-Based Simulation Models* Michael J. Ashworth Kathleen M. Carley
11:25-11:50	*A Measurement Model of Tie Strength for Business Networks: The Case of a Dutch High-Tech and an Indian Low-Tech Organization* Victor Scholten Suresh Bhagavatula Gerhard van de Bunt Tom Elfring		*Concepts of Network Centrality In Relation to Adolescent Peer Groups and Antisocial Behavior* John M. Light Phillip Bonacich Thomas J. Dishion	*Using 2-Mode Network Analysis to Understand Complexity in R&D Environments* Jonathon E. Mote	*Dynamizing Static Networks — Simulation Experiments in the Context of Power Structures* Harald Katzmair Jürgen Pfeffer
11:50-12:15	*Relational Dimension of Social Capital and Ego-Networks among Small Entrepreneurs.* Francesca Odella	*The Effect of Internet on Civic Engagement* Kakuko Miyata	*Ethnic Identity and Personal Networks in Sarajevo* Claudia Aguilar José Luis Molina	*R&D Networks in Greece, 1995-2001* Despina Tomadaki Moses A. Boudourides Eleutherios Papayannakis	*Monte Carlo Studies on the Spatial Random Graph Model* Ling Heng Wong Philippa Pattison Garry Robins
12:15-12:40	*Measuring Social Capital Effects in Business via the SNA.* Marina Burakova-Lorgnier Tatiana Bouzdine-Chameeva	*Power in Public Spheres – A Network Analysis. The Discourse on EU Governance Structures* Silke Adam	*Networks of Identification to Europe. Friendship and Identities of European Students.* Ainhoa de Federico	*Social Networks and Professionalization: The Case of Five Complementary and Alternative Medicine Occupations* Beverly Wellman Laura Lunansky Merrijoy Kelner	*MCMC estimation of the p_2 model* Bonne J.H. Zijlstra Marijtje A.J. van Duijn
12:40-13:05		*Some Aspects of the Discursive Competition between German Newspapers and the Construction of Capital City Journalism* Sophie Muetzel	*Lake Wobegon Upside Down: The Paradox of Status Devaluation* Stoyan V. Sgourev	*Networks as Resource and Modus Operandi: The Case of Private Business Schools in Central and Eastern Europe* Nina Bandelj David Gedlicka Danica Purg	*Cooperation in Network Formation Games* Aljaž Ule Arno Riedl
14:30 –	**Pečina/Bernardin: POETRY READING by Aleš Debeljak**				

Friday, May 14, 15:30-17:35

Friday	Emerald I	Mediteranea I	Mediteranea II	Adria	Emerald II
May 14	Inter-Organizational Networks – 5	On-Line Communities – 1	Homophily	Academic Scientific Networks	Network Modelling – 3
Chair	F. Odella	J. Hersberger	I. Talmud	G.Coenders	
15:30-15:55	*Social Capital and Access to Business of Entrepreneurs in the French Construction Industry* Catherine Comet	*Information and Communication Technologies and the Structure and Maintenance of Personal Support Networks* Keith Hampton	*Fuzzy Homophily in Interpersonal Relationships* David R. Schaefer	*What Makes Sciences Innovative? The Measurement of Innovation Potential and its Application in the Austrian Academic Research Network* Wolfgang Neurath Harald Katzmair	*Using High-Level Petri Nets for Modeling Dynamics of Social Networks* Istvan Back
15:55-16:20	*Interplay of Individual and Community Social Capital. An Empirical Investigation among Business Starters.* Boris F. Blumberg	*Formation and Characteristics of Internet Assisted Friendship and Sex Networks* Sevgi O. Aral Divya Patel King K. Holmes Betsy Foxman	*Centrality-Based Homophily and Micro-Macro Linkage* Soong Moon Kang	*Unevenness in the Growth of Medical Knowledge: Network Analysis of Coronary Angioplasty* Gindo Tampubolon Ronnie Ramlogan	*Efficient Generation of Random Networks* Vladimir Batagelj Ulrik Brandes
16:20-16:45	*Networks, Trust, and Performance* Andrej Rus	*Information Acquiring-and-Sharing in Internet-based Environments: Examining a Social Networking Behavior* Kevin Rioux	*Sex, Society and Association: A Cross-National Study of the Strength of Homophily by Sex* Matthew E. Brashears	*Academic Genealogies and Reproductive Schemes from a UNAM[1] Researchers Sample.* Jorge Gil-Mendieta Alejandro Ruiz	*Dynamic Discrete Behavioral Choice on Networks: The Nested Logit Model – Analytical Results and Empirical Application* Elenna Dugundji Laszlo Gulyas
16:45-17:10	*Social Networks, Social Capital and Absorptive Capacity* Jaume Guia Jordi Comas	*A Star is Born, But Can She Help? : The Interplay of an Electronic Social Network and Online Social Support* Antonina Bambina	*Homophily and Social Networks in Computer Mediated Communication: A Study of Adolescents in Israel.* Gustavo S. Mesch Ilan Talmud	*Structural Properties and Evolution of Academic Networks: Some Evidences from the Demographer Network in Italy* Giulia Rivellini Susanna Zaccarin	*"Robust" Estimation of a Linearized Gravity Model via Unbiased Decomposition: Linear-ORDEC* Yoichiro Higuchi
17:10-17:35	*Many Links = Internet?: The Role of Social Capital on the Diffusion of Information Technologies in a Rural Area of Hungary* László Letenyei Eliza Eranus Sarolta Láng	*Neighboring and the Internet: Ties Across the Street* Benjamin Forman Keith Hampton	*Social Networks in French Wedding Parties* Florence Maillochon	*Changing Paradigm in the Social Sciences Based on Network Analysis* Samuel Schmidt Jorge Gil-Mendieta	*The Emergence of Complex Exchange Networks* Andreas Flache Josep M. Pujol Ramon Sangüesa Jordi Delgado

Friday, May 14, 18:00-18:50

Friday	Emerald I	Mediteranea I	Mediteranea II	Adria	Emerald II
May 14	**Inter-Organizational Networks – 6**	**Small World Research**	**Student Networks**	**Actors Located in Networks**	**Viszards Session**
Chair	**J. Raab**	**S. Feld**	**H. Katzmair**		**L. Freeman**
18:00-18:25	*Kinship Networks in Two Italian Industrial Districts: A Pre-Test* Ester L. Rizzi	*How to Search a Social Network* Lada Adamic Eytan Adar	*A Newly Available "Old Dataset": The Development of Network Relationships Among Freshmen at University.* Wolfgang Sodeur	*Structurally Important People: Gantze Macher or Nebbish?* Mark Fleisher Christopher McCarty	*Analysis and Visualization of Network Data* Vladimir Batagelj Ulrik Brandes Jeffrey C. Johnson Lothar Krempel Andrej Mrvar
18:25-18:50	*Regional Productive Systems From a Network Analysis Perspective* María Semitiel-García Pedro Noguera-Méndez	*A Cosmopolitan Model of the Small World* Scott L. Feld	*Detecting broker roles in a large network: A German freshmen population* Volker G. Täube	*Peer Nomination as a Method of Selecting Socially Influential Young People for Peer-Led Interventions: A Social Network Perspective* Jo Holliday Laurence Moore	*Viszards session*

Saturday, May 15, 8:30-10:35

Saturday	Emerald I	Mediteranea I	Mediteranea II	Adria	Emerald II
May 15	Intra-Organizational Networks and Job Performance – 1	Social Influence and Diffusion – 1	Social Capital and Social Resources – 1	Networks and Health – 1	Documents, Words and Networks
Chair	A. Rus	D. Dekker	H. Flap	C. Steglich	P. Carrington
8:30-8:55	*Cultural Influences on Social and E-mail Communication Networks Work Related Communication in a Multinational Firm* Peter Groenewegen Rubin van der Heiden	*Weak Ties Are Not So Strong After All* Linton C. Freeman	*It's Not Only Who You Know, It's Also Where They Are: Using the Position Generator to Examine Access to Socially Embedded Resources* Sandra Enns Ralph Matthews Todd Malinick	*The Impact of Social Networks and Social Support on People's Perceived Health Status in Ireland.* Deirdre M. Kirke Kevin P. Balanda Jane Wilde	*Analysis of US Patents Network* Nataša Kejžar Simona Korenjak-Černe Vladimir Batagelj
8:55-9:20	*Interpersonal Affect and Instrumental Work Ties* Tiziana Casciaro Miguel Lobo	*Structure Matters: An Analysis of Consensus Formation in Social Networks* Fabio Rojas Tom Howe	*How Social Capital Changes Over Time* Bonnie H. Erickson	*Relationship of Personal Social Support Network and Subjective Well-Being among Non-Disabled and Disabled People* Laura Szabó	*Network Analysis of Word Association Thesaurus* Aleš Žiberna
9:20-9:45	*Internationalisation of Public Utilities: Do Cultural. Geographical and Political Factors make an Impact on Ownership Structure?* V. Popov	*Notes on the Social Influence Within Organizations* Jan-Erik Johanson	*The Invisible Hand of Social Capital* Nan Lin	*Social Network Position and Physiological and Psychological Outcomes* Jeffrey C. Johnson Lawrence Palinkas James Boster	
9:45-10:10	*Interdependencies, Power-Coalitions, and Co-worker Cooperation: A Social Network Analysis* Stefan Thau Marijtje A.J. van Duijn Rafael Wittek	*Interaction and Consensus in Research* Erin Leahy Joseph F. Cabrera	*Social, Cultural, and Economic Resources and Job Attainment: The Position Generator as a Measure of Cultural and Economic Resources* Henk Flap Beate Völker	*Intra-Organisational Networks, Well-Being and Job Strain: Analysing Social Capital and Social Liability at the Workplace* Riku Nikkilä	*Roles Analysis of a Publication Network Based on Eigenvector Centrality* Kenth Engo-Monsen Geoffrey Canright Asmund Weltzien
10:10-10:35	*Structural Logic of Network Organizations* Olaf N. Rank	*From Innovation to Social Norm: Bounded Normative Influence* D. Lawrence Kincaid	*Measuring Social Capital in a Network* Ainhoa Unamuno Ángel Arboníes Marisol Basabe	*Structures of Workplace Well-Being* Minna Janhonen	*Centrality in Student Networks and the Reception of Relevant Information* Mark Trappmann

Saturday, May 15, 11:00-13:05

Saturday	Emerald I	Mediteranea I	Mediteranea II	Adria	Emerald II
May 15	Intra-Organizational Networks and Job Performance – 2	Social Influence and Difussion – 2	Social Capital and Social Resources – 2	Networks and Health – 2	Networks Measures: Validity and Reliability
Chair	O. Rank	F. Rojas	N. Lin	M. Pearson	D. Brewer
11:00-11:25	*Analysis of Interactions Network in Workgroup* Johanne Saint-Charles Pierre Mongeau	*Torn between Like and Dislike: The Effects of Ambivalence on Social Influence in Attitude Formation* Gerhard van de Bunt Zuzana Sasovova	*Social Capital in Organizations – Perspectives and Unresolved Issues* Christian Waldstrom	*Psychology, Agency and Network Structure: The Relationship Between Individual Predispositions, Structural Holes and Network Closure.* Yuval Kalish Garry Robins	*Meta Analysis of Reliability and Validity Estimates for Egocentered Network Data Using a Multilevel Multitrait Multimethod Model* Germa Coenders Lluís Coromina
11:25-11:50	*Real Communication Networks: Companies and Beyond* A. Arenas L. Danon A. Díaz-Guilera R. Guimerà	*What Determines the Congruence of Proxy- and Self-Reports on Attitudes towards Immigrants in Germany?* Angela Jäger	*The Making of Social Capital in a Low-Income Community* Breno Fontes	*The Dynamic Mutual Influence between Networks and Individual Behavior, and its Application to Adolescent Friendship and Smoking* Tom A.B. Snijders Christian E.G. Steglich Michael Pearson	*Multilevel Multitrait Multimethod Model. Application to the Measurement of Egocentered Social Networks* Lluís Coromina Germa Coenders Tina Kogovšek
11:50-12:15	*Cooperation Network Structure and Individual Performance in a Global Investment Bank* Martin Gargiulo Gokhan Ertug Charles Galunic	*The Effects of Social and Political Networks on Voting Behavior in Taiwan* Jay Chih-jou Chen	*Markets and Networks: Chinese Immigrants with Poor Social Capital* Janet Salaff Arent Greve	*An Intervention Using Peer Supporters to Spread Anti-Smoking Messages Through Their Social Networks: Rationale, Implementation and Impact in 30 Schools* Laurence Moore Jo Holliday	*The Reliability of Social Support Items: Giver-Receiver Asymmetries across Gender and Ethnic Boundaries* Christian E.G. Steglich Chris Baerveldt
12:15-12:40	*A Model of the Impact of Social Capital on Career Outcomes* Claire Gubbins Thomas Garavan	*Preference Profiles on a Social Network* Stelios S. Scarlatos Moses A. Boudourides	*Marital Networks as Social Capital: Data from the Newly Weds* Yang-chih Fu Nan Lin Jay Chih-jou Chen	*Individual and Relational Characteristics Associated with the Stability of Injection Drug Users' Personal Relationships* Elizabeth Costenbader Carl Latkin	*Stability of Measures of Centrality and Prominence Based on Fixed Choice Data Collection Modes* Barbara Zemljič Valentina Hlebec
12:40-13:05	*To Dislike and To Be Liked: Self-Monitoring, Affect-Intensive Relations and Work Performance* Zuzana Sasovova Michaéla C. Schippers	*Social Capital and Diffusion: Relationships and Attributes Overtime* Christina Prell	*Social Networks of Otomí Migrants in Mexico City* Andrea Scholz		*Collective Action and Network Stability* Károly Takács Béla Janky

Saturday, May 15, 15:30-17:10

Saturday	Emerald I	Mediteranea I	Mediteranea II	Adria	Emerald II
May 15	**Networks and Global Processes – 1**	**On-Line Community – 2**	**Antisocial Behavior**	**Networks and Health – 3**	**Data Collection and Sampling – 1**
Chair	**J. Rodriguez**	**G. Petrič**	**P. Carrington**	**J. Johnson**	**U. Brandes**
15:30-15:55	*International Tourism: Economic Patterns and Tourist Flows* Lothar Krempel	*Strong Ties, Weak Ties, and ICT Ties: Results from the Pew Social Ties Survey* Jeffrey Boase Barry Wellman John B. Horrigan Lee Rainie	*Differential Associations, Control Theory, and the Strength of Weak Ties – Assessing Criminological Theories by Means of Social Network Theory* Mattias Smangs	*Findings from the Teenage Health in Schools Study* Michael Pearson Patrick West Robert Young Helen Sweeting Jacki Gordon Katrina Turner	*Interviewer Effects in the Elicitation of Sexual and Drug Injection Partners* Devon D. Brewer John J. Potterat Stephen Q. Muth
15:55-16:20	*The World City Network as a Social Network* Ben Derudder	*Knowledge Construction, Virtual Neighborhoods Architecture, Mechanisms and Design Features in Online Communities* Reuven Aviv Zippy Erlich Gilad Ravid	*Friendship and Delinquency of Adolescents* Andrea Knecht Chris Baerveldt	*Personal, Contextual and Network Influences on Gay Men's Behaviour* Anthony Smith Jeffrey Grierson David Wain Marian Pitts Philippa Pattison	*A Higher Level Approach of Informant Accuracy for Complete Social Networks* Daniëlle De Lange Filip Agneessens Hans Waege
16:20-16:45	*Greek Anti-Globalisation Networks in the Early 2000s* Iosif A. Botetzagias Moses A. Boudourides	*Information Sharing and Community Building in an Internet-based Learning Environment* Julia Hersberger Kevin Rioux Ray O'Keefe Cruitt	*Competition and Differentiation as an evolving Network* Ivar Vermeulen Jeroen Bruggeman	*Contexts of Friendship. Friendship Patterns in Different Social Settings* Beate Völker Henk Flap	*Inconsistent is Different from Inaccurate* Patrick Kenis Ulrik Brandes
16:45-17:10	*An Empirical Test of Theories of World Divisions and Globalization Processes* Paulette Lloyd	*By the Community, for the Community: An Analysis of Open Source Software Projects* Yutaka Hamaoka	*Masculinities and Violence in Secondary Schools* Dean Lusher Garry Robins	*An Explorative Study of Romantic Love and Social Network in Singapore* Chan Wing Lun	*The missing link: Non-Respondents in Social Network Surveys* Gerd Beidernikl

Saturday, May 15, 17:35-18:50

Saturday	Emerald I	Mediteranea I	Mediteranea II	Adria	Emerald II
May 15	**Networks and Global Processes – 2**	**On-Line Communities – 3**	**Visualization**	**Software for Networks**	**Data Collection and Sampling – 2**
Chair	**M. Boudourides**	**G. Barnett**	**L. Krempel**	**B. Richards**	**V. Vehovar**
17:35-18:00	*Structural Equivalence and International Conflict, 1816-2000: A Social Networks Analysis of Dyadic Affinities and Conflict between States* Zeev Maoz Lesley Terris Ranan D. Kuperman Ilan Talmud	*The Structures of Relationships and Communication in Large Instant Messaging Network.* Dominik Batorski	*Visualization of Personal Networks* Christopher McCarty	*Software for Statistical Analyses of Social Networks* Marijtje A.J. van Duijn Mark Huisman	*Collecting Data on Ego-Centered Social Networks on the Web: Methodological Issues* Katja Lozar Manfreda Gašper Koren Vasja Vehovar Valentina Hlebec
18:00-18:25	*Social Network Analysis and Productivity Growth* Juan Carlos Barahona	*Temporal Characteristics of email Interactions in an Academic Environment* Scott B.C. Dynes Gregor Schrott Peter A. Gloor	*Analysis and Visualization of Genealogies: Ragusan Patriciate in the Fourteenth and Fifteenth Centuries* Irena Vipavc Polona Dremelj Andrej Mrvar Vladimir Batagelj	*Extracting Structural Models of Macro Social Cognition about Categories from Electronic Archives of Public Discourse* Mark T. Kennedy	*Sub-sampling of Alters as a Mean to Reduce the Respondent Burden in Egocentric Social Network Questionnaires* Luka Kronegger Vasja Vehovar Valentina Hlebec Gašper Koren
18:25-18:50	*Networks of Economic Power in Europe* Josep A. Rodríguez Julián Cárdenas Christian Oltra				*Variance Estimation and Design Effects in Respondent-Driven Sampling* Matthew J. Salganik
21:00 –	**Arcade/Bernardin: CONCERT Fake Orchestra**				

Sunday, May 16, 8:30-10:10

Sunday	Emerald I	Mediteranea I	Mediteranea II	Adria	Emerald II
May 16	**Policy Networks**	**World Wide Web**	**Personal Networks**	**Networks and Academic Achievement**	**Exchange Networks / Game Theory**
Chair	**F. Stokman**	**G. Robins**	**J. Molina**	**A. Ferligoj**	**K. Tákacs**
8:30-8:55	*Uncovering Integration Linkages: The Effect of Differential Commitment* Robyn Keast Kerry Brown	*National Nodes' International Web In-Degree and Their Internal Content Structures: Middle-Eastern Domains* James A. Danowski	*Is There a Turn Towards Networked Individualism?* Bernie Hogan Barry Wellman	*Social Ties of Doctoral Students in Slovenia as Social Capital* Anuška Ferligoj Tina Kogovšek Uroš Matelič Valentina Hlebec	*Representations of Exchange: A bilateral exchange experiment* Jacob Dijkstra Marcel van Assen
8:55-9:20	*The Challenge of Operationalizing* Actor-Centered Institutionalism*: Examples of Power Scenarios in Policy Networks* Nicolas D. Hasanagas	*A Network Analysis of International Internet Hyperlinks* George A. Barnett Han Woo Park	*Are French Networks Different?* Michel Grossetti	*Religion and Academic Engagement: The Role of Social Networks* Jennifer L. Glanville David Sikkink	*Statistical Models for Real-Valued Exchange Networks* Christopher Wheat
9:20-9:45	*Networks of Political Action and Socio-Technical Coordination: Business Associations in the U.S. Information and Communication Sector* Volker Schneider Johannes Bauer	*The network of the Slovenian World Wide Web: How hypertextual is it?* Gregor Petrič	*A Re-Evaluation of the Community Question Based on Wellman's Perspective* Marina Hennig	*The Influence Of Homophily On Information And Individual Knowledge Sharing* Antoinette Saint Hilaire	*Trust and Trustworthiness in Negotiated Exchange* Davide Barrera
9:45-10:10	*Measuring and Testing Homogeneity and Status Seeking of Actors in Networks* Marcel van Assen Frans N. Stokman	*The Architecture of the Internet Hyperlinks: A Network Analysis* Teodora Erika Uberti	*Does Distance Make a Difference for Relationships?* Diana Mok Ranu Basu Barry Wellman	*The Role of Social Networks in Adolescents' Educational Self-Efficacy Beliefs and Aspirations* Markku Jokisaari Jukka Vuori Petri Koivisto Jari-Erik Nurmi	*Network Formation against Free-riders: An Experiment with Intergroup Mobility* Jun Kobayashi Hirokuni Ooura
10:30	**INSNA** *Business Meeting*				

Abstracts

Monday and Tuesday, May 10-11, 2004

Symposium Dynamics of Networks and Behavior

Tom A.B. Snijders (University of Groningen, The Netherlands)

This two-day symposium is about methods, models, and empirical applications concerning the mutual influence between the dynamics of relational networks and the dynamics of individual behavior (including individual attitudes, performance, etc.). The focus is on linking theoretical, statistical, and substantive empirical research on dynamics in complete networks.
The symposium focuses on topics such as:

- mutual influence between friendship and smoking, drug taking, or other lifestyle or health-related behaviors;

- the genesis and evolution of norms in networks;

- dynamics of networks and economic performance;

- dynamics of communication patterns and communication behavior;

- statistical methods for the dynamics of networks and behavior;

- visualization of network dynamics.

The purpose is an intensive exchange between researchers interested in substantive questions concerning the mutual influence between relational networks, and researchers interested in methodological issues concerning this domain. There are only invited presentations.

Wednesday, May 12, 2004

Pajek – Analysis of Large Networks

Vladimir Batagelj and *Andrej Mrvar* (University of Ljubljana, Slovenia)
Wouter de Nooy (Erasmus University Rotterdam, The Netherlands)

The workshop consists of three parts. In the first part we present an introduction to the use of Pajek based on our textbook on social network analysis *Exploratory Social Network Analysis with Pajek*.

In the second part we present some efficient approaches (valued cores, triangular and short cycle connectivity, citation weights, pattern search, generalized blockmodeling, islands) to analysis and visualization of real-life large network (genealogies, collaboration networks, citation networks, Internet networks, dictionary networks, 2-mode networks). We will also discuss the 'fine-tuning' of Pajek's layouts (pictures).

In the last part participants will have an opportunity to discuss about the use of Pajek (questions, suggestions, analysis of specific data...). To actively follow the workshop bring your laptop with you. Program Pajek is available at:

`http://vlado.fmf.uni-lj.si/pub/networks/pajek`

Introduction to the Analysis of Network Data via UCINET and NetDraw

Stephen Borgatti (Boston College, Massachusetts, USA)
Martin Everett (University of Westminster, United Kingdom)

A beginners tutorial on the concepts, methods and data analysis techniques of social network analysis. The course begins with a general introduction to the distinct goals and perspectives of network analysis, followed by a practical discussion of network data, covering issues of collection, validity, visualization, and mathematical/computer representation. We then take up the methods of detection and description of structural properties such as centrality, cohesion, subgroups, cores, roles, etc. Finally, we consider how to frame and test network hypotheses. An important element of this workshop is that all participants are given a demonstration version of UCINET 6 for Windows and the Netmap visualization software, which we use to provide hands-on experience analyzing real data using the techniques covered in the workshop. In order to participate fully in the workshop, participants should bring laptop computers so that they can run the analyses on their machines at the same time as they are being demonstrated by the instructors.

IV Mesa Hispana para el análisis de redes sociales

Isidro Maya Jariego (Universidad de Sevilla, Spain)
José Luis Molina (Universitat Autonoma de Barcelona, Spain)

The aim of this workshop is to provide a space for researchers from Iberoamerica interested in the network perspective to present their ongoing projects and join the international com-

munity. The workshop is structured in two parts: a presentation of the state of the art by the organizers and a brief presentation of papers by the participants. More information in `www.redes-sociales.net`.

Siena – The Analysis of Longitudinal Social Network Data

Tom A.B. Snijders (University of Groningen, The Netherlands)

Longitudinal social network data are understood in this workshop as two or more repeated observations of a directed graph on a given node set (usually between 30 and 100 nodes, sometimes up to a few hundreds). In other words, this workshop is about statistical modeling of the dynamics of complete networks. The workshop teaches the statistical method to analyze such data, as described in *Sociological Methodology - 2001*, p. 361-395, and implemented in the *SIENA* program. The statistical model used for the network evolution allows various network effects (reciprocity, transitivity, cycles, popularity, etc.), effects of individual covariates (covariates connected to the sender, the receiver, or the similarity between sender and receiver), and of dyadic covariates. One interpretation of this model is an actor-oriented model where the nodes are actors whose choices determine the network evolution. Further information about this method, including references and a JAVA demo, can be found at website `http://stat.gamma.rug.nl/snijders/siena.html`. The statistical analysis is based on Monte Carlo simulations of the network evolution model and therefore is a bit time-consuming.

The computer program *SIENA* is included in the package *StOCNET* which runs under Windows. The workshop will demonstrate the basics of using *StOCNET* and *SIENA*.

Attention will be paid to the underlying statistical methodology, to examples, and to the use of the software. The morning session will focus on the intuitive understanding of the model and operation of the software. The afternoon will continue this, and also present some further mathematical background. Some attention will be paid also to a recent development: models for the simultaneous dynamics of networks and behavior; and to the use of SIENA for the $p*$ or (equivalently) Exponential Random Graph Model.

Participants are requested to check website

`http://stat.gamma.rug.nl/snijders/siena.html`

in the week before the workshop to download the workshop materials.

Networks for Newbies

Barry Wellman (University of Toronto, Canada)

This is a non-technical introduction to social network analysis. It describes the development for social network analysis, some key concepts, and some key substantive methods and findings. It is aimed at newcomers to the field, and those who have only seen social network analysis as a method.

Thursday, May 13, 2004

Policy Networks 1 8.30

Diversity and Cross-Border Policy Networks

Dietmar Paier and *Gerd Beidernikl* (Center for Education and Economy, Austria)

The growing diversity of the European Union in times of enlargement and the problem of stimulating sustainable cohesion is the red thread in major EU debates. The suggested paper takes up the issue of developing cross-border networks in labour market and economic integration processes at both levels, theoretical and methodological. Its primary interest is to develop and to present models concerning the usability of network theory and social network analysis for analyzing the development of cross-border policy networks.

The unfolding of political multi-level systems triggers a development that can be characterized as shifts in the governmental balances and further development of political and institutional processes, structures and behavioural patterns of societies involved. The paper will concentrate on two core issues: Firstly, a theoretical model of the influence of diversity factors (political, institutional, cultural, social and economic factors) on the scope and limits of cross-border network building in labour market and economic interaction shall be developed. With regard to the aim of the European Union - advanced regional cohesion - cross-border networks create and represent important modes of enhanced communication and collaboration of elite actors based on diverse politico-institutional, social and other backgrounds. Therefore, the adverse and benign factors in the newly emerging network's environment will be scrutinized in order to understand the potential of deepening cross-border relations through cross-border network relations.

Secondly, methodological implications shall be discussed. Based on the assumption that "external" factors influence the developmental capacity of cross-border networks, methodological models to assess and to measure the relations between properties of cross-border networks and its environmental factors have to be developed. These models will be discussed by a combination of network data and simulations of environmental variables. Finally, the question of applicability of the models developed for future research on policy networks will be of interest.

Cross-Sector Networks of Care for Multiple Health Morbidities: Service Landscapes for Persons with HIV and Severe Mental Illness in Los Angeles and New York

Peter Mendel, *Gery Ryan*, and *Paul Koegel* (RAND Corporation, USA)

A growing body of literature has examined the network characteristics of community health systems (Provan et al. 2002; Provan and Milward 1995; Wright and Shuff 1995; Goldman et al. 1994, 1992). However, current research is still limited in analyzing these local inter-organizational networks from the perspectives of the many service sectors accessed by persons with multiple health morbidities, such as HIV and severe mental illness (SMI), as well as their

effectiveness in terms of health outcomes for individual clients.

This paper provides a unique analysis and comparison of the service landscapes for persons with both HIV and SMI in New York and Los Angeles. In contrast to previous work, the study constructs the local networks of care using a representative sample of individual HIV-SMI clients in each locale, and includes data from service agencies across the mental health, HIV treatment, social service, and drug treatment sectors serving this population. The data, collected as part of an NIMH-funded study, include network linkages and organizational characteristics from over 65 programs per city (response rates of approximately 90%).

The analysis will compare the composition and structure of service networks in Los Angeles and New York, supplemented by both key informant interviews on the community/network contexts and systematic qualitative data on service coordination gathered from each participating organization. We will also address other innovations in network methodology implemented in the study, including the use of multiple techniques for eliciting organizational linkages from respondents. This analysis will form the basis for future examinations relating network structure, network position and other characteristics of service organizations to objective as well as self-reported measures of individual health outcomes.

Topics: inter-organizational networks, community health systems, mental health, HIV/AIDS, co-morbidities, service coordination, integration, comparative network structure, network methods

Inter-State Collaborations in Science and Technology in India A Network Analysis of Parliament Questions

Nirmal Haritash (National Institute of Science Technology and Development Studies, New Delhi, India)

Introduction

In Parliamentary democracies the role of Parliament is gaining ever increased significance in perceiving the role of science in appropriating government decisions on the policy issues of science. So far, there are no indicators of Parliamentary influence on S&T policy, which ultimately determine the future of national S&T systems. Our present concern is to construct indicators of Parliamentary influence on the policy issues of science.

The "Question-Hour" in the Parliament forms a special component of the proceedings of the Parliament in making inquiries from the government about the implementation of the policies and programmes and to suggest ways and means to improve the performance of the government. In the course of time this forum of Parliament has gained considerable importance. This is evident from the fact that the total number of questions asked by the Members of Parliament (MPs) during the Question-Hour have increased progressively. Taking S&T questions raised during the Question-Hour as indicators of S&T activity being understood and performed at different levels in the Parliamentary democracy, the S&T questions raised during the Question-Hour have been content analyzed. A comparative trend analysis of data for the period 1951-1998 reveals an ever increase in the growing concern of the Parliament for science. This has been exhibited through an increase in the proportion of S&T policy related questions from about 5% to about 20% in the overall questions raised in the Parliament. Along with the growth of S&T related issues in the Parliament there has been a shift in the sectoral priorities for the

development of science for its impact on society.

The structure of the data exhibits that the Parliamentary concerns for science is not always limited to the party ideologies and is not only restricted to the geographic boundaries. Since, many of the S&T policy questions raised in the Parliament cut across party line while others cross geographic boundaries. As, these S&T questions are raised by joining together of MPs belonging to different political parties and/or by the MPs from different regions and states. Co-sponsorship of MPs in raising a question in the Parliament, implies more widespread ness of concern of MPs on that issue of science than the question raised by a single Member of Parliament.

Objectives

The present study focuses on the co sponsorship pattern among the Members of Parliament on S&T related issues raised during the "Question-Hour" period. Such a quantitative analysis reflects the common concern of the MPs for S&T issues, inspite of their belonging to different geographical regions, called "states". These states differ in respect of geographic area, size of population and level of social and economic development.

Since, the strength of inter-state co sponsorship among MPs play a significant role in determining (pressure groups) the effectiveness of Parliament in deciding policy issues on science. In this context our present concern is to construct indicators of inter-state co-operation among MPs on policy issues on science. The specific concerns of the indicators used are to examine the:

- Dynamics of co-sponsorship among MPs wherein MPs belonging to different states collaborate in raising issues of wider national concern.

- The extent and nature of co-sponsorship along with the propensity among MPs states for collaboration on S&T issues.

- The very structure of co-sponsorship on S&T policy issues among different states and the position of various states in the collaboration network.

Methodology

The Data

A content analysis of Parliament questions was performed to classify the questions into different categories and to depict the widespread ness of concern for science in Parliament in: i) assigning sectoral priorities to science in the fulfillment of national goals ii) and their perception of the way science be managed in the country, in the present and future context. It involved quantitative and qualitative categorization of S&T issues through classification schemes adopted for different aspects of MPs participation in S&T issues along with the projection of socio-economic and cultural background of MPs concern and interest in the policy issues of science.

A database of Parliament Questions on S&T related issues has been set up which covers years from 1951 to 1998. The database comprises more than 10,000 questions classified into 14 socio-economic categories and 8 policy categories. The present study is based on the sub-set of data for the 12th Lok Sabha, year 1998.

Measurement of Inter-state collaborations

In the present study the collaboration among 28 states of the Indian Union (including union territories) has been examined based on the count of S&T policy related inter-state co-sponsored questions in the context of total S&T policy related questions raised in the Parliament.

The network of collaboration links of states is created in order to study the following:

- The structure of the network of linkages among the states. How are the various states linked among themselves and which state collaborates with whom and to what extent?

- Which are the states that fall in the center of network and which are the states that fall in the periphery of the network?

The network of collaboration links among 28 Indian states which have at least contributed 5 science questions in a year (1998) have depicted in the form of a (valued) adjacency matrix:

$$C =\mid Cij \mid$$

Where Cij indicates the number of collaboration links between the state I and the state j. Obviously Cij = o, since these links are bi-directional and the matrix is symmetric.

Based on the co-sponsorship linkage matrix we constructed indicators of the following:

Inter-State Collaboration Index: Inter-state collaboration index measures the incidences of inter-state collaboration links of a state compared to the number of questions on S&T issues raised by the state.

E-I Index: E-I Index for each state is computed to identify whether co-sponsorship varies with the size of the state and what is the extent of inter-state linkages in the overall linkages. The E-I Index (Krackhardt and Stern 1998) compares the number of internal and external links within the groups in the network

Affinity-Index: Affinity-Index of each state is calculated to measure the affinity towards other co-sponsoring states in raising S&T issues. Affinity index is a measure of collaborations between a given state A and the other state B compared to the total collaborations of the given state A with all the other states in a given period of time.

With a view to give concrete shape to the inter-state linkages and to quantify the position of different states in the network we have used the software UCINET V. Through the software we computed the Eigenvector Centralities of different States and the Network Centralization Index.Whereas, the distance between the different states in the network has been determined through Dissimilarity Matrix. The data of the normalized matrix has been transformed into a graph for giving a visual representation to the pattern of linkages. Krack Plot 3.0 was used to plot the graph the maps yielded by MDS algorithm.

Analysis and Results

The analysis reveals that almost all states have collaborated with other states on S&T policy related issues. However, there are significant differences in the nature and extent of collaboration links between different states. State to state affinity among different states reveals that propensity between two states depends upon the size of the state, its geographic location and its status in terms of the socio-economic developments achieved. The structure of multivariate relationship of states analysed through multi-dimensional scaling reveals that a few states have

strong collaborative links as they occupy central position in the collaboration network, whereas, others have comparatively weak links as they are situated on the periphery of the network of collaborative links among states.

Conclusions

The data and analysis presented in the study provides useful insight into the very structure of relationship among different states in dealing with the important issues of science. The variations in the pattern of collaborative linkages among different states reflects upon the variations in the interests among different pressure groups in the Parliament about the way science should perform; is an important feed back to the Government in deciding future S&T policy of the country.

Prevention and Attention of the Domestic Violence through Policy Networks: A Study of Three States in México

María del Rosario Campos Beltrán (Universidad Nacional Autónoma de México, Mexico)

In this paper, the notion of policy networks is seen from two viewpoints: as a form of mediation, and as a form of government. Both views comprise the conceptual, theoretical foundation which explains the influence that relationships have upon the actors, in order to identify domestic violence as a problem, include it on the public agenda, and design, implement and evaluate specific policies for its prevention and attention. This explanation draws from formal network anaysis for its composition, morphology and structure.

The networks of three Mexican federal entities are studied: the Federal District, Guanajuato and Puebla, where inititatives and programs are implemented to attend to and prevent intra-marital domestic violence, and where there is a legal framework to punish domestic violence.

A Social Network Analysis among the Korean Provinces: Examining Relationship Between Information and Transportation Flows among Provinces

Han Woo Park (Yeung Nam University, South Korea)
Kang-Dae Lee (Seoul National University, South Korea)
George A. Barnett and *Jang-Hyun Kim* (State University of New York at Buffalo, USA)

This paper examines network flow patterns among the South Korean provinces based on social cohesion theory. Since the inauguration of new president Moo-Hyun No, social cohesion has become of great interest to S. Korean government policy makers focusing on such problems as community solidarity and information inequality. However, few studies have tried to document these issues using a quantitative method. Social cohesion represents a set of social ties among the members of society who have shared social and communicational connections. In this sense, the connected structure of inter-provincial relations may be well examined through social network analysis.

Data on telecommunications, Internet connectivity, bus passengers, and freight transportation among the 16 provinces are analyzed to describe the relational structure of S. Korea. The provinces are as follows: Seoul, Bu-san, Dae-gu, In-cheon, Kwang-ju, Dae-jeon, Ul-san, Kyung-gi, Kang-won, Chung-buk, Chung-nam, Chon-buk, Chon-nam, Kyeong-buk, Kyeong-nam,

Che-ju. The research is expected to answer the following questions:

1. Are all four indicators of the network flows among the provinces are similar or different? Specifically, what are relations between information and transportation flows among provinces? Which variable among province-based indicators such as regional wealth explains and predicts the relations best?

2. Which province is at the center or periphery of S. Korean life? Is the structure revealed by this analysis reflects inter-provincial information inequality?

3. What are the factors that may facilitate or impede social cohesion in S. Korea? Do the causing factors fall outside both the ability and scope of regional polity entities?

Topics: social networks in Asia, communication networks, social cohesion

Network Dynamics 1 8.30

Social Networks and the Problem of Time

Daniel A. McFarland and *Skye Bender-deMoll* (Stanford University, USA)

A core assumption of network theory is that social relations arise from stable patterns of interaction (Nadel 1957). However, researchers have never established the unit (or even range) of time-aggregation where we observe the link between interactional form and social structure. Moreover, they have never identified the units of time-aggregation at which interactional and network mechanisms most apply (Collins 1981). In our paper, we broach the subject of time and networks and begin a series exploratory analyses that identify not only those time-aggregations at which stable patterns of communication arise, but the time-aggregations at which network and interactional mechanisms most influence pattern stabilization. For such analysis, we use unique data on 800,000 streaming interactions in classrooms and vary the unit of time-aggregation used from seconds, to minutes, to half-hours, etc (see McFarland and Bender-deMoll 2004). We then assess whether certain interactional mechanisms (e.g., stylistic forms of speech) or network mechanisms (e.g., balance, homophily, centralization, and clustering) generate stability in relational patterns over time. We perform these analyzes using, on the one hand, dynamic network visualizations, or network movies, that illustrate the change in social dynamics as we alter time-aggregations (Moody, McFarland, and Bender-deMoll 2004), and on the other, multi-level growth curve models that allow us to identify the salience of various mechanisms to relational stability as units of time vary (Snidjers and Bosker 1999).

Topics: network dynamics, time, interaction, visualization, multi-level modeling

Social Networks and Group Affiliation: A Dynamic Analysis

Sonja Drobnič (University of Hamburg, Germany)

This paper builds on the imagery of the individual and "social" in Georg Simmel's metaphor on the "intersection of social circles" (Simmel 1922). The individual is linked to society through his/her affiliation with social circles or social groups. On the one hand, the overlapping group affiliations created by a single individual tie together different groups in social space. On the other hand, groups with which a persons affiliates, "intersect" in one and the same person and uniquely define this person's position in the society. This approach recognizes multiple levels of social structure, and the importance of social ties between actors at various levels. Implicitly, a dynamic relationship is assumed between individuals and groups; however, the time dimension and the exact mechanisms of individuals' movement through social space are not explicitly developed.

In this paper, I attempt to depict the movement of individuals through various social circles as a series of career trajectories in occupational organizations and voluntary associations. Two different mechanisms operate to shape the relationship between career lines in occupational and voluntary organizations. The first is competition for resources, notably competition for members' time; the second consists of network mechanisms operating in the intergroup relations. According to the theory, the probability of membership creation depends upon the social network ties that connect individuals in social space. In other words, voluntary organizations recruit new members through the network ties of the existing members. Since joining an occupational organization exposes a person to more network contacts (particularly in terms of weak ties), this should facilitate and increase the probability of affiliation in voluntary associations.

The assumptions of the theory concerning the effect of social network characteristics on organizational affiliation are tested, using event-history analysis of survey data on the timing of entry to organizational membership, and data on ego centered social networks. Results confirm the effect of career trajectories in occupational organizations on the rate of joining voluntary associations. They also support the hypotheses that network size and network distance increase joining rates for voluntary associations, and network density suppresses joining rates.

Affiliation within Boundaries: Niche Size, Shape and Positioning in the Blau-Space

Gabor Péli (University of Groningen, The Netherlands)

This paper concerns networks embedded into an *N*-space (Freeman 1983). Distance between nodes is Euclidean, and the space is spanned by *N* sociodemographic characteristics (Blau-space). Occupants of some focal nodes (focal agents) seek network ties to potential associates. As the chance of affiliation decreases with distance, each focal agent has a limited catchment area or niche in the Blau-space. Three aspects of niche-based affiliation are addressed.

1. *Niche shape.* In biology and social sciences, niches are considered as rectangles (McPherson 1983) or as spheres (Péli and Nooteboom 1999). The presentation suggests that affiliates' perception pattern can determine the niche shape to be expected.

2. *Optimal niche size.* Increasing niche diameter gives access to more nodes, but the prob-

ability of affiliation diminishes with distance. This tradeoff may imply an optimal niche breadth. The optimum is sensitive to the pattern how affiliation chance decreases with distance, and also to *N*.

3. *Niche positioning.* If niches get close to each other, then neighboring focal agents have to share their access to certain nodes. Assume that establishing ties with nodes outside the niche is non-desired (cliques). How to pack up the *N*-space with niches in a way that prevents interference between them? Two arrangements are compared. The niche centers form a net of *N*-cubes in the first, an arrangement that builds up simply but bad in space utilization. The second is based on dense sphere packings (Conway and Sloane 1998); it maximizes the number of non-interfering niches, but the price to pay is a tedious search process.

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Network Attrition, Membership Commitment and Parallel Ties

Ezra W. Zuckerman (MIT Sloan Business School, USA)
Stoyan V. Sgourev (Stanford University, USA)

This work is one of the first attempts to explicitly target the issue of network attrition. It goes beyond the dichotomy of self-interest versus "collective logic" in seeking to illuminate a concrete set of mechanisms that reinforces membership in social structures. The analysis demonstrates that performance indicators are insufficient to account for the observed patterns of network departure. We compare three types of network relationships – help/advice, friendship and motivation/inspiration, looking both at aspects of an individual firm's ties to others as well as macrostructural variables. The social content of ties, much more so than the resources flowing through them or the perception of membership benefit, is responsible for the observed patterns of member retention. The analysis thus lends credence to sociological arguments about membership "faithfulness", without discounting altogether the role of self-interest in sustaining participation in the network.

At the individual level of analysis, a notable finding is the primacy of perceived integration in the group over status-maintenance as a mechanism for enhanced membership loyalty. Identification with positive role models and the perception of a friendly environment provide much more powerful incentives for continued membership than the prestige accorded via nominations by

network peers. At the group level, the results suggest that the distribution of ties, rather than their volume, matters for membership commitment.

Topics: attrition, commitment, peer networks

Culture Wars and Dynamic Networks: A Hopfield Model of Emergent Structure

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James A. Kitts (University of Washington, USA)

Andreas Flache (University of Groningen, The Netherlands)

Steve Benard (Cornell University, USA)

Why do populations often self-organize into antagonistic groups even in the absence of competition over scarce resources? Is there a tendency to demarcate groups of "us" and "them" that is inscribed in our cognitive or social architectures? We look for answers by exploring the dynamics of influence and attraction between computational agents. Our model is an extension of Hopfield's attractor network. Agents are attracted to others with similar states (the principle of homophily) and tend to converge toward the states of agents to whom they are attracted, given the strength and valence of the social tie. Negative valence implies xenophobia (instead of homophily) and differentiation (instead of imitation). Consistent with earlier work on structural balance, we find that networks can self-organize into two antagonistic factions, without the knowledge or intent of the agents. We investigate this tendency as a function of network size, the number of potentially contentious issues, and agents' openness and flexibility toward alternative positions. The surprising finding is that the global alignment of a multi-dimensional opinion space along a single polarizing definition of opposing ideologies is facilitated by the ideological flexibility and open-mindedness of local constituents.

Social Support 1 8.30

Tit-for-Tat and All That: Reciprocity among East Yorkers

Gabriele Plickert, *Rochelle Cote* and *Barry Wellman* (University of Toronto, Canada)

Reciprocity has been much talked about, studied in laboratory experiments, and discovered in bounded villages and desert islands. Yet, as far as we know, it has never been sytematically studied through survey research in an unbounded urban population. We use data from the second East York (Toronto) study of a large sample of ties (N=350), building upon our NetLab's extensive analysis of social support in this district of Tor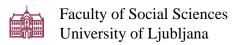onto. We address the following questions: 1. To what extent do specific exchanges of the same kind of support happen over and above what one would randomly expect? 2. To what extent does generalized reciprocity happen, in which one kind of support is exchanged for another? 3. To what extent do other characteristics of a tie (tie-strength, frequency of contact, role relationship) affect the likelihood of reciprocity. 4. To what extent do the personal resources of Egos and network members affect reciprocity? 5. To what extent does the extent of suppotiveness in an Ego's network affect reciprocity over

and above the characteristics of each Ego-network member's ties and personal resources? As our data come from 1979, they provide the further advantage of allowing a baseline comparison with how relationships have changed in conjunction with new forms of communication, such as the Internet and cellphones. This is the focus of our new Third East York study of relationships in an era of "network individualism".

Social Support Networks of Individuals Living in Different Family Forms

Polona Dremelj and *Mateja Nagode* (Inštitut Republike Slovenije za socialno varstvo, Slovenia)

The conditions of contemporary society directly influence the living of individuals and their relations to others. In modern and premodern societies people were engaged in different social groups and collectivities such as family and kin. In contemporary society the process of individualization enables people to establish individualized living conditions and forms. Individualization also enters into the area of the family. Traditional family is losing its monopoly due to pluralization of family forms and forms of cohabitation. Despite growing possibilities for selection among many alternatives relations among family and kin are still strong and important for individual.

The paper examines the personal support networks of the residents of Slovenia in order to confirm that despite growing individualization in contemporary society people in need still rely on family and kin. The data were collected in the year 2002 by telephone interview on a random sample of 5012 residents of Slovenia. We obtained the list of alters with 9 name generators for four dimensions of social support: minor material support (helping with domestic work, borrowing tools...), major material support (repairing the house, borrowing money...), emotional support (conversation about important things), and social companionship.

In the paper we want to examine the differences in personal support networks between people who live in different living arrangements (forms of cohabitation). We examine the size and composition of personal support networks with special emphasis on proportion of family and kin members in the network. We also examine gender differences in size and composition of personal support networks (number of studies have shown that differences between men and women exist in the composition of their support networks) and other socio-structural differences in personal networks.

Life Stages, Network Structure, and Network Support in Urban Beijing

Gina Lai (Hong Kong Baptist University, Kowloon Tong, Hong Kong)
Rance P.L. Lee (Chinese University of Hong Kong, Shatin, Hong Kong)
Danching Ruan (Hong Kong Baptist University, Kowloon Tong, Hong Kong)

In the course of an individual's life, he/she tends to play different roles at different times. To successfully cope with the varying role demands at different life stages, the individual has to acquire different kinds of resources. The social embeddedness of resources and its consequences for individual well-being have been extensively documented in research literature. The types of resources are further found to be associated with network structure. In addition, the supportive function of social networks has been largely assumed in previous research. Very few studies

have examined the burden arising from expectations of network member and demands of obligatory ties, which are often linked to life stages. Thus the issue arises: Whether a social network of given structural properties would give similar benefits to individuals at different life stages. The present paper aims to answer this question by examining the impact of life stages on the relationship between network structure and social support. Data from a community survey of 1004 adults in urban Beijing will be used for analysis.

Topics: social support, interpersonal networks, life stages

Transformations in the Support Networks of Older Persons in Taiwan and the Philippines

Emily Agree and *Elizabeth Costenbader* (Johns Hopkins Bloomberg School of Public Health, USA)

With advancing age comes the loss of many relationships. Parents, siblings, and spouses, as well as many friends, die or move. These changes mean that the social and support networks of older persons may be transformed over time as older family members and friends are replaced by younger ones, and networks become smaller, more localized, and increasingly dominated by relatives, especially adult children and grandchildren. Research in Western countries has shown that, although the support networks of older persons are largely stable (Wenger 1986; Scharf, 1997), over time, they become increasingly composed of kin (Wenger 1990; Miller and McFall, 1991; van Tilburg, 1995) especially in response to widowhood (Broese van Groenou, 1997) and ill health (Miller and McFall, 1991; Bowling, et al. 1995).

In Asia, where family support remains paramount, even in the course of rapid social and economic development, less is known about the stability of support networks and their response to adverse events, such as ill health or economic hardship. Newly available longitudinal data from the Philippine Survey of the Near Elderly and Elderly, and the Taiwan Survey of Health and Living Status of the Elderly allow the examination of dynamics in the nature of support and degree of involvement of family members over time in two unique settings. Intergenerational social support is operationalized as the financial, material, and instrumental support that older adults and their immediate relatives (non-coresident siblings, spouses, and children) give and receive. Using social network measures of support activation and multiplexity (Agree et al., 2001), we examine support within and across types of kin within families. These measures allow us to evaluate how family structure affects support provided, and the extent to which changes in family structure affect the amount and type of support provided, as well as who in the family becomes involved.

Topics: support networks, personal networks, longitudinal, aging populations

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Social Networks of Elderly in Slovenia

Valentina Hlebec (University of Ljubljana, Slovenia)

Owing to growing number of elderly it is necessary to study their social support networks. Based on representative sample of elderly in Slovenia six distinct types of social support networks were found using multivariate cluster analysis. These six types of social support networks were classified into three qualitative types, namely local family dependent social support networks that represent 65% of all networks. Locally integrated social support networks represent 15% of all networks and wider community focused support networks represent 21% of the sample. Within respondents with local family dependant social support networks a group of elderly with very small networks can be found. Together with elderly, having wider community focused support networks, this group is probably the one that will need additional formal sources of social support.

Topics: elderly, social networks, clustering, social support, network typology

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Knowledge Networks 1 8.30

The Relational Structures of Learning: Elementary Forms and Evolution of Advice Networks

Emmanuel Lazega (Université des Sciences et Technologies de Lille, France)
Claire Lemercier (Université de Paris, France)
Lise Mounier and *Ana Maria Falconi* (Lasmas-IdL-Cnrs, France)
Philippa Pattison (University of Melbourne, Australia)
Tom A.B. Snijders (University of Groningen, The Netherlands)

Building knowledge and sharing it in social settings depends in part on how members manage their relationships, especially in maintaining, creating, dropping social ties on which they rely for learning, for example in advice networks. In this paper, we first look at relational substructures that are particularly likely to emerge in one particular advice network (that of the judges of the Commercial court of Paris) using p* models (Pattison, 2003 version). In this analysis we find that, consistent with a previously developed micro-sociological theory of rationality (Lazega, 1992), building knowledge and sharing it in social settings partly depends on access by members to "authority arguments" (hierarchical and expert). Based on this result, we then examine the evolution of this advice network over time to find new indicators for this relationship between learning and authority relationships. Characteristics of actors creating new advice ties or dropping old advice ties are examined separately and jointly. Tests using SIENA (Snijders, 2002) find structural effects and characteristics of members that tend to confirm the existence of this relationship between learning and authority relationships.

Knowledge Transfer: Communication Networks and Individuals' Roles

Rick Aalbers, *Wilfred Dolfsma* and *Otto Koppius* (Erasmus University Rotterdam, The Netherlands)

Innovation within a firm often results from combining knowledge that already exists, but which is dispersed throughout the firm. Combining or recombining knowledge is, however, by no means obvious. This study uses network data to look at the factors that drive the knowledge transfer process between divisions within a large multi-divisional firm, to make two contributions.

Although, first of all, the role of informal networks is often emphasized as driving innovation, we show that the formal network is also a significant determinant of inter-divisional knowledge transfer. This implies, as we argue, that there are two parallel and related routes by which this transfer of knowledge can occur. One route is through informal contacts between employees of different divisions, usually at lower levels of the divisions. The other route is through formalized inter-divisional meetings, usually at higher levels of the divisions.

Previous studies showed that an employee's *betweenness* centrality positively influences the degree to which this employee is involved in the inter-divisional knowledge transfer process. We corroborate this finding, but argue that by solely looking at centrality, valuable information about the contribution of individuals and the roles they play in the knowledge transfer process

is being left out. We thus find, secondly, following Gould & Fernandez (1989), that individual actors within the network can be distinguished based on their brokerage role in transferring knowledge and that different brokerage roles have different effects on inter-divisional knowledge transfer. We re-interpret Gould & Fernandez' (1989) five *brokerage roles* in triads by distinguishing between two internally and three externally oriented brokerage roles. We show that employees with an externally oriented brokerage role in both the formal, but particularly in the informal network, are more likely to be involved in inter-divisional knowledge transfer. Besides offering a contribution to the existing literature, these results can help organizations to improve inter-divisional innovation processes.

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Do Modern Systematic Design Methods Affect The Creativity of Engineering Design Teams?

Roger Th.A.J. Leenders, *Jan Kratzer* and *Jo M.L. van Engelen* (University of Groningen, The Netherlands)

Modern design projects require design methods that must be flexible, allow for the task variety involved, and be capable of being planned, optimized, and verified. As a result, integrated systematic design methods have become widely used. In this paper we study the effect of modern design methodology on the creativity of design teams. First, we propose that four principles underlie modern design methodology: hierarchical decomposition, systematic variation, satisficing, and discursiveness. The literature on team creativity has argued that creativity strongly depends on the communicational network of a team. We therefore discuss the effect of the four design principles on team communication network and empirically test how communication networks affect team creativity. We find that integrated modern systematic design methods indeed affect design team creativity. The main conclusion of the paper is that the design principles work together and need to be considered as an integrated whole. Design team creativity can only effectively be managed by using and aligning all four of them.

Networks of Practice, Work Proximity, and Knowledge Transfer between Professional Groups

Elisa Mattarelli and *Maria Rita Tagliaventi* (University of Bologna, Italy)

In both academic and managerial literature knowledge management has gained an increasing attention and recently a new analytic category has been proposed: the community of practice. The community of practice is a spontaneous and self-managing system with three distinctive features: first, the sharing of working practices as a basis for the transfer and generation of knowledge; second, the awareness of belonging to a group possessing unique, distinctive and lasting values, which can themselves be directly linked to practices; and third the emergence

of mutual and regular interactions among members. Given the vital importance that knowledge be operational, there is a need for research that can capture the ways in which interactions among individuals construct, extend, and transfer knowledge. Practices are also the means for transferring knowledge within networks of practice, i.e. spontaneous groupings of peers with similar skills and positions, albeit mostly in relation to different organizations and therefore with links weaker than those pertaining to communities. Of particular importance, and as yet unexplored empirically, are the kind of relations between heterogeneous communities and networks of practice that cut across an organization, as viewed from the perspective of an organization as a "community of communities". The present research is explorative in nature and aimed at an understanding of exchanges of knowledge between groups of professionals belonging to different networks of practice within a context characterized by a high level of task interdependence. We examine the main issues in the literature, focusing on the object of research and the analytic category adopted: respectively, knowledge, and communities and networks of practice. A series of research questions are formulated and the process of generation and transfer of knowledge is studied by means of an ethnography realized in the radiotherapy unit of a major hospital in Northern Italy.

Social Networks and School Bullying: Patterns of Friendship and Victimization

Robert Faris, *Susan T. Ennett*, *Karl E. Bauman*, *Andrea Hussong*, and *Vangie A. Foshee* (University of North Carolina at Chapel Hill School of Public Health, USA)

The focus of this paper is the relationship between position in a friendship network and position in a network of victimization. Data come from a longitudinal survey of middle and high school students in three counties in North Carolina. At wave 1, all public school students in grades 6, 7, and 8 for each county were asked to participate, resulting in over 5,000 participants divided among 29 grade/class networks. The biannual survey, administered in schools, began in the spring of 2001 and is ongoing. In addition to questions concerning substance use and delinquency, the survey asks students to nominate up to five of their best friends. Waves 4 and 5 add questions asking students to nominate up to five students whom they are mean to or pick on and up to five students who are mean to or pick on the respondent.

We use a p* regression to model the presence of a bully-victim (BV) relationship among ordered pairs of students, testing the effects of popularity, friendship distance, demographic heterogeneity, and position in or outside of friendship groups. Among BV pairs, we further test the effects of popularity, network position, and demographics on the form (direct physical attacks, direct verbal abuse, and/or indirect behind the back manipulation) and frequency of victimization.

Methods 1 8.30

A New Approach to Role Assignment

Jürgen Lerner and *Ulrik Brandes* (University of Konstanz, Germany)

Role assignments are partitions of the set of actors of a social network, such that equivalent actors have "similar" links to other actors. The use of equivalence relations, however, involves a serious problem: an equivalence relation declares two actors as being either indistinguishable (in terms of their social role) or totally unrelated. Since many pairs of actors will be somehow, but not totally role equivalent, this seems to be an inappropriate model for real-world data. A solution of this problem would be the assignment of real-valued (in contrast to boolean) "degrees of equivalence" to pairs of actors.
Here we define a relaxation of equivalence relations that generalizes properties of the boolean definition. This yields similarities for which we introduce a regularity condition that translates the condition of regular equivalence relations to our model. Our approach is based on a vector space interpretation and leads to an elegant, yet highly applicable mathematical formulation of structural positions. The broad utility of this perspective is illustrated on several examples, including the detection of core-periphery structure.

The Complement Graph and Negative Data

Stephen Borgatti (Boston College, USA)
Martin Everett (University of Westminster, United Kingdom)

Most social network data is collected on positive relations. Whilst some data is collected on negative relations the special nature of the data means that certain standard methods are not applicable to such data. In particular many techniques have an underlying assumption that the network is a basic structure in which things flow. Nothing could be further from the truth in negative relations. Given any graph G then we can easily construct the complement graph G' which has the same vertex set but G' has an edge whenever G does not have an edge. In this paper we discuss social network methods with respect to negative relational data and the complement graph.

Binary Choices on a Social Network

Moses A. Boudourides (University of Patras, Greece)

Each actor – located on a node of an arbitrary graph (assumed to represent the social network over which actors are embedded) - is choosing to adopt one of two states. To reach such a decision, actors are considering the states of their neighbors (adjacent nodes) but they possess their own propensities according to which they define how many of their neighbors should have adopted a state so that they might follow them in the same choice or they might persist in their previous choices. Initially actors states are defined arbitrarily. Subsequently, actors are randomly (or arbitrarily) chosen in order to decide whether they prefer to preserve or to change

their states accepting or resisting to their neighbors' influences. We are interested in the emergence of equilibrium profiles in which actors' state are stabilized and they cannot change further on. Our general result is that the total population of actors is decomposed in a number of blocks connected with each other such that actors' states alternate on each block. The case of a single block represents the homogeneous equilibrium profile in which a single state dominates over the whole network (lock-in of a global cascade). However, depending on the graph, heterogeneous equilibrium profiles might emerge in which the two states can coexist over the graph as they are sustained over different blocks of the graph. Furthermore, we are investigating the path (or history) dependence of such equilibrium profiles in the sense that the latter depend on the scheduling of the series of actors decisions, i.e., the succession of actors who are choosing their states - according to the above rules - at each step of the simulation.

An Exponential Family of Permutation Models for Comparison of Adjacency Structures

Carter T. Butts (University of California, USA)

A common problem in network analysis is the comparison of multiple (possibly valued) adjacency structures on a shared vertex set. Typically, this problem is framed as one of network regression, and is solved by using QAP test procedures to evaluate coefficients resulting from a classical least-squares solution. Here, an alternative, likelihood-based approach is demonstrated for such problems, based on an exponential family of permutation models. Maximum likelihood estimates and associated asymptotic standard errors are obtained via Markov chain Monte Carlo maximum likelihood methods (MCMC-ML), obviating the need for QAP tests. Extensions of the model family to incorporate individual-level covariates are also discussed.

Topics: graph comparison, network regression, permutation models, MCMC-ML

The Bernard Estimator: A Simulation Study in Case of Overlapping Subpopulations

Silvia Snidero and *Dario Gregori* (University of Torino, Italy)

Bernard estimator is a novel approach to estimate the size of hidden or hard to count subpopulations. This estimator is based on the concept of social networks: respondents are interviewed about the number of people known in several subpopulations (of known size) and a subpopulation E (which size is to be estimated).
Assuming that the proportion of subjects belonging to E over the number c of people in the social network of a person is the same that in the overall population we get the Bernard's estimate of the size of the target subpopulation E. In literature there are several social network size estimators.
The possible consequences of the potential overlapping in the subpopulations of known size have not been addressed explicitly. For overlapping subpopulation we intend that a person can belong to one or more subgroups. This problem face us potentially in all studies using subpopulations. The exception is when we use subpopulations based on names, where overlapping is not possible.

In this work we present a Monte Carlo simulation experiment aim at understanding the statistical behaviour of the Bernard and ML estimator under several conditions with populations with different degrees of subpopulations overlapping.

Our simulations show that increasing the degree of overlapping leads to an increasing and marked bias with Bernard estimator. On the contrary ML estimator leads to substantially unbiased estimates, with an efficiency dependent from the degree of overlapping.

Interorganizational Networks 1 11.00

Prominence in Inter-Organisational Communication Networks: The Weakness of Strong Ties

Stephen Pryke (University College London, United Kingdom)

We examine inter-organisational information exchange networks in five project-based, multi-organisation coalitions in France and the UK. We classify information exchange networks according to the principal functions of the project coalition and examine the density of these networks and the degree centrality of the key actors within each of these networks.

The conference presentation will outline the five projects very briefly and deal with some issues associated with typicality and project variables, both of which have presented some difficulties in data gathering. An outline of the methodology will deal with the application and adaptation of linear responsibility charts as a structure for data gathering. The material presented will focus on communication networks associated with multi-disciplinary, iterative, interdependent and yet essentially independent activity related to the five case studies.

The data gathered comprised both quantitative and qualitative data; data gathering and analysis was dealt with in close collaboration with the research partners for each case study. In addition to network data, information was gathered about overall project performance, based upon a number of industry benchmarks.

It is suggested that centrality in information exchange networks, within the context of multi-disciplinary, iterative and interdependent activities, does not imply prominence in the sense that we currently understand. There is evidence that, for some actors, degree centrality in information exchange networks is associated with a negative impact upon the performance of the information exchange network. In particular, centrality appears to reflect initiation of incomplete or inaccurate information.

Conflict and the Structure of Interorganizational Social Networks

Katherine L. Woodard (Western New Mexico University, USA)
Patrick Doreian (University of Pittsburgh, USA)

While a lot of work has examined issues to do with cooperation and competition among organizations, conflict in inter-organizational networks has seldom occupies center stage. Using data that spans a three year period, we analyze a conflict that erupted in a social services delivery network between two of the most central and important organizations in the delivery network.

The conflict was substantive, organizational and, by the end, intensely personal for the central protagonists. We examine the responses of other organizations, at both the staff and director levels, of organizations and delineate the structural changes of the network that ensued. We explore the substantive implications for the operation of the network and methodological implications for the collection of network data for organizations when conflicts engulf a network.

Multiplex Embeddedness in Interorganizational Networks

Maurits de Klepper (Free University, Amsterdam, The Netherlands)
Peter Groenewegen and *Gerhard van de Bunt* (Vrije Universiteit Amsterdam, The Netherlands)

Social networks and embeddedness are closely related subjects in the discussion of firm collaboration and performance. In research on embeddedness the strength and mix of ties is central, whereas network analysts focus on structural properties of networks. In methodological terms it is still a challenge to combine these two approaches.

Research on embeddedness has focused more on the content and the strength of ties. Hite (2003), identified different components of embeddedness of organizations, but also took into account network related aspects, e.g. personal relationship, dyadic economic interactions and social capital. With regard to embeddedness, firm centered studies are most common, only a few multilevel analyses on firm-level, pair-level and network-level have been conducted (Gnyawali & Madhavan, 2001). When shifting from ego-centered approaches to network level measures attention has been given to the strength of ties. Rowley, Behrens and Krackhardt (2000), distinguish between relational (the content of a relation) and structural embeddedness the network characteristic of a relation. They argue that relational and structural embeddedness should be considered together.

We will present some first steps to pursue these ideas following the emerging insights in the multiplexity of personal networks relations. The methodological strategy is to extend the analysis of closed interfirm networks, by not only looking at single type networks, but also to take into account the multiplexity of ties. We will use models that are provided within the StOCNET-environment (Snijders, several articles).

Evolution of Tie and Capability Based Roles in a Modular Business Network Structure An Experimental Study

Diederik W. van Liere, *Lorike Hagdorn*, *Martijn R. Hoogeweegen* and *Peter H. M. Vervest* (Erasmus Research Institute of Management, The Netherlands)

A firm in a business network creates value by combining different capabilities and offering that to the market. This role is a capability-based role; it signals to the other firms in the network how it adds value in the production of a particular product or service. In the "structuralist" view roles are based on the ties an actor has with other actors, the so-called tie-based role. This paper tries to overcome a pure structuralist (Kilduff et al., 2003) view by expanding the traditional tie-based role with the notion of capability-based role.

A role can be seen as a status signal, not in the traditional sense of the word status but in a

broader context that a tie as prism (Podolny, 2001) signals fundamental properties of an actor including status, role and brand. Role as status signal can be utilized in the following two ways: a firm is able to make itself noticeable in a network by claiming a particular distinctive capability based role and through this increased recognition will make itself more attractive for other firms to connect with. Second, having a clearly recognizable capability based role in a network will reduce the search costs for other firms and reduce the altercentric uncertainty, this in turn leads to increased attractiveness to establish ties with that firm.

The evolution of the business network structure is discussed in terms of network reinforcing or network loosening events (Madhavan et al., 1998). Structure reinforcing events are those events that favor the power rich firms in a network structure. Structure loosening events have the opposite effect, the network poor have a greater benefit from the event than the network rich.

Topics: tie-based role, capability-based role, network dynamic

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Are Corporate Reputations Contagious? A Social Network Effects Theory of Corporate Reputation

Tim Williams (Henley Management College, Henley-on-Thames, UK)

The topic of this paper is how corporate reputations form. Although a popular construct with a burgeoning and multidisciplinary literature, the emerging field remains wide open for research and theory building. The paper proposes that corporate reputations, like other attitudes, evaluations, or perceptions, can be substantially understood as the consequence of influence and communication exchange within social, and specifically stakeholder, networks.

Most research to date has been concerned with conceptualising and operationalising the corporate reputation construct, and with its consequences rather than its nature or antecedents. However the paper identifies from the literature an emerging socio-cognitive view of corporate reputation, the essence of which is that the reputation of a focal organisation is best understood as the social construction of the organisation's multiple, interconnected stakeholders (variously defined.) Assessments by stakeholder individuals arise from their direct experience of the focal organisation and from information exchange and influence. Reputations as a collective construct emerge over time as a function of these relationships and exchanges amongst the organisation and stakeholders. Models also variously consider a role for intermediaries - primarily the media. It is therefore surprising that to date researchers have substantially ignored the potential conceptual (social influence theory, and cohesion and structural equivalence network effects models) and methodological (social network analysis) contribution of the social network paradigm to gain understanding of the reputation construct and build theory on how reputations emerge - and from an instrumental perspective, may be managed.

Conversely, corporate reputation represents a comparatively novel area of study for network scholars.

This paper reviews the emerging multidisciplinary research from reputation and stakeholder theorists, and extends this by providing a theoretical discussion of the network basis of reputation construction. The paper then discusses the methodological challenges of empirically testing a network effects model.

Network Dynamics 2 11.00

In Search of Stars: Efficiency, Equity and the Dynamics of Network Formation

Jakob Goeree, *Arno Riedl* (Tinbergen Institute and University of Amsterdam, The Netherlands)
Aljaž Ule (Tinbergen Institute and University of Amsterdam and Universitat Autonoma Barcelona, The Netherlands)

In this paper we theoretically and experimentally investigate the formation and dynamics of networks with heterogeneous players. Building upon Bala and Goyal (2000) we extend their model with two-way flow of benefits and decay to the more realistic situation of heterogeneous players. We allow players to differ with respect to their value to the other agents as well as with respect to their linking costs. To control for the influence of the different dimensions of heterogeneity we run four treatments: (BI) only homogeneous agents, (CI) one agent with low linking costs, (VI) one agent with high value, (CVI) one agent with low linking costs and one agent with high value. We theoretically characterize the efficient and the strict Nash networks. We show that in all treatments some kind of star architecture is the (unique) efficient *and* strict Nash network. In the experiment it turns out that in all treatments theory fails to predict actual behavior, though at different degrees. While in the treatment with homogeneous agents only the Nash network is virtually never played there seems to be some kind of convergence towards the efficient strict Nash network in the treatment with one high value agent. Additionally, we also investigate experimentally the role of information about other players' types. It turns out that information about types plays a less important role than expected for the formation of networks per se. However, the convergence dynamics seem to be significantly influenced by the fact whether types or only its distribution are known.

Kinship in Family Transition – A Network Approach to Kin Ties in "New" Family Forms

Anna-Maija Castrén (University of Helsinki, Finland)

The paper discusses findings of a study that aims to find out which relationships form the core of family communality (i.e. intimate and close relationships, bonds of intimacy, commitment and responsibility) at a time when the diversification of family patterns both decreases the potential, e.g. because of divorce, and doubles the amount of relatives as second marriages and new families are formed. "New" forms of family challenge the ties of kinship on many levels. Using methods of qualitative social network analysis the study investigates ego-centred social networks collected in qualitative theme interviews of parents, women and men, who have gone through a divorce and are either single or have remarried. The analysis focuses on the genealogy of a social network and on the process where the main components of family communality have been chosen anew. Dissolution of marriage and a nuclear family affects a social network more or less profoundly, and the present study - through its qualitative approach - aims to enlighten the ways in which people handle these changes and in a sense renegotiate some of the most significant ties in their lives. Effects of divorce on social networks are discussed also more

generally.

Four Years of Friendship: Preliminary Findings from the Notsoec College Social Network Study

Jenny Godley (University of Calgary, Canada)

This paper uses a new dataset to contribute to our understanding of friendship formation and stability during the young adult years. I provide the first descriptive analysis of data from a new survey, the Notsoec College Network Study. Complete friendship data and social / academic club and sports team membership information were collected from the Senior Class at a small, academically elite, liberal arts college on the East Coast of the United States during the Spring Semester, 2002 (N = 283; response rate = 82%). The first section of the paper examines patterns of gender, social class, religious, and racial / ethnic homophily within the friendship networks. In this particular higher education setting, I find that while social class and religious homophily are strong, friendships tend to be heterogenous with regards to gender and race /ethnicity. I speculate that both the size and the culture of the educational institution may contribute to these findings. The second section of the paper examines the correspondence between the friendship networks and the club / team membership affiliation networks. I find surprisingly little correspondence between these networks, suggesting that even students who are very active in clubs and on teams are more likely to make friends in other settings (such as in classes and residence halls). The final section of the paper examines the correlation between friendship length, homophily across social categories, and co-participation in activities. I find that friends who met most recently (during the latter two years of college) are more likely to participate jointly in social / academic clubs and teams. Friends who met earlier, by contrast, are more likely to have similar demographic characteristics. While not generalizable to the larger population, the Notsoec College Network Study findings provide us an opportunity to examine the evolving friendship patterns of a group of adolescents moving through young adulthood.

Linking, Jumping and Other Selection Strategies in Freshmen Networks

Chris Baerveldt (Utrecht University, The Netherlands)
Ronan Van Rossem (Ghent University, Belgium)
Gerhard van de Bunt (Free University of Amsterdam, The Netherlands)
Marjolijn Vermande (Utrecht University, The Netherlands)

Society produces new networks on a regular basis. At the start these networks include no or few ties among the members. This implies that the members need to invest in new relations with other members. As time and energy are scarce, profits from relationships may vary and are uncertain, it is important for individuals to establish new relations effectively and efficiently. They may use different selection strategies with different risk, costs and profits. The simplest strategy is to remain passive and stick to already existing ties or let others take the initiative. Active strategies include linking: befriending the friends of friends; and jumping: try others with whom one has no link yet. When jumping, similarity and equivalence can, among other, serve as proxies for the expected value of relationships.

In our paper we investigate selection strategies of freshmen in Dutch high schools. Our main question is why certain freshmen use certain strategies, and how they can be distinguished. One of our hypotheses is, for instance, that freshmen with stronger (initial) network positions use less risky strategies.

While network dynamics is the strongest in the first weeks, when risk is higher, and information often scarce, starting networks provide better grounds to study choice strategies. Data was gathered about 850 freshmen in 38 classes of three high schools in a small Dutch town. The pupils filled out a questionnaire twice: in the first week of school and after four months. Network data was collected about positive, negative, prior (primary school) and desired relationships among all students in a class.

Topics: selection, strategy, starting networks, pupils' networks

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Social Support 2 11.00

Recovery From Natural Disasters and "The Strength of Weak Ties"

Christine Avenarius and *Jeffrey C. Johnson* (East Carolina University, USA)

This paper examines the relationship between psychological well-being and ego-network structure for victims of hurricane Floyd in North Carolina in the summer of 1999. In particular, it focuses on a population of victims who were made homeless by the disaster and who were without their own replacement housing for a period of at least one year, living primarily in government supported trailer communities. These extended recovery victims represent an interesting population of people who have been under prolonged economic, social, and psychological stress. The study finds higher rates of depression and anxiety among individuals whose ego network consists primarily of close kin ties even when considering other forms of institutional support (e.g., American Red Cross, Federal Emergency Management Agency). Thus, those individual actors with more extensive social networks or "weak ties" fare better under such conditions. Possible theoretical reasons are discussed.

Network Support and Psychological Distress in Two Chinese Cities: Beijing and Hong Kong

Rance P.L. Lee (University of Hong Kong, Hong Kong)
Gina Lai and *Danching Ruan* (Hong Kong Baptist University, Kowloon, Hong Kong)

From face-to-face interview data collected from random sample surveys in Beijing (n= 1004) and Hong Kong (n= 1121) in the summer of 2000, we found that most Chinese adults aged 18 and above in both cities perceived their personal social networks as being easily available for providing support and often capable of rendering adequate support. Most of them were also satisfied with the social relations and not bothered by the demands of others in the network. Compared with the Chinese in Beijing, the Hong Kong Chinese were less positive about their support networks. They also reported a higher level of psychological distress as measured by the Center for Epidemiologic Studies Depression scale. In both cities, the perceived functions

of network support are far more powerful than social-demographic characteristics in producing distress. The impact of personal network support on distress in stronger in Beijing. These findings could be explained by the difference between the two cities in modernization and urbanization.

Topics: emotional distress, perceived social support, network functions

Risk Sharing Relations in Rural Zimbabwe: An Empirical Investigation Using Social Network Analysis.

Marleen Dekker (Vrije Universiteit Amsterdam, The Netherlands)

The economic literature on informal insurance networks increasingly recognises that risk is not shared in exogenous groups such as the village. Risk is more likely to be shared in sub-groups in the village: small, tightly knit groups that are endogenously formed to deal with information and enforcement problems. Recent empirical studies on sub-group formation have proposed a dyadic approach to network formation that takes the relationships between households rather than households as the unit of analysis. This approach allows for an analysis of the influence of social structure on risk sharing. At the same time it poses a methodological challenge, as the observations in the analysis are not independent. Past studies on sub-group formation have not or only partially addressed this non-independence, potentially leading to biased estimates of the determinants of network formation. In this paper we present a dyadic model that explicitly deals with the dependence of observations, the p_2-model. We use this model to analyse the determinants of observed (ex-post) risk sharing networks in four land reform communities in Zimbabwe. These communities were established relatively recently (early 1980s) and are characterised by a scarcity of kinship relations. Despite high levels of new civil social activities we find that intra-village social ties that pre-date resettlement, such as those with kin, clan members or households who lived in the same geographical area prior to resettlement, are most instrumental in risk sharing. The exact type of social tie that is used for risk sharing varies however between villages, confirming that social capital is highly village and goal specific. We also find that households are most likely to share risk with households with whom they shared risks in the past, which suggests informal insurance takes place in bilateral relationships rather than small groups.

Levels of Multiplexity and Types of Support Providers: Personal Networks of Indian Immigrants in Argentina

Isidro Maya Jariego (Universidad de Sevilla, Spain)
Lía de la Vega (Universidad del Salvador, Buenos Aires, Argentina)

We examine the personal networks of a sample of 209 first and second generation Indian residents in Salta and Buenos Aires (Argentina). We present a way of describing the personal network of immigrants, analysing the prevalence of diferent types of (familiar and non-familiar) support providers in the network. The respondents cited 2,226 social support providers. We identify 11 types of significative links and three levels of multiplexity. These two dimensiones are useful in the classification of the personal networks of firts and second generation Indians.

The results of the study show an inverse relationship between the multiplexity of compatriot friends and the multiplexity of family members. Implications are examined for the assessment of the social integration of immigrants.

Topics: personal networks, multiplexity, immigrants

Knowledge Networks 2 11.00

The Two Network Structures That Facilitate Innovation in Large Organisations

Mats Lingblad (London Business School, United Kingdom)

A classic finding in organisational theory is that organisations are designed to excel at routine activity, but are less effective in engaging in non-routine activity. One type of non-routine activity is innovation. In successful innovation projects information is assembled, resources mobilised and new knowledge created. The paper argues that social networks are of central importance when organisations engage in non routine activity. Previous research has related the network structure of individual actors to individual performance. The issue of how an individual's network structure affects group performance had not been directly addressed. The paper argues that two mutually exclusive network structures are related to high performing projects: Project managers with either a large weak-tie network or a small strong-tie network are hypothesised to be better situated for managing innovation projects. In line with previous research, it is also argued that only the former network structure will result in high individual performance. The theory is tested with a new egocentric social-network dataset. Data have been collected in face-to-face meetings with 100 innovation project managers in three multinational organisations. Data on performance of the 100 innovation projects have been collected from senior executives outside the projects. The key hypotheses are modelled as an interference interaction in regression terminology. The paper ends with a discussion of possible contingencies that can explain the micro-mechanisms behind the results.

Topics: intra-organisational networks, innovation, ego-centric networks

The Network Structure of Knowledge Advancement

Gianluca Carnabuci (University of Amsterdam, The Netherlands)

New knowledge is not generated in isolation, but results from novel relations between existing knowledge 'elements'. Such relations do not emerge randomly; on the contrary, they are embedded in a relatively stable network structure connecting different knowledge domains. I posit that such structure has a powerful yet unexplored impact on the process of knowledge advancement.

In an attempt to build a social network theory of knowledge advancement, this paper addresses the question: What structural conditions are responsible for the (very) different advancement rates of individual knowledge domains? To this end, I formulate a series of hypotheses concern-

ing the effects of four classes of network properties characterizing the structural embeddedness of knowledge domains: brokerage, specialization, core-ness, and niche overlap.

For the empirical analysis, I employ data concerning all patents granted by the largest international patent office worldwide (USTPO) between 1975 and 1999. In order to capture the dynamic aspect of the process of knowledge advancement, I model the data as a time series of networks, thus obtaining a panel of data. The nodes of the network represent the 418 internationally standardized technological domains into which the USTPO classifies each patent; directed valued ties represent patent citations between the domains.

The results lay the foundations of a network theory of knowledge advancement, and show that the network-analytic approach explains mechanisms that would be hardly discernible by other approaches.

Topics: knowledge advancement, patent citation analysis, longitudinal network data, technological innovation

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Creativity in Complex Innovations: Using Social Networks to Create Knowledge

Arent Greve (The Norwegian School of Economics and Business Administration, Norwey and University of Toronto, Canada)

Creativity in technology innovation depends on interaction in social systems and can be studied as the combination of a creative mind interacting with other people facilitating and developing creativity. It is rarely an individual endeavor. This research studies creativity as a social phenomenon by looking at technologies that are more complex than a single individual can fathom. The creation of complex technologies requires a combination of complementary disciplines. This article describes a group of creative engineers that use three knowledge breakthroughs in different fields to construct two technologies for floating off-loading and production of oil. Social network analysis reveals how nested networks of industries, organizations, and individuals contribute opportunities and resources to complete the innovations. The firms where these innovations take place are located on the fringe of the oil industry, and not immersed in existing technological paradigms. The initiators and their closest collaborators have careers that span several firms in different fields in shipping and oil activities. These networks embrace all sectors of the oil industry. The initiators have direct links to all the firms that supply the fundamental knowledge. They and their connections mobilize all the necessary resources to complete and install the innovations at oil fields, altogether 113 people in 32 organizations.

Topics: creativity, social capital, complex innovations, inter organizational relations

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The Strength of Performative Ties: Dynamics of Knowledge Network Exchange

Sheen S. Levine (University of Pennsylvania, USA)

Although Knowledge has grown to occupy a major role in the discussion on firm performance, we currently know little about the micro-processes involved in search and transfer of knowledge.

Social network theory, useful elsewhere, is mostly silent about network evolution and dynamics. Drawing on extensive fieldwork in multiple offices of a large, multinational professional service firm, we identify the surprising role of knowledge transactions between unacquainted and unequal employees. We present the minutiae of such transactions, and hypothesize on two circumstantial conditions to for their success: affiliation and status similarity. Highlighting the difference between the observed phenomenon, indirect ties, and complete unacquaintanceship, we present a definition of performative ties. We argue that such ties are theoretically significant, have several advantages for knowledge dissemination, and have been observed elsewhere, although never explicitly identified. We compare performative ties to market, embedded, and community based exchange relations, to argue that such ties allow wide search for potential exchange partners, and intimate transfer once they are found. Thus performative ties combine benefits previously attributed to one mode of exchange or another. We describe how performative ties allow organizations efficient use of the knowledge embedded in individuals and routines, hence our relevancy to the conference theme.

Topics: social network, micro-processes, exchange, knowledge, professional service firm

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Knowledge Sharing and Group Pressure

Dino Ruta (IOSI Bocconi University, Italy)
Noshir S. Contractor (University of Illinois, USA)

This study utilized social network analysis to explain knowledge sharing in organizational Intranets. Intranets are virtual knowledge repositories for organizational members to identify solutions, materials, experts, and expertise, mapped by knowledge area. Members use advanced communication and collaboration technologies to retrieve from, as well as contribute to, this knowledge repository. Intranets can therefore be interpreted as a public good where there are inherent motivational inhibitors in the decision to contribute knowledge. The willingness to share knowledge is an individual attribute, not an organizational one, and it is built and perceived through social interactions. Social pressure is a critical factor in influencing behavioral conformity among organizational members. Therefore people are inclined to share knowledge when they see other colleagues doing so. Data was collected from 155 members who belonged to 14 groups in two multinational organizations. Consistent with our hypotheses, our results indicate that the quantity of members' knowledge contributions was influenced by their perceptions of contributions made by other members. Further, members were most heavily influenced by those members with whom they had a high frequency of communication.

Topics: knowledge sharing in knowledge networks, communication technologies, group pressure

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Methods 2 11.00

"Natural" Groupings and Roles in Social Networks Based on Eigenvector Centrality

Geoffrey Canright, *Kenth Engo-Monsen* and *Asmund Weltzien* (Telenor R&D, Norway)

We have developed a method for associating nodes of a network into natural groupings. Here "natural" means that the grouping is done purely using topological information (which may however include link strength measures). We can identify well-connected groups and their centers, the bridging nodes and links which connect these groups, and those nodes which lie at the "edge" of the network. Our method uses eigenvector centrality as a "height function" over the network, and then follows ideas based on the resulting topographic picture to define the groupings. The resulting analysis offers a simple and illuminating way of defining how well connected the network is. We present the method, and then illustrate it by applying it to snapshots of the peer-to-peer network Gnutella from 2001. We find that this self-organized network is very well connected: snapshots with around 1000 nodes decompose into one, or at most two, groups, with (in the latter case) a large number of bridges connecting the two groups.

Topics: cluster analysis, network roles, eigenvector centrality

Geometric MST Clustering of Text Network Collections

Steven R. Corman (Arizona State University, USA)
Marco Gaertler and *Dorothea Wagner* (University of Karlsruhe, Germany)

Distance-based clustering is important in many fields of science where it is necessary to induce clusters from a set of observed distances and where the number of clusters is not known in advance. Standard procedures for distance-based clustering present an operational problem: Common clustering algorithms have $O(N^3)$ time efficiency, making them unsuitable for large datasets. In this paper, we engage the clustering problem using network concepts in three ways. First, we look at the application of clustering to text collections using distances derived from a network text analysis method called Centering Resonance Analysis (CRA). This method is routinely applied to large collections of texts and incurs the time inefficiency mentioned above. Second, we test an alternative clustering method based on a network perspective. Geometric MST Clustering (GMC) treats the distance matrix as a valued network and uses spectral analysis to separate dense parts of the graph. As implemented here, the procedure has time efficiency O(N log N), so in principle it is a much more efficient alternative for clustering large datasets. Third, we compare Ward's hierarchical clustering with GMC using 1065 articles from a Wall Street Journal corpus. We assess both methods on quality indices developed for the study, and compare cluster structures using intersection graphs. Results indicate that the GMC method is superior to the Ward's on these evaluation criteria. However, GMC seems to produce clusters that are too large for practical use. We suggest a hybrid approach where large data sets are broken down into subclusters using GMC, and large subclusters are then analyzed as needed with traditional hierarchical clustering. Such a method can be considered one step toward an automatic, flexible, and usable classification system for unstructured texts like news articles.

Topics: network text analysis, clustering

Eigen System Analysis of Hermitian Adjacency Matrices of Perturbed Star Graphs

Bettina Hoser, *Andreas Geyer-Schulz* (University Karlsruhe, Germany)

The Eigensystemanalysis of complex Hermitian adjacency matrices [**?**] yields a good understanding of the substructure of a group based on its communication behavior. Based on this method we describe in this paper how in the special case of perturbed star graphs the Eigensystemanalysis can be used not only to detect the original star, but also to identify the communication connection which perturbes the star.

In the case of an unperturbed star the eigenvalues would have identical absolute values, and the eigenvectors would be equal but for a phase shift of π. In the perturbed case the eigenvalues show a difference within Weyl-type-bounds, while some eigenvector components show a phase shift $\Delta\phi \neq \pi$ in the argument of the complex-valued components. It can be shown, that the group members with a phase shift of this behavior $\Delta\phi \neq \pi$ of their eigenvector components are the source of the perturbation.

Topics: eigenspectralanalysis; Hermitian matrix; perturbation

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1. Bettina Hoser, Andreas Geyer-Schulz: Use of Hermitian matrices in the anlysis of newsgroups (Sunbselt 2003). To be published: Connections 25(3), 2004

Eigen System Analysis of Hermitian Adjacency Matrices as a Tool to Explain Group and Subgroup Behavior over Time

Jan Schröder, *Bettina Hoser* and *Andreas Geyer-Schulz* (University Karlsruhe, Germany)

Time evolution of group structure is one of the interesting questions in SNA. In this paper we present a method based on the eigensystemanalysis of complex Hermitian matrices [1] to analyze group structure evolution over time.

The time evolution of the principal eigenvalue of complex Hermitian adjacency matrices H taken at continous points in time t_i gives an indication of possible shifts in the traffic volume behavior of the group as well as of the subgroup structure and shifts in the position of the most relevant group member. The evolution of traffic volume clearly influences the evolution of the eigensystem due to the eigenvalue equation $H\mathbf{x} = \lambda\mathbf{x}$. Thus for example $\lambda(t_i)$ follows qualitatively the behavior of the total amount of traffic volume over time as well as by changes in group structure. The shift in dominance between subgroups can be seen when the $\lambda(t_i)$ is analyzed together with the changes in position of the most relevant group member at any given point in time.

Topics: eigenspectralanalysis, Hermitian matrix, time evolution

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1. Bettina Hoser, Andreas Geyer-Schulz: Use of Hermitian matrices in the analysis of newsgroups (Sunbselt 2003). To be published: Connections 25(3), 2004

Analysis of the Diffusion of a Software Client in a Social Network Based on Eigenvector Centrality

Asmund Weltzien, *Geoffrey Canright* and *Kenth Engo-Monsen* (Telenor R&D, Norway)
Fahimeh Pourbayat (University of Oslo, Norway)

Based on a method for associating nodes of a network into natural groupings, we analyze the diffusion of the software client *Skype* in a social network in Norway. *Skype* is a free software client for ip-telephony that has spread swiftly. It allows users to create lists of friends and contacts from the whole world and talk cost-free and at good quality with these, providing they have access to a broadband Internet connection. We report on a work in progress where we track the diffusion process and map the social network in which this software client spreads among students at the Oslo University College. We also give some preliminary results of our analysis of the diffusion process. Our analysis uses a topographic picture that defines the network's natural groupings and "well-connectedness". The method for finding this picture is elaborated in the Sunbelt 2004 abstract *"Natural" groupings and roles in social networks based on eigenvector centrality*. We present the roles that these topologic features play in the diffusion of *Skype* in a social network. Our conjecture is that due to the digital character of the innovation in question, *Skype*, and of the network in which it spreads, the threshold for diffusion is low. Furthermore, we speculate that this form of "user-driven" diffusion differs qualitatively from more conventionally fuelled diffusion processes.

Topics: diffusion analysis, network roles, eigenvector centrality

Interorganizational Networks 2 15.30

Profitable Connections? A Longitudinal Study of the Impact of Directorate Interlocks on the Profitability of New Zealand Firms.

Bruce Cronin (University of Greenwich Business School, United Kingdom)

Amidst the great volume of almost a century's research on director interlocking, one finding is striking: the limited evidence of any relationship between interlocks and corporate profitability. While the potential for these networks to channel important information between firms has been extensively explored, it appears that if these communication channels are used in the suggested manner, they are not used very effectively.

It has been suggested that the elusiveness of an interlock-profitability relationship may reflect methodological limitations; research in this area is almost universally cross-sectional, while social learning is a longitudinal process. For example, director interlocking has been found to be a frequent response of firms to financial difficulty, so a simple cross-sectional association between interlocks and profitability is unlikely to be found. Similarly, the content of information

passed through interlocks may change over time. Few studies examine the specific mechanics of the transfer of information through interlocks. Comprehensive investigation of network effects is also hindered by the wide variety of interlocking that takes place among directors. Interlocks arise in many ways and do not necessarily simply constitute an instrument for the firms involved. This research takes up the methodological challenge in this area, exploring the interlock-profitability relationship longitudinally and dynamically. It distinguishes intentional from accidental relationships and draws on recent research on the mechanics of information transfer within director networks. The dataset comprises directors and financial results of the 100 largest New Zealand companies over a twenty year period.

The Social Times of Network Spaces: Sequence Analysis of Network Formation and Foreign Investment in Hungary, 1987-2001

David Stark (Columbia University, New York USA and the Santa Fe Institute, USA)
Balazs Vedres (Central European University, Hungary and Columbia University, USA)

To model, from its inception, inter-enterprise network formation and its interaction with foreign investment across an entire epoch of rapid and profound economic transformation, we gathered data on the complete ownership histories of 1,696 of the largest Hungarian enterprises from 1987 to 2001. We develop a combination of network and sequence analysis to identify distinctive pathways whereby firms use network resources to buffer uncertainty, hide or restructure assets, or gain knowledge and legitimacy. During the period, networked property grew, stabilized, and involved a growing proportion of foreign capital. Cohesive networks of recombinant property were robust, and in fact integrated foreign investment. Although multinationals, through their subsidiaries, dissolved ties in joint venture arrangements, we find evidence that they also built durable local networks. Our findings suggest that developing economies do not necessarily face a forced choice between networks of global reach and those of local embeddedness.

The Banks in the Mexican Corporate Network

Alejandra Salas Porras, *Jorge Castro*, *Jorge Gil-Mendieta* (Universidad Nacional Autónoma de México, Mexico)

After the financial crisis of 1994-95 the control of Mexican banks is gradually taken over by foreign banks (Spanish, Canadian and American). De-nationalization of the banking system from 1997 to 2003 (still underway) entails a recomposition of the banks boards of directors provoking important changes in the patters of interlocking and in particular a rollback towards spaces of family control. On one hand, blocks are formed within which the intensity and density of connections tends to grow and, on the other hand, the number of connections between the blocks diminish. Nevertheless, each of the foreign banks connects in different way with the network. While, in less than two years after being taken over by the American financial group Citicorp, Banamex-Citibank disconnects almost completely from the network, in contrast BBV-Bancomer maintains a much higher level of connection after 5 years of the acquisition. The purpose of the paper is to present preliminary results regarding patterns of interlocking of the banks controlled by foreign capital and the changes they provoke in the patterns of Mexican

groups.

The Evolution of Interlocking Directorates

Johan Koskinen and *Christofer Edling* (Stockholm University, Sweden)

Social network analysts have been interested in interlocking directorates for nearly half a decade, and the substantial implications of this phenomenon are widely discussed. However, with a few notable exceptions the genesis and time evolution of interlocking directorates is restricted to ad-hoc reasoning. Does the induced corporate network merely reflect the ownership structure or the natural liaisons formed between companies in the same Industrial sectors? Close at hand is the assumption that the interlock network is a direct consequence of an underlying friendship structure among the board members. This assumption shifts the focus to explaining the formation of the friendship ties, e.g. "old boys networks", pedigree, etc, which in some sense seems natural as it is individuals who constitute the links between company boards. The premise for this study is that the board is the actor and that the board in conjunction with individuals (potential board members) constitutes the basic elements for the formulation of change mechanisms. To investigate the worth of individuals in the eyes of the actors we focus on the decision processes involved in changing the composition of the boards, i.e. the release and recruitment of board members. The question of relevance for the present study of evolving interlocking directorates is whether the boards position in the interlock structure that would result from a course of action indeed influences the decision of the board. Hypothesis are evaluated and tested on longitudinal data on publicly traded firms on the Stockholm stock exchange 1996-2002, using a Bayesian implementation of the generalised SIENA model.

Topics: interlocking directors, longitudinal social networks, SIENA

Adding Information about Relationships to Traditional Social Network Measures: Does It Add to the Prediction of Behavior?

Karl E. Bauman, *Robert Faris*, *Susan T. Ennett*, *Andrea Hussong* and *Vangie A. Foshee* (The University of North Carolina at Chapel Hill, USA)

Social network measures – such as, indegree, betweeness centrality, density, and position (group member, bridge, or isolate)– often derive from asking subjects in a defined population to identify their friends. The purpose of this research was to determine whether additional information about friend relationships changes the associations between those measures and behavior. The additional information considered here are 1) feeling of closeness to friend, and whether 2) they had been in the friends home or vice-versa, 3) they had been with the friend outside school, 4) they had met their friend's parents, and 5) the friends' parents had met. For a study of adolescent drug use, in Spring 2001 friendship nominations and other data were collected from more than 5,000 students in grades 6 to 8 in 3 North Carolina school districts. The social network measures identified above (indegree, etc.) were created using UCINET. Then, the social network measures were recreated when weighted for the additional information (feeling of closeness, etc.). The weighted and non-weighted measures then were related to adolescent substance use, and those associations compared to determine their relative predictive power.

The findings are considered in the context of the value of adding information to traditional social network questions.

Networks and Development 15.30

A Network Approach to the Analysis of Equity in Community Involvement in a Participatory Research

Frédéric Mertens, *Johanne Saint-Charles* and *Donna Mergler* (Université du Québec a Montréal, Canada)

Effective involvement and equity in participation between men and women and the various community groups is likely to influence the equity in the sharing of the development outcomes of any participatory research project. The involvement of the communities in the research process is essential to ensure the local ownership of the research results and to make the communities responsible for building their own solutions. However several studies have shown that participatory development programs that do not take the sociocultural diversity of the community into account, although they may have a globally positive impact on the living conditions of the community, may actually increase the inequalities, widening the gap between the elite and the groups of lower socioeconomic status.

In the present study, we use a network analysis to identify the sociocultural factors that may promote or limit the actual involvement of the local population in the discussions about mercury and health, in a project based on the ecosystem approach to human health, carried out with the inhabitants of Brasilia Legal, a small village located on the left shore of the Tapajs river in the Brazilian Amazon. Villagers are exposed to mercury through fish consumption and a participatory intervention based on dietary changes aimed at reducing mercury exposure from fish consumption was initiated in 1995. The rationale for this study, carried out in September 2001, is that information exchanges and discussion between the members of the community are essential to reach a common understanding of health problem associated with mercury contamination and are likely to influence the actions to be undertaken to reduce exposure. Furthermore, the results of the study will allow us to develop specific measures to address the low level involvement of some groups and to ensure that all community members are included in the research agenda.

Comparing Sociometric and Egocentric Measures of Indirect Exposure to a Mass Media Family Planning Program in Ghana

Marc Boulay (Johns Hopkins Bloomberg School of Public Health, USA)

Communication scholars have long recognized the role of informal communication networks in the two-step flow of mass media messages. Through these networks, some individuals are indirectly exposed to, and influenced by, a program's messages. Recent research in Nepal suggests that indirect exposure can substantially broaden the reach and behavioral effect of health-related mass media campaigns and that a failure to account for indirect exposure may re-

sult in underestimates of program impact. However, current approaches for measuring indirect exposure require sociometric data, which may limit the ability of many programs to measure indirect exposure in their evaluations. This paper examines whether egocentric measures provide comparable estimates of indirect exposure to those obtained using sociometric data. Valid egocentric measures, available using standard population-based surveys, would simplify the measurement of indirect exposure and expand its use. To compare egocentric and sociometric measures of indirect exposure, data were collected from a census sample of members of 9 women's groups in Ghana at two points in time (panel N=280). These data include measures of exposure to an ongoing family planning radio program, contraceptive use status, and egocentric and sociometric measures of the interpersonal communication patterns about personal issues, family planning, and the family planning radio program within the women's group. The extent to which egocentric and sociometric measures categorize similar respondents as indirectly exposed to the program will assess the feasibility of incorporating this approach in mass media program evaluations that rely on standard population-based surveys.

A Social Network Analysis of Contraceptive Use by Women in Rural Bangladesh

Kaberi Gayen, *Robert Raeside* and *Michael Pearson* (Napier University, United Kingdom)

The total fertility rate in Bangladesh declined from 6.3 children per women in 1975 to 3.3 in 1997-1999. This decline of 48 per cent over a 25-year period occurred without a substantial improvement in socio-economic status, health conditions and other factors thought to be essential for fertility decline. To investigate the reasons for this fall 724 married women of reproductive age were interviewed from six villages of the six administrative divisions of Bangladesh. Sociometric data along with socio-economic-cultural and family planning practice data were collected using a structured questionnaire. This has been analysed using conventional statistical methods to construct a model of the likelihood that a woman practices family planning. The main influencing variables were demand for male child, death of male child and variables connected with communication such as degree of interpersonal communication, mass media exposure, husband, Family Welfare Assistants (FWAs) and frequency of discussion with FWAs. Communication variables, especially interpersonal communication was found to be most important. The dominant source of general information is FWAs, relatives and friends. FWAs followed by friends and relatives are the main source of family planning information who along with Husbands influence fertility decisions. The need to further understand the web of interactions among individuals, peer groups and opinion leaders was achieved using social network analysis. To do this three matrices were constructed to reflect any communication link, the strength of these links and approval of family planning. Various centrality measures, clique patterns and actors positions in the network were produced and analysed using Ucinet-6. This revealed that the actors who were not strongly connected or exist in the periphery of this web tended not to practice family planning. Variables created from the centrality measures were then added in logistic regression model, which enhanced the explanation of fertility behaviour of the women in rural Bangladesh.

Topics: fertility behaviour, Bangladesh, communication, social network analysis

Disseminating HIV/AIDS Knowledge in Rural Namibia

Kim Witte (California State University, USA)
Rachel Smith (Johns Hopkins University, USA)
Merissa Ferrara and *Nithya Muthuswamy* (Michigan State University, USA)
Erna Keulder (Research Facilitation Services, Namibia)

Diffusion of HIV/AIDS knowledge was examined in a sociometric analysis of geographic regions surrounding hospitals specializing in AIDS treatments and prevention. The spread of HIV/AIDS information through mass media (e.g., television, radio, newsprint), personal networks, and key social groups (e.g., churches, soccer clubs, local bars) was assessed. The relative accuracy of information source suggests that significant differences exist by region. In media rich environments where television and radio are available, more inaccurate knowledge of HIV/AIDS appears when networks are denser and individuals belong to more groups. The opposite is true in media-poor environments. Program and policy implications of these findings are discussed.

Topics: Diffusion of HIV/AIDS knowledge and behaviors in a sociometric analysis of geographic regions surrounding hospitals in rural Namibia. Examination of influence of television, radio, social norms, religion, and social groups on accuracy and spread of HIV/AIDS knowledge

Social Network Analysis Techniques for Monitoring and Evaluating Headquarters-Level, Collaborative International Development Activities.

Harold D. Green, Jr. (University of Illinois, USA)

Food Aid Management (FAM) is a consortium of sixteen US-based nongovernmental organizations (NGOs) that use American agricultural commodities for international development and relief programming throughout the world. FAM Member organizations interact with each other in both general and topic-specific contexts relevant to improving the design, implementation, monitoring and evaluation of their programs. Member organizations believe that their collective activities have improved the overall quality of food-assisted development and relief programs and have strengthened professional relationships among development nonprofits that were largely nonexistent in the past. However, FAM member organizations and staff members had no means to visualize or quantify these changes in organizational interaction in ways that would communicate their successes and help them to guide activities toward continued improvements. Social network analysis techniques were implemented as a set of techniques to document collaborative activities in a quantitative, replicable way as part of an extensive USAID-required final evaluation for the grant that funds FAM. This paper explains how network visualization, centrality and centralization analyses, and core/periphery analyses were implemented in monitoring and evaluating FAM activities, how targets and benchmarks were set for improvement over time, and what changes occurred in the following fiscal year as a result of the organizational network study's initial findings. USAID's support for collaborative activities in the field is growing, due to the efficiencies and economies of scale that they are expected to provide for international development activities. This paper concludes with a discussion of how lessons

learned from headquarters-level organizational interactions are likely to be incorporated into field-level development and relief activities in the future.

Topics: inter-organizational collaboration, international development, monitoring and evaluation techniques, applied social network analysis

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Elites Networks, Democratic Transition 15.30

Covering the Elite Structure of a Modern Western Society. The Case of Austria.

Doris Spielthenner, *Ruth Pfosser*, *Christian Gulas*, *Maximilian Ruhri* and *Harald Katzmair* (FAS.research Vienna, Austria)

The paper presents first findings of a long-term research project on the social morphology of the economical, technological and cultural key sectors of Austrian society. Drawing on compiled information on 120,000 Austrian opinion leaders and over 10,000 affiliations (directoral board memberships, juries, event participation, event locations, memberships in professional and private associatations, VIP lists etc.) the paper compares the specific structural characteristics (group centrality, power law distribution; fragmentation rate, degree correlation etc.) as well as the interconnectedness (brokerage roles, E-I index) of the following sectors and areas: economy (fortune 2500), media & advertisment, medicine & health, science & technology, high society networks (local celebreties, VIPs etc.); The underlying data sources range from the commercial register, television, newspapers and gossip columns to membership lists, best-of-rankings, biographical sources and internet databases.

Elite Social Structure and Democratization

Andrew D. Buck (University of Reading, United Kingdom)

This paper proposes to understand the process of democratization by examining shifts in the social structure of elites. The paper draws specific attention to alterations in the composition and configuration of elite coalitions. The dynamic conception of democratization is applied to community elites from a post-socialist Russian locality, 1994-2000. The research uses data from membership lists of civic organizations to draw conclusions about changes in the coalitional structure and their effects on democratic outcomes, such as elections and bureaucratic appointments. The application demonstrates that persons with split loyalties or "bridgers" lost during the community's circuitous democratic transition.

Topics: political networks, network dynamics, elites, coalitions and democracy

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Political Capital, Party-Bloc Homophily, Socio-political Cleavages in Hungary

Róbert Tardos (Research Group for Communication Studies of the Hungarian Academy of Sciences at Eotvos Lorand University, Hungary)

The last decade in Hungary has witnessed a strong concentration of political constituencies toward two big parties on the left and right poles along with several smaller ones in the respective camps resulting in a bloc-like segregation. As one of its main issues, the ongoing Hungarian Political Stratification Study focuses on the bearing of the political element on the formation of social fabric, and, in turn, the role of network-based political resources in present-day social stratification. The face-to-face survey carried out at the end of 2003 contained a social network module (n=1500, national sample) with a name-generator instrument also approaching political affiliations of important others, and a "party-generator" battery modeled on the lines of the Lin-Dumin position-generator technique. The former one (with a principally strong-tie focus) goes back to a Hungarian research antecedent from the second half of the nineties, so permitting some temporal comparison, while the latter one (closer to weak-tie aspects) has been applied now for the first time. Preliminary analyses point out a continuing trend toward political homophily among close relationships, with signs of a cleavage-like polarization, partly balanced by a larger degree of cross-cutting party affiliations and bridging ties among wider circles of acquaintance. Range of ties along the political spectrum, on the other hand, emerges as a telling indicator of political capital, closely related to important features of socio-economic standing and subjective identification as well.

Social Networks and the Process of "Spontaneous" Privatization in Post-Communist Hungary

Larissa Adler Lomnitz and *Diana Scheinbaum* (Universidad Nacional Autónoma de México, Mexico)

Following our previous interest on the economic importance social networks have had for the Latin American and Soviet state-employed middle classes, this paper explores the importance social networks ("connections") have had on the process of privatization and market liberalization of Post-Communist Hungary.

Network Capital Dependent Path Dependency

Endre Sik and *Andras Lapos* (ELTE University, Budapest, Hungary)

I assume that communism in general and in the mature phase of it in particular was (partly due to structural reasons, partly due to historical coincidence) a network-sensitive society (Sik, 1994). The network capial dependent path of the transformation was further strengthened (the more intensive the traffic on a path is, the more likely the path widens into a highway due to the mutually re-inforcing interests of and consequently of the long-term investments of all actors on the road) by the following mutually non-exclusive phenomena:

- post-communism unavoidably was built on the brickolage of network-sensitive commu-

nist institutions,

- the high-inertia of networks as institutions,

- the (partly network induced) temporary weakening of alternative institutions (such as the state, the internal market, etc.), and last but not least

- the network dependent nature of the transformation process. There were certain transformation-specific processes, which by their immanent characteristics were network-dependent. Such processes were the privatisation, the restitution, the emergence of the multitude of new entrepreneurships, the appearance of multinational business, the opening of the national borders and last but not least the increasing risks of various economic actors in the course of "transformation crisis" (such as unemployment and decreasing real wages for the average households, the total collapse of the economic viability for certain ethnic groups and regions, the increasing rate of criminality, etc.).

The ultimate question is whether a network-sensitive country can or cannot leave its path. Transforming this question into three simplier one (experessing the cultural, economic, and institutional aspect of the original question): Can deeply socialised networking culture be abandoned? Can economic actors who have vested interests in maintaing corruptive networks be encouraged to disclaim these assets? Can institutions embedded into a network-sensitive environment be disembed from it?

Knowledge Networks 3 15.30

Team's Social Capital and Knowledge Creation
Jar-Der Luo, *Wei-Sheng Hui* (Yuan-Ze University, Taiwan)

There is a kind of knowledge, possessed by groups, that is more than the aggregation of individual knowledge. Nahapiet and Ghoshal call it intellectual capital. How does a project team develop intellectual capital? The creation of intellectual capital has been recognized as a social process, in which information sharing, knowledge diffusing and brain storming all need a good social environment as the greenhouse of creativity. The macro-level social capital of a team without doubts provides fertile land in the greenhouse. The purpose of this paper is to study the impacts of social capital of a team on its performance of knowledge creation.
Following Coleman's definition, in which the macro-level social capital can be taken as good will in social ties bringing about cooperation and social resources, we develop a measurement of team's social capital by two constructssubjective trust and objective social connections. Two types of controls are included in the explanatory model–one is the variation of a team, including the variation of age, education and tenure, and another is the team's network structure, including power centrality and group segregation. In the empirical test of 63 teams, mutual trust in the team has slight impacts on its performance, while dense social connections show important influence on knowledge creation.

Social Network Structures in Knowledge Based Team: The Importance of Social Capital for Job Performance

Filip Agneessens, *Daniëlle De Lange*, *Hans Waege* (Ghent University, Belgium)

The importance of social capital and particularly of social networks has surged in organisational theory in the last decades (e.g. Sparrowe et al., 2001, Reagans & Zucherman, 2001). However, social capital has been conceptualised in very different ways, both with respect to the content of the social network relation, and with respect to the sort of network structure considered.

On the one hand, social capital can refer to either formal or to informal network relations in organisations. Formal networks refer directly to the flow of work related information between members of a team (e.g. advice and cooperation networks). More informal relations refer to the availability of social support and to the existence of friendship relations in a team.

One the other hand, network characteristic, both at a local level and at a global level, can help to explain the job performance of employees (e.g. Sparrowe et al., 2001). On a local level, network patterns (such as centrality) as well as the attributes of the employee and the relevant alters might be important. Attributes of actors refer to individual characteristics such as gender, age, tenure and attitude towards work. Since these individuals are nested in teams, global network characteristics also need to be taken into account. As a result a multilevel approach is needed (cf. Snijders, 1998) with team characteristics such as density, centralization, but also team-diversity with respect to personal characteristics (cf. Reagans & Zucherman, 2001).

In this paper the influence of local and global network characteristics of a team and background characteristics on the individual job performance is studied in 32 teams of two Belgian knowledge organisations.

The Effect of Social Interaction on the Creation, Development and Success of New Ideas in R&D Labs

Bob Kijkuit (Erasmus University of Rotterdam, The Netherlands)

The "Fuzzy Front End" of product development has always been problematic for most companies and typically involves ad hoc decisions and ill-defined processes (Montoya-Weiss and O'Driscoll, 2000). As modern day innovations are becoming ever more complex and cross-functional, cooperation amongst people, units and divisions becomes increasingly important. Most ideas for new products can no longer be generated, developed and receive funding through the work of one individual scientist.

In this conceptual paper, I propose that through interaction with others, people are able to not only generate more novel ideas, but also to further develop an idea. Burt (1992) described these possible advantages of social interaction as "information benefits". However, apart from being generated and extended, ideas also have to be evaluated in order to receive funding. I propose that this evaluation is also influenced by social interaction. It is assumed that this is based on two mechanisms, namely convincing others by communication and by status signalling (Podolny, 1993; Zuckerman, 1999).

To link the idea development process with social interaction, I employ the concept of "role as resource" (Baker, 1991). It is proposed that different roles can be identified that play a part in the generation, development and evaluation of ideas. These roles are defined in terms of the concept of network diversity. It is often proposed that, within certain limits, the more diverse a network is the more it benefits the creation of ideas. However, in this paper, I propose that diversity of ones' contacts in general is not always beneficial to an idea. I, therefore, introduce the concept of "directional" diverse networks. This concept explains how the content of a network can effect idea generation, development and evaluation and includes potential negative effects of certain ties.

Correlating Temporal Communication Patterns of Online Communities With Innovation

Peter A. Gloor, *Rob Laubacher* (MIT CCS, USA)
Scott B.C. Dynes, *Yan Zhao* (Dartmouth Tuck CDS, Hanover, USA)
Gregor Schrott (University of Frankfurt, Germany)

Our project analyzes and compares communication patterns in virtual innovation networks such as standards working groups and consulting firm practice groups and correlates those patterns with the outcomes of these innovation efforts. We will present first results on (1) norms for successful communication patterns, (2) tools for analyzing innovation-related communication patterns, and (3) suggest interventions for improving communication for more successful innovation.

Using our tool to analyze the evolution of e-mail traffic networks over time within a group we have studied online communities such as the W3C and IETF working groups, an Internet startup, and project teams in large corporations. Our tool takes email archives and automatically generates static and dynamic visualizations of the calculated communication networks. The static visualization allows users to step through a chosen time period by looking at communication networks at subsequent time intervals. The dynamic visualization consists of an interactive movie showing the evolution of the communication network within the group over time. Active relationships are displayed in a sliding time window, with inactive relationships decaying over time.

We have been able to distinguish temporal communication patterns typical of different types of collaborative knowledge networks such as innovation networks, learning networks, and interest networks. We make initial correlations between the patterns and success of the individual efforts, given our knowledge of the outcome of these endeavors and their communication patterns.

Our continuing goals are to gain deeper insights into the correlation of the evolution of online group dynamics with innovation, and developing a theory of member roles in innovation communities using more detailed communication pattern analysis.

See `www.ickn.org/html/innovation.htm` for sample flash movies of our visualizations.

Friends Don't Go Downhill: Informal Contacts and the Performance of Innovation Teams

Jan Kratzer (University of Groningen, The Netherlands)
Tamas Bartus (Budapest University of Economic Sciences and Public Administration, Hungary)

The paper deals with the effect of interpersonal, friendly relationships among members of innovation teams on the productive performance of the team. Innovation teams consist of members from various disciplines, who work together on developing new products of services. The members of the team have professional relationships with each other, but may also develop friendly interpersonal relationship over time. The literature is contradictory about how such non-work related friendly ties affect the performance of a team. In our study, we focus on the effect of the frequency and structure of such non-work relationships on team performance. For this research, we collected full network data on non-work relationships in a sample of innovation teams and investigate how these "friendly networks" affect the productive performance of innovation teams.

The paper we propose is largely empirical; we first derive theoretically several hypotheses on the effect of interpersonal relations on team performance and then test these hypotheses through regression analyses. We end the paper with a discussion on what this means for team design and how these findings can be used to manage innovation teams (more) effectively with respect to their productivity.

Methods 3 15.30

Local Clustering in Bipartite Graphs: Theoretical Models and Some Empirical Comparisons.

Malcolm Alexander (Griffith University, Australia)
Garry Robins (University of Melbourne, Australia)

Small world network architecture involves the unexpected combination of high local clustering and short path lengths. This paper looks at the general issues of local clustering as they appear in affiliation (2-mode) networks and their associated bipartite graphs. Affiliation networks are particularly important for understanding clustering since they comprise visible clusters and groups. We first consider the conceptualisation and measurement of clustering in 1-mode graphs. We then discuss the representation of bipartite graphs and the extrapolation of information from them into their derived, dualistic 1-mode graphs. We present a bipartite clustering coefficient analogous to the standard global clustering coefficient for 1-mode graphs. We demonstrate how this coefficient operates in an empirical dataset of interlocking directors compared to the predictions of simulated graphs of the same dimensions. We also compare clustering in these datasets to that in a dataset of community organisation interlocks.

Topics: clustering, affiliation networks, bipartite graphs, global network structure, small world architecture

Islands
Matjaž Zaveršnik and *Vladimir Batagelj* (University of Ljubljana, Slovenia)

In large network analysis we are often interested in important parts of a given network. There are several ways how to determine them. Our algorithm is based on the importance weights of vertices.

Let t be any real number. If we delete all vertices (and corresponding edges) with the importance weights less than t, we get subnetwork called vertex-cut at level t. The number and sizes of its components depend on t. Often we consider only components of size at least k and not exceeding K. The components of size smaller than k are discarded as noninteresting while the components of size larger than K are cut again at some higher level.

Vertex-island is a connected subnetwork which vertices have greater importance weights than the vertices in its neighborhood. It is easy to see that the components of vertex-cuts are all vertex-islands. We developed an algorithm that identifies all maximal vertex-islands of sizes in the interval $k..K$ in a given network. Each island is identified with its port – its lowest vertex. The main problem are the vertices at the same level – flat regions.

For networks with weighted edges we can similarly define edge-islands. The edge-islands algorithm is based on edge-cuts.

Both algorithms and some applications of islands in analysis of large networks will be presented.

Centrality Indices, Graphs, Matrices, Matrix Norms, and Statistics
Geoffrey Tootell and *Amy Vu* (San Jose State University, USA)

We address some fundamental issues which confront the development of powerful formal network theories. First, we discuss briefly some problems which arise when theorist-researchers cannot represent an inverse precisely or when a row or column of a matrix is a linear combination of another vector. Some of these problems occur due to the lack of a definition of division in matrix algebra and to the limitations of strategies used to circumvent the resulting difficulties (e.g., finding inverses of non-square matrices or of ones without real-valued elements). Second, we develop descriptive and inferential statistical measures that are specifically addressed to uses of networks and to network problems. In one we use matrix norms to generate a measure which corresponds to the familiar measure of correlation and/or regression. Another is, on the whole, a measure of the likelihood that a specific network structure will be found, given the cardinality of the vertex set and the probability of generating random graphs which match those of randomly chosen subgraphs of the particular graph used in a study. In particular, we examine converting the graph of the given network to a line graph and applying binomial probability theory. Where n ¿ 20, this allows us to use some of the characteristics of a normal distribution. Finally, to illustrate, we build a formal theoretical path from graph theory through a measure of centrality, its transformation into matrix theory, and through matrix norms to the development of new network specific measures of matrix correlation or regression, and then to a measure of likelihood. We hope that this example will encourage others to develop new theoretically specific, appropriate ways to bridge the well recognized and deep gulf that exists between and

methods in social sciences.

Recent Advances in the Application of the Galileo System for Social Networks

Joseph Woelfel, *George A. Barnett*, *Raymond Hsieh*, *Hao Chen* and *Varsha Tickoo* (State University of New York at Buffalo, USA)

All networks whose internodal connections can be represented by numerical values in a matrix can also be represented in a spatial coordinate system in which the nodes are points and the connections are distances among the points. Often the motivation for spatial representation is simply to make a two or three-dimensional visualization of the network, but a more important reason is the increase in mathematical power by the analytic representation as Cartesian coordinates. The utility of a Cartesian representation is particularly salient for time series network data, since changes can be represented by movements of the nodes through space.

The geometry of the resulting coordinate system is completely given by the rank of the socio-matrix and the relative magnitudes. Social networks tend to be high-dimensional and non-Euclidean. Moreover, since most socio-matrices are asymmetric, their corresponding spaces generally have complex eigenvectors. With time series, spatial representations are further complicated because principle axes methods for finding spatial coordinates may not share a common orientation at each point in time. This makes it necessary to perform rotations and translations of the individual spaces to provide a common orientation against which motions can be assessed. Moreover, the dimensionality of the process may vary, and may exceed that of any given time period.

This paper presents a method for developing spatial representations for asymmetric, non-Euclidean social networks using $\text{Galileo}^{\text{TM}}$ methods. The procedure produces four distinct matrices for each time interval, the left matrix, right matrix, average matrix and difference matrix. Each of these provides one Galileo space, which can be compared to each other and with themselves over time.

Also presented is a rotation algorithm, which allows transforming onto common coordinates high-dimensional, non-Euclidean spaces that allows the differential weighting of nodes. This is particularly important if the nodes differ in mass (resistance to change). Examples are provided.

Topics: method for the measurement of longitudinal network processes

Network Autocorrelation Analysis to Loosely Coupled Interactions by using Presence Memos on Mobile Internet Phones: A Study for Personal Network Assistance

Satoru Watanabe and *Yoichiro Higuchi* (Tokyo Institute of Technology, Japan)

We discuss findings of network autocorrelation analysis applied to our empirical study of a kind of instant messaging(IM) service on mobile phones.

We developed a prototype Internet system, which provides users for writing text memos and showing them on their "buddy list", which users can freely made from their personal relations. We call these "presence memos".

Using this prototype, we conducted a field trial with young Japanese female university students, who enjoyed habitually using the service and gave us invaluable feedback. We observed and heared their way of use, while the system server automatically collected their log of the service-use by the individual activity like "memo writing", "friend's memo detail referencing", "buddy list referencing", and so on. Fifteen subjects joined for 77 days with each mobile phones lented and they said that presence memos made them feel comfortable and free from the pressure of having to send something to friends, compared with e-mail or chat.

To explain their interdependent memo writing activity, we tried network autocorrelation analysis using various relation matrices which we made from their buddy lists' relations and activities. The statistical test showed the existence of network autocorrelation ,which might reflect their actual interdependencies. The friends' relations or referencing activities seemed to be more effective but the effect from their professor and help staffs seemed less negligible.

Finally, we discuss some points to improve the method more practical and the possibilities of network autocorrelation analysis for personal network assistance.

Friday, May 14, 2004

Interorganizational Networks 3 8.30

Alliance Formation in the Software Industry During the Period 1992-2000

Francois Collet (Oxford University, United Kingdom)

This study looks at the likelihood of alliance formation for any given pair of firms and year during the period 1992-2000 in the software industry. The main objective is to build a predictive model of the behaviour of different types of firms in the face of a speculative bubble.

Particular attention is paid to the position of each firm in the network of existing alliances between software firms. Several studies have shown that network position has a significant effect on the likelihood of alliance formation between two firms. I contrast the influence of network position before the Internet bubble and during the Internet bubble.

The magnitude of network effect varies across different industries and across groups of firms within an industry. In the software industry, network effects are expected to be greatest for firms offering services in contrast with firm selling products. Given the low level of constraints during the Internet speculative bubble, variations in the magnitude of network effect is interpreted as the result of the strategic anticipations of firms. Services firms are expected to experience a greater increase in network effect than software products firms.

The concept of reasonable behaviour, proposed by Pierre Bourdieu, is used as an explanatory tool to understand the relationship between the conditions in which economic agents strategize and their strategizing patterns.

Topics: alliances and networks, speculative bubble

Network Analysis as Means of Planning for the Formation of International Strategic Alliances - The Example of The Austrian Railway Cluster (ARC)

Gerhard A. Wührer (Johannes Kepler University, Austria)

Theoretical and empirical approaches dealing with the internationalization of enterprises have a least two perspectives: internationalization via "going alone", that is to do the market entry and market operation as single firm or internationalize via collective action in form of a network. A literature research in the major journals, i.e. Journal of International Business Studies (JIBS), Journal of International Marketing (JIM), or Journal of World Business (JWB) neglect the fact that social network theory and analysis can be applied to the planning process of international alliances.

But looking at the development of the network thinking in marketing brings forward a remarkable body of both theoretical and empirical findings, which dealt with aspects of networks. The founding fathers and mothers date back to the years of the last century when early institutional economists contributed to some of the basic concepts and principles that become the foundation for later research in business networks, only to name John Commons, Joseph Schumpeter and

Ronald Coase.

A major Austrian firm in the international railway business is the basis for the case study presented here. The main focus was the investigation of likely interests of Austrian enterprises to take part in an Austrian Railway Cluster (ARC). The research is centred on market based and resource based concepts of the theory of the firm. A qualitative and quantitative social network analysis approach dealt with different planning aspects of international railway business network.

The main research findings concentrate on the perceived advantages and disadvantages of going international via networks, the main resources which are offered and demanded by potential network partners, and which enterprises are likely network key players. So also approaches for the management of structures and processes are possible. Hypothesis tests show the usefulness of actors attributes to explain the structures of the network relations in a future Austrian Railway cluster.

Evolution of Organizational Rationality in Social Complexity Interorganizational Networks in Environmental Biotechnology Industry

Hyung Sam Park (University of Pittsburgh, USA)

This research demonstrates how organizational rationality is bounded in social complexity and how interorganizational networks interplay when organizations are dealing with resources of social issues ("risk organizations", below). Social complexity is measured in terms of increased normative constraints in the field of interest indicated by the increased number of organizations that support environmentalism, regulations on development and use of hazardous environmental technologies, and civil/international events on environmentalism. Four relationships are specifically examined concerning social complexity and organizational rationality. As normative constraints increase in environments, it is, first, observed that structural positions of risk organizations are peripheralized in network hierarchy. The structural positions are measured in terms of centrality, core/periphery, and structural equivalence of organizations in network hierarchy. Second, it is shown that subgroup formations are more active among risk organizations than among other organizations. Subgroups such as cliques and k-plexes are detected and compared to examine whether or not there is any difference in forming coalitions between risk organizations and other organizations. Third, it is demonstrated that risk organizations in subgroups have more ingroup ties over outgroup ties, compared with other organizations. Lastly, it is revealed that peripheralized risk organizations depend on less variety of ties than other organizations do. A historical network analysis is carried out based on longitudinal collaborative ties between environmental biotechnology firms (EBFs) and other organizations in the industry of environmental biotechnology over the period since 1970. The findings contribute to locating structural positions, sub-networks, and cohesion/solidarity of organizations with resources of social issues that vary depending on social complexity - especially, the levels of normative constraints - and predicting the flows of hazardous resources in complex interorganizational networks.

Topics: social complexity, normative constraints, organizational rationality, network hierarchy, structural locations, subgroups, hazardous resources, environmental biotechnology organiza-

tions

Social Network Dynamics and Entrepreneurship: the Relevance of Complementary Assets

Joan Solé and *Jaume Guia* (University of Girona, Spain)

The literature on social networks and entrepreneurship highlights and emphasizes the importance of the entrepreneur network structure and content in the process of creation of new firms for the prospects of success of the venture.

Nonetheless, the process of creation of new ventures is not uniform and some literature has identified particular phases from the creation of the initial idea to the actual functioning of the firm. In this context the paper first describes a framework depicting the dynamics of the structure and content of the network through these phases.

In addition, the requirements for the success of a new venture depend as well on the context in which it is born, and therefore, the particular characteristics of the entrepreneur network will also be dependent on this context. Then, the paper explores two cases: a) the case where the venture requires other interdependent actors to create new complementary assets, and b) the case where the new firm can be created with no need of other actors being involved in the creation of these idiosyncratic complementary assets.

As a result, a general framework is presented in which the desired characteristics of the entrepreneur social network is contingent simultaneously to the phase in the process of creation of the firm and to the need (or not) the new venture has of other actors having to develop new complementary assets.

Exploration and Exploitation Clusters in the Internet Industry

Koen Dittrich and *Bob Kijkuit* (Erasmus University of Rotterdam, The Netherlands)

March (1991) defines two basic strategies for firms to acquire new knowledge, when adapting to a changing environment. These two strategies of organizational learning are referred to as *exploration* of new opportunities and ideas and exploitation of old certainties. Exploration can be associated to searching, flexibility and innovation, while *exploitation* refers to refinement, production and execution (March 1991: 71). We propose that exploration requires diverse knowledge, whereas exploitation requires specialised knowledge. We intend to measure the diversity of knowledge along two related dimensions. The first dimension is the level of "industry" diversity. Ties that span across industry boundaries can provide a company with unique knowledge. This knowledge is not available in ones' own industry and facilitates exploration. On the other hand, ties within an industry will further enhance a companys current expertise, which facilitates exploitation.

The second dimension is level of non-redundancy. To facilitate exploration, ties should not only span industry boundaries, but also be disconnected from each other. Thus, exploration will benefit from a combination of high industry diversity and high non-redundancy. Exploitation, on the other hand, will benefit from high interconnectedness within a cluster. Enhancing competence within the cluster leads to a competitive advantage over firms outside the cluster.

A sample was taken from the *ComputerSelect* database containing publicly announced product development agreements for R&D on, and production of Internet applications or Internet network technologies. The sample covers 298 product development agreements between 314 distinct companies. In our sample we found three large exploitation clusters constituted by 10 or more ties. We also found six large clusters of exploration in which more than 10 companies with different SIC codes are tied together.

Topics: exploration, exploitation, clusters, industry diversity, non-redundancy

Civil Society and Public Sphere 1   8.30

Network Dependence of Political Entrepreneurs

Dimitrios C . Christopoulos (University of the West of England, Bristol, USA)

Political entrepreneurs are identified by personal resources of the classical entrepreneurial type, i.e. intellectual ability, good knowledge of their domain, team building skills, reputation, extensive networks, strategic vision and tenacity. They differ from classical expositions of entrepreneurship in that there is no assumption of exceptional leadership or indeed uniqueness of them as actors. This "non-uniqueness" is significant because it implies that the political entrepreneur type is more condition dependent than classic assumptions of entrepreneurship imply. Their personal and professional networks provide the context within which they thrive. Management of their network as a resource is vital to their success. Most significantly, as all entrepreneurial activity bears risks, networks are employed to mitigate them. This in turn facilitates the creation of coalition support mechanisms for innovative actors. Entrepreneurial risk is therefore diminished to the degree actors can draw support from their network. Accepting the premise that political entrepreneurs are network dependent implies that their ability for political action is network contingent as well. I will examine here a number of assumptions as they relate to the effectiveness of political entrepreneurs as policy innovators. I focus on assumptions of network reach, centrality, Bonacich power and value concordance.

Transactions, Social Bonds, and Controls in Civic Networks

Delia Baldassarri (University of Trento, Italy)
Mario Diani (University of Trento, Italy and University of Strathclyde in Glasgow, Scotland)

This paper deals with civic networks, i.e., the web of collaborative ties and overlapping memberships between organizations, formally independent of the state, acting on behalf of special, collective, and public interests. We draw upon evidence collected among organizations operating in two British cities, Glasgow and Bristol, on issues of social exclusion, ethnic and minority rights, and environmental protection. We differentiate between simple exchanges of resources for action, with a strong instrumental, ad hoc component (we call them "transactions"), exchanges that are also embedded in other types of ties, suggesting stronger bonds and a greater continuity of interdependence between the organizations involved (we refer to them as "social bonds"), and what we define "control" ties, based on the perceived influence one organization

may have on another. We analyze our evidence at three levels. First, we look at the extent to which transactions and social bonds are symmetric. The more symmetric they are, the more we may expect mutual recognition of relevance to go on between two organizations. Second, we explore how transactions and social bonds relate to perceptions of influence. To this purpose we test how being connected in the networks consisting of transactions or social bonds may account for the perception of influence. Third, we look for organizational traits that may account for differences in centrality measured as degree – in both the transactions and social bonds networks.

Destabilization of Terrorist Networks: A Comparative Study

Maksim Tsvetovat and *Kathleen M. Carley* (Carnegie Mellon University, USA)

It has been shown that most covert networks such as terrorist groups, take on a form of cellular network. Cellular networks consist of a number of self-contained cells with dense connection patterns inside the cell and sparse interconnection between cells, thus achieving both information partitioning and redundancy. However, not all covert networks are created equal, and while they might use a similar network form, they use it in different ways. For example, Al Quaeda is built from quasi-independent self-sufficient cells organized by location. Conversely, Hamas is divided into functional units ("services") that, in turn, consist of localized cells.

Hence, we stipulate that to destabilize different terrorist networks, one must take into account not just the network form of the organization, but also the distribution of skills, resources and task assignments within the network, corresponding to the MetaMatrix model. MetaMatrix model of organizational networks was introduced by Carley and Krackhardt and allows simultaneous analisys of social network, knowledge, resource and task structrures within the organization.

In this paper, we extend the MetaMatrix model to analyze dynamically evolving organizational networks of terrorist groups. To do so, we have developed NetWatch – a dynamic multi-agent network simulation system that uses the MetaMatrix concept as well as Artificial Intelligence-based planning and learning algorithms to build high-fidelity dynamic simulations of covert networks. We use NetWatch to model a number of different covert networks and study the effectiveness of destabilization strategies that could be used against these networks.

Topics: dynamic networks, covert networks, simulated organizations, multi-agent models

Creating Society: Networks of Organized Civil Society in Spain

Fredesvinda Mérida, *José L. C. Bosch*, *Josep A. Rodríguez* (Universitat de Barcelona, Spain)

XXI century is witnessing how the articulation and empowering of society enhances its social and political role in face of changing political structures. In this paper, using multiple memberships in civil organizations from the World Value Survey 2000, we study how the network of organized civil society takes shape and contributes to vertebrate Spanish society. After looking into the co-membership network we decomposed it into the active and passive structures and analyze the relation among them. Interorganizational networks of strong relations are used to understand the core of society and its dominant role, while networks of weak relations provide

a vision of the potential for action. We also build and compare the social worlds according to gender, age, education and social class as a way to assess the capacity for social and political action of these population segments.

Topics: networks of organized civil society, social worlds

Networks and Trust 8.30

Trust and Cognitive Social Structure as Drivers of Relational Changes

David Dekker (University of Nijmegen, The Netherlands)
Philip-Hans Franses (Erasmus University Rotterdam, The Netherlands)
David Krackhardt (Carnegie Mellon University, USA)

In this paper we study the effects of interpersonal perceptions and attitudes on relational change. We hypothesize that perceptions of the social structure (cognitive social structure) and a trusting attitude affect relational change more than the "actual" network structure. More specifically, we consider effects of cognitive social structure, trust in intentions and trust in abilities on changes in two types of information relations. Furthermore, we explore two types of dynamic effects, 1, the effects of levels of trust and social structural perceptions, and, 2, the effects of changes in these variables on relational changes. For example, we consider the effects of the amount of trust as well as the effect of the change in the amount of trust one individual has in another individual on relational change. We test our hypotheses with two datasets that were collected in two independent organizations. The first organization is an IT consultancy firm where we collected data over three periods in a network of 13 individuals. The second is a network of 24 individuals that we could track over 2 periods. For our analyses we use an error-correction model and a semi-partialing MR-QAP test for statistical inference. Our results support the hypothesis that perceptions and attitudes have more impact on relational change than the "actual" network. Furthermore, the results show that it is useful to distinguish between level and change effects of perceptions.

Topics: network dynamics, trust, cognitive social structures

Personal Networks and Trust

Hajdeja Iglič (University of Ljubljana, Slovenia)

The relationship between networks and trust has been widely disputed in the literature: some authors argued that the relationship is strong and others that it is weak or even absent. Also the causal order of the variables is unclear: trust is treated as a by-product of organizational and communal involvement as well as as an important facilitator of group membership. The paper argues that our understanding of the linkage between networks and trust can benefit a lot by introducing varied forms of trust and networks, instead of working with simple dichotomies of less/more trust and less/more network involvement.

On the first point of the correlation between networks and trust we show that different forms of

trust (generalized, particular and familiar) are embedded in very different network structures. This correlation is a result of the fact that varied forms of trust which we obtained by empirical analysis relate to different kinds of social ties: to trust in anonimous others in the case of generalized trust, to trust in weak ties that are established in specific social contexts in the case of particular trust, and to trust in strong and very close ties of family members and few associates in the case of familiar trust. On the second point of the causal relationship between networks and trust we argue that while networks that develop in a certain social context like workplace affect the emergence of context-specific trust (or particular) trust, they have little effect on the generalized trust, which is much better explained by non-contextual factors (individual or systemic). Finally, we show that networks and generalized trust present two very different paths of developing particular trust (for example, trust in coworkers) which allows for cooperation in specific social situations.Particular trust develops as a result of both strong informal integration and feelings of closeness with associates, and general attitudes towards others expressed through the notion of generalized trust.

The data used in the analysis come from the representative national survey on Social citizenship, involvement and democracy conducted in Slovenia in early 2002.

Investigating the Relationship Between Social Capital and Trust in a Social Network Context

Ralph Matthews, *Sandra Enns*, *Todd Malinick* and *Brian Elliott* (The University of British Columbia, Canada)

Literature on social capital has been ambivalent about the relationship between social capital and trust. Coleman saw social capital as adhering to relations of trust (Coleman, 1990: 303). Putnam (2000: 136-137) argues that trust and trustworthiness are key in the formation of social capital. However, work by Stolle (2003) argues that there is no strong relationship between membership in networks and social trust. Likewise, key policy documents from the UK, OECD, and Canada have removed trust for their definitions of social capital. A Canadian government document (GOC 2003:9) declares "One cannot assume that social trust is necessarily a product of social networks. Hence, the relationship between the two phenomena remains a question for empirical testing."

This paper will examine the relationship between social capital and trust using data from a mailed survey to residents of 22 rural communities on the British Columbia coast (N=4262; response rate 60%). Though focused primarily on the relationship between social capital and economic resilience, the survey measures generalized trust, personal trust, positional trust and institutional trust. Social capital is measured through involvement in social activities, group membership, network composition using the Position Generator (Lin, 2001), voting behaviour, and media use.

Using multivariate analysis, this paper will examine the relationship between different types of trust and various social capital measures. It seeks to identify whether trust is an outcome of network involvement and whether levels of social capital formation are enhanced by trust and trustworthiness. It will also examine the extent to which trust formation in network relationships is affected by gender, age, education and income.

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Social Networks and Pro-Social Behaviour: Preliminary Results From Cross-Cultural Economic Experiments

Abigail Barr (University of Oxford, United Kingdom)
Jean Ensminger (California Institute of Technology, USA)
Jeffrey C. Johnson (East Carolina University, USA)

In 1998 the MacArthur foundation funded a team of social anthropologists and economists to investigate the diversity of pro-social norms and preferences (particularly fairness, trust, reciprocity, and cooperation) across a wide range of economic and cultural contexts. By involving members of isolated, less developed, non-western, small-scale societies in games (played for real money) these researchers were able to quantify some aspects of pro-social behaviour and thereby reveal a very high level of diversity. In subsequent analyses very little of the variation in behaviour across individuals could be explained with reference to demographic and economic characteristics. However, a considerable proportion of the variation across groups could be explained with reference to differences in contextual factors including levels of market integration and dependence on cooperative modes of production.

In a series of new studies, a wider range of games has been incorporated into the research programme along with the inclusion of a number of other possible explanatory theoretical concepts that might better account for cross-individual variation in behaviour. Our primary hypothesis is that an agent's tendency to behave in a pro-social manner is dependent on their position within their social network. More specifically individuals with higher betweenness centrality are likely to be more trusting and fair due to the strategic nature of their structural position. Fairness and trust are essential to the building of social capital and will therefore be reflected in the playing of the games.

This paper represents a preliminary analysis of two data sets that include the Orma of Kenya (pastoralists) and Ghanaian wage labourers. In both cases we find a strong correlation between trusting behaviour and betweenness centrality and this correlation is robust to the inclusion of income, gender and age. These relationships and their theoretical implications are discussed.

Topics: social capital, pro-social behaviour, experimentation

Who do You Call in a Crisis? Reliability vs. Capability for Trusted Communication

Denise Anthony and *Eleanor Lewis* (Dartmouth College, Hanover, USA)

This paper will examine the communication networks that emerge between organizations during a crisis situation. As part of a large simulation of a crisis involving public and private organizations in multiple industries, we collected qualitative and quantitative data on the inter- and intra-organizational communication produced as these entities address and manage the crisis. Our primary research questions are about how perceptions of trust and the structure of relationships influence participants' communication over the course of the crisis. Specifically, in this paper we discuss competing explanations of how crisis events impact individuals' and organizations' positions in the communication network and how the network changes over the course of the crisis (measured in the content and extent of their communication). The data we use to construct the commmunication networks is from a database of e-mails produced by participants in the simulation, and the simulation was of a large-scale, sustained cyber attack.

Topics: communication networks, networks during crises, trust in communication networks

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Knowledge Networks 4 8.30

Social Network Analysis as a Method for Expert Localisation and Sustainable Knowledge Transfer

Tobias Mueller-Prothmann (Free University Berlin, Germany)

Commonly, transfer of personal knowledge and conservation of specialised expertise is picked out as a central theme to organisations only after experienced members have already left. The paper presents a "Method for Expert Localisation and Sustainable Knowledge Transfer" based on Social Network Analysis (SNA) as developed during a project co-operation between the Department of Information Science at the Institute for Media and Communication Studies, Free University Berlin, and the Fraunhofer Institute for Production Systems and Design Technology IPK, Berlin. By pragmatically adapting SNA, the method provides a strategic tool to localise experts, to identify knowledge communities and to analyse the structure of knowledge flows within and between organisations. Using recent insights into network analysis, it explains structural patterns (like structural holes, clusters, modularity, etc.) as well as positional models (like hubs, expert-agent relationships, etc.) in the broader context of organisational knowledge and innovation management. It shows its advances and increasing relevance for the practical use in organisational environments by taking into account specific organisational conditions, such as resource limitations and organisational culture, as well as individual behaviour and privacy issues. The paper presents preliminary results of the method as applied to the internal analysis of the research institutes of the Fraunhofer Gesellschaft. It argues that SNA provides a rigorous analytical foundation for the implementation of practical methods in innovation management, particularly for creation and support of informal communities and networks within and between R&D organisations, and for establishing new measures (among others) for assessing their contribution to overall organisational performance. In addition, the presentation aims at laying the

foundations of an international comparative analysis to provide approaches for modifications of the method to be applied under different organisational and cultural conditions.

Topics: social network analysis, knowledge communities, expert localisation, innovation management, applied research

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IT-Supported Monitoring and Analysis of Social Networks in Virtual Knowledge Communities

Matthias Trier (Technical University Berlin, Germany)

Knowledge Workers in knowledge intense business processes are connecting their personal experience with information from related subject matter experts. A network of dynamic relationships emerges and creates topic-oriented social Communities of Practice (CoP), which accumulate competence.

In a corporate application, a Community Management role is often established: e.g. Shell employs "Hub-coordinators" for facilitating large groups of more than 1000 people and Siemens establishes CoP Managers. These coordinators can not employ hierarchical power but have to carefully utilize the basic mechanisms of voluntary Communities by nurturing social interactions, knowledge sharing, and learning processes. IT can support these tasks with a Community Analysis Cockpit for analyzing and visualizing Community structures and processes.

Following a systematic approach, in the first step data models of modern CoP-Software are matched with requirements of corporate Community Moderators. In the focus domain of asynchronous discussion groups, most required data like users, contributions, and references can be extracted from platforms like phpBB or Usenet. A second challenge is the selection of helpful measurements for the analysis component. In the domains author, social structure, thread, and topic, the focus is on interaction analysis (including contents, interaction patterns, clusters, traffic patterns, etc.) and the visualization and analysis of social structures (concentration of expertise, role formation, integration of isolated members, and elimination of network gaps). The resulting Community "Cockpit" can help to determine influential experts, relations, or supporters or to examine the acceptance of new topics. Subsequently, IT can support the establishment of a management cycle for facilitating a Community network consisting of observation, measurement, interpretation and corrective action.

Topics: network analysis, visualization, discussion board, software, virtual communities, business

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Chances of Innovative Cooperation in Computer Supported Team Working Processes

Gerit Götzenbrucker (University of Vienna, Austria)

The analysis is based on a case study of communication structures among process- and project-team members in a mobile phone company during a 12-month period.

Social Networks may support information-, communication- and innovation-processes in organisations. Further social networks could enhance the cohesion of team members as well as

the connections to the company's environment. Social network research shows

- Job satisfaction and teamwork competences are enhanced by employees' social connections – a mixture of strong and weak ties — may therefore offer the best chances.

- New information and communication technologies support the construction of new social networks and preserves already existing connections: ICT enable social networks as well as ICT support social networks.

Four Case Studies were conducted to demonstrate the existence, importance and innovativeness of electronic cohesion in team working processes.
A questionnaire was applied to ask the team members about the teamwork-process, satisfaction with the teamwork, usage of new communication technologies in working processes and personal social relationships.
Further the log file data, all of the team member's e-mail communications (team-related, inbound and outbound) were analysed by using tested network parameters like centrality, density, reciprocity and structural autonomy.
The discussion of the results was an integrative part of the research approach. All Teams usually discussed "their" results separately. In the final phase all team members were invited to give an evaluation of the research results.
The results of the research point out

- E-mail supports the establishment of relationships in an uncomplicated way

- E-mail may help to reduce deficits in communication

- Even the decomposition of hierarchies as well as their reestablishment has been seen.

Methods: survey, team observations, questionnaire with (ego-) network generator, structural analysis of electronic action (with PAJEK), workshops and discussions.

Topics: social networks (ego networks and whole networks), computer supported social networks, organisational communication, e-mail communication, technology assessment, CSCW computer supported collaborative work

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Managing the Boundary of an "Open" Project

Siobhán O'Mahony (Harvard Business School, USA)
Fabrizio Ferraro (IESE Business School, Spain)

Large open source software projects have attracted both amateur and commercial collaborators and now struggle to develop code in an open public environment that still protects their communal boundaries. This research applies a dynamic social network approach to understand how one community managed software project, Debian, develops institutional processes to manage membership and leadership. We examine the projects face-to-face social network during a five-year period (1997-2001) to see how changes in the social structure affect the evolution of membership mechanisms and the determination of gatekeepers and leaders. While the amount and importance of a contributors work increases the probability that a contributor will become a

gatekeeper, those more central in the social network are more likely to become gatekeepers and influence the membership process. A greater understanding of the mechanisms open projects use to manage their boundaries has critical implications for research and knowledge producing communities operating in pluralistic, open and distributed environments.

The Role of Time and Social Structure Dynamics in the Formation of a Collective Mind: An Empirical Investigation

Santi Furnari and *Giuseppe Soda* (Department of Organization and Human Resource Management, Milan, Italy)

Recent advances in information technology and the increasing cross-connection of global economy are fostering the emergence of horizontal networks of collaboration within and among organizations. Many of these networks took the form of virtual project teams whose members are (1) temporarily bound together towards a specific goal; (2) geographically distributed; (3) linked more through technology-supported communication than through face-to-face communication; (4) functionally and culturally diverse.

Many research studies have shown that group dynamics in those teams follow complex path of development, evolving through rapid and continuous changes both in their membership and in their social and relational structure. In this paper we address the question of whether those dynamics may hinder the capability of a virtual project team in developing some form of collective knowledge.

The research question investigated in our work is: *how, and to what extent, the group's social structure dynamics over time influence the development of a collective mind*?

In answering this question, we conducted a longitudinal study on a joint virtual team between two organizations. Data for the study are constituted by all the electronic messages exchanged among team members during the entire period of the project.

We used social network analysis methods to measure group's structure using traditional network metrics (such as, structural holes, closure, density, centrality, etc).

We employed semantic network analysis and various content analysis techniques to analyze each message's original text. Using those techniques, first we identified e-mail threads and main topics, then we defined a set of proxy-metrics to measure variations in collective mind over time (such as, *collective mind memory, renewal, computational power, stability, etc.*).

Both content and relational data were analyzed longitudinally, computing the variations in group's social structure and in its collective mind for each temporal window considered, from the project's beginning to its end.

Network Modelling 1 8.30

Neighbourhood-Based Models for Social Networks: Model Specification Issues

Philippa Pattison (University of Melbourne, Australia)
Tom A.B. Snijders (University of Groningen, The Netherlands)
Garry Robins (University of Melbourne, Australia)

Pattison and Robins (2002) argued that social networks can be modelled as the outcome of processes that occur in overlapping local regions of the network, termed local social neighbourhoods. Within this framework, each neighbourhood is conceived as a possible site of interaction and is associated with a subset of possible network ties. Global network structure is then hypothesised to arise as the outcome of processes occurring within these overlapping local neighbourhoods. In this paper, we review theoretical arguments for various hypotheses about the forms of these local neighbourhoods. We consider Markovian neighbourhoods as well as generalized *realisation-dependent* neighbourhoods that are generated, in part, by interactive network processes themselves. We introduce some promising new neighbourhood forms including what we term *k*-triangles, multiple triadic structures sharing a common dyadic base. We also introduce hypothesized relationships between parameters representing related neighbourhood structures, such as *k*-stars or *k*-triangles, and thereby obtain simplified model specifications. Illustrative empirical analyses based on these various model specifications are presented.

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New Transitivity Specifications for Exponential Random Graph (p*) Models: Avoiding Near-Degeneracy.

Garry Robins (University of Melbourne, Australia)
Tom A.B. Snijders (University of Groningen, The Netherlands)
Philippa Pattison (University of Melbourne, Australia)

We present simulation results for new parameterizations of exponential random graph (p*) models.

Markov random graphs have been the standard form for exponential random graph models, although for large values of a triangle parameter the resulting graph distributions exhibit problems with near-degeneracy. So Markov random graphs are frequently too restrictive as models for empirically observed networks. As a result, practical algorithms for maximum likelihood estimation of Markov random graph models are not always available when the observed graph has high levels of transitivity. But higher order non-Markov models (particularly models based on partial dependence assumptions) may help to circumvent some of these problems.

Simulation studies show that models with only an edge parameter and the proposed new transitivity parameter of alternating k-triangles result in graph distributions reflecting "core-periphery" phenomena. We show by example that these models can accommodate observed graphs with much higher levels of transitivity than can Markov models. We also present initial results for new k-independent-2-path models. In parts of the parameter space, graphs with one or two very centralized nodes result, indicating that these parameters may be useful in modeling highly centralized networks.

The simulations illustrate that partial dependence models open up possibilities of modeling a much wider range of observed network phenomena, expanding the scope and applicability of exponential random graph models.

Network Evolution Models with Actor-Dependent Random Coefficients

M. Schweinberger and *Tom A.B. Snijders* (University of Groningen, The Netherlands)

In the stochastic actor-oriented model for network dynamics proposed by Snijders (Sociological Methodology, 2001), the relational choices made by actors are based on the so-called objective and gratification functions, expressing the actors' preferences and relational tendencies. It is assumed there that these functions are the same for all actors; or, if there are differences, that these can be represented completely on the basis of measured actor-bound covariates. This is often not a realistic assumption, because there may well be unexplained heterogeneity between actors. A model will be proposed here in which the objective and gratification functions include actor-dependent random coefficients to represent unexplained heterogeneity. This approach leads to more parsimonious models of actor heterogeneity than models with actor-dependent statistical parameters. This also opens the possibility to test whether covariates (such as gender, education, "being career oriented") can be used to explain actor-dependent predilections regarding, for instance, reciprocity or transitivity. Model parameters are estimated by likelihood-based methods using data augmentation in MCMC algorithms.

Topics: network dynamics, stochastic actor-oriented model, actor heterogeneity, random coefficients

Pseudolikelihood Estimation of Biased Net Models

John Skvoretz (University of South Carolina, Columbia, USA)

Biased net theory, introduced by Rapoport and others in the 1950s, is one of the earliest attempts to formally model social networks. The theory postulates that ties between nodes derive both from random and non-random events of connection. The non-random connections arise through "bias" events that reflect known or suspected systematic tendencies in tie formation, such as, a dyadic-level bias towards reciprocity or a triadic-level bias towards closure. In this paper, I explore pseudolikelihood methods for estimating the parameters related to these biases and to the random chance of connection. Specifically, three alternative ways of expressing the pseudolikelihood function * at the pair level, the dyad level, and the triad level * are considered. A grid search algorithm is used to implement each of these estimation equations and to analyze several example data sets for the purpose of comparing the outcomes of the different levels of

estimation.

Analysis of Large Genealogies with Pajek
Andrej Mrvar and *Vladimir Batagelj* (University of Ljubljana, Slovenia)

Genealogies can be represented as graphs in several different ways: as *Ore graphs*, as *p-graphs*, or *bipartite p-graphs*. p-graphs are more suitable for analyses and visualization.
Some approaches to analysis of large genealogies implemented in program Pajek are presented. A special emphasis is given to the relinking patterns in genealogies: Different genealogies can be compared according to frequencies of selected patterns of relinking (and blood) marriages. These approaches will be illustrated with analyses of some typical large genealogies.

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Interorganizational Networks 4   11.00

From Words to Numbers to Graphs: A Suggestion on How to Analyze Inter-Organizational Networks Using Archival Sources
Joerg Raab (University of Konstanz, Germany)

In most studies, in which network analysis is used to analyze historical structures and events, relational information is extracted from lists or registers (see for example the work by Padgett/Ansell, Gould or Barkey). However, there are cases in which these sources are not available or the data is not adequate to answer the research questions of interest. But there might be other sources like letters, memos, protocols or telegrams which are produced in abundance especially by organizations since the beginning of the 20th century. Therefore, a technique is proposed combining content analysis and network analysis to extract and analyze relational data from written texts. It is suggested that once refined and tested, this technique could become a valuable addition to the standard data collection procedure using questionnaires which relies very much on the sometimes quite biased reports of individuals of their relations with others. It could also help in overcoming the static character of network analysis by collecting data for different time periods.

The technique is introduced and discussed by presenting results from an ongoing research project on the persecution of Jews in Western Europe under German occupation from 1940-1944. Examples will be from case studies on the persecution of Jews converted to Christian congregations in the Netherlands in 1942/1943 and the forced sale of companies with Jewish owners in France and Belgium from 1940 to 1944.

Topics: historical network analysis, inter-organizational networks, archival sources, holocaust

A Measurement Model of Tie Strength for Business Networks: The Case of a Dutch High-Tech and an Indian Low-Tech Organization

Victor Scholten (Wageningen University, The Netherlands)
Suresh Bhagavatula, *Gerhard van de Bunt* and *Tom Elfring* (Vrije Universiteit Amsterdam, The Netherlands)

In this paper we analyze the concept of tie strength for business networks. Originally, Granovetter (1973) defined the concept of tie strength as a combination of amount of time spent on the relationship, emotional intensity, intimacy and reciprocal services. However, the concept is based on friendship networks and not business networks. As a result ad-hoc measures of tie strength are being applied increasingly in business studies. They are used to explain, for instance, individual careers, knowledge sharing among organization sub-units, firm performance, and entrepreneurial success. We stress that business networks are different from friendship networks because of the goals that are pursued. Using multiple indicator techniques, this study addresses the problem of measuring the concept of tie strength for business networks.

Data are collected from two surveys: one in a high-tech environment and the other in a low-tech environment. The data for the high-tech environment are collected among entrepreneurs in the ICT and Biotechnology in the Netherlands, while the data for the low-tech environment are collected among entrepreneurs in the fashion industry in India. For both data-sets the questionnaires are sent to the entrepreneur of these new ventures. The network data is first analyzed with structural network analysis before it is analyzed along with additional data using multivariate techniques. We use the following approach. First, we analyze for each data-set the measurement model. Second, we compare the two measurement models. This approach allows us to examine the network benefits for entrepreneurial success of young small firms and systematically compare these network benefits for two very different business environments.

Topics: measurement model, business networks, tie strenght, comparison high-tec and low-tech organizations

Relational Dimension of Social Capital and Ego-Networks among Small Entrepreneurs.

Francesca Odella (University of Trento, Italy)

In the last decade, the concept of social capital has attracted the interest of social scientist and the extensive theoretical and empirical researching concentrated among other topics, on the issue of operationalization of the concept. Recently, part of the attention has been paid to the oppor-

tunity to combine, by means of social network analysis, information about individual relational resources and about structure of the social context. In particular, while the use of Ego-network in surveys increased, due to methodological problems in dealing with relational data, analysis tend to be restricted to social support aspects. Other aspects of social capital, however, could benefit from such a perspective and specifically those aspects linked with patterns of access to economic resources or related to participation in specific social groups. Relaying on these large theoretical issues, the paper focus on the results from a recent network surveys on social capital among small entrepreneurs. The paper concentrates on the problem of significance and accuracy in catching relational dimension of social capital concept. Networks of a large sample of entrepreneurs have been collected using CAPI and different dimensions of social capital have been measured looking at different aspects of the entrepreneurs' activity (economic relations, information diffusion about credit and technology, family and friends, membership and participation to associations). The paper will describe the general framework of the research, discuss the main results and concentrate on problems dealing with the transformations of the network through time, looking at changes in expressive and instrumental networks.

Measuring Social Capital Effects in Business via the SNA.

Marina Burakova-Lorgnier and *Tatiana Bouzdine-Chameeva* (Bordeaux Business School, France)

The advantage of social capital is recognized in the economic sciences and proved by the numerous studies to have a positive effect on knowledge sharing, transferring technologies, company performance, etc. [e.g. Hall 2001; Davern 1997; Dyer, Nobeoka 2000, etc.]. Social capital is embedded in structure, modality, and psychological mechanisms of social relations enlightened through the social structure. Thus the role of social capital in business environment can be interpreted and measured through a set of certain network parameters.

"Social-capital-as-closure" [Coleman 1990, 1994] and "social-capital-as-structural-holes" [Burt 2000] present two major social capital approaches. We propose the dynamic social capital model at the point of interaction of these two approaches. Our model is based on the complexity of structural (size, homogeneity, density, hierarchy, structural holes and entrepreneurial functions) and relational (modality of relation, trust, reciprocity, norms and sanctions) network parameters. In the framework of this model, the flexibility of the mentioned parameters allows to characterize social capital as a mobile phenomenon. Numerous factors influencing structuring/restructuring networks could be taken into consideration (activity, goals, cultural context, psychological needs, etc. [Michailova, Worm 2003; Giacobbe-Miller, et al. 2003; Wang 2002]). The empirical research supposes two procedures. The first one is a "Social Capital in Business" questionnaire elaborated by the authors. It is aimed on measuring different forms of trust and reciprocity, connectedness, norms and sanctions. The second procedure is a sociometric analysis of a network, which is mainly oriented to the reconstruction of sub-networks, structural holes, and entrepreneurs. The elaborated procedures serve as a diagnostics tool for analysing the type of social capital, and its effectiveness in order to develop the specific correctional programs for the examined network.

The Common Structure of Interorganizational Networks

Fabio Fonti (Boston College, USA)
Alessandro Lomi (University of Bologna, Italy)

The study of network change requires an operational definition of network form, since this latter one determines the "change space" for the network (i.e., the set of possible states the network can evolve into). In turn, the identification of network forms rests on the possibility of articulating a system of similarities and differences among observable configurations of network ties.

However, due to the significant variety of the possible interorganizational arrangements that can be observed in any specific industry and the sensitivity of interorganizational processes to a large number of institutional details, operational definitions of form have remained elusive. To make things more complicated, in the study of interorganizational networks we lack general theoretical principles of "organizational bonding" that can be used to formulate specific hypotheses that might link micro-relational activities and aggregate network structures.

In this paper we begin to address some of these theoretical and empirical issues in the context of a comparative empirical study of two different interorganizational communities: ceramics machinery manufacturers located in Northern Italy and producers of means of transportation located in Southern Italy. These communities are profoundly different in many crucial respects. For example, while the former community (producers of ceramic machinery) is a typical example of entrepreneurship, production decentralization and organizational innovation, the latter one (producers of means of transportation) represents almost a textbook example of state intervention where local entrepreneurial forces are absent. However, in the study we argue that the structures within these two communities suggest a number of potential empirical similarities. In the empirical analysis, first we explore the possible similarities in forms of interorganizational division of labor through exploratory block-model analysis performed separately within the two communities. Then, we move to the computation of semigroups of relations for the two communities and, finally, we use algebraic methods to search for common structures across the two different interorganizational communities.

Results of the study illuminate key aspects in the comparative analysis of interorganizational networks and help to specify a number of testable hypotheses about the antecedents of change in network configurations.

Topics: network form, network comparison, network change, algebraic models

Civil Society and Public Sphere 2   11.00

Some Patterns of NGO Networking in A High-Growth Industrial Region: A Case Study of the Kryviy Rih Region of Ukraine

Oleh Dyachenko (Polish Academy of Sciences in Warsaw, Poland)

The overall aim of my study was to test the hypothesis that a high-growth industrial region possesses strong and cooperating civil society institutions which are capable of fulfilling the tasks of the catalysts of regional growth ascribed to them in the Ukrainian state regional policy

documents. In the course of the study state regional policy has been operationalized as a system of activities undertaken by the governmental and non-governmental institutions with the aim of securing the functional management of political, economic and social development of a state, regions and territorial communities. In turn, regional socioeconomic development has been operationalized as a change in the regional socioeconomic conditions within a state, meaning the increase in people's social safety, economic activity, the quality of self-management of existing resources, and the quantity of ties the existing regional social networks acquire in the process of revitalization of or shift in regional developmental trajectory. Recent success reports from the center of Ukraine have drawn my attention to the Kryviy Rih Industrial Region in which social networks were analyzed. Methods of interview and social network analysis have been applied for the collection of data on social networks in the KRIR and the further data analysis and representation. The small-scale study of social networks undertaken allowed me to gain insight into the sociologically significant divisions in the given population. The findings indicate that the majority of the population actors are isolated, having no existing relations among each other and, thus, are unable to function as described in their statutes at their best. The analysis of regional network patterns has shown them to be vertical, not horizontal. The results of the empirical analysis refute the hypothesis put forth. Contrary to the expectations suggested, it has been shown that the status of high-growth region does not precondition the same level of regional network development. Such a phenomenon may influence the expectations of the Ukrainian policy-makers, who have ascribed to existing regional social networks the role of actors of change and path-shifters by default.

Topics: social underpinnings of regional development, NGOs in Ukraine

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Circuits, Networks and Hierarchies: the Argentine Global Barter Networks, 1995-2003

Jacqueline Ortiz (Yale University, USA)

From 1995 to 2003, the Argentine Global Barter Networks (GBNs) functioned as the largest parallel currency market in the contemporary world, growing from a small group of activists in Buenos Aires to a 6,000-node (as neighborhood markets are called) network with over 2 million participants.). In the course of their seven-year run, multireciprocal barter networks absorbed hundreds of thousands of 'newly poor' middle class Argentines. Moreover, they functioned as a shadow economy in which participants called "prosumers" not only exchanged consumables but also had access to a wide range of goods and services including home repair (carpentry, plumbing, electricity), medical care through barter HMOs (including dentistry and pharmaceuticals), classes and tutoring, personal care, psychological therapy, and a wide array of handcrafts, all purchased with barter currency called the "crédito social" or social credit. In this paper I account for the development, function, expansion, and eventual implosion of the GBNs as "Zelizer circuits" or specialized networks that employ distinctive media, exchanges and boundaries. The Argentine case suggests that circuits face strong challenges in terms of social control. The flexibility provided by the GBNs' network structure makes them particularly prone to dissension and variability in the application of norms. To solve this problem, hierarchies emerge that increasingly limit participatory decision making, impose illegitimate norms that increase conflict and lead to operational decisions regarding script emission and other issues that negatively affect

the function of the network.

The Effect of Internet on Civic Engagement

Kakuko Miyata (Meiji Gakuin University, Japan)

This paper examines the causal relation between Internet use, social capital and desirable civic outcomes such as trust, reciprocity, political participation, and tolerance of people different from oneself. My research question is as follows: Does access to the Internet increase civic engagement? Putman (2000) indicates that media use such as watching TV or surfing the Internet may restrict opportunities to participate in voluntary groups, which increase social capital. However, it is supposed the Internet may be enhancing their civic engagement if people use the Internet to participate in online political activities. To examine this hypothesis, a panel survey was conducted in 2002 and 2004 in Japan. The results show that people who access the Internet by PC are most active at gathering information related to social and political issues, and have relatively high levels of participation in politically oriented online communities. Moreover, these online activities facilitate participation in offline volunteer groups. It is also apparent that those users who have high levels of generalized reciprocity tend to feel positive about the prospect of using online communities to discuss political issues. Through the experiences of social exchange and support in online communities with diverse membership by PCs, internet users nourish social trust on other users and recognize the possibility of mutual reciprocity. In contrast, those who access the Internet through mobile phones show relatively low levels of generalized reciprocity and are much less enthusiastic about online political participation, though mobile phones allow people the opportunity to maintain greater connectivity with their personal networks, by facilitating high levels of interpersonal communication. These results mean that the usage of the Internet through PCs facilitate to participant in online communities with diverse networks, then social trust and reciprocity fermented through use of Internet may enhance the level of civic engagement in everyday life.

Topics: social capital, internet, civic engagement

Power in Public Spheres – A Network Analysis. The Discourse on EU Governance Structures

Silke Adam (University of Hohenheim, Germany)

This article examines the degree and forms of "Europeaness" in the debate on EU governance structures within the German quality newspaper Frankfurter Allgemeine Zeitung. The degree and forms of "Europeaness" can be analysed by studying the power distribution in the public sphere between actors from the EU, other member states, candidate member states, states outside of Europe and the nation state. The question of power in debates gains importance as public spheres have the potential to influence the political process by legitimatising actors, their ideas and their acting and by integrating communities. As power is not an actor's attribute, but rather arises out of the interaction between actors, a power analysis calls for a specific conceptualisation of public spheres. Public spheres are regarded as networks. This concept of public spheres allows not only to distinguish different forms of power (agenda-setting vs. reputational

power), but also to use the methodology of network analysis. To use network measures for the investigation of content analysis data, allows a relational focus on textual information and thus broadens the scope of content analysis. Network analysis leads to new and challenging insights how the media depict political discourses and how they distribute power.

Some Aspects of the Discursive Competition between German Newspapers and the Construction of Capital City Journalism

Sophie Muetzel (Humboldt-University Berlin, Germany)

The analytic starting point for this paper is the recently discussed model of "markets from networks", in which the key variable for the construction of markets is that participants "watch each other within a market" to obtain cues on others' action and moves. Networks in this view are constitutive of actors' identity and social action in general. Moreover, it has also been shown that relational ties are constituted of more than mere observations: it is stories and their sequential exchange that help to shape and to maintain social structures and their activities. Stories are the ties, which connect actors and actions over time and help constitute each actor's identity.

My empirical focus lies on the market of German opinion-shaping newspapers at the end of the 1990s. I use a sample of editorial disputes over a period of two years and across five German newspapers. These newspapers are at a crucial time in their strategic positioning as they are competing against each other to become the leading newspaper from the new German capital. First, I highlight the structure of the dispute interventions and shed light on leading and following newspapers. I then take the content of the disputes into account by focusing on the evaluative principles to which newspaper editorials adhere. In the analysis, I treat each newspaper's string of evaluations in a given dispute, always in relation to the other four newspapers in that particular dispute, as a sequential string. I use sequence analysis and, complementary, cluster analysis techniques to trace patterns that emerge from those newspaper disputes over time. I find distinct patterns of newspapers' evaluative strategies over time and, in conclusion, match those with the structural patterns found in the first part of the paper. I conclude with some remarks on newspapers' identity shaping strategies.

Topics: discursive competition in networks, narrative construction of markets

Networks and Idenitities   11.00

Balance and Classification

Wouter de Nooy (Erasmus University Rotterdam, The Netherlands)

This paper addresses a classic sociological concern: the entanglement of social structure and mental classifications. It shows how the network structure of affections among a set of professionals shapes and is shaped by the ways in which these people identify and label subgroups among themselves. Furthermore, it discusses how general social distinctions enter into this process, causing the structure and classifications to reproduce general social distinctions. A

case study of Dutch literary criticism is used to support these claims. The paper exploits the well-known property of balance theory to refer to tendencies at the micro (individual) level and, at the same time, to blockmodels at the meso (group) level. In longitudinal signed digraphs, tendencies at the micro level can be captured by logistic regression models predicting the sign of a relation from the (balanced, clustered, or rank-clustered) structure of the sender's (extended) ego-network. Blockmodels capture partitions of opposing plus-clusters in the overall signed network. A classification labelling subgroups reflects plus-clusters that emerge from the balance-theoretic tendencies at the individual level. Once communicated, however, the classification influences action at the micro level because the professionals tend to adjust their affections to it. General social distinctions, especially when they play a role in the discussion among the professionals, enter into this process both at the micro and meso level.

Topics: micro-model, micro-macro link, balance theory, classification, professional circles, art criticism

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Concepts of Network Centrality In Relation to Adolescent Peer Groups and Antisocial Behavior

John M. Light (University of Oregon, USA)
Phillip Bonacich (UCLA, USA)
Thomas J. Dishion (University of Oregon, USA)

A variety of centrality measures exist in the social network literature. Some of these measures have been shown to represent different aspects of "connectedness" or "status"; for example, local vs. global centrality, status that depends on how connected one's immediate contacts are vs. how un-connected they are, status that depends only on positive ("liking") links vs. status that also depends on negative ("disliking") links, and so on. Using longitudinal network data from 5 separate cohorts, obtained during 6th, 7th, and 8th grade, we examine these and other relevant measures as prospective predictors of early adolescent antisocial behavior. Literature on adolescent problem behavior suggests that involvement with deviant peers is a risk factor for later delinquency, substance use, and academic difficulties. Our objective in this paper is to address how different types of early peer "connectedness" may predict later deviant peer involvement, and subsequent problem behavior; thus the analysis has both practical significance(which measure predicts best, perhaps under what circumstances, an aid to future studies), and also theoretical significance (what types of interpersonal influence processes are suggested by these results).

Ethnic Identity and Personal Networks in Sarajevo

Claudia Aguilar and *José Luis Molina* (Universitat Autònoma de Barcelona, Spain)

This paper is the result of a fiedwork developed during the Spring-Summer 2003 among young people in Sarajevo. Our main goal was to identify the different discourses around ethno-national identity and their effect in social relationships. Following this objective we did a discourse analysis of the information obtained by ethnographical research and a network analysis of egonetworks, or personal networks.

With the aid of Egonet we collected for each informant a free list of 45 people and some attributive data (age, nationality, religion, etc). With this information we were able to feed-back the informant with the global structure of her personal network. In this paper we show how the different types of ethnic discourses and ethnic identities are correlated with different types of personal networks in our sample.

Topics: personal networks, ethnic discourses and ethno-national identity

Networks of Identification to Europe. Friendship and Identities of European Students.

Ainhoa de Federico (Université de Lille 3 - Charles de Gaulle, France)

This research studies identification to territorial imagined communities with an approach based on structural interactionism. The author examines how establishing transnational friendship relations favors identification with territorial imagined communities more and more cosmopolitan. The hypothesis has been empirically tested with a survey on a sample (N=301) of students in three European countries (France, Spain, Netherlands). Most of these students were participating in European exchange programs Socrates-Erasmus thus having the opportunity to establish friendship relations with people from other countries. The research addresses the emergence of transnational relations and their effects on identification of alters as well as territorial self-identification, in particular self-identification to Europe.

Lake Wobegon Upside Down: The Paradox of Status Devaluation

Stoyan V. Sgourev (Stanford University, USA)

The paper highlights an intriguing stratification paradox in a post-communist country.

In sharp contrast to the "Lake Wobegon" status-enhancement bias, respondents in Bulgaria tend to decrease their standing in comparative evaluation. Thus, 98% of respondents report that they are either average or below-average on material welfare. Comparison of the objective and subjective distributions on material welfare reveal that nearly half of all respondents claim lower relative status than objectively merited.

Relative deprivation emerges as the principal factor of status-devaluation. It is the product of unfulfilled expectations and unfavorable comparison to the pre-reform period. The structural properties of personal networks represent another notable factor of status-devaluation. Network inertia derails comparative evaluation by reducing awareness of external variation. Strong ties reinforce status-devaluation dynamics by supplying reference points that encourage oversampling on similar others, thereby depressing individual self-estimates.

The analysis suggests that status-devaluation reflects escalating social fragmentation. Faced with the uncertainty of reforms, people increasingly orient themselves to familial and friendship networks for assistance and support. Uncertainty accelerates the rate of dissolution of ties among non-similar others and the formation of niches of similarity in social space.

Topics: status, relative deprivation, social fragmentation, postcommunism

Research Networks: Non-Academic 11.00

Collaboration in Networks of Public Funded Coordinated Programs

Jürgen Guedler (German National Science Foundation (DFG), Germany)
Lothar Krempel (Max Planck Institute for the Study of Societies, Cologne, Germany)

The paper summarizes empirical results from the German Funding Ranking published by the German Science Foundation in 2003.

This report contains for the first time a network chapter, which analyzes the participation of different recipients in coordinated programs and presents network mappings of the funding induced research networks for various disciplines. These allow allow to identify central institutions, and are also informative about the integration of non-university research in different disciplines

How these network derived measures relate to other ranking indicators, and how the potential of network techniques in science research can be further ehanced are discussed.

Using 2-Mode Network Analysis to Understand Complexity in R&D Environments

Jonathon E. Mote (Center for Innovation, University of Maryland, USA)

In this paper, 2-mode network analysis is applied to investigate the impact of complexity of division of labor in an R&D environment. While inter-organizational networks have been studied in science (see for example Powell, 1996), these investigations have not necessarily looked at the complexity of the division of labor contained within the networks. In Alter and Hage (1993) the connection was examined in a study of welfare agencies, but the focus was on non-profit organizations, not scientific research organizations. Yet, this argument is a critical one in the new idea innovation network literature (Hage and Hollingsworth, 2000; van Waarden and Oisterijk, 2003). As Hage argues, a complex division of labor provides for the diversity of knowledge that is critical for creative, complex and rapid problem solving (Hage, 1999). Within the field of social networks, however, the study of scientific innovation typically focuses on informal networks among scientists, focusing on the individuals and not their attributes (Crane, 1972; Senter, 1987; Newman, 2001). The approach taken in this paper is that scientific collaboration also involves a range of specialties and skills, which can be viewed separately from the individuals involved in the collaboration process. The basic hypothesis in this paper is that research collaborations with a more complex division of labor, as typified by a greater number of disciplinary competencies, will have greater research output. To explore this hypothesis, 2-mode data was collected and represented in matrix form for twenty research projects in a multi-disciplinary national laboratory. In this manner, the dataset consists of relations between equally important sets of entities, projects and scientific departments. Following the efforts of Borgatti (1995) and Borgatti and Everett (1997), 2-mode network analysis is employed to identify the central projects and internal departments within the intra-organizational network field. These results are then assessed according to a number of project performance measures

to determine their bearing on scientific output.

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R&D Networks in Greece, 1995-2001

Despina Tomadaki (National Technical University of Athens, Greece)
Moses A. Boudourides (University of Patras, Greece)
Eleutherios Papayannakis (National Technical University of Athens, Greece)

Through participation in various R&D projects, the creation of research consortia between firms, universities and research centres has gained the attention of technological policy in Europe for the promotion of innovation, competitiveness and diffusion of knowledge under the perspective of the Knowledge-Based Economy.

By employing social network analysis, we are studying the evolution of the R&D networks that have been formed in Greece among three types of actors: firms, universities and research centers. These actors have been involved in collaborative research projects aiming at technology transfer. The funding of these projects has been assured during the period 1995 - 2001 by three sources: (a) the EU Framework Programmes, (b) the Greek General Secretariat of Research and Technology and (c) the participating firms themselves. The paper discusses the main dynamical and topological features of these growing multirelational networks created by the above three distinct mechanisms of R&D funding. Our aim is to derive a number of indicators applied for the network analysis and to examine the way in which the three distinct funding relations contribute to the evolution of the emerging R&D networks. Our results indicate that the observed networks are dominated by a few central actors, whose centrality and connectivity is gradually strengthened over time and across relations. Furthermore, the R&D networks can be described as small worlds, implying their efficiency as mechanisms of knowledge diffusion.

Social Networks and Professionalization: The Case of Five Complementary and Alternative Medicine Occupations

Beverly Wellman (University of Toronto, Canada)
Laura Lunansky (York University, Canada)
Merrijoy Kelner (University of Toronto, Canada)

Not all networks are the same. The right kinds of social networks can help groups to professionalize. Our research has shown that groups with more developed, diverse and extensive networks are closer to professional status. This is based on interviews we conducted in Ontario, Canada with leaders of a variety of complementary and alternative medicine (CAM) groups: chiropractors, traditional Chinese medicine doctors/acupuncturists, naturopaths, homeopaths and Reiki practitioners. Chiropractors, the most recognized and mainstream of the CAM occupations clearly have strong intra organizational links with other chiropractic associations as well as many inter organizational links to other health care associations and governmental agencies. They are a self-regulating profession in every province in Canada. By comparison, the networks of homeopaths are much less extensive, diverse and cohesive. They are not even being considered, at this time, for self-regulation. We conclude that networks are two-way streets. First, diverse, extensive networks bring to organizations the information they need for professionalizing. Second, networks help position organizations in their quest for professional status.

Topics: networks and organizations, networks and professionalization, intra organizational and inter organizational links

Networks as Resource and Modus Operandi: The Case of Private Business Schools in Central and Eastern Europe

Nina Bandelj (University of California, USA, and IEDC-Bled School of Management, Slovenia)
David Gedlicka and *Danica Purg* (IEDC-Bled School of Management, Slovenia)
The establishment of private business and management schools in post-socialist Europe appears to be a highly network-dependent phenomenon. Eastern Europe during socialism lacked two major components necessary for the creation of private business schools after the fall of the Berlin Wall. First, it lacked knowledge on how to operate private educational institutions, and second, it lacked academics and professionals who would be able to conduct instruction on operation of market economies and private enterprises. For these two reasons, we argue that the creation of business schools in Eastern Europe is network dependent and we expect that in most cases, network ties between founders of private business schools in Eastern Europe and their connections in the West, are a necessary condition for establishment of private business schools in Eastern Europe. We test this hypothesis by examining cases of failed and successful attempts of private business school creation in Eastern Europe.
In addition, we argue that network connections not only constitute a key resource for establishment of these educational institutions but, moreover, represent their core modus operandi. We look for empirical support for this proposition in the ways East European business schools forge connections to their peers abroad. We suggest that networking arises as the key organizing principle not only because networks are a crucial resource, but also because, cognitively, networking is perceived as the logic of practice of a contemporary academic organization. This

conception is promoted by international management associations and further strengthened by the fact that students and executives who attend business schools learn that networking is the contemporary efficiency enhancing principle, without increasing their awareness about possible negative consequences of network embeddedness.

Topics: network dependence, networking as modus operandi, logic of practice, academic institutions, Eastern Europe

Network Modelling 2 11.00

Widening the Boundaries: A Review of the Past Fifteen Years of Agent-Based Simulation Models

Michael J. Ashworth and *Kathleen M. Carley* (Carnegie Mellon University, USA)

Scholars engaged in the study of work group and organizational behavior are increasingly calling for the use of integrated methods in conducting research, including the wider adoption of computational models for generating and testing new theory. Our review of the state of modern computational modeling incorporating social structures reveals steady increases in the incorporation of dynamic, adaptive, and realistic behaviors of agents in network settings, yet exposes gaps that must be addressed in the next generation of organizational simulation systems. We compare 28 models according to more than two hundred evaluation criteria, ranging from simple representations of agent demographic and performance characteristics, to more richly defined instantiations of behavioral attributes, interaction with non-agent entities, model flexibility, communication channels, simulation types, knowledge, transactive memory, task complexity, and resource networks. Our survey assesses trends across the wide set of criteria, discusses practical applications, and proposes a detailed research and development agenda.

Dynamizing Static Networks - Simulation Experiments in the Context of Power Structures

Harald Katzmair and *Jürgen Pfeffer* (FAS.research Vienna, Austria)

Drawing on models from the field of complexity theory (adaptive walks on rugged power landscapes), clustering theory and E-state structuralism the paper contributes to current efforts in dynamic network analysis (DNA). Taking a certain network structure, the paper focuses on how to identify the most influential attractor in the k-step environment of an individual node. The aim of the paper is to present several algorithms which simulate the future behavior of a given static network (probabilistic scenario analysis). The paper describes the basic assumptions of these models as well as the technical structure of the algorithms. The practical application of these models is illustrated by the example of the directorial interlock network of the Austrian fortune 2500 enterprises.

Monte Carlo Studies on the Spatial Random Graph Model

Ling Heng Wong, *Philippa Pattison*, and *Garry Robins* (The University of Melbourne, Australia)

We present a generalisation of the Erdos-Renyi random graph model which we call the spatial random graph model. The main motivation is to provide a theoretical understanding for the relationship between spatial settings of individuals and the global structure of a complex social network. Here, the random graphs are embedded in a metric space and we let the edge probability between two nodes be a function of the metric distance between them. In general, we allow two individuals to have a better chance to be related if they are within a certain neighbourhood of each other. We perform Monte Carlo simulations on the model and where possible, present rigorous proofs of the conjectures derived from the simulation results. The statistics we are interested include various graph statistics (e.g. degree distribution, characteristic path length, mean shortest path, and clustering coefficient, etc) and spatial statistics (e.g. mean edge length and mean triangle size, etc).

MCMC estimation of the p_2 model

Bonne J.H. Zijlstra, *Marijtje A.J. van Duijn* (University of Groningen, The Netherlands)

The p_2 model is a model for the analysis of social network data. The dependent variable is a (binary) network, or directed graph, on a given set of actors, or nodes; there can be explanatory variables on the levels of the actor and the ordered pair of actors. In the p_2 model, differences between actors in attractiveness and productivity (outgoingness) are modeled by random effects. The model includes variance parameters and a covariance for attractiveness and productivity, and parameters for density (log-odds of existence of a tie) and reciprocity; these parameters can be related to explanatory variables.

Since an IGLS algorithm produced biased estimates for the p_2 model, we suggest to estimate model parameters with a Gibbs sampler. However, the conditional distributions for the random effects and the model parameters cannot easily be sampled from. One way to overcome this problem is using Metropolis steps with random walk proposals to approximate draws from these conditional distributions. Unfortunately, results from a Gibbs sampler with such Metropolis updating steps proved to suffer from the dependence between the covariance for attractiveness and productivity and the reciprocity parameter.

We now propose a normal approximation for the conditional distributions of the random effects and the model parameters. These approximated conditional distributions are used in Metropolis-Hastings steps within the Gibbs sampler.

Results will be presented to illustrate the differences between the IGLS and the MCMC algorithms.

Cooperation in Network Formation Games

Aljaž Ule and *Arno Riedl* (University of Amsterdam, The Netherlands)

The possibility that cooperation may be sustained within networks is speculated by social scientists and economists and seems supported by our everyday experience. However, in view of the

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standard theoretical results about repeated games this seems to be too optimistic: any finitely repeated Prisoner's Dilemma game has a unique 'defective' subgame perfect equilibrium. Generally, this conclusion extends to Prisoner's Dilemma games played on a static network. In contrast with these negative results, cooperation may be sustained in networks whose links are formed endogenously by the players. In this paper we show that the out-for-tat strategy "cooperate until the last but one round and do not link to defectors" is subgame perfect in *finitely* repeated Prisoner's Dilemma games on an endogenously formed network, whenever players have strict upper bounds on the number of individual links. It is, however, not the unique subgame perfect solution and a folk theorem – like result is given for finitely repeated games on the endogenously formed networks. Using laboratory experiments we study the evolution of cooperation and network structures in four similar network formation games with linking constraints. Our results indicate that cooperation in endogenously formed networks is higher than in exogenously imposed ones, but that fully cooperative networks form only when linking bounds are tight, that is, when competition for partners is high.

Topics: network formation, cooperation, public goods, prisoner's dilemma, game theory, laboratory experiments

Interorganizational Networks 5 15.30

Social Capital and Access to Business of Entrepreneurs in the French Construction Industry

Catherine Comet (University of Science and Technology of Lille, France)

We aim at discussing the relation between networks and performance for entrepreneurs. Our empirical data deal with small firms in the French Construction industry. More than 150 entrepreneurs have been interviewed and data have been collected about their ego-centered network. The social capital of these entrepreneurs appears to be strategic to have access to business. Reputation and intermediaries in particular play key role given the quasi absence of other quality control means. Here we zero in on important contacts regarding information about markets, recommending the firm to new clients or providing directly business. Different measures of social capital are used as centrality, cohesion and structural constraint. However, if constraint seems to be linked to production volume for this sample of entrepreneurs, the relation between network structure and profitability is more contingent. We propose hypotheses in order to contextualize the efficiency of relational strategies in function of the nature of firms' activity. For instance, the more or less routine influences the search for security or flexibility, which don't induce theoretically the same relational profile. Different regression models have been tested with structural variables taking into account resource dependence and contacts' status. Besides, our findings enhance the role of public monopsonies and monopolies in French Construction markets. Moreover, beyond access to business, professional networks are essential for work efficiency. For, given the specificity of the production process, they enable good coordination on the building sites, when there is no prime contractor to play this role.

Interplay of Individual and Community Social Capital. An Empirical Investigation among Business Starters.

Boris F. Blumberg (Maastricht University, The Netherlands)

The concept of social capital has been widely acknowledged in the social sciences and beyond. However, scholars employ the concepts at rather different levels. Whereas some view it as an individual characteristic rooted in the individual's personal networks (see, e.g., Becker 1992, Burt 1992, Coleman 1990), others perceive it at an aggregate level as a property of groups or communities (see, e.g., Putnam 1999, Dasgupta 2000). Although both approaches have been fruitful in explaining individual and group outcomes, studies investigating the interplay between social capital at the individual level and the community level are scarce.

This paper attempts to shed some light on this interplay by relating the core networks of business founders to the social capital of the communities they start their business in. More specifically, we are interested whether the social structure of a community affects the usefulness of the individual's network. Following the organizational literature on strategic fit we investigate whether a good fit between the social capital at the community level and at the individual level is advantageous for starting a business. The empirical analysis of this paper relies on a study of about 900 business starts in different local communities in the Dutch sub province South Limburg.

Networks, Trust, and Performance

Andrej Rus (University of Ljubljana, Slovenia)

Trust has been an exciting topic in economic sociology because of the assumed effect of trust on effectiveness of organizations. While the link between trust and performance have been often explored conceptually there was little empirical research that would provide evidence of this assumed relationship. Sako (1992) proposed a typology of trust distinguishing between contractual, competence and goodwill trust to demonstrate a complex link between different types of trust and company performance. We propose a less descriptive and more coherent typology of trust distinguishing between interpersonal, network and institutional trust and look a the mechanisms that link trust to performance. We demonstrate that this typology of trust provides an insight into different ways i.e. mechanisms through which trust can affect performance. In this paper we dwell deeper into the quality of relationships on which interpersonal and network trust are based. By looking at the quality of relationships that undely trusting ties we aim to provide a perspective on trust as a relational rather atributional concept.

Social Networks, Social Capital and Absorptive Capacity

Jaume Guia, *Jordi Comas* (University of Girona, Spain)

In an evolutionary context, the sustainability of the competitive advantage of economic actors is not as much a consequence of the protection of valuable resources, as it is a consequence of the constant creation of new resources that are valuable in the different environments that crop up as a result of a process of co-evolution. Economic actors should, then, develop absorptive capacity, that is the capability for identifying, assimilating, combining and exploiting the knowledge

that flows through the system at any moment. Two types of social capital are defined in the paper. Differentiative social capital is derived from the particular position within the network of contacts in which the economic actors are embedded. It determines the variety, moment of time, and exclusivity of the information to which he/she has access and, therefore, affects directly his/her capabilities for identifying and assimilating valuable knowledge. In contrast, integrative social capital is derived from the cohesiveness of the different groups within the system of contacts in which economic actors operate and belong to. This type of social capital reduces transaction costs by facilitating co-ordination through the development of social norms and by mitigating opportunistic behavior among the members of the group through the development of trust. Consequently, it affects the actor's capability for combining and exploiting any newly acquired piece of knowledge.

Nonetheless, no system operates in isolation. The paper shows how contacts with economic actors, external to any system of reference, also play their role. Moreover, any system can be divided into differentiated subsystems, each of them providing the actor with indirect contact with different categories of external actors. Accordingly, the number of an economic actor's external contacts will add to the stock of differentiative social capital within the system. Similarly, the position of the actor within each of the subsystems of contacts in which the original system can be divided won't necessarily have the same impact on the acquisition of knowledge, and on the future of his/her competitive advantage within the industry.

Many Links = Internet?: The Role of Social Capital on the Diffusion of Information Technologies in a Rural Area of Hungary

László Letenyei, *Eliza Eranus* and *Sarolta Láng* (BKAE University, Hungary)

Our empirical research focused on two topics:

1. How social capital affects the access to Information Technology (IT). In other words: how many and what kinds of acquaintances an actor needs in order to acquire a PC and/or computer skills.

2. The phenomenon of increasing of IT is usually described as a diffusion process in social sciences. We wanted to test whether the fast spreading of IT is really a diffusion process. And, if it is a diffusion process, would it be possible to model the increase of IT knowledge in the Central-European region?

To answer these questions we conducted empirical research in the Hungarian city of Kaposvar and its surrounding region, under the auspices of the European SIBIS research program. Based on qualitative and quantitative methods (survey and participant observation) we noted that not the social capital in general, but rather the structure of the ego-network is relevant. For example in our regression model we found that an educator and a manager acquaintance have more effect on the access to IT than the total number of acquaintances.

About the increase: we discovered that IT growth in the field was not a diffusion process meaning that users did not pass the innovation on to new users. The main mediators of the growth process are institutions such as schools, working places, town halls and so on. In this sense the process of increasing IT in this Hungarian region is more centralised (redistributive) than we assumed before the research.

On-line Communities 1   15.30

Information and Communication Technologies and the Structure and Maintenance of Personal Support Networks

Keith Hampton (Massachusetts Institute of Technology, USA)

As the Internet has grown in popularity and use, it has become imbedded in everyday life. Yet, studies of Internet use tend to treat online ties as if they were a social system removed from the rest of a person's social network. Online relationships are rarely examined in the context of support networks, and there is little discussion of how existing "real world" social ties are maintained online. In addition, online relationships, by the nature of their mode of connectivity, are evaluated as less meaningful and supportive than traditional "offline" social ties. This paper views the Internet as one technology amongst many that plays a role in the structure and maintenance of a personal network, including the telephone and television. In addition, Internet use is examined, not as a single technology, but as a multidimensional technology with passive and active components. 200 people from four middle-class Boston neighborhoods were interviewed using a position generator in the spring of 2002 and again in 2003. This paper uses hierarchical linear modeling (HLM) to model the structure of participants' support networks over time based on their personal and network characteristics. The results of this analysis demonstrate that very few people are making new acquaintances online that become "strong ties". However, email use has become well integrated into the maintenance of support networks and is associated with a larger, more diverse network. Web use is associated with the opposite effect. Email use is also associated with more frequent communication online and by telephone, but not in-person. This analysis also reveals very different patterns in the structure of support networks of early and late adopters of the Internet.

Formation and Characteristics of Internet Assisted Friendship and Sex Networks

Sevgi O. Aral (Centers for Disease Control and Prevention, Atlanta, USA)
Divya Patel (Karmanos Cancer Institute, Detroit, USA)
King K. Holmes (University of Washington, USA)
Betsy Foxman (University of Michigan, USA)

Background: Use of the internet for the recruitment of friends and sex partners may affect the size and nature of friendship and sex partner networks
Objectives: To describe characteristics of internet based friendship and sex networks in a representative sample of the general population.
Methods: In 2003-2004, 919 sexually active persons 18 to 39 years of age participated in a random digit dialing survey (RDDS) in Seattle, Washington. The cooperation ratio was 81.9%.
Results: Internet based partner recruitment increased monotonically from 18% for 18 to 19

year olds to 32% for those 35 to 39; it was highest among homosexuals (59%) followed by bisexuals (45%) and heterosexuals (21%). Thirty-two percent of men but none of the women; 24% of White Americans (WA) and 33% of African Americans (AA); 44% of homosexuals and 33% of bisexuals but none of heterosexuals who recruited sex partners through the internet had sex within one day. Over the past 12 months 8.9% of men and 3.8% of women; 6.9% of WA but none of AA; 11% of homosexuals, 14% of bisexuals and 3% of heterosexuals met 10 or more friends or partners over the internet. Nine percent of men and 4.8% of women; 5.8% of AA and 7.3% of WA; 34.4% of homosexuals, 15.4% of bisexuals and 4.2% of heterosexuals met their internet contact in person. 6.3% of men and 2.1% of women; 5.8% of AA and 4% of WA; 28.1% homosexuals, 10.3% of bisexuals and 2% of heterosexuals had sex with an internet contact.

Conclusions: The internet may increase the size and formation rate of sex networks particularly among White Americans, men and homosexuals.

Information Acquiring-and-Sharing in Internet-based Environments: Examining a Social Networking Behavior

Kevin Rioux (The University of North Carolina at Greensboro, USA)

Internet-based information resources and dissemination tools are continuing to rapidly develop and be adopted by individuals all over the world. Given the far-reaching implications of these trends, researchers in library and information science (LIS) are seeking to better understand individual users' behaviors in these contexts. A user information behavior that is under-examined in the literature is information acquiring-and-sharing (IA&S) in Internet-based environments. This overlooked status is problematic, because we cannot get a complete picture of individuals' information use behavior if we exclude what may turn out to be a relatively common activity.

In response to this problem, the author systematically examined IA&S behaviors among individual Internet users using grounded theory techniques, and developed theory statements that describe and explain these phenomena. The following research questions were explored:

1. What are the behaviors and processes associated with IA&S in Internet-based environments?

2. What are the motivators and corresponding affective and cognitive states associated with IA&S in Internet-based environments?

Respondents targeted for this study were graduate students who study and/or work at a medium-sized American public university who regularly acquire-and-share information in Internet environments. Given the varied social roles and information needs of these Internet users, they demonstrated a broad array of variables that are inherent to this behavior.

Findings show that IA&S in Internet environments is driven by a mix of cognitive, affective, motivational, procedural, and need attributes. The intent of this proposed Sunbelt presentation is to present an emergent conceptual framework based on grounded substantive theories that identifies, explains, and integrates these behavioral attributes, and to examine them in the context of both social network theory in general and the "Internet in everyday life" in particular.

Hopefully this effort will help broaden existing information behavior and social network theories and models, and will inform the practice of information professionals who are tasked with developing and improving information systems.

A Star is Born, But Can She Help?: The Interplay of an Electronic Social Network and Online Social Support

Antonina Bambina (Columbia University, USA)

The number of online support groups is increasing rapidly. Not only do the groups themselves diverge, but the way in which members within each group participate also varies. Differences in patterns of interaction shape the configuration of the social network that constitutes the group, which in turn influences the transmission of social support among the members. This work analyzes the discussions of an online support group, SOL Cancer forum, to uncover the configuration of relations that develop in such an online environment. The structure of the electronic social network is then constructed and its impact on the transmission of support is examined. SOL Cancer forum is a virtual space where those who have had cancer touch their lives exchange numerous types of support. It is an unmoderated group that has been active since 1995. By the year 2000, the forum's electronic social network had developed an intriguing star configuration consisting of one dominant actor responsible for linking a highly bifurcated network. One half the network are support takers who post solitary requests for support and generally only receive support from the central actor. The other half of the network is made up of members who give support to the central actor and one another, but rarely the support takers. These actors are faithful members who call themselves SOLers, consider the SOLers a family and refer to the central actor as their leader. Even though they share this common identity, there are differences in the supportive behavior of the SOLers as well. Analyzing the features of the SOL network in conjunction with message content reveals the influence of social structures that form online on the presence and process of social support.

Topics: electronic social networks; online social support

Neighboring and the Internet: Ties Across the Street

Benjamin Forman and *Keith Hampton* (Massachusetts Institute of Technology, USA)

This paper examines the structure of neighborhood social networks. Specifically, we address hypotheses related to the impact of Internet use on the size, density, strength, frequency of communication, and geographic distribution of local social networks. In the spring of 2002 and again in 2003, four-hundred and fifty adult residents of four Boston area neighborhoods were surveyed as part of this project. Each respondent reviewed a roster of neighborhood residents and indicated how much communication they had with each neighbor that they recognized. Frequency of communication was recorded for phone, email, instant messaging, and face-to-face visits. Respondents also reported how "close" they felt to each neighbor. Following the first wave of interviews, residents in three of the four neighborhoods were provided with neighborhood email lists, and a series of services that facilitated neighborhood interaction, while the fourth was observed as a control group. We use hierarchical linear modeling (HLM) to com-

pare two of the project neighborhoods, a suburban community and the control neighborhood, also a suburban community. Our results suggest that the intervention of a simple Internet service that affords local opportunities for interaction – a neighborhood email list – is associated with an increase in: network size, frequency of interaction, neighborhood closeness, and the geographic dispersion of neighborhood ties. In addition, these changes in the structure of local resident's networks lead to increased neighborhood trust, neighborhood attachment, community awareness, and the ability of the community to address local problems and concerns.

Homophily   **15.30**

Fuzzy Homophily in Interpersonal Relationships

David R. Schaefer (University of Arizona, USA)

Research has consistently shown that individuals' personal networks are homophilous on numerous dimensions; however, most previous research has focused on dimensions individually rather than simultaneously. This research argues that the likelihood of interpersonal relationships depends upon the joint values of different individual characteristics. A method based on Boolean algebra and fuzzy-set logic is utilized in which homophily is measured with combinatorial techniques rather than a linear, additive model. Ego-centric network data from the 1985 GSS are used to demonstrate this method. Results indicate that the strength of homophily varies across relationship type and that different configurations of homophily are necessary for those relationships.

Centrality-Based Homophily and Micro-Macro Linkage

Soong Moon Kang (Stanford University, USA)

The linkage between microprocesses and macrostructures has been one of the most enduring debates in social sciences, and sociology in particular, from both theoretical and empirical perspective. As many commentators have observed, social network analysis provides a powerful framework to bridge micro and macro levels of analysis. In this paper, I present a conceptualization of a basic micro-level process – homophily – in terms of centrality, and discuss how it relates to network centralization, a macrostructural construct. I describe the relationship between these two concepts for different measures of centrality, and provide comparisons between alternative measures of homophily based on centrality. Finally, I provide examples and applications for micro-macro linkages.

Topics: homophily, centrality, network centralization, and micro-macro linkage

Sex, Society and Association: A Cross-National Study of the Strength of Homophily by Sex

Matthew E. Brashears (University of Arizona, USA)

Over the last century a number of significant social changes have occurred within Western society, but few have been more dramatic than the growing equality of women. With increased access to employment outside the home, education, and lifestyle choices, the sexual revolution has decisively altered the social and political landscape. Despite the obvious magnitude of these changes, however, many studies continue to examine issues focal to the politics of sexuality, rather than examine questions that are peripheral politically, but of concrete importance to how men and women live their day to day lives.

The present paper attempts to address such a peripheral issue by examining how sexual liberalization in the workplace affects the social ties of males and females. Specifically, the degree of preference for same sex, versus opposite sex, alters will be examined across a range of economic conditions using the 1986 International Social Survey Projects social networks module. This study provides interesting and suggestive, though not conclusive, evidence that male preferences for sexual homophily decrease with liberalization, and that female preferences for sexual homophily increase. This finding has a number of interesting implications both for the success of sexual equality and for the true nature of homophily.

The paper begins by considering previous research in the area, continues by explaining the methods and rationale employed in the study, describes the results, and concludes by considering drawbacks in the research as well as implications for future work.

Homophily and Social Networks in Computer Mediated Communication: A Study of Adolescents in Israel.

Gustavo S. Mesch and *Ilan Talmud* (University of Haifa, Israel)

Sociological studies of friendship formation have long established that homophily, the tendency of individuals to affiliate with others that are similar in their social attributes, is a persistent characteristic of social networks. In particular, this tendency is much more prominent among adolescents because their activities are bounded to place and school.

Recent research on computer-mediated communication has argued that the communication attributes of the Internet facilitate the formation of computer mediated social ties. On the one hand from communication complexity theory it stems that ties created on the Internet are thin, weak and socially heterogeneous. By contrast, others have argued that computer mediated communication expands the number and the strength of ties. This study is based on a representative sample of Israeli adolescents and includes ego network data of individuals who are Internet users and non users. The findings suggest that among adolescents social networks are becoming heterogeneous in terms of age, gender and place of residence. Furthermore, Internet connection increases the likelihood of dissimilarity of social attributes between ego and alters. The implications of the findings are discussed.

Social Networks in French Wedding Parties

Florence Maillochon (LASMAS — IdL, CNRS, France)

Marriage in France has seen considerable change in the late 20th century. The changes are both quantitative and qualitative. The number of weddings constantly decreased after the Second World War and especially after 1970. The decline in marriages stopped in 1994 and a revival of weddings has occurred since that date. A new kind of union (the PACS which authorizes a civil union between two persons, whatever their gender) was legalized in 1999 and the number of weddings continues to increase. According to the INSEE (National Institute of Statistics and Economics Studies), 285,400 weddings were celebrated in 1999 (253,700 in 1994). Estimations for 2000 confirm this trend. The meaning of marriage has also changed. It is no longer considered as a wedding of convenience chosen by families, but as a "love affair" concerning only the couple. Marriage is becoming more and more a "private" affair. It is nevertheless a very strong alliance which should be studied. Wedding ceremonies have also changed a lot. Church weddings have decreased. There is no longer a standard traditional wedding defined by social or regional origins but a variety of ceremonies mixing different influences. Most couples try to escape social conventions and make their wedding an unique and memorable day. This study proposes to describe the wedding ceremony itself, its new characteristics and meaning by exploring the different kind of relations solicited. A wedding is still a strong and very specific social bond. We propose a "relational approach" to marriage which should combine traditional sociological analysis of weddings with a structural analysis of social networks. Indeed, marriage is one of the ways to mix different social relationships: those of women, of men, of the family and also friendship relations. How do people deal with their different social spheres of influence? A wedding is a stage. The ceremony gives people a rare opportunity to materialize their social networks. They have to decide if they legalize their union with only the two witnesses required by law or if they organize a larger celebration. In that case, they have to choose how many people and who could or should be invited to different parts of the wedding (civil ceremony, church, lunch, dinner, etc.). This "relational approach" to weddings allows a new reading of gender issues in the couple. How do husbands and wives join together their personal social networks? Do they share or separate their relations? How do they organize the mixing? Who are the people they get together or keep separate?

The methodology of the study involves the detailed analysis of 30 weddings. Couples selected for the study are in the same period in their life cycle (first wedding, aged around 30) but they come from different social categories and live everywhere in France. Information has been collected during two in-depth interviews (one before and one after the wedding) and commentaries concerning the guest list.

Preliminary results show that people give great importance to the selection of their guests. The selection process not only changes the meaning of the wedding party but contributes to its symbolic — and also economic – sumptuousness. Weddings often provide the opportunity to revive old relationships. Not only family relationships, but also gender relationships within the couple, may be very sensitive during wedding organization. There is often a major shift between the role taken by the women in the preparations (especially to confirm the symbolic position of the bride during the wedding) and the effective place given to the bride's own network.

Academic Scientific Networks   15.30

What Makes Sciences Innovative? The Measurement of Innovation Potential and its Application in the Austrian Academic Research Network

Wolfgang Neurath (Federal Ministry for Economic Affairs and Labour, Austria)
Harald Katzmair (FAS.research Vienna, Austria)

Most recent research on the structure of innovative networks has identified three main factors underlying the innovation capacity and robustness of successful networks: first, the structural embedded ability to broker between different sources of information and problem-solving strategies (including the capacity to stand unbalanced triads); second, the diversity and multi-dimensionality of the network; third, the overall structure of the innovation landscape (existence of percolating clusters adapted for "adaptive walks" and learning behavior). While there are sound models for measuring the brokerage ability of networks (Gould Fernandez indices, Burt indices, E-I index etc.) as well as the overall structure of the innovation landscape (domain analysis, fragmentation coefficient, clustering coefficient, overall network centrality etc.) techniques to model the comparative diversity of networks are far less standardized. This paper presents several approaches to measuring the innovation potential derived from the field of complexity theory, ecology and the neo-Schumpeter informed tradition of innovation theory. The practical application of these models is illustrated by the example of the collaboration network of 1050 academic disciplines and subdisciplines. Data is compiled from more than 5000 academic research projects funded by the Austrian Science Fund (FWF) between 1995 and 2003.

Unevenness in the Growth of Medical Knowledge: Network Analysis of Coronary Angioplasty

Gindo Tampubolon and *Ronnie Ramlogan* (University of Manchester, United Kingdom)

Ancient and modern accounts strongly suggest two features of medical knowledge developments: re-discovery and unevenness. Using the recently developed concept in network analysis, i.e. islands, (Batagelj 2003), applied to the modern literature on medical knowledge we aim to discover the processes and features of accumulation of knowledge about coronary angioplasty. Islands concept in network analysis can be used to discover local, as opposed to global, dense subnetworks in a network of citations. This is akin to local likelihood or local regression (Loader 1992) in statistics in that it attempt to account for local observations in determining the model that described the observed data. The efficacy of islands and temporal analysis of citation network are compared. We show that islands concept can be used to identify emerging peaks in a network, hence for network with time ordering such as papers citation network or patents citatin network it can be used as prospective tools. Used in this way, islands concept can be used to extend existing practice in the analysis of temporal networks.

Academic Genealogies and Reproductive Schemes from a UNAM[2] Researchers Sample.

Jorge Gil-Mendieta and *Alejandro Ruiz* (IIMAS-UNAM, DMMSS (Social Systems Mathematical Modelling Department), Mexico)

We like to introduce some initial steps around the study of the academic structure in the main academic institution of Mexico, the National University of Mexico, hereby UNAM. In this analysis we considered 524 authors with 7172 coauthors, those 524 authors belong to 18 research Institutes and 10 research centers at UNAM. Those authors produced 6282 papers reported in the main International Journals between 1952 through 2003. In this paper we analyse the academic genealogies, reproductive schemes; and the publication networks as well. Another important information we like to get is centrality, cliques, actors distance, blocks, and those important for our research project [3]
The actual research system at UNAM comprise more than 2500 research persons and these number is variable with time but what is important they are considered the most important research group in Mexico.

Topics: academic genealogies, academic reproduction, centrality, cliques, distance, blocks, actors, publications schemes

Structural Properties and Evolution of Academic Networks: Some Evidences from the Demographer Network in Italy

Giulia Rivellini (Università Cattolica del Sacro Cuore, Italy)
Susanna Zaccarin (Università di Trieste, Italy)

The scientific community organises its relationships into network patterns, where the nodes are individuals (scientists) and the links are acquaintance and common work, usually presented in workshops and conferences and/or published in books and scientific journals.
Since 1992, a references review on Population Studies of Italian scientists is delivered every two years by the Italian National Group for Demography; the review is usually exhaustive for academic demographers.
Preliminary results from the 1998-1999 review based on a traditional analysis (performed with logistic regression model) carried out on observed characteristics (sex, academic position, and university affiliation) of the dyads of demographers suggest that "closeness", defined in a wide sense and not only as geographical proximity, plays a major role in determining scientific relationships. In this paper we extend the modelling of the network estimating a p* model to evaluate the structural network effects based on 1998-1999 data. The analysis is then completed by using network data collected at two time points (1992 and 1998) that allow the study of the network evolution using the statistical method implemented in SIENA.

Changing Paradigm in the Social Sciences Based on Network Analysis

Samuel Schmidt (Universidad Autónoma de Ciudad Juárez, Mexico)
Jorge Gil-Mendieta (IIMAS-UNAM, Mexico)

In this paper we present the impact of Network Analysis on the paradigms of political analysis. We first review some of the main assumptions of political science and then we review the paradigm that characterized political analysis on the Mexican political system.

The last ten years we have analyzing the Mexican Political Network (more than 6,800 politicians). One political party and one large network was in control for last 70 years without any major political party change, which we confirmed doing a clique analysis by year in order to determine groups of politicians in a 50 years span.

Some conventional analysis helps explain the macro conditions for such political stability but network analysis helped explain also the conditions for the maintenance of one of the most stable political systems in the world.

Network Modelling 3 15.30

Using High-Level Petri Nets for Modeling Dynamics of Social Networks

Istvan Back (ICS/University of Groningen, The Netherlands)

Petri Nets were originally developed in information technology and engineering to provide a compact, mathematically grounded set of tools for the aid of the specification and design process of complex hardware and software systems. In this paper I show that a high-level extension of Petri Nets could be applied for modeling dynamics of social networks. Petri nets do not only provide a powerful mathematical background suitable for both state-space analysis and simulation experiments of the modeled system but they also boast an expressive graphical representation appealing for researchers in the field of social networks. Petri nets were originally designed to model concurrency and non-deterministic operation. High-level extensions of Petri nets allow the definition of state-transition probabilities and timings, making them ideal for modeling stochastic processes. Some formalisms include fuzzy techniques and advanced performance analysis methods. Yet others incorporate subnets making them especially useful for modeling large, hierarchical systems. Through a simple example I present how high-level Petri Nets can be applied for modeling and analyzing social networks.

Efficient Generation of Random Networks

Vladimir Batagelj (University of Ljubljana, Slovenia)
Ulrik Brandes (University of Konstanz, Germany)

Random networks are frequently generated, for example, to investigate the effects of model parameters on network properties or to test the performance of algorithms. Recent interest in statistics of large-scale networks results in a growing demand for network generators that can generate large numbers of large networks quickly. We present simple and efficient algorithms to

randomly generate networks according to commonly used models. Their running time is linear in the size of the network generated, and they are easily implemented.

Dynamic Discrete Behavioral Choice on Networks: The Nested Logit Model – Analytical Results and Empirical Application

Elenna Dugundji (University of Amsterdam, The Netherlands)
Laszlo Gulyas (Hungarian Academy of Sciences, Hungary)

Suppose you have the possibility to choose to adopt one of a number of discrete behaviors or to choose to buy one of a number of different products. Moreover, suppose the choice is multi-dimensional or more generally, that there are common unobserved attributes of the choice alternatives. A classic approach to statistical prediction in such a situation given an observed sample of decision-making agents in a population is the nested logit model, pioneered by Ben-Akiva (1973). Now suppose your choice to adopt a discrete behavior or buy a discrete product is influenced by what choices your neighbors and/or members of your social network make, or by your personal general perception of percentages of segments of the population making these choices. Brock and Durlauf (2003) have proposed a variant of the nested logit model for handling multi-dimensional choice of group and behavior, noting that, "There has yet to be any analysis of (such) models... when self-consistency is imposed on the expected group choice percentages. Such an analysis should provide a number of interesting results." It is our aim to fill this gap. First, we present analytical results for mean-field, steady-state corner solutions in parameter space derived drawing on techniques from the mathematics of dynamical systems and bifurcation theory. We also show that our nested logit model reduces to the well-known Potts model in statistical mechanics under various simplifying assumptions. Second, we present an empirical application of the model to transportation mode choice using pseudo-panel microdata collected by the Municipality of Amsterdam Agency for Traffic, Transport and Infrastructure (dIVV) in the greater Amsterdam region during the period 1992-1997. Here we combine advanced econometric estimation with computational techniques from the field of multi-agent based simulation. Finally, we conclude highlighting limitations of our present study and our recommendations for future work.

Topics: discrete choice analysis, network interaction effects, dynamical systems, transportation demand modeling, multi-agent based social simulation

"Robust" Estimation of a Linearized Gravity Model via Unbiased Decomposition: Linear-ORDEC

Yoichiro Higuchi (Tokyo Institute of Technology, Japan)

Traditional determinant analyses of the socio-economic interaction network data are vulnerable to biases in parameters if estimated without important relation factors. Especially, the biases are considerable if they are estimated with a single-equation model, and it is often the case that data of relation factors are difficult to obtain.

In order to avoid this bias problem, the Odds Ratio Decomposition method (ORDEC) has been proposed and applied by the author. However, its statistical properties of decomposed factors

have only been derived with Monte-Carlo simulations.

This study, firstly, demonstrates an unbiased decomposition of a linearized Gravity Model. The interaction data can be unbiasedly decomposed into latent push factor, pull factor and relational factor by the Generalized Least Square method. Secondly, it is shown that determinant analyses of these decomposed latent factors can be separately conducted to contain biases and that unbiased and consistent estimates of determinants' parameters can be obtained. The results of this paper would greatly help us to understand both determinants of socio-economic and spatial interaction data, and characteristics of the ORDEC.

In this paper, due to limitations of space, only the unbiased decomposition of push factor and its determinant analysis are described on the premises that diagonal elements of a socio-economic or spatial interaction data matrix can be used and may be treated equivalently to non-diagonal ones. Cases without diagonal elements are briefly presented in the concluding remarks.

The Emergence of Complex Exchange Networks

Andreas Flache (University of Groningen, The Netherlands)
Josep M. Pujol, *Ramon Sangüesa* and *Jordi Delgado* (Technical University of Catalonia, Spain)

The celebrated "small world" and "power-law" network structures have recently been prominently proposed as models of large networks in a variety of substantive realms. However, it remains unclear to what degree the mechanisms of "preferential attachment" and "random rewiring" that have been argued to underlie the emergence of these networks are sociologically plausible. First, these mechanisms require the sociologically implausible assumption of globally available knowledge about structural positions. Second, individual goals and cognitions that motivate actors' decisions to make or break ties remain implicit.

In this paper we present a computational model of the emergence of complex networks (such as small-world or power-law) that is grounded in social exchange theory and assumptions of bounded rationality. More specifically, we draw on previous work by Flache and Hegselmann and assume that agents seek to find and keep attractive exchange partners in a population where actors differ in attractiveness, for example in their expertise in knowledge exchange.

Agents pursue their goal under imperfect, local information without initial knowledge about others or the global network structure. Moreover, agents in our model are strongly adaptive, i.e. knowledge is only acquired in the course of interaction and simple search heuristics are applied. Our results suggest that under a large range of conditions a segregated network arises in which exchange partners are highly similar in attractiveness. Moreover, we find that the topological structure of the emergent social network depends heavily upon the harshness of the particular exchange game (i.e. the danger of exploitation) and the cognitive properties of the agents (memory size, exploration probability, knowledge exchange mechanism). In particular, we show that it depends on the uncertainty and the harshness of the underlying social exchange situation whether star-like, small world or power law structures emerge.

Topics: social dilemmas, social networks, complex networks, small-world networks, power-law networks, scale-free networks, computer simulation

Interorganizational Networks 6   18.00

Kinship Networks in Two Italian Industrial Districts: A Pre-Test

Ester L. Rizzi (Universita Cattolica di Milano, Italy)

A combination of familiar and historical factors buttress industrial district's economic progress in the North of Italy. As far as the former, the continued existence of the extended family provides for economic relations based on cooperation and trust, and facilities the search for new employees through family and friendship ties.

In this study, we aim to describe kinship relations which are also economic relations of two industrial districts area of the North of Italy, by a network-level analysis.

Data from two pre-tests is used: 130 entrepreneurs (selected on the basis of snowball criteria) are asked questions in order to generate a list of relatives (alters) who are the members of their personal socio-economic network, i.e., to get information about the kinship relations, we measured ego-centered kinship networks. Characteristics of the focal individual (entrepreneur), characteristics of the network members (relatives) and characteristics and content of ties (kinship relations) are considered. Then, summary measures of each network's composition are calculated - distinguishing by level of entrepreneur's and enterprise's attributes – together with some measures of density.

Topics: Italy, industrial districts, kinship, ego-centered network

Regional Productive Systems From a Network Analysis Perspective

María Semitiel-García and *Pedro Noguera-Méndez* (University of Murcia, Spain)

This paper discuss a methodology to analyse industrial relationships based on social network analysis and on the concepts of embeddedness (Granovetter, 1973), productive system (Wilkinson, 1985) and social capital. Once the perspective is discussed it is applied to study industrial relationships in the Basque Country (Spain).

The application of the social network analysis to economic research is at the moment at its initial stages, although it has been widely applied in sociology and psychology. The dominance of the neoclassical mainstream paradigm in economics, based on principles and developing theories that do not consider as relevant the social and relational character of agents and systems, is among the main reasons. However, all the perspectives, even the neoclassical, assume that economics is a social science.

In this paper relationships are the focus of the analysis and they are considered for a particular productive system, geographically and historically specified. The concept of productive system is understood by considering mercantile and non-mercantile relationships among the firms constituting a particular industrial sector. Moreover, relationships are linking firms, and economic sectors at a more macro level, with other types of institutions such as technology parks, research institutes and universities. At the same time, informal relationships among actors should also be included, together with the formal links, to analyse a complete productive system. The whole relational structure is analysed considering its context, and therefore allowing for the

consideration of geographical, historical and social peculiarities, that are necessary for a better understanding of its characteristics.

Topics: regional productive systems, social network analysis, social capital, industrial relations

Small World Research 18.00

How to Search a Social Network
Lada Adamic and *Eytan Adar* (HP Labs, Palo Alto, USA)

We address the question of how participants in a small world experiment are able to find short paths in a social network using only local information about their immediate contacts. We simulate such experiments on a network of actual email contacts within an organization as well as on a student social networking website. On the e-mail network we find that small world search strategies using a contact's position in physical space or in an organizational hierarchy relative to the target can effectively be used to locate most individuals. However, we find that in the online student network, where the data is incomplete and hierarchical structures are not well defined, local search strategies are less effective. We compare our findings to recent theoretical hypotheses about underlying social structure that would enable these simple search strategies to succeed and discuss the implications to social software design.

Topics: small world search, email analysis

A Cosmopolitan Model of the Small World
Scott L. Feld (Louisiana State University, USA)

I suggest that a realistic model of the Small World requires an understanding of essential types of underlying social organization. Watts' original lattice model contained nodes with "local" ties' producing high local density (clustering) connected by random shortcuts. I suggest that there are rarely approximations of "random shortcuts". Rather, even as all nodes are disproportionally local, they vary in the extent of their localism. Most nodes are local in the extreme, but certain cosmopolitan nodes are disproportionately tied to other cosmopolitan nodes that are spread more thinly throughout the space. The most cosmopolitan nodes can reach one another through short paths, and can reach all nodes in their locality through short paths.
The cosmopolitan model has several noteworthy features:

1. Even the ties of the most cosmopolitan nodes are more local than "random" ties.

2. The greater the underlying distance between nodes, the longer the network paths that are required to reach between the nodes.

3. Shortest paths often involve moving "upwards" beyond the level of the target and then back down to the target.

4. Network distances increase logarithmically with population size.

The intuition for this model is fully contained within the seminal paper by Poole and Kochen, and is consistent with the empirical findings of Milgram's Small World Studies and Killworth and Bernard's Reverse Small World Studies.

The present model combines features of multi-dimensional and multi-scale network models developed by Watts and colleagues, and extends Borgatti and Everett's core/periphery models. However, the present model specifically focuses attention on the role that interconnected locally grounded cosmopolitans play in making distant connections. Further implications are discussed.

Student Networks   18.00

A Newly Available "Old Dataset": The Development of Network Relationships Among Freshmen at University.

Wolfgang Sodeur (University of Duisburg Essen, Germany)

A very complex network dataset from 1978 about a population of freshmen (first 10 weeks) will be available now along with a basic documention in English. This paper aims to introduce the main features of the data collection, the content of the dataset and the utilities which are added to handle the dataset. The project was sponsered by the German Science Foundation (DFG contract HU 288/2).

There are individual data about almost all enrolled freshmen, who at least partly answered questionnaires or took part in telefone interviews (N=299), and data about a variety of different social relationships from the participating freshmen with their fellow students and with people from outside university (N=208).

Most of these relational data are egocentric. If target persons belong to the same faculty, participated themselves, and if additional information about the identity of the target persons across questionnaires is available, there are complete network data, i.e. about a subset of 182 out of 208 respondents normal network analysis may be done. The information about missing data is documented in separate files.

To simplify the analysis, 116 networks were extracted and stored separately (see CNETZ.DOC). These networks were collected by means of 25 different name generatores during 9 weeks.

The complete data set is documented in the file STUDANF.DOC. The file contains basic information about the original data set, its decomposition into parts (relational data based on diaries and sociometric data, individual data, missing data), utility programs to extract and/or combine different sorts of network data and to handle missing data informations.

Topics: network data

Detecting broker roles in a large network: A German freshmen population
Volker G. Täube (Swiss Federal Statistical Office, Switzerland)

For to test on the validity of a social capital measure which is based on the idea of *role equivalence* (see also Täube, 2003 in Connections Vol. 25, Nr. 3) the measurement instrument was applied to a sociometric data set stemming from the first ten weeks of a large freshmen population (N=200) at a German university (Hummell and Sodeur, 1984). Based on Merton's theoretical distinction between Locals and Cosmopolitans the instrument yields at the differentiation of broker roles dealing primarily within dense ("socio-emotional") or weak ("instrumental") relational contexts, respectively.

At Sunbelt XXIII. first results were presented that mainly focused on the detection of Local roles within the evolving social structures of this population. Since the questionnaire employed allowed for differentiation between contacts that might be described as being of a rather socio-emotional or more of an instrumental content the decisive relational information used to identify triadic positions can be traced back to the context in which it appeared. Consequently, in a second step of the analysis the entire measurement procedure was applied. For the brokers detected then it was controlled subsequently if their emergence is due to their relevance within networks of a certain relational content.

Topics: social capital, broker roles, role equivalence

Actors Located in Networks 18.00

Structurally Important People: *Gantze Macher* or *Nebbish*?
Mark Fleisher (Case Western Reserve University, USA)
Christopher McCarty (University of Florida Survey Research Center, USA)

Typical sociocentric analyses focus on network structure and the structural position of individual nodes. It is often assumed that nodes exhibiting unique structural positions, such as high betweenness centrality, are synonymous with power within the network. Examples of this are structural holes as described by Burt. Competing views, such as Krackhardt's "Ties that Torture" suggest that depending on the personal attributes of the node such structural positions may be disadvantageous.

We present a sociometric visualization and analysis of 74 female youth-gang members from Champaign, Illinois. These 74 main represent three major gangs. Using extensive ethnographic data, we present interpretations of the structure of this sociocentric network. Ethnographic interpretations illustrate that attributes of a person in a structurally important position must be considered prior to the assumption that such people use their structural position to their advantage.

Peer Nomination as a Method of Selecting Socially Influential Young People for Peer-Led Interventions: A Social Network Perspective

Jo Holliday and *Laurence Moore* (Cardiff University, United Kingdom)

The ASSIST intervention is not a typical peer-led intervention. It relies on the diffusion of new norms of behaviour through social networks by influential students working informally as peer supporters. Following peer nomination, peer supporters receive training to give them the information, skills and confidence to talk informally to their peers about being smoke-free. Whilst it was apparent that the peer nomination process generally gave a good spread of young people from different classes and with good representation of both genders, it was important to identify how peer supporters were distributed in relation to the social networks of the year group, and whether they were equally represented in risk-taking and risk-averse friendship clusters. As a result, social network data were collected in all 59 schools in the ASSIST trial, at three time points over two years. On each occasion, approximately 10,000 students named up to six of their closest friends and provided other information about the nature and strength of their friendship. This presentation will present the initial findings of social network analysis of data collected in four schools at the first post-intervention data sweep. 732 of the 756 students in these schools completed a social network questionnaire. 655 students named 6 friends, 42 named 5 friends, 24 named 4 friends, 6 named 3 friends and 5 named 2 friends. 1,267 friends were named on 4,264 occasions. The majority (730) of these friends were in year 8 at the same school, 208 were in different years at the same school, and 329 did not go to their school. The distribution of the nominated peer supporters and the implications for the potential success of the ASSIST intervention will be discussed. Broader lessons will be identified for the use of peer nomination in identifying socially influential students.

Viszards Session   18.00

Viszards Session: Analysis and Visualization of Network Data

Vladimir Batagelj (University of Ljubljana, Slovenia)
Ulrik Brandes (University of Konstanz, Germany)
Jeffrey C. Johnson (East Carolina University, USA)
Lothar Krempel (Max Planck Institute for the Study of Societies, Cologne, Germany)
Andrej Mrvar (University of Ljubljana, Slovenia)

At the Sunbelt XXII "Viszards session", we presented different analyses and visualizations of the media coverage of the September 11 terrorist attacks and at Sunbelt XXIII we analyzed "The Summer Joker" network. With this year's session we are continuing this tradition.
Rather than a series of contributions on related subjects, this session features a single, joint presentation by all contributors. Our aim is to demonstrate the richness and power of network analysis, in particular when supported by visualization. We therefore present a multi- perspective analysis of a single data set, utilizing a broad range of visualization methods.
In this year we will analyze a data set which describes the players market of the football World Championship 2002. The data allow to identify international transfers between countries and

clubs and contain additional attributes. The international perspective is supplemented from national perspective by a second data set. It describes the players and clubs of the German Bundesliga, by the player's country of origin, and among other attributes by their transfer values.

Saturday, May 15, 2004

Intraorganizational Networks and Job Performance 1   8.30

Cultural Influences on Social and E-mail Communication Networks Work Related Communication in a Multinational Firm

Peter Groenewegen and *Rubin van der Heiden* (Free University , Amsterdam, The Netherlands)

Attention to differences in national cultures is specific area of research on organizations. The basic ideas of Hofstede on cultural differences which he separates in four dimensions, have been the basis for much research on the role of cultural consequences for organizational behavior. Two of these dimensions, uncertainty avoidance and power distance, suggest an effect not only on the tone of conversation or attitude from worker to supervisor, but also on the structure of interaction. Social network research that asks for work related and social interaction can be used to map these communication effects. For instance power distances should be visible in the way in which workers ask for advise. A high score on power distance should relate to network structures of the manner in which members of organizations communicate with each other and their boss. Relatively little is known about the interrelation between the score of members of organizations on these issues for different types of communication. We have studied the relation between tow dimensions of culture and four types of communication networks. Friendship, social contact, and advice are commonly used to analyze network structure. We added email exchanges because a number of authors claim that this type of information can be considered less sensitive to social control or cultural norms.

In the presentation we will discuss the outcomes of a study of the communication networks in two units of an agricultural multinational firm. One unit in the Netherlands and one in Ecuador with a clearly different score on both cultural dimensions.

Interpersonal Affect and Instrumental Work Ties

Tiziana Casciaro (Harvard University, USA)
Miguel Lobo (Duke University, USA)

It is increasingly clear that emotions, and especially negative ones, are driving forces behind social action in general, and instrumental action in particular, with affective and task-related foundations for instrumental ties unavoidably intertwined. Nonetheless, in current network research, so-called "expressive" ties are often treated in opposition to "instrumental" ties, and measured with proxies, such as friendship, that can only capture in small part all-important visceral emotional responses among social actors, with negative affect rarely measured. We draw from two survey network studies of employees in a prominent information technology company and MBA students at a large U.S. business school, respectively, to analyze the role of interpersonal affect in instrumental work ties. Based on a methodology drawing from social psychological models of interpersonal perception, social network analysis and hierarchical Bayesian models, we provide evidence for the strong association between interpersonal affect

and the structure and performance of work networks. We further discriminate between positive affect (i.e., like) and negative affect (i.e. dislike), and find support for a negative asymmetry hypothesis, according to which negative interpersonal affect has a larger effect on the choice of work partners than positive affect. We discuss implications of these findings for social network theory and the management of organizations.

Topics: instrumental ties, affect, Bayesian data analysis

Internationalisation of Public Utilities: Do Cultural. Geographical and Political Factors make an Impact on Ownership Structure?

V. Popov (The University of Greenwich, United Kingdom)

Globalisation is the main issue in the agenda of businessmen, politicians and scholars. It affects almost all everybody on the planet. Globalisation has been explored in many dimensions. However, there is no clear understanding of its content and consequences, yet. This study refers to this issue by studying the process of entering multinational corporations into national markets. It assumes that privatisation and internationalisation of the ownership of public utilities is one of the most important features of globalisation. This study aims to test the significance of factors that might make an impact on the global ownership structure in the water sector. In particular, the impact of geographical, political and cultural factors is examined. Social network analysis is the main method of this research. QAP and EI index are used. Data on companies are taken from the PSIRU data base, which includes over 5000 companies.

Interdependencies, Power-Coalitions, and Co-worker Cooperation: A Social Network Analysis

Stefan Thau, *Marijtje A.J. van Duijn* and *Rafael Wittek* (University of Groningen, The Netherlands)

Previous research on interdependencies and cooperation relied on hypotheses about overall exchange behavior based on a structural theory (interdependence theory), which was mainly tested with perceptual measures of general interdependendence. As a result ecological fallacies occur and hence a structural theory on dyadic behavior has practically not been tested yet in field studies. Based on interdependence and power-dependence theory, we derive hypotheses about the relationship between task interdependence, power coalitions, and employee cooperation on a relational level. It is hypothesized that general trust in peers will be a weaker predictor of dyadic worker cooperation than dyadic trust, that employees are more likely to cooperate with others when their dyadic degree of task interdependence is high, and that employees whose informal power based on trust coalitions was high will be less likely to cooperate with others with whom they had a weak trust tie in the coalition. In addition, formal power based on status is hypothesized to be a weaker predictor for dyadic co-worker cooperation than informal power based on coalitions. Hypotheses will be tested with longitudinal network data collected in three Dutch and German organizations.

Topics: cooperation, interdependencies, power, triads

Structural Logic of Network Organizations

Olaf N. Rank (University of Bern, Swiss)

Organizational networks have attracted increasing attention within the last decades. Although a growing body of conceptual and empirical research has been accumulated, the question about the underlying structural logic of complex network organizations still warrants further research efforts.

In our paper, we conceptualize organizations as multivariate networks, in which corporate entities form the set of network actors being linked by a multiplicity of exchange ties of different relational contents. We propose that actors base their decisions on building and maintaining ties with other actors mainly on two features that relate to themselves as well as to their relational partners (Tichy / Tushman / Fombrun 1979, Granovetter 1985): attributes and characteristics (e.g. reputation, experience) on the one hand and structural embeddedness on the other hand. On an aggregate level, we assume that the interdependencies existing between relations and attributes form the basis of the networks underlying structural patterns.

To examine the structural logic of complex multirelational network organizations, we employ a class of multivariate p* models, originally proposed by Wasserman and Pattison (1996, 1999). Within a comparative case study using a dissimilar case design empirical data is gathered for the strategy making process in two German multinational corporations (MNCs). Based on a thorough review of previous studies, we use the data to test predictions about the structural logic of networks. Particular emphasis is devoted to three research questions: Firstly, can stable patterns (e.g. reciprocity, transitivity) within the cooperation networks be found? Secondly, how does the formal organizational structure shape the observable networks? And thirdly, how is actual cooperation influenced by existing friendship ties?

Despite the different characteristics of the two MNCs examined, our study findings reveal a number of consistencies. In both networks, several stable substructures can be identified on a dyadic as well as on an extra-dyadic level. Furthermore, the influence of the formal organization on actual cooperation is limited to the level of pairs of actors, while no effects can be found on the level of larger subgroups. In contrast to this, friendship shapes the actual cooperation structures noticeably. Overall, the results allow for a detailed explanation of the structural logic underlying complex organizational networks and hence for the deduction of further insights into the functioning of this organizational device.

Social Influence and Diffusion 1 8.30

Weak Ties Are Not So Strong After All

Linton C. Freeman (University of California, USA)

This paper re-examines the conception of the flow of information that was presented by Granovetter in his classic article, "The strength of weak ties" (Granovetter 1973; 1982). A careful

analysis of the logic in Granovetter's argument seems to indicate that it contains a critical flaw. And an application to eight existing data sets shows -- through simulated information flow – that new information typically reaches an individual through stronger, rather than weaker, ties.

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Structure Matters: An Analysis of Consensus Formation in Social Networks

Fabio Rojas (Department of Sociology, Indiana University, Bloomington, USA)
Tom Howe (Social Science Computing, The University of Chicago, USA)

Social scientists have long linked network structures to collective beliefs and behavior (e.g., Simmel 1950; Levi-Strauss 1969; Padgett and Ansell 1993; Bearman 1997; Bearman, Moody, and Stovel 2002). However, little theoretical work isolates network structure effects from other effects. Using consensus formation as an example, this paper argues that "structure matters" — the effects of structure on behavior persist even when controlling for other relevant factors. We develop a formal model of consensus formation based on social network influence theory (Friedkin and Johnsen 1990, 1999; Friedkin and Cook 1990; Kobayashi 2001) and show that network structure has significant effects on in-group agreement, even when controlling for other parameters in the model. Analysis of our model permits us to compare consensus across groups with different interaction patterns and develop testable hypotheses about group structure and consensus. We conclude with a summary of our results, possible model extensions and applications to case management models, groupthink theory, and focus group analysis.

Notes on the Social Influence Within Organizations

Jan-Erik Johanson (University of Helsinki, Finland)

This literature based theoretical study deals with social influence in organisational setting. The study addresses three main questions 1) measurement of social influence, 2) the areas of social influence and 3) the outcome of social influence.
Social network analysis has put forward direct contact, clique membership as well as structural and reqular equivalences as alternative mechanisms for social influence. These mechanisms aim to measure social influence processes of contagion, group pressure and adaptation. The challenge is that measurement instruments differ in their ability to grasp social influence processes. Social psychological theories provide some propositions as to what kind of opinions might be attuned to social influence. Early assumption was that people favour objective cues over the definitions offered by their social relationships. However, social identity theory contests this

assumption by arguing that group identity can fulfill needs for accuracy, positive self-concept as well as affiliation. We cannot define a priori areas of social influence, because adoption of group identity precedes social influence. By contrast, social impact theory argues that convergence through social contagion affects mostly unimportant opinions, whereas divergence is a result of interaction concerning important opinions.

Several propositions of outcomes of social influence have been put forward in order to avoid assumption of eventual convergence of opinions among all people. The existence of parallel social influence processes offers one interpretation of differences in opinions. The strength of social influence is also assumed to vary according the number of people individual is connected to, according to certain threshold levels, and according to micro-macro differences.

In conclusion, measurement instruments are not always well-understood. Moreover, social influence cannot be understood purely in structural terms. The subjective importance of opinions and the salience of group membership are likely to be important dimension which should be included in the analyses of social influence.

Interaction and Consensus in Research

Erin Leahy and *Joseph F. Cabrera* (University of Arizona, USA)

The goal of this paper is to understand the process of consensus formation in a research setting, and to fuse two rather distinct subfields: the sociology of science and studies of consensus. After reviewing and critiquing earlier literature on the determinants of consensus, we identify a rather neglected factor ? interaction ? and incorporate it into our conceptual, process-oriented model as a variable that intervenes between traditional bases of similarity (shared affiliations and demographic characteristics) and resultant attitudinal consensus. The attitudes of interest concern two research practices: data editing, which is relatively unstandardized, and statistical significance testing, which is more codified. We find empirical support for our model. The role of affiliations ? especially the sharing of office space ? in promoting interaction among colleagues is highlighted. Interaction, in turn, is a significant predictor of shared attitudes: weak forms of interaction (i.e., advice-seeking) promote consensus in attitudes, and strong forms of interactions (i.e. close working relationships) promote consensus in actual practice.

Topics: consensus formation, interaction, sociology of science, affiliations

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From Innovation to Social Norm: Bounded Normative Influence

D. Lawrence Kincaid (The Johns Hopkins University, USA)

Every innovation begins as a deviation from existing social norms. Given the strong effect of social norms and pressure, how can any innovation ever diffuse to the point where it becomes a new social norm? The seeming paradox of how a minority can influence the majority has not been explained well by prevailing social science theory. Computer simulations of the diffusion of a new behavior within the social network of a Bangladesh village led to the discovery of a new principle of social change that resolves this paradox. The results revealed the important but overlooked role played by boundaries that emerge within a social network and how such local boundaries affect the creation of a new social norm. A minority position can become the social

norm by means of the process of *bounded normative influence.* As long as a minority maintains its majority status within its own, locally bounded portion of the network, then it can survive, recruit converts in the near surround, and establish its behavior as the norm for the network as a whole. The process is accelerated when the minority subgroup is centrally located in the network and communicates more frequently and persuasively than the majority.

Topics: social networks and behavior change

Social Capital and Social Resources 1 8.30

It's Not Only Who You Know, It's Also Where They Are: Using the Position Generator to Examine Access to Socially Embedded Resources

Sandra Enns, *Ralph Matthews* and *Todd Malinick* (The University of British Columbia, Canada)

This paper examines which types of social ties are most effective in providing access to persons having significant social resources. Data are taken from a community-based survey by the Resilient Communities Project in coastal British Columbia, Canada. Within 22 communities, 4,262 households were randomly sampled (response rate 60%). While preliminary results from this survey were presented at last years conference, this paper provides a more comprehensive analysis.

In the analysis, the Position Generator (Lin, 2001) is used to identify potential resources in a person's social network focussing on positions frequently found in coastal communities. Positions reflected a range of socio-economic statuses (e.g., worker vs. manager), allowing for the exploration of aspects of inequality in access to available resources in individual networks. In addition, measures for type of relationship (e.g., acquaintance, close friend or relative) and location of tie (e.g., inside or outside the community) were included, allowing for a better understanding of the composition of networks within and between communities, and to identify bridges linking to resource-rich positions outside of the community.

This paper examines how involvement in social activities and groups relates to access to embedded resources. It will identify whether these data support Putnam's argument that involvement in social activities is an effective way to make social ties. It will also investigate Granovetter's theory that making weak ties or bridges creates access to key resources. In addition, it will test Burt's theory of structural holes, which focuses on the position of the individual within the social structure, and demonstrate that it is the position of the group in which the individual is embedded that plays the most important role in determining access to resources. Finally, it will examine how these findings are influenced by community, gender, age, education, occupation and income.

How Social Capital Changes Over Time

Bonnie H. Erickson (University of Toronto, Canada)

Until now, studies of social capital (as measured by position generators) have been cross-sectional. This paper reports on one of the first longitudinal studies of social capital, using a sample of residents of Ontario who were interviewed in the fall of 2000 and the summer of 2002. These respondents reported whether or not they knew a man, and whether or not they knew a woman, in each of fifteen occupations varying in both prestige and gender composition. Topics include: (1) how do the fifteen occupations change, as some respondents report gaining a new tie to an occupation, or losing an old tie? (2) how do respondents change in their overall social capital, that is, in their occupational variety of ties to men and to women? (3) how do respondents change in their connections to individual occupations?

The Invisible Hand of Social Capital

Nan Lin (Duke University, USA)

(An earlier version was presented at the Academy Colloquium, "Creation and Returns of Social Capital", Royal Netherlands Academy of Arts and Sciences, Amsterdam, October 30-31, 2003. The empirical work discussed in the paper has been supported by a grant from the Chiang Ching-kuo Foundation. I would like to acknowledge the support of the National Science Council and the Institute of Sociology, Academia Sinica, Taiwan, for their support during my stay at the Sinica, April – July, 2003, when a significant portion of the analyses were carried out and an initial version of the manuscript was drafted.)

One puzzle in the study of social capital in the labor market is the empirical finding that a significant portion of individuals does not report the use of personal contacts in job searches. Two possible explanations suggest either that measurements need improvement or that social capital is a substitution for those deficient in human capital. The purpose of this essay is to argue that social capital, or diverse resources embedded in social networks, indeed offers competitive advantage in the labor market. However, the advantage is sometimes subtler and less visible than responses provided in typical job search surveys where respondents are asked, among methods used to find jobs, whether there are any personal contacts or connections. A significant advantage of having such embedded resources is in receiving job-related information in routine exchanges. Receiving useful job information in routine exchanges, without one's asking or actively searching for it, provides significant advantage in the labor market. The essay explicates such a theory, and subjects derived hypotheses to an empirical test. The findings confirm the utility of the invisible hand of social capital.

Social, Cultural, and Economic Resources and Job Attainment: The Position Generator as a Measure of Cultural and Economic Resources

Henk Flap and *Beate Völker* (Utrecht University, The Netherlands)

Since Bourdieu (1971) it is a received view that middle and higher level occupations differ ac-

cording to the access to cultural and economic capital that they provide. The position generator as developed by Lin (see e.g. Lin, Cook and Burt 2001 for a review) measures a person's social capital by his or her access to various positions and occupations. By recoding these occupational titles according to their financial and cultural resources they provide access to, this measure will be used to assess the resources of a person in this respect. We use occupational scales of the cultural and economic capital of jobs that were provided by De Graaf and Kalmijn (2001) to recode the occupational positions of ego and the network members. We analyse whether this reinterpreted position generator explains occupational attainment better that the original position generator In particular we test the expectations whether those who have a higher income have also more network members in a similar sector as their own occupation. Our data come from the SSND, The Survey of the Social Networks of the Dutch (2000), a national representative sample (n=1007) of individual respondents. The survey provides detailed information of respondent's personal networks and activities in different social contexts.

Measuring Social Capital in a Network

Ainhoa Unamuno, *Ángel Arboníes* and *Marisol Basabe* (MIK Mondragón Innovation and Knowledge, Spain)

When talking about networking and relationships there are two main objects embedded in the definition of Social Capital; *Trust* and *Reciprocity*. These two concepts become the focus of different studies carried out in the evaluation and measurement of Social Capital among communities.

The central point of this paper is a Community of Practice (CoP). CoPs are considered as groups of people who come together to share and learn from one another and they are held together by a common interest in a body of knowledge and are driven by a desire and need to share problems, experiences, insights, templates, tools, and best practices (American Productivity and Quality Centre). The success of a CoP is transform information in something meaningful for the community. So far, we should have a close look at the moment where information is transformed into knowledge. We are working on the idea that knowledge is a flow in an act of relationship that gives sense to the community.

This paper attempts the study and evaluation of those factors, elements that contribute to the efficiency of the network to make knowledge flow within the network. The paper will work in the identification and definition of the indicators on trust and reciprocity and the role they can play in the success of the Community of Practice.

Since early ages individuals are strongly encouraged to network to one another to survive in a given community (family, group, enterprise, etc.) and collaborate in joint activities to reach either individual or collective goals. In the last two decades there has been an increasing interest in the study, analysis and measurement of these relationships and connections among individuals, groups or business organisations. Networking easily captures the imagination of managers as an intellectual situation where knowledge flourishes. Lesser (2000) refers to the critical role of Social Capital in the creation, management and maintenance of knowledge among the relationships. Social Capital is about the value created among connections between individuals.

Topics: social network analysis, social capital, community of practice and knowledge flows

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Networks and Health 1   8.30

The Impact of Social Networks and Social Support on People's Perceived Health Status in Ireland.

Deirdre M. Kirke (National University of Ireland Maynooth, Ireland)
Kevin P. Balanda and *Jane Wilde* (The Institute of Public Health in Ireland, Ireland)

This paper examines the impact of people's social networks and social support on their perceived health status using data from the All-Ireland Social Capital and Health Survey, in which face-to-face interviews have been conducted with 2000 adults (aged 18 years or over) in Ireland and Northern Ireland. The frequency of contact the respondents have with members of their social networks, and three types of social support, including practical, financial and emotional support, emanating from members of their networks, are examined for their impact on the respondents' health. Five different measures of perceived health are used in the analysis: the respondents' reports of their general health; whether they are free from long-term illness; their mental health score; their satisfaction with their own health and their assessment of their quality of life. Possible explanations for the associations found between social networks, social support and people's perceived health status are proposed in the paper.

Relationship of Personal Social Support Network and Subjective Well-Being among Non-Disabled and Disabled People

Laura Szabó (The Gallup Organization, Hungary)

The research results from the field indicate the demographic variables explain a little from the variance of subjective well-being. If not demographic variables, what else explains the level of subjective well-being?

According to both classical and modern sociological theories, close social relationships are necessary for the survival and development of individuals. Previous research results show, that for satisfaction and happiness it is important to have good quality social relationships, too. Social relationships also affect how often people have pleasant or unpleasant experiences, how depressed or optimistic they are, primarily as a result of supportive and buffering effects of social relations. Personal relations that give help in everyday and crisis situations form the relational capital of individuals and this makes different resources accessible to individuals or their households. This network could have an affect on the individuals subjective well-being, and in this way it also determines the quality of life of the community, in which the network is embedded.

The intended result of my research, to add to the study of subjective well-being, that is, it analyses high or low values of subjective well-being (dependent variable) in relation to the composition and structure of a special kind of network, social support personal network (not as a function of the properties of personal relationships). Using logistic regression models, I proved that certain characteristics of social support personal network improve the fit of the regression models comparing to the starting-model which include only the demographic variables.

I examine these relationships not only in a sample of normal, but also in a sample of disabled people. The empirical research is based on the comparison of two, coordinated, experimental design studies. There are two, small sized, statistically independent sub-samples, in which I explore the relationships between the characteristics of social support personal networks and subjective well-being.

Topics: subjective well-being, personal network, social support, disabled people

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Social Network Position and Physiological and Psychological Outcomes

Jeffrey C. Johnson (East Carolina University, USA)
Lawrence Palinkas (UCSD School of Medicine, USA)
James Boster (University of Connecticut, USA)

There is currently considerable interest in the social sciences in the relationships between physiological and neuro-physiological processes and various cognitive and behavioral factors. For example, there has been recent work in neuroeconomics on understanding the relationship between such concepts as trustworthiness and brain activity as determined through the use of fMRIs. This paper is interested in exploring such physiological linkages through an examination of the relationship between individual and group elements of social networks and various psychological and physiological outcomes. Specifically, this paper examines the relationship between aspects of an actor's network position and his/her psychological and physiological state. Cross-cultural data from 4 Antarctic research stations (U.S., China, Russia, Poland) is used to examine the relationship between network position and various psychological outcomes as measured using verbal reports of mood states. In addition, blood was drawn from 10 members of a recent Chinese National Antarctic Expedition at Great Wall Station. Seeking advice (out-degree centrality) from fellow crewmembers was significantly associated with serum adrenalin ($r = .49$, $p < 0.05$). Degree of social interaction (degree centrality for social interaction) with fellow crewmembers was significantly associated with measures of free T3 ($r = .61$, $p = 0.006$) and total T3 ($r = .47$, $p < 0.05$). The study finds a clear relationship between network position and both psychological and physiological indicators of anxiety, stress, and depression.

Intra-Organisational Networks, Well-Being and Job Strain: Analysing Social Capital and Social Liability at the Workplace

Riku Nikkilä (Finnish Institute of Occupational Health, Finland)

The aim of this study is to examine whether features of intra-organisational networks affect perceptions of workplace well-being as well as job strain and stress. The network analytic perspective to social support and well-being has rarely been applied to workplace contexts. Previous

explanations of job strain and stress have focused on job control, job characteristics, social climate and other organisational attributes, while not taking account the social network structures in which employees are embedded. It is hypothesised that communication networks provide employees with social support and facilitate achievement of work related goals (social capital), but that they may also cause social liabilities, such as excessive work demands. It is proposed that high density of the personal communication network enhances well-being through alleviation of excessive workload on the employee. Occupying a brokerage position in the communication network is assumed to be associated with job autonomy. On the downside, employees in such a position may be exposed to excessive work demands and consequently, work stress. Whole network data (advice, collaboration, friendship) and attribute data (job-related opinions) were collected on employees of four Finnish firms in April 2002 (n=275). Controlling for background factors (organisation, sex, tenure, job title, etc.), higher ego-network density was associated with better well-being and decreased workload. High betweenness centrality was associated with more autonomy in the job, but also with increased work load and stress symptoms. In conclusion, the study shows that workplace networks do affect employee well-being and it also provides evidence for social relational explanations of job strain. These findings have implications for organisational development and workplace health promotion practices.

Structures of Workplace Well-Being

Minna Janhonen (Finnish Institute of Occupational Health, Finland)

The study aims to analyse the networks between formal actors engaged in the planning and implementation of workplace health promotion (eg. co-operation between occupational health service nurses, managers and representatives of personnel). Workplace health promotion (WHP) is action that aims to improve well-being in work organisations. In Finland the WHP is statutory, which makes the research of the co-operation of formal actors important.

The study combines two structural approaches: social network analysis and sociosemiotics. Network analysis is used when identifying different kinds of triadic patterns between formal actors. Different triads found in the analysis are investigated more profoundly by using the sociosemiotic approach, which reveals the meaning structures that are embedded triadic patterns. Also the relationship between culture and social structure in organisation is examined. Is the culture and the structure confluenced or divided? It can be assumed that the different kinds of modes of the relationship between culture and social structure have an effect to the well-being. The Finnish Barometer of Maintenance of Work Ability (2001) is used as a database. The data consists of the structured interviews of the representatives of all three formal actors engaged in WHP in same organisations. About 600 triads of formal actors can be found from this data.

This kind of approach can elucidate how well-being is understood in different kind of combinations of social structures and organisational cultures. Different kinds of triads and their sociosemiotic models can present this.

Documents, Words and Networks   8.30

Analysis of US Patents Network

Nataša Kejžar, *Simona Korenjak-Černe*, and *Vladimir Batagelj* (University of Ljubljana, Slovenia)

The network of US patents from 1963 to 1999 (Hall, Jaffe, Tratjenberg 2001, USPTO) is an example of very large citation network (3774768 vertices and 16522438 arcs). We present an approach to determining the main themes in such networks by computing SPC (Search Path Count) weights (Hummon, Doreian 1989, Batagelj 2003) and determining islands (Zaveršnik, Batagelj) with respect to them. As a result we present and discuss the obtained main US patents topics.

The analysis was done using program **Pajek**.

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Network Analysis of Word Association Thesaurus

Aleš Žiberna (University of Ljubljana, Slovenia)

Word Association Thesaurus is a set of word association norms showing the counts of word association as collected from subjects, such as The Edinburgh Associative Thesaurus (EAT) [http://www.eat.rl.ac.uk/], which is analyzed in this paper. It is not a developed semantic network such as WordNet [http://www.cogsci.princeton.edu/ wn/], but empirical association data. The traditional way to collect word association norms is to show or say a word to several people and ask them to say the word which first comes to their minds upon receiving the stimulus. The link established between the stimulus and the response is not semantically labelled and can only be regarded as an association.

The Edinburgh association norms were collected by growing the network from a nucleus set of words. Data collection stopped when 8400 stimulus words had been used. Each stimulus word was presented to 100 different subjects, each of whom received 100 words. The network available from ETA website has 23219 vertices (words or meaningful verbal units), 325624 arcs of which 564 are loops. It has 8210 stimulus words (and not 8400).

In this paper the network analysis approach is applied to The Edinburgh Associative Thesaurus (EAT). Several network analysis techniques are used and evaluated in the analysis of this association network. The special features of this type of dictionary network are examined and an attempt is made to identify important or interesting parts of the network, important vertices, etc. The possibility of using this approach in analysis of other dictionaries and similar networks is discussed.

Application of Social Network Measures for Film Retrieval

Gregory H. Leazer, *Jonathan Furner* and *Rachel Napper* (University of California, USA)

We describe the use of three alternative methods for ranking films in an information retrieval (IR) project. A large film-person incidence matrix is generated by listing the principle cast, directors, producers and screenwriters associated with each film. For the first method, a film-film adjacency matrix is derived. Two films are considered to be adjacent if there is any overlap in the people associated with each film. The adjacency matrix is then used to derive the shortest path distances between all pairs of films resulting in a film-film distance matrix according to a standard technique. The second and third distance measures are our innovation and involve the creation of a similarity matrix that expresses the amount of overlap in the people associated with any two films using Dice's coefficient. A "product distance" matrix is then derived that expresses the distances between any two films based on the product of the similarity weights on a path that connects those films. We also derive an "accumulative difference distance" matrix for which the similarity weights are subtracted from one. Distances are based on the sum of these difference weights on a path that connects two films. In building these two matrices, the shortest distances between all pairs of films are found using Dijkstra's algorithm. The distance, product distance and accumulative difference distance matrices are applied to the Internet Movie Database (IMDb) and described. Empirical findings include the observation of small-world networks consistent with findings from other studies of collaborative activity. We also report how the three distance measures are used to generate recommendations for a known set of relevant films.

Roles Analysis of a Publication Network Based on Eigenvector Centrality

Kenth Engo-Monsen, *Geoffrey Canright*, and *Asmund Weltzien* (Telenor R&D, Norway)

We report on results from an analysis of the publication network at Telenor Research and Development for the years 2001 and 2002. This network is obtained by defining each research scientist as a node, and then defining an undirected link between two researchers if they have coauthored a technical report or note. The analysis is limited to internal collaboration only. We have developed a method for finding centers in a network and associating regions with each center node of the network. (See "'Natural' groupings and roles in social networks based on eigenvector centrality" by Geoffrey Canright, Kenth Engo-Monsen, and Asmund Weltzien for more details.) The analysis method is applied to the publication network at Telenor Research and Development, and the results will possibly also be compared to the results from applying the same analysis to a similar publication network of another research institute. Some results

for the Telenor network are that the largest connected component of the publication network consists of 137 of the researchers (approximately 2/3 of the total number of researchers), in addition to a number of smaller connected components and isolated researchers. Our analysis shows that the largest component is well connected and consists of just one region/center. Our method also allows us to compare the natural (topological) groupings with the administrative groupings (research groups).

Topics: cluster analysis, network roles, eigenvector centrality, publication network

Centrality in Student Networks and the Reception of Relevant Information

Mark Trappmann (Universitaet Duisburg-Essen, Germany)

During the winter term 1978 about 200 freshmen of a German university took part in an experiment. While (almost) the whole population provided data about the developing social relations over time, only a random sample of students were informed about the offer to buy a standard text book in economics at a reduced price. The book is compulsory for first year courses. Thus students who get this information have a strong motive to purchase the book. The randomly selected students are sources of an information diffusion process within the population.

The paper aims to examine in how far different centrality or prestige measures like degree, betweenness, closeness or eigenvector based measures in different networks (e.g. sociometric/ communication networks) within the population of first year students can be used to predict the reception of the information as measured by the purchase of the book. Hypotheses are established on the basis of theoretical argumentation and later tested.

The data are part of a now publicly available data set which will be presented at the same conference by Wolfgang Sodeur and Hans J. Hummell.

Topics: diffusion, centrality, prestige, student networks

Intraorganizational Networks and Job Performance 2   11.00

Analysis of Interactions Network in Workgroup

Johanne Saint-Charles and *Pierre Mongeau* (Université du Québec a Montréal, Canada)

In this paper we will present how centrality indices can be used to analyse workgroup interactions. We will discuss methods for coding interactions in terms of their frequency, content and communication strategies. What we call "analysis of interactions network in workgroup" is used in the context of a research aimed at verifying hypotheses related to the relationship between communicational strategies of group members, group structuration process and emergence of leadership. The challenge here is to adapt methods created for the analysis of relationship patterns into methods for the analysis of interaction patterns while trying to figure out how interactions transform into relationship which then structure the group communication network.

Real communication networks: companies and beyond.

A. Arenas and *L. Danon* (Universitat Rovira i Virgili, Spain)
A. Díaz-Guilera (Universitat de Barcelona, Spain)
R. Guimerà (Northwestern University, Evanston, USA)

The network of interactions within organisations is considerably more complex than the formal chart implies. Due to a variety of reasons such as resolving problems of an unexpected nature, personal and cultural similarities, and political motives, new connections are being made all the time. Understanding such informal networks and how they operate is necessary for management of large firms.

Traditionally, informal network studes are performed in two steps. First, employee questionnaires are used to survey the network. However, employees' answers often contain subjective elements such as "political" motives and the worry about offending colleagues. This effect can be minimized by the second step: cross-checking of the answers which is not free of subjectiveness either. A more significant limitation of questionnaire based analysis is that time and effort costs make it prohibitively expensive to map the entire network even for medium sized organisations.

The rapid development of electronic communications media provides a powerful alternative for studying informal networks. The exchange of e-mails between individuals in organisations is a good indicator of who is linked to who and it should contain information not found in the formal chart, apart from being relatively inexpensive. Online databases provide a wealth of informal network datasets, an unorthodox example being the redhotjazz.com archive of early Jazz recordings, providing historical information about the network of early Jazz musicians and bands.

The study of these networks is interesting from a theoretical point of view, and also, in the case of social networks in firms, form a managerial point of view.

Cooperation Network Structure and Individual Performance in a Global Investment Bank

Martin Gargiulo, *Gokhan Ertug* and *Charles Galunic* (INSEAD, France)

Research on the effects of network structure on individual performance has paid insufficient attention to the conditions that determine the production and the valuation of resources and information in those networks. In particular, a distinction between supply and demand can be crucial to explain performance in cooperation networks, where an actor's ability to add value to her demand network depends partially on the quality of the inputs she gets from her supply network. Building on this intuition, we analyzed the relationship between cooperation network structure and performance for 2259 investment bankers working for a global securities firm. The analysis confirms that a distinction between supply and demand networks is crucial to explain performance in cooperation networks. A bankers ability to add value to her colleagues increases with the density of cooperation among the people who supply inputs to this banker, although the positive effect reverts at high levels of density, suggesting that there are decreasing returns to network density in the supply network. Conversely, the banker's performance decreased with

the density of ties among the people in her demand network–that is, people who depended on her input for their work. Our results contribute to the study of the process of value creation in cooperation networks and mediate between competing theories of how network structures influence individual performance

Topics: social capital, cooperation networks, intra-organizational networks

A Model of the Impact of Social Capital (structural and resource characteristics) on Career Outcomes

Claire Gubbins and *Thomas Garavan* (University of Limerick, Ireland)

This paper proposes a model for analysing the characteristics and influence of Human Resource Development (HRD) professionals' social networks on career outcomes. Research on the roles of HRD professionals found "social interaction" to be a key element of a HRD professionals' role and "relationship building" a key competence required by successful HRD professionals (Garavan et al. 2001; O'Brien & Thompson, 1999; Nijhof & de Rijk, 1997; McLagan et al.1983). Poell et al. (2003) found that strategies such as "negotiating flexibility", involving the "whole" organisation, meeting with key players, mobilising support and ensuring commitment' were used by HRD professionals to organise learning programmes. HRD professionals rely on "relationships" and the resources, information and specifically the support made available through those relationships, to perform effectively in their roles. These relationships frequently include contacts in different functions or external to the organisation. This paper posits that HRD professionals are both required, as an element of their role, and well positioned to expand their social networks. Furthermore, recent growth in the social capital literature indicates that researchers are continuing to recognise the importance of social capital and more specifically, numerous studies have found social capital to influence career success. (Kim,2002; Gabbay & Zuckerman, 1998; Podolny & Baron, 1997; Sparrowe & Popielarz, 1995; Meyerson, 1994; Wegener, 1991; Burt, 1992; McPherson & Smith-Lovin, 1982). Understanding and describing the structural (weak ties, strong ties, structural holes) and resource (social resource) characteristics, of these social networks, that are both performance and career enhancing informs current thinking on the types of strategies and activities that serve to facilitate the accumulation of beneficial and useful social capital, particularly for the HRD professional.

Topics: social capital, social networks, career outcomes, human resource development professional

To Dislike and To Be Liked: Self-Monitoring, Affect-Intensive Relations and Work Performance

Zuzana Sasovova (Vrije Universiteit Amsterdam, The Netherlands)
Michaéla C. Schippers (Erasmus Universiteit Rotterdam, The Netherlands)

We used data collected at a radiology department to examine the effects of affect-intensive social relations at work on individual's workplace performance and the effects of a personality trait – self-monitoring – on the occupation of structural positions in the networks of affect-

intensive positive and negative social relations at work. Results revealed that differences in individual's positions in the social networks of affect-intensive relations were systematically related to their work performance. As expected, we found that prominence in the network of negative ties (being object of adversarial relations) was associated with lower workplace performance. However, controlling for gender, function, rank and tenure, prominence in the positive relations - the advice and friendship networks - was not associated with higher workplace performance. Further, the more adaptive high self-monitors were more likely to occupy prominent positions in the advice and friendship network. In addition, high self-monitors reported having more negative relations with others and tended to connect pairs of negatively related others. Confronted with a larger number of negative relations, high self-monitors probably managed to appear sociable and friendly, making positive impressions on others such that, as a result, self-monitoring was not predictive of prominence in negative relations. The implications and limitations of the present study are discussed.

Topics: self-monitoring, intra-organizational social networks, individual performance

Social Influence and Diffusion 2 11.00

Torn between Like and Dislike: The Effects of Ambivalence on Social Influence in Attitude Formation

Gerhard van de Bunt and *Zuzana Sasovova* (Vrije Universiteit Amsterdam, The Netherlands)

Drawing on the social information processing perspective this paper focuses on the effects of a particular characteristic of an individual's attitude - ambivalence - and its effects on social influence in attitude formation. We define and operationalize attitudinal ambivalence as a simultaneous existence of positive and negative beliefs and emotions with regard to the same object in an individual's attitudinal basis. Ambivalence theorists suggest that attitudes held with ambivalence are more pliable and less predictive of behavioral intention and subsequent behavior. We suggest that ambivalence is closely related to social influence. A theoretical framework describing the role of ambivalence in attitude formation is formulated and empirically tested using individual-level data collected at a radiology department in two subsequent questionnaire survey rounds. The studied object of attitude is an integrated information system – Picture Archiving and Communication System (PACS). The surveys included attribute data (individual characteristics and perceptions of the PACS) and relational data (complete social networks for three types of interpersonal relations). The first measurement was conducted before and the second measurement at the start of the implementation of the PACS. The results reveal that social influence is more likely to be an antecedent of ambivalence, rather than its consequence. In addition, we found evidence of moderating effects of ambivalence on social influence in attitude formation. Implications and limitations of the present study are discussed. In particular, we consider the role of ambivalence in organizational change processes.

Topics: ambivalence, attitude formation, intra-organizational social networks

What Determines the Congruence of Proxy- and Self-Reports on Attitudes towards Immigrants in Germany?

Angela Jäger (University of Mannheim, Germany)

The paper analyses the degree to which subjects are able to report "accurately" the attitudes of their reference group or close discussion partners towards immigrants in Germany. Specifically, it focuses on factors which affect the probability that ego's proxy-reports are in congruence with alter's self-reports on these attitudes. Studies using a social network approach have found evidence for a strong association between respondents' own attitude reports and their reports on the perceived attitudes of relevant others. Since most research has not tested whether this perception of ego is congruent with the actual attitudes of the alteri, it remains unclear to what degree the observed correlations are substantiated in social influence processes or simply result from egos' projection their own attitudes on their alteri. This paper addresses the following questions: Is the accuracy of proxy-reports on attitudes towards immigrants affected by characteristics of the social relationship between ego and alter? How relevant are the perceived or actual features of the whole network? Which role does the respondents' accuracy motivation play? In order to answer these questions we use recently collected data (N = 1.693) about egos' attitudes towards immigrants, including information about egos' perception of alter's attitudes and alter's self-reports in this respect. According to our results the accuracy of proxy-reports is conditional on characteristics of the dyads as well as the complete network these dyads are embeded in. Egos in dense and actual homogenous networks in respect to the attitude were significantly more able to report alter's attitudes correctly. This applies even when the homogeneity of the dyad in respect to the attitude is statistically controlled for. The frequency of contact and the emotional closeness are found to affect the accuracy of the proxy-reports in a non-additive way. The discussion about immigrants in Germany doesn't enhance the convergence.

Topics: ego-centric networks, proxy-reports, attitudes

The Effects of Social and Political Networks on Voting Behavior in Taiwan

Jay Chih-jou Chen (Academia Sinica, Taiwan)

Many studies have shown the importance of political culture, social cleavage, campaigning, and tactical voting as influences on electoral decisions in Taiwan, which has a short but highly contentious electoral politics. Despite the fact that widespread grassroots mobilizations and even vote buying in rural area had long existed in Taiwan and were believed to affect voting behavior, few empirical studies have demonstrated the impact of social networks and conversations on voting in Taiwan. This paper uses a 1998 national survey data (N=3,400) to explore how social and political networks influence voting behavior in Taiwan. It first addresses the extent to which the respondents' social and political characteristics correspond to the characteristics of the members of their political networks. It finds large similarities between the respondents' characteristics and those of their political network members and also between the characteristics of the various network members; the political networks of the Taiwanese are homogenous with respect to education, ethnic groups, and social status. The study also confirms that voters were influenced by the conversational environments of their political networks. Other things being

equal, talking to a supporter of a particular party increased a respondent's chances of voting for that party (and decreased the chance of voting for its rivals). In part, conversational milieus might be one route through which the dominant ruling party mobilized or "bribed" its potential supporters. Other things being equal, those who were approached and successfully persuaded to vote for a particular candidate tended to vote for the dominant ruling party with stronger campaign networks. Finally there are no effects of crosscutting social circles on not voting in Taiwan.

Preference Profiles on a Social Network

Stelios S. Scarlatos and *Moses A. Boudourides* (University of Patras, Greece)

Consider a (finite) set of alternatives - at least three. Each voter - located on a node of an arbitrary graph (assumed to represent the social network over which voters are embedded) - is ranking these alternatives according to a binary relation a preference - which is assumed to be a weak order (reflexive, transitive and complete). Assume that initially voters' preferences are given arbitrarily. Subsequently, voters might interact in pairs and possibly be influenced by each other in order to change their preferences. We assume that interactions only occur on dyads which are connected in the network: First a voter is randomly selected and then one of its neighbors is again randomly selected (as long the former is not isolated); the preferences of these two voters are compared and the former might be influenced by the latter. The type of interactions (influences) we are considering is such that the similarity between the preferences of the interacting dyad always either increases or it remains invariant (i.e., it never decreases). As voters keep on interacting in this way, we are interested in the emergence of equilibrium profiles in which voters' preferences are stabilized and they remain invariant on any subsequent interactions. This means that at an equilibrium profile, when two voters are adjacent, their preferences have to be either completely similar or completely dissimilar. We are investigating the diversity of preferences in such an equilibrium profile compared with the initial profile of preferences. Furthermore, we are examining whether the initial preferences survive in the equilibrium profile or they are replaced by new preferences which are emerging through voters' interactions. Finally, we are interested in understanding the emergence of different blocks (or positions) of the network sustaining diverse preferences and the diffusion of preferences across different positions of the network.

Social Capital and Diffusion: Relationships and Attributes Overtime

Christina Prell (University of Sheffield, United Kingdom)

The present paper draws upon social capital and diffusion of innovations as theoretical frameworks for studying relationships among youth-service workers in a small city in upstate New York. Network and attribute data were gathered via interviews at two different times: May 2000 and June 2001. Network data consisted of information on respondents' relations of trust, resource exchanges, and communication patterns. Attribute data were gathered on respondents' age, gender, organizational affiliation, and attitudes toward specific information technologies. The first round of interviews showed individuals' centrality scores being strongly correlated

with individuals' organizational affiliation and their attitudes toward a specific information technology. The later round of interviews yielded similar results, yet also showed that the network was more cohesive than the previous year and that respondents' attitudes toward the information technology were starting to coincide with one another.

For this paper, additional analyses will be performed to explore how such structures as mutuality, exchange, and multiplexity relate to attitudes toward information technology and how these structures and attitudes have shifted from one year to the next. These results will be discussed in relation to diffusion and social capital to reveal the extent to which this case study reflects or fails to reflect concepts posited in these theories. Finally, the relationship between social capital and diffusion will be discussed, and suggestions made towards further research.

Social Capital and Social Resources 2 11.00

Social Capital in Organizations – Perspectives and Unresolved Issues

Christian Waldstrom (Aarhus School of Business, Danmark)

The importance and usefulness of social capital as a concept in the study of organizations have been established by a large body of research. The aim of this paper is to review the concept of social capital in an organizational context, and identifying five main issues that need to be addressed in future research before social capital can move definitively beyond being merely a metaphor for advantage. First, the unresolved issue of causality is a barrier in the study of social structure and social capital alike, and hampers both measuring scales and implications drawn from empirical research. Secondly, it is necessary to determine whether social capital can or should be measured. Thirdly, the negative aspects of social capital should be explored and integrated into the existing research. Fourthly, the field between social capital of the individual and organizational social capital lacks a consistent, bridging theory. Finally, there is a lack of understanding on how social capital develops over time and the potential benefits of taking a life-cycle view of social capital. In conclusion, the field of social capital in organizations still needs a consistent and coordinated research effort in each of the mentioned areas - separately and concurrently – in order to move beyond structure and metaphor.

The Making of Social Capital in a Low-Income Community

Breno Fontes (Universidade Federal de Pernambuco, Recife, Brazil)

The objective of this article is to analyse the insertion, in egocentric networks, of individuals from a low income community in the city of Recife. Beginning with some initial considerations on egocentric networks we conduct an analysis of networks constructed in a low-income community. The data utilized for the analysis was taken from empirical research undertaken in a low-income community in the city of Recife. Our objective is to verify what is specific to these low-income populations and to what extent it is possible to identify regularities in egocentric networks and in addition to observe, from indices of constructed social capital, what differentiated positions in the social structure can exist when the variable "social network" is included.

We are particularly interested in discussing the FLAP hipotheses regarding social relations as resources and as capital. The indices constructed lead to three large blocks of questions: (a) the number of relations in which are inscribed potencial capacities for assistance; (b) the extension of these networks of assistance, which is a function of the intensity of relations and (c) the resources which could be allocated based on these relations.

The empirical basis of this study refers to information extracted from egocentric networks in the Chão de Estrelas community, Recife. Some 295 questionaires were applied based upon a simple random sample in a universe of 1131 residences (one adult per residence being chosen).

Markets and Networks: Chinese Immigrants with Poor Social Capital

Janet Salaff (University of Toronto, Canada)
Arent Greve (The Norwegian School of Economics and Business, Norway)

This paper studies the nature of ties that skilled workers from the PRC use to get jobs in Toronto. Some maintain that if immigrants follow ascriptive ties to the ethnic enclave, they get higher paying jobs. Others believe these channels mainly exploit ethnic labor. In our study of 100 job seekers (50 couples) we distinguish social networks and the market. We ask: will new immigrants do better by staying in the enclave, where their social networks are concentrated, or do they do better by using the market. The social network path to jobs include kin and acquaintances. The market path includes the media, ads, and on-line job agencies. We find that these new immigrants cannot bring their social capital from their Chinese careers to Canada, and they have trouble building new social capital. As a result, they get worse jobs in the enclave than using the market place. When social capital is poorly placed, a market may do it better.

Marital Networks as Social Capital: Data from the Newly Weds

Yang-chih Fu (Institute of Sociology, Academia Sinica, Taiwan)
Nan Lin (Duke University, USA)
Jay Chih-jou Chen (Institute of Sociology, Academia Sinica, Taiwan)

This paper explores how social capital among the newly weds varies by the extent to which their personal networks intersect and overlap with each other. As husbands and wives spend more time together and participate in each other's activities, their individual networks often become intertwined. Some eventually evolve into joint marital networks. Such joint networks, employing the spouse as a bridge, help expand useful resources for both husbands and wives, thus increasing the couples' social capital. However, the extent of resources accessed through the spouse-bridge may also reflects the extent to which one depends on the spousal relationship and increases vulnerability of one's social capital. Our hypothesis is that women, especially in a more traditional society, usually rely more on their husbands' networks. Furthermore, women's individual networks are more likely to shrink as they conform to traditional family roles. Based on survey data from the newly weds in Taiwan (N=436) and mainland China (N=513), we examine the initial process of marital networks formation. The preliminary analysis shows that the gender gap remains highly significant whether social capital is measured by position generator or other network measures. We then discuss the implications of unequal social capital

embedded in marital networks for husbands and wives and propose agenda for future research.

Topics: social capital, marital networks, network overlapping, position generator

Social Networks of Otomí Migrants in Mexico City

Andrea Scholz (Institute of Ethnology/ University of Bonn, Germany)

This paper examines the social networks of Otomí people from Santiago Mexquititlán/ Quertaro in Mexico City.

The author did fieldwork among a group of Otomí migrants from February '03 to May '03. Some years ago these people had lived in an illegally occupied building located in an upper-class neighborhood. During the time of fieldwork they were dispersed in various buildings, but all belonged to two organizations which formerly had been one organization. Through effective networking with agents of social politics one of the Otom leaders gained support from several institutions interested in helping the urban poor. An apartment house for the whole group on the once illegally occupied ground was built. In spite of this unusual success the marginal situation of the migrants did not change effectively.

To explain the poverty and marginality of Otomí migrant people from a structural point of view several kind of network data were collected (sibling ties between households, friendship ties among women, personal networks of some adult and young women, ties between the Otom organizations and other organizations and institutions in Mexico City).

There will be a focus on the special position of the Otomí leaders who act as brokers between the Otom ingroup and the mestizo outgroup. It will be shown that agents of social politics also play an important role. Despite their intention to help poor Otom migrants they leave them in their marginal position. In the current situation Otom people seem to have no choice. Treated as an marginal ethnic group and gaining this kind of support they can't be integrated into the urban society.

The paper demonstrates that it may be possible to find better ways to support Otom migrants applying methods of social network analysis. The results are some propositions addressed to the agents of social politics.

Networks and Health 2 11.00

Psychology, Agency and Network Structure: The Relationship Between Individual Predispositions, Structural Holes and Network Closure.

Yuval Kalish and *Garry Robins* (University of Melbourne, Australia)

We examine the effect of individual psychological differences on network structures, proposing several hypotheses about how individual differences might predispose actors to structure their social environment by seeking network closure or by sustaining structural holes. We introduce a new triad census method to examine personal networks of strong and weak ties. For 125 egocentric networks we correlated the triad census results with several extensively researched psychological instruments. The triad census reduced to three principal components, describing

central aspects of strength-of-weak-ties and structural holes theories. Psychological predispositions explained a significant proportion of the variance in each of these components.

Our results suggest that people who see themselves vulnerable to external forces tend to inhabit closed networks of weak connections. On the other hand, people who seek to keep their strong tie partners apart, and thereby bridge structural holes, tend to be individualists, to believe that they control the events in their lives, and to have higher levels of neuroticism. Finally, people with strong network closure and "weak" structural holes (as with the "strength of weak ties") tend to categorize themselves and others in terms of group memberships. They also tend to be more extraverted and less individualistic.

Topics: Egocentric networks, individual differences, structural holes

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The Dynamic Mutual Influence between Networks and Individual Behavior, and its Application to Adolescent Friendship and Smoking

Tom A.B. Snijders and *Christian E.G. Steglich* (University of Groningen, The Netherlands)
Michael Pearson (Napier University, Scotland)

Networks of relations between social actors - for individuals as well as for corporate actors – are crucial social opportunities and constraints for the behavior and performance of the actors. The social networks themselves are usually not exogenously determined but arise as the outcome of individual choices and behavior. The selection of others as interaction partners depends strongly on characteristics (such as perceived abilities and attitudes) and behavior of the actors involved, as well as on the earlier or present network structure, and the embeddedness in the wider social network. On the other hand individual behavior is influenced strongly by the behavior of relevant interaction partners.

A stochastic model is proposed and elaborated, expressing how networks and individual behavior change dynamically in a mutual influence process; with an associated statistical methodology for parameter estimation and testing, assuming that repeated observations on the network and on the behavior are available. This methodology is based on computer simulation since the model is too complicated for explicit calculations. Special attention is given to the importance of network positions such as membership of cohesive groups, peripheral connections to such groups, isolation, etc. The methodology is applied to a three-wave panel study of friendship and smoking behavior in a Scottish secondary school.

An Intervention Using Peer Supporters to Spread Anti-Smoking Messages Through Their Social Networks: Rationale, Implementation and Impact in 30 Schools

Laurence Moore and *Jo Holliday* (Cardiff University, United Kingdom)

Reducing smoking uptake among adolescents is a policy priority, but effective interventions have yet to be identified. Peer-led interventions may be one possible solution. Although peer influence is generally characterised in terms of the negative role it has in smoking uptake, it can have a positive influence, which could be harnessed to reduce smoking prevalence.

The ASSIST intervention is not a typical peer-led intervention. It relies on the diffusion of new norms of behaviour through social networks by influential students working informally as peer supporters. Following peer nomination, peer supporters receive training to give them the information, skills and confidence to talk informally to their peers about being smoke-free. They are then provided with support by trainers over a ten-week intervention period at four follow-up visits.

This presentation will discuss the rationale for the design of the intervention and provide some detail on its delivery in 30 schools, and its acceptability to schools, teachers and students. Early results from the evaluation of the intervention will also be presented. The evaluation design is a cluster randomised controlled trial of 59 schools, with data obtained at four time points over two years from 10,889 students. Response rates at baseline and first post intervention follow-up were 93.7% and 91.0% respectively. The intervention was delivered successfully in all schools. 942 students were invited to be peer supporters following peer nomination, of which 867 consented to attend the training. Of these, 687 (79%) fully carried out the role of peer supporter, including keeping a diary of their conversations with peers. 27% of students in intervention schools reported that they had had a conversation with a peer supporter. Results from the first post-intervention follow-up suggest that this intervention which relies on the diffusion of a message through social networks can reduce smoking prevalence among adolescents.

Individual and Relational Characteristics Associated with the Stability of Injection Drug Users' Personal Relationships

Elizabeth Costenbader and *Carl Latkin* (Johns Hopkins Bloomberg School of Public Health, USA)

An understanding of factors that influence the stability of injection drug users (IDUs) social relationships and consequently social networks is critical for understanding the spread of HIV and social influence among IDUs as well as for designing more effective interventions. Using data from a longitudinal study of IDUs and their non-injecting associates, the goals of the present paper are to test a series of hypotheses that may explain why some relationships remain stable over time while others dissolve. At baseline, which began in 1997, 1,617 individuals were interviewed and provided information on 14,816 relationships. This analysis was limited to a subset of 9,861 relationships reported by 1,075 individuals who were interviewed at baseline and at either one or both of two follow-up interviews, conducted approximately one year and four years later.

The study used a multilevel logistic regression analysis to test hypotheses regarding the influence of relational and individual characteristics on relationship stability (Byrk and Raudenbush, 1992). The hypotheses were developed integrating assumptions regarding the nature of social exchange in small groups and the generation of social capital as well as from findings of other studies of the social networks of individuals in high-risk populations (Hoffmann, Su, and Pach 1997; Latkin et al. 1995; Neaigus et al. 1996; Rothenberg et al. 1998).

Results: Upon completing a systematic matching of the names and demographic characteristics of network contacts identified at baseline and follow-up, we determined that of the 9,861 relationships reported at baseline, 4,251 (44%) were reported again at either the first or second or both follow-up interviews.

At both the relationship and the individual level, we found support for some but not all of our hypothesized associations. Perhaps most surprising to us was the finding that balance in exchanges of material and financial support was not positively associated with the stability of relationships but rather had a significant negative association with relationship stability.

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Networks Measures: Validity and Reliability   11.00

Meta Analysis of Reliability and Validity Estimates for Egocentered Network Data Using a Multilevel Multitrait Multimethod Model

Germà Coenders and *Lluís Coromina* (University of Girona, Spain)

In this paper we assess reliability and validity of egocentered network data using the multitrait-multimethod approach. The confirmatory factor analysis model for multitrait-multimethod data (Werts & Linn, 1970; Andrews, 1984) is used with this purpose.

We consider egocentered network data as hierarchical; therefore a multilevel analysis is required (Muthén, 1989, Hox, 1993). We use Muthén's partial maximum likelihood approach, called pseudobalanced solution (Muthén, 1989, 1990, 1994) which produces estimations close to maximum likelihood for large ego sample sizes (Hox & Mass, 2001). This approach provides reliability and validity estimates at both the group and individual levels, and other interpretable decompositions of indicator variance.

Data come from an experimental design using web surveys in which 4 countries used the same questionnaire systematically varying the question format (all labelled categories in response scales versus only end labels, question order by alters versus by questions, plain text web design downloading fast versus fancy design with images downloading more slowly). The contribution of each of these factors to reliability and validity is obtained by means of a meta analysis.

Multilevel Multitrait Multimethod Model. Application to the Measurement of Egocentered Social Networks

Lluís Coromina and *Germà Coenders* (University of Girona, Spain)
Tina Kogovšek (University of Ljubljana, Slovenia)

Our goal in this paper is to assess reliability and validity of egocentered network data using multilevel analysis (Muthén, 1989, Hox, 1993) under the multitrait-multimethod approach. The confirmatory factor analysis model for multitrait-multimethod data (Werts & Linn, 1970; Andrews, 1984) is used for our analyses.

In this study we reanalyse a part of data of another study (Kogovšek, et al., 2002) done on a representative sample of the inhabitants of Ljubljana. The traits used in our article are the name interpreters. We consider egocentered network data as hierarchical; therefore a multilevel analysis is required. We use Muthéns partial maximum likelihood approach, called pseudobalanced solution (Muthén, 1989, 1990, 1994) which produces estimations close to maximum likelihood for large ego sample sizes (Hox & Mass, 2001).

We show that some of the results obtained by classic methods are biased and that multilevel analysis provides more detailed information that much enriches the interpretation of reliability and validity of hierarchical data. Within and between-ego reliabilities and validities and other related quality measures are defined, computed and interpreted.

The Reliability of Social Support Items: Giver-Receiver Asymmetries across Gender and Ethnic Boundaries

Christian E.G. Steglich (University of Groningen, The Netherlands)
Chris Baerveldt (Utrecht University, The Netherlands)

In this paper, we investigate the reliability of social support items in a group of actors who are categorized, e.g., according to ethnicity or gender. We argue that in many common applications, network items are prone to bias resulting from category-based differences of opinion about the nature of the relationship that is measured. For instance, girls may see emotional support as much less exceptional than boys do, and in particular may they see emotional support given to a boy as much less worth mentioning than the boy who receives the support. We investigate the impact of this type of bias on item reliability. While in principle, the phenomenon affects network items of all types, we concentrate on social support items because here, the usual procedure of assessing reliability "en passant" via reciprocity is not possible. We argue that the phenomenon is potentially widespread and dangerous, as it can lead to distorted conclusions in a couple of network analyses. Further, the possibility to control for the bias by means of two-sided measurement of the support item (giving and receiving) is investigated. Our argument is illustrated with data from the Dutch Social Behavior Study.

Stability of Measures of Centrality and Prominence Based on Fixed Choice Data Collection Modes

Barbara Zemljič and *Valentina Hlebec* (University of Ljubljana, Slovenia)

This study evaluates the stability of measures of centrality and prominence of social networks among high school students. The results from ten experiments altogether are presented. In the first set of four experiments, four types of social support were measured three times within each class. Four measurement scales – (1) binary, (2) categorical and (3) line production – were implemented. The free choice method was used in data collection – the number of choices offered to respondents was limited by the number of people composing each network. In the second set of six experiments, two measurement scales were applied i.e., (2) categorical and (4) 11 point scale. However, the number of choices respondents were allowed to make was limited. The number of choices was limited to between three and five and was assessed against the free choice method. The measurement technique was limited to free recall as well. The stability of six different network centrality and prominence measures was estimated by the Pearson correlation coefficient. A meta analysis of factors affecting the stability of measures of centrality and prominence was done by ttest and ANOVA. Apart from previous findings with regard to global and local measures, in- and out-measures, time between repetitions and social support, the reduction in the number of choices decreased the stability of measures of centrality and prominence.

Topics: stability, measures of centrality and prominence, social support, free recall, fixed choice data collection mode, measurement scales

Collective Action and Network Stability

Károly Takács (Budapest University of Economic Sciences and Public Administration, Hungary)
Béla Janky (Budapest University of Technology and Economics, Hungary)

A critical assumption in models of collective action that count on social network effects is the stability of the network. Endogenous network development is an issue hardly investigated in the context of public good games. This study goes beyond the static analysis of network effects in collective action and incorporates the opportunity of forming and severing ties. We analyze the effects of public good problems on network formation and we consider how the foresight of structural change influences collective action outcomes.

Interpersonal ties are among the most important mobilizing forces in collective action, as they transmit different forms of social control such as behavioral confirmation and social selective incentives. In order to capture the interrelations between network structure and collective action, this paper offers a new framework of analysis: we incorporate social control mechanisms and consequently social network effects in the n-person public good game. We consider this game with the extension that actors decide about breaking or keeping their social ties. We introduce an equilibrium refinement that embraces the concepts of Nash equilibrium and network stability. Next to providing a game-theoretical framework, we intend to determine the macro-level properties of stable structures. First results indicate that segregated networks are more likely to be stable. Furthermore, dense networks are more stable than sparse ones, even if they

are less segregated.

Networks and Global Processes 1 15.30

International Tourism – Economic Patterns and Tourist Flows
Lothar Krempel (Max Planck Institute for the Study of Societies, Cologne, Germany)

International tourism is an important sector of the global economy which has been growing continuously for decades. Today, tourism services generate approximately ten percent of the world domestic product, making tourism economically more important than trade in crude oil, automobiles or telecommunications products. For nonindustrial countries in particular, the export of tourism services often constitutes a considerable asset in their balance of payments.
The analysis tries to trace some benefical aspects of globalization: where and how non-industrial countries benefit from a growing toursim activity. The presentation gives some first results on the economic impact of international tourism for the countries in the world and analyses tourism flows among selected countries.

The World City Network as a Social Network
Ben Derudder (Ghent University, Belgium)

There is a long tradition of social network analyses in urban studies. However, the bulk of these studies focus on networks within cities and therefore neglect the external relations of cities, i.e. networks between cities. The latter has recently come to the fore in the world/global cities literature building on the work of Friedmann and Sassen for whom inter-city relations are crucial in linking urban development to the restructuring of the world economy. In this context reference to conceptual frameworks such as a "global network of cities" has become commonplace but without any accompanying social network analysis. This conceptual advance without rigorous analytical support is clearly illustrated in Castells' hugely influential The Rise of Network Society. His much-debated theory of space, which deals with the complexity of the interaction between technology, society, and space, has provided a theoretical grounding for understanding inter-city relations as constituting world-wide networks. The bottom line in Castells' theory of space is that society is increasingly dominated by a networked spatial logic, which is the material organisation of time-sharing practices that work through flows. This spatial logic has three layers: the infrastructure networks that make the contemporary Network Society possible (e.g. through electronic impulses), the social networks of places which constitute the nodes and hubs through which every day's Network Society is organized, and the distinctive elite social networks that form the spatial organisation of the "cosmopolitan rich" in their work, play and movement. Castells locates the world city network as a crucial component of the middle layer dubbing it the most direct illustration of a social network of hubs and nodes, but without accompanying practical analyses. The purpose of this contribution is to add such a necessary network-analytical and empirical dimension.

Greek Anti-Globalisation Networks in the Early 2000s

Iosif A. Botetzagias and *Moses A. Boudourides* (University of Patras, Greece)

Drawing upon newspaper data, we are analyzing civil society protests taking place in Greece for the period 2002-2003. In general, such waves of protest activism are considered to be triggered by the (global) policies of supra-national decision-making while they materialize, mainly, at various international summits. Our aim is to investigate a manifest "split" in the protest events: certain organizations choose either to protest together and/or to abstain from protest events initiated by "opposing" groups. Thus, we are investigating two relations on the network: (i) a relation of co-participation in protest events and (ii) a relation of "anti"-participation – in the sense that the "anti"-participating organizations are deliberately avoiding to be present at the same protest event together with other antagonistic organizations. In this way, using standard block-modelling techniques, we are studying the emergence and the dynamics of coalitions among various organizations appearing in the studied protest events in Greece. What we are observing are structures of political polarization within the anti-globalisation movement, which are clustered around the two major Greek left-wing parties. We are also attempting to understand the structural reasons for such a political positional dichotomy basing our arguments on two types of hypotheses: (i) dependence on certain attitudinal characteristics (e.g., socio-demographic data, opinions, perceptions etc.) of the parties' adherents and (ii) occurrence of top-down decision-making by the parties' leadership aiming to secure their own political space from their rivals. These two hypotheses are complementary in the sense that if the analysis had demonstrated that the rank-and-file of different "anti"-participating organizations hold competing beliefs then the split would simply indicate the pre-existing divisions amongst followers; on the other hand, if this did not turn out to be the case, one would have good reasons to argue that this was a case of party politics.

An Empirical Test of Theories of World Divisions and Globalization Processes

Paulette Lloyd (University of California, USA)

Are old East-West and North-South divisions giving way to a reordering of international and interregional economic, political and military alliances and organizations, or are they giving way to fundamental cleavages along civilizational/cultural lines? I test this question by looking at United Nations General Assembly (UNGA) roll call votes for the period 1981-2001– ten years before and after the dissolution of the Soviet Union–as I believe the UNGA provides a realistic representation of geopolitics. I apply Michael Mann's model of power to the data to enable me to examine voting alliances and issues around his four ideal types of social power: ideological, economic, military and political.

Evaluating the voting alliances and issues that shape them enables me to address globalization theories ranging from world systems theory to Huntingtons clash of civilizations theory. Using Mann's model of power enables me to examine multiple processes of international globalization, rather than focusing on one aspect, such as economic or cultural globalization. In addition, I examine state membership in key international and regional organizations such as

NATO, WTO, MERCUSOR and ASEAN, and individual level state data, such as type of political regime; cultural factors such as religion and language; economic factors such as GNP per capita and other measures of development such as found on the World Social Development Indicator as factors potentially influencing votes.

Topics: Network analysis of global power networks

On-line Comunnities 2 15.30

Strong Ties, Weak Ties, and ICT Ties – Results from the Pew Social Ties Survey

Jeffrey Boase and *Barry Wellman* (University of Toronto, Canada)
John B. Horrigan and *Lee Rainie* (Pew Internet and American Life Project, USA)

This paper draws on results of a recent survey, which was funded by Pew Internet & American Life Project. The telephone survey used random digit dialing to collect a sample 2,200 American adults. This paper ties together the following themes: social network composition, communication patterns, access to resources, psychological dispositions and social tolerance. Preliminary evidence suggests that heavy email users use email in conjunction with other media, to maintain a relatively large number of weak ties. These weak ties tend to come from different social backgrounds (i.e. ethnicity, occupation and gender), which effect these respondents in a number of ways. The occupational diversity allows them access to a variety instrumental knowledge, or social capital. Further, their contact with diverse others means that these respondents tend to be more socially tolerant and open to new ideas (a psychological disposition psychologies refer to as "openness"). As these respondents are heavy communicators, they tend to be relatively extroverted. They are more likely to make new friends online and be early adopters of new technologies that are oriented towards social purposes. In summary, email use effects the composition of social networks, which in-turn leads to the following outcomes: greater access to instrumental knowledge, social tolerance, openness and a sense of social support.

Knowledge Construction, Virtual Neighborhoods Architecture, Mechanisms and Design Features in Online Communities

Reuven Aviv, *Zippy Erlich* and *Gilad Ravid* (Open University of Israel, Israel)

We attempt to reveal the relations between knowledge construction, virtual-neighborhoods architectures, underlying mechanisms, and the design features of asynchronous, broadcast, online communities. Specifically we compared a "Knowledge Constructing community" – a group of committed distance learners, accepted by registration, with well defined collaborative, consensus directed goal project, strict schedule, and strong interdependence with a "Q&A community" which was open to all students with the goal of learning support. Knowledge construction levels were established by content analysis. Markov p* models were applied to the *response* relation of both communities. Both communities' architectures include strong *negative* tendencies for single response virtual neighborhoods. This lurking behavior is explained by actors attempting

to gain social capital by applying minimal responsiveness, which in a broadcast network is zero. The positive components of the communities' responsiveness have different architectures and controlled by different mechanisms. Major neighborhoods in the architecture of the responsiveness in the Knowledge Constructing Community are *transitivity* and *out-star*. These are controlled by the cognition balance and the collective action mechanisms, respectively, resulting from the consensus directed goal and the tight schedule design-features of this community. The architecture of the responsiveness in the Q&A forum consists of single person, the Tutor, and *mutual* virtual neighborhoods. These are controlled by the responsibility of the Tutor as a primary responder, and exchange mechanisms, respectively, resulting from the pre-assigned roles, and the non-collaborative goal, design-features of that forum.

Topics: knowledge construction, virtual neighborhoods architectures, online communities

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Information Sharing and Community Building in an Internet-based Learning Environment

Julia Hersberger, *Kevin Rioux*, *Ray O'Keefe Cruitt* (The University of North Carolina at Greensboro, USA)

Maintaining successful online collaborative learning spaces represents a challenge for educators, who seek to learn more about the nature of Internet-based communities (IBCs) in order to develop superior distance education offerings. The development of online relationships and communities are readily observable phenomena in well-designed Internet-based distance learning courses. The proposed presentation will report on the preliminary findings of an exploratory study that is examining information sharing behaviors and concomitant personal relationships and communities that emerged in a graduate-level online LIS distance education course.

Today's e-learning environments take on a "many-to-many" communication configuration, which typifies online environments characterized as being "collaboratoria" or Computer-Supported Cooperative Learning (CSCL) contexts. Much of these dynamic communication patterns facilitate information sharing, an important component of social support resources expended and obtained via the online social networks that emerge and exist in online courses. Information sharing has often been conceptualized in the context of social and organizational learning. Rioux (2000) initially identifies "information acquiring-and-sharing" in his examination of SIF-FOW (Sharing Information Found For Others on the Web). Rioux"s findings show that sharing information found for others on the Web is an identifiable, natural, highly social and pleasant information behavior that is supported by habituated sharing strategies. A subsequent study conducted by Erdelez & Rioux (2000) suggests that many Web users accidentally discover (or encounter) information for others, and frequently share that information in some way.

Blackboard^{TM} discussion fora postings, MOO (Multi-user Object-Oriented domain environment) transcripts, class assignments and student evaluations were collected from two online LIS seminars. Using content analysis techniques, multiple researchers developed an emergent coding scheme. Follow-up interviews, member checking and peer debriefing were pursued to enhance the trustworthiness of the data analysis. Social network mapping will be used to demonstrate how information sharing plays a role in relationship building and social support among various class members.

On a practical level, the significance of this study is based on the assumption that if LIS ed-

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ucators can better understand the social and information behavior processes that occur in the online communities that characterize Internet-based learning environments, we may be able to continue improving distance education courses and curricula within our field. On a theoretical level, this study may help to inform the development of new information behavior models and expand existing ones.

By the Community, for the Community – An Analysis of Open Source Software Projects

Yutaka Hamaoka (Keio University, Japan)

Open source software projects getting significant phenomena. Aim of this paper is to propese performance metrics and thier determiners of open source software project and to test them throught empirical analysis. Proposed metrics focuses (1) development process (2) quality of developed software (3) diffusion to market (4) impact to user community, and (5) impact to community members. Determiners of those metrics are also discussed. Publicly available data are compiled form Sourceforge.net, an internet site that host 60,000 OSSPs. Through statistical analysis, positive feedback loop: recognition to OSSP –> the number of download –> the number of community member –> recognition to OSSP is confirmed.

Topics: on-line communities

Antisocial Behavior 15.30

Differential Associations, Control Theory, and the Strength of Weak Ties – Assessing Criminological Theories by Means of Social Network Theory

Mattias Smangs (Stockholm University, Sweden)

A long-lived debate within criminology is concerned with the issue of how to conceive of delinquents and their relations to others. In this regard, two viewpoints compete: "the social ability model" and "the social inability model". According to the former model, represented by, for example, Sutherland's theory of differential associations, delinquents are to be conceived of as people in abnormal circumstances, but with normal social capabilities, whereas the latter model, represented by, for example, Hirschi's control theory, contends that delinquents lack social capabilities and consequently are not able to engage in close affectional, intimate or trustful relationships with others. The aim of the paper is to assess the plausibility of these competing conceptions of juvenile delinquents by using social network theory, more precisely Granovetter's notion of weak and strong ties. In order to assess the models, a number of hypotheses are derived regarding the structural features one would expect to observe in networks of relations among delinquents, given the implications of the models' different conception of delinquents and the nature of their interpersonal relationships. These hypotheses are tested empirically by the use of a data set containing information on relations among delinquents in the form of co-offending, covering all persons under the age of 20 who were suspected of having committed

a crime in the Swedish city of Borlänge (approx. 50,000 inhabitants) during a period of three years.

Friendship and Delinquency of Adolescents

Andrea Knecht and *Chris Baerveldt* (Utrecht University, The Netherlands)

A common finding of earlier studies on friendship and delinquent behavior of adolescents is that delinquent behavior tends to be more similar among friends. How can this be explained? In principle, two processes exists that lead to this result. Either the adolescents have selected each other as friends because their delinquency levels are similar, or friends adjust their behavior. Studies compare those two processes are rare.

We have been collecting complete longitudinal network data (four waves) in 126 classes in Dutch secondary schools. For the analysis of these data we use SIENA in order to compare the strength of the selection and influence processes.

We will present some preliminary results for a subset of 20 networks.

Topics: selection & influence processes, friendship networks, delinquent behavior, adolescents

Competition and Differentiation as an evolving Network

Ivar Vermeulen and *Jeroen Bruggeman* (Universiteit van Amsterdam, The Netherlands)

The World Wide Web offers new opportunities to study the dynamics of competition in populations of firms at a high level of precision. We analyzed these dynamics in a population as an evolving network of competitive relations between individual firms. We studied the population of Internet search engines from its inception onwards, and found that, despite an ongoing inflow of specialist search engines, competitive pressure on specialists decreased after 1998, as a result of specialist differentiation. During the same period, competitive pressure on generalist search engines, which did not differentiate, increased. We also found that specialists differentiated in a low-dimensional consumer space.

Topics: competition, internet, market differentiation

Masculinities and Violence in Secondary Schools

Dean Lusher and *Garry Robins* (University of Melbourne, Australia)

Hegemonic masculinity is the central concept of Connell's (1987; 1995) social theory of gender. It expresses the dominance of males over females, achieved at least in part by [the threat of] violence against females, and also against subordinated and marginalised males. Hegemonic masculinity can be seen as occupying the dominant position in a hierarchy of masculinities, with culture/race, sexuality, physical abilities and SES having an impact on the positioning of other types of masculinity within such a hierarchy. Although this theory has gained extensive recognition, the structural relations that underpin it have received little empirical investigation.

This paper presents a social network analysis of hegemonic and other masculinities as they are expressed among adolescent male school students in Australia. Cluster analyses reveal the presence of different types of masculinities within the school setting, lending support to a non-unitary conception of masculinity. Blockmodel analyses show that particular masculinities are seen as more powerful and popular than others. In at least some schools, hegemonic-type masculinities seem associated with power, with the theorized hierarchy of violence expressed through bullying relationships. The structural relations of these multiple masculinities and the personal attributes of varying types of masculinities, as well as their divergent relations to violence, will be discussed.

Topics: masculinities, violence, bullying, social networks, hegemonic masculinity

Networks and Health 3 15.30

Findings from the Teenage Health in Schools (THiS) Study

Michael Pearson (Napier University, Scotland)
Patrick West, *Robert Young* and *Helen Sweeting* (Glasgow University, Scotland)
Jacki Gordon (NHS Health Scotland, Scotland)
Katrina Turner (University of Glasgow, Scotland)

THiS (Teenage Health in Schools) is a study carried out by members of the MRC Social and Public Health Sciences Unit (Gordon & Turner, 2003) which developed from the West of Scotland **11 to 16** Study (West & Sweeting, 1995; Pearson & Michell, 2000). The investigators conducted surveys of whole year groups of second (age 13) and fourth (age 15) year pupils in 9 secondary schools (3500 pupils) in the West of Scotland. As part of the survey component, data on pupil friendships were collected which were processed using the NEGOPY software to identify the sociometric position of pupils. The main findings from a preliminary analysis of 6 of the schools are that sociometric groups are gendered in their formation and that smoking, as well as other substance use, are highly associated with gender, age and sociometric position. Our study used a wider range of sociometric categories than previously examined: specifically Large Group, Small Group, Peripheral, Isolated Tree, Dyad, and Isolate 1. A key finding is that it is in this order (that is, as degree of social isolation increases) that smoking and substance use increases. We also found that smoking and substance use increases with age and is higher for girls than for boys. Interactions were explored using logistic regression.

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Personal, Contextual and Network Influences on Gay Men's Behaviour

Anthony Smith, *Jeffrey Grierson*, *David Wain* and *Marian Pitts* (La Trobe University, Australia)
Philippa Pattison (The University of Melbourne, Australia)

Notions of peer education underpin much of the HIV-prevention education for gay men. However, most research into HIV prevention for gay men explores social psychological models which can accommodate the influences of peers and social networks only a limited degree. The Victorian Networks Study (Vines) was an empirical exploration of the social and sexual networks of a sample of gay men in Melbourne, Australia. We interviewed 206 gay men of whom 58% were recruited through advertising and 39% through chain referral. The present paper documents associations between participant characteristics, network composition and structure and gay men's sexual behaviour and their patterns of discussion about their sex lives, particularly about episodes of unprotected sex. The density of gay men's social networks appears particularly associated with patterns sexual activity whereas a range of other aspects of network composition and structure appear to be associated with gay men's patterns of communication about their sex lives.

Contexts of Friendship. Friendship Patterns in Different Social Settings

Beate Völker and *Henk Flap* (Utrecht University, The Netherlands)

In the perspective of the sociological program it is not a private decision with whom one socializes and becomes a good friend but depends on conditions beyond the individual. A major case of such extra-individual conditions are the different social contexts in which people spend their daily life. These contexts determine the contact opportunities and hence the structure and composition of personal networks. In our contribution we examine friendship patterns in different social contexts. We inquire into four different social contexts, i.e. education, work, neighborhood, and voluntary associations and study whether friendship relationships recruited from these contexts differ with respect to similarity, multiplexity, and trustworthiness of the relationship. Our data come from the SSND, The Survey of the Social Networks of the Dutch (2000), a national representative sample (n=1007) of individual respondents. The survey provides detailed information of respondent's personal networks and activities in different social contexts. Our results show among other that there are important differences among friends recruited from the neighbourhood and friends recruited from education with regard to their ascribed trustworthiness. Furthermore, social groups differ with regards to the setting that they prefer as a pool from which friends are selected: while for the whole population, work and voluntary associations are the most important contexts for finding friends, the neighbourhood is in particular important for the elderly, lower educated, and for women. Our study aims to contribute to a theory that combines micro-level interaction opportunities with assumptions on individual choices for network members.

An Explorative Study of Romantic Love and Social Network in Singapore

Chan Wing Lun (University of Singapore, Singapore)

I shall divide the set of my research questions into three important issues and explain why they are the important research questions in a sociological study. The first issue is romantic love. From the historical point of view, romantic love is not taken for granted in the old days. The arranged marriage by family always made romantic involvement impossible (Beck and Beck-Gernsheim, 1995; Goode, 1959; Macfarlane, 1995; Parsons, 1954). Thus, we could say the rise of romantic love has come from the fall of extended family's influences. However, it is worth noting what kind of social force and control is playing a role in the development of romantic involvement nowadays. An analysis of the issue will also be particularly significant in Singapore, where the government has already stepped in, organizing a "Romancing Singapore Campaign" in the hope to "create an environment where couples can be romantic" (The Strait Times, March 3, 2003).

Seen in this light, the second issue of relevance is the relations between romantic involvement and social network. It is not difficult to imagine your romantic partner might be your classmate or colleague, but what definitely matters is the social network itself in the college or workplace, providing a ready access of potential romantic partners. Thus, it is important to examine how a social network makes romantic involvement possible. Furthermore, in a review of the literature, the network-mediated functional outcomes have always been remarked in terms of employment, ethnic entrepreneurship or community development (Portes, 1998: 12-15). In this sense, we should start filling a gap in a poorly researched area in network-mediated-outcome studies and being aware of romantic involvement as such a functional outcome.

The gender difference in building up a romantic relationship is the third issue deserving attention. The gender difference towards the perception of romantic love has long been pointed out (McDaniel, 1969; Simon, Eder, and Cathy Evans, 1992). However, to be studied is whether the difference is originated from, cultivated in and sustained by a social network in which romantic involvement is taking place.

Topics: social network, social capital, social control, romantic love, gender issue

Data Collection and Sampling 1 15.30

Interviewer Effects in the Elicitation of Sexual and Drug Injection Partners

Devon D. Brewer (Interdisciplinary Scientific Research, Seattle, USA)
John J. Potterat (Independent consultant, Colorado Springs, USA)
Stephen Q. Muth (Quintus-ential Solutions, Colorado Springs, USA)

Interviewer effects, or variations in interviewee responses associated with interviewers, are not uncommon in survey research. Such effects are more likely when interview questions are open-ended. Recent research shows moderate interviewer effects in the number of personal network members elicited, with intraclass correlations ranging between .13 and .15 after adjustment for respondent and interviewer characteristics (Marsden, 2003; van Tilburg, 1998). It is crucial that

network elicitation be as complete as possible, because most network measures are sensitive to missing data.

Sexual and drug injection networks shape the transmission of sexually transmitted diseases, HIV, and other infectious agents. The elicitation of sexual and drug injection partners involves asking sensitive open-ended questions, which may increase the likelihood of interviewer effects. Therefore, we assessed the magnitude of interviewer effects in the elicitation of such partners. Our ongoing analyses involve multiple data sets from research studies and disease control activities. The results from the first four data sets suggest no or relatively small interviewer effects on the number of partners elicited (intraclass correlations $<= .06$, median $= -.01$). We found similar results when adjusted for numerous covariates and when we examined interviewer effects on the number of partners that interviewees estimated (prior to listing partners individually) they had. Moreover, there is no consistent interaction between interviewer and interviewee sex on the number of sexual partners elicited, indicating that, on average, male and female interviewers are equally effective with interviewees of either sex. Our discussion highlights the implications for the collection and analysis of sexual and injection network data.

A Higher Level Approach of Informant Accuracy for Complete Social Networks

Daniëlle De Lange, *Filip Agneessens* and *Hans Waege* (Ghent University, Belgium)

Social network researchers are often confronted with a considerable amount of survey nonresponse when collecting complete social network data. A common practice is either to ignore the answers of nonrespondents (leaving the respective actors out of the analysis) or to replace the missing data by means of particular imputation procedures. The major concern of this paper is to search for a reliable imputation source. This paper continues on the tradition of accuracy research (cf. Bernard et al. 1977, 1980, 1982; Killworth et al., 1976, 1979 and Krackhardt, 1987, 1990). In current accuracy research, the question "whom are the most accurate respondents in perceiving the network of social relations surrounding them?" is crucial.

The basic idea of this paper is that when particular types of respondents can be identified which are highly accurate in their perception of the social network or of specific network relations, their reports could be used for missing data imputation. Reports from the most accurate network members are considered as a valuable data imputation source. However, a sufficient understanding of informant accuracy is a necessary precondition for this imputation procedure.

This paper is an extension of earlier research efforts (De Lange, Agneessens and Waege, 2003) in which a new accuracy measure is developed. Previous accuracy research concentrated on estimating informant accuracy in a context of zero nonresponse and dichotomous data. The main advantage of the new measure is that it can deal with valued data and missing answers. The measure was used to study the relation between individual characteristics and informant accuracy. However, estimating informant accuracy at this individual level is only part of the picture (cf. Bondonio, 1998). Besides considering characteristics of the perceiver as important determinants of informant accuracy, a perceiver's perception can also vary according to the attributes of the sender and/or receiver of the relation. Characteristics of sender, receiver (dyadic level) and the combination of both (triadic level) will be taken into account when estimating informant accuracy.

Topics: complete social networks, informant accuracy, response

Inconsistent is Different from Inaccurate

Patrick Kenis (Faculty of Social and Behavioural Sciences, The Netherlands)
Ulrik Brandes (University of Konstanz, Germany)

Most procedures for network-data collection bear the risk of producing inconsistent information. In a questionnaire, for instance, the two actors of a dyad may disagree about the existence of a tie between them, or respondents' reports of perceived social networks may be incongruent. While this is often considered a problem of measurement accuracy, inconsistent data is fundamentally different from erroneous or incomplete data, because it may actually represent additional information on the content of relationships. Consequently, inconsistency should not necessarily be eliminated (e.g. by using complete-case or available-case analysis), but exploited where possible.
We discuss sources and types of inconsistencies as well as means to make sense of, or at least identify the degree or relevancy of inconsistency.

The missing link: Non-Respondents in Social Network Surveys

Gerd Beidernikl (Center for Education and Economy, Austria)

Every kind of survey research has to face the problem of missing values caused by unit and item non-response. This inherent questioning problem is even getting more serious in a social network context as missing network data results in more or less great holes in the who-to-whom data matrix and therefore weakens or even distorts any findings about the complete network. The proposed paper tries to explore and illustrate the problems caused by non-respondents in communication and co-operation network surveys by means of some empirical examples. We will try to derive possible solutions for analyzing networks that include missing data (e.g. imputation, reconstruction) and specific criteria that justify doing so. We will sum up some research efforts dealing with non-response in a network setting and discuss their relevance to everyday survey research. Finally we are going to offer some suggestions for validating results of incomplete networks and for the enhancement of response rates.

Networks and Global Processes 2 17.35

Structural Equivalence and International Conflict, 1816-2000: A Social Networks Analysis of Dyadic Affinities and Conflict between States

Zeev Maoz and *Lesley Terris* (Tel-Aviv University, Israel)
Ranan D. Kuperman and *Ilan Talmud* (University of Haifa, Israel)

This study offers a first cut into the analysis of international networks and international conflict. We explore the extent to which structural affinity between states reduces the probability of con-

flict. We explore the following issues: (1) how the extent of affinity between states affect their conflict behavior? (2) Are there systematic differences among affinities that are interpretable as "revealed preferences", such as alliance and trade portfolios, and affinities that are based on more structural factors, such as ethnic similarity? If so, how do different types of affinity determine conflict propensities in dyads? (3) Can a complex measure of linkage between states predict the likelihood of dyadic conflict ?

In this paper, we offer a general classification scheme to characterize the factors, commonly thought to affect the probability of dyadic conflict. From this scheme, we present indicators of dyadic affinity. We discuss in existing schemes of conceptualizing and measuring dyadic affinity in the literature, and show some limitations of the existing measures. We then offer an alternative approach to conceptualizing and measuring dyadic affinity that is based on the concept of structural equivalence. Our results, drawn from a variety of complex data sets, suggest that international affinity has a significant impact on the reduction of the probability of dyadic conflict. We discuss the limitations, implications of this study for future research.

Social Network Analysis and Productivity Growth

Juan Carlos Barahona (MIT Media Lab, USA)

Sustainable economic development is based on sustainable increments of productivity which comes from innovation.

Social Networks have always been a part of the human experience, it is through social networks that ideas, collaboration and resources flow, generating innovation in production process, products and services, and distribution systems that add more value per unit of input.

Through history we have seeing the impact of information and communication technologies on human networks and their productivity (written language, transportation networks, the invention of the print, etc.)

Today, Internet provides a fabulous infrastructure to sustain faster, even real time, interaction among members of a network. Ideas flow at high speed at a much lower cost, become more accessible or easier to produce through dissemination of knowledge, collaboration and resources. Technology allows each node to add and receive more value per unit of time and to operate effectively in several local and global networks in parallel.

Low cost, real time and asynchronous communication through Internet are a critical innovation to empower human networks.

In 2002, only 7% of people on the planet connected to the Internet, in contrast to an average 40 percent in the European Union, above 50% percent in North America, and above 60% in Scandinavia. Thus, the pace of diffusion of the Internet becomes significant to bridge the Gap (Servon, 2002)

This work borrows on Weimans research on the influentials, Lazarsfeld two step flow of communication model, Rogers concepts on diffusion and Castell's concept of the "networked society" to propose a methodology that uses social network analysis to accelerate the pace of diffusion of Internet as a tool to empower community networks. It also reports the design and early results of a project that is implementing this methodology in rural Costa Rica within a community of coffee growers.

Topics: social network analysis, influentials, asynchronous communications, wireless and mo-

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bile communications, diffusion of ideas, innovation, rural development, Costa Rica

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Networks of Economic Power in Europe

Josep A. Rodríguez, *Julián Cárdenas*, *Christian Oltra* (Universitat de Barcelona, Spain)

In this paper we look into the process of creation of Europe as a new economic, social and political entity by studying the convergence between countries and the configuration of supranational social structures. Our study first compares national inter-corporative and ownership structures and networks to assess the level of convergence or dissimilarity between the countries power structures. In the second part of our work we attempt to unveil the existence and relevance of a supranational ownership network (and its corresponding intercorporative structure). In looking into the European multinational network we focus on its characteristics as well as on its relations with the national structures.

Topics: comparative European power structures, European multinational economic network

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On-line Communities 3   17.35

The Structures of Relationships and Communication in Large Instant Messaging Network.

Dominik Batorski (Warsaw University, Poland)

This paper examines the variability of personal social networks among over 2,5 million users of Gadu-gadu the most popular instant messenger in Poland. Instant messaging is a convenient way to see when friends and family are online and to communicate with them in real time. Our social network data consist of two relations (friends lists and communication).

This paper presents some preliminary observations on the structure of the Gadu-gadu community. We first document the variability of main personal networks properties: indegree, outdegree, personal networks size and composition, local density. We analyze mutuality and balance in these local networks (dyad and triad census). We then explore how variability in various network properties is related to other characteristics of users - their gender, age and place of living (taken from users personal profiles). We also study the likelihood that those users who share a particular attribute are connected. Last part of paper describes two partitions of network. We find number and size of weakly and recursively connected subgraphs.

Special software was developed to analyze this data. In this paper we additionally present some approaches to analysis of very large networks. Many standard network algorithms are very time and space consuming and therefore unsuitable for analysis of such networks.

Temporal Characteristics of email Interactions in an Academic Environment

Scott B.C. Dynes (Dartmouth Tuck CDS, USA)
Gregor Schrott (University of Frankfurt, Germany)
Peter A. Gloor (MIT CCS, USA)

Different communities use email communications in different ways: some use it as a primary means of interaction, some use it as an adjunct to more physical forms of communication. As an extreme example, we would expect that senior statesmen would only use email for interacting with other senior statesmen after having a personal conversation, while for teenagers the email might likely be the conversation.

It is reasonable to think these differing approaches would be reflected by manifesting different temporal interaction patterns in email logs. To test this hypothesis, we analyze the email logs of a medium-size university, which over a period of 3 months contains around 986,000 email messages from over 10,000 actors. While the archive was anonymized, individual actors were broken out into four categories: Professors, Assistants to professors, Staff, and Students.

In our analysis we use a time window approach to look at neighborhood size, messages per unit time, and where possible the characteristic lifetime of groups for each group.

This is part of a larger ongoing effort with colleagues at MIT to examine the types of collaborative structures that foster effective knowledge sharing and innovation.

Visualization 1 17.35

Visualization of Personal Networks

Christopher McCarty (University of Florida, USA)

One of the most active areas in social network research is network visualization. Several algorithms and software packages have been developed for displaying the relationship between actors within a whole (sociocentric) network. These visualization packages use an adjacency matrix representing the relationship between actors. These visualizations routines have occasionally been applied to personal (egocentric) network data.

Personal network adjacency matrices require respondents to report on all alter-alter ties, an enormous respondent burden when there are more than 30 alters. The author is developing a web site for the collection and visualization of personal networks that takes into account issues unique to personal networks. In a pilot study concerning smoking, 100 respondents (50 smokers and 50 non-smokers) will submit to an EgoNet study that will elicit 45 alters and all alter-alter ties from the respondent. These same respondents will then use the web application and the results will be compared.

Analysis and Visualization of Genealogies: Ragusan Patriciate in the Fourteenth and Fifteenth Centuries

Irena Vipavc (University of Ljubljana, Slovenia)

Polona Dremelj (Social Protection Institute of the Republic of Slovenia, Slovenia)

Andrej Mrvar and *Vladimir Batagelj*(University of Ljubljana, Slovenia)

Metal trade became the main source of Ragusan wealth in 14th and 15th century. Along with well-being it also brought development of strong and wealthy patriciate. Ragusan patriciate performed the highest administrative and political functions. In 14th and 15th centuries ten patrician families held the majority of political positions.

In the paper we analyse Irmgard Mahnken's (1960) genealogies of the Ragusan patriciate with Pajek computer program. Genealogies include 5999 individuals. We focus on marriages up to third degree of consanguinity according to the canonical law, marriages with considerable age differences between partners, and cross-sibling marriages that were most likely the result of arranged marriages, most prevalent among the largest and most powerful patrician houses. We analyse families with most children, their size and marriage relationships until forth generation of descendants. Additionally we search for the longest male line in one family. The findings point to a very high index of in-marriage among Ragusan patriciate, the reasons for which could be found in the isolated position of Ragusa (Dubrovnik) and a relatively restricted marriage pool.

Topics: genealogy, Ragusan patriciate, marriages

Software for Networks 17.35

Software for Statistical Analyses of Social Networks

Marijtje A.J. van Duijn and *Mark Huisman* (University of Groningen, The Netherlands)

This paper gives a state-of-the-art overview of available software for the statistical analysis of social networks as of spring 2004 (??). It reviews and compares six programs with respect to their statistical procedures, illustrating their functionality with example data. The programs are UCINET, Pajek, NetMiner, Structure, MultiNet, and StOCNET. The choice of routines that were inspected is restricted to procedures for statistical modeling based on probability distributions (e.g., exponential random graph models, QAP correlation, statistical analysis of longitudinal network data). This definition of analysis routines excludes the extensive review of procedure-based routines based on more complex (iterative) algorithms like cluster analysis or eigendecompositions. Also, some other (special-purpose) software packages and software routine packages for general statistical software are reviewed briefly. The paper concludes with some recommendations.

Extracting Structural Models of Macro Social Cognition about Categories from Electronic Archives of Public Discourse

Mark T. Kennedy (University of Southern California, USA)

This paper presents theory and method for extracting structural data about categories from electronic media archives that hold vast, largely untapped collections of public sensemaking about similarities and differences relating and dividing named actors and objects. Working from theory that suggests categories can be elaborated and identified inductively by examining who is mentioned with whom in talk about them, a technique for extracting category graphs from public discourse is proposed. To implement the proposed technique, software was developed to analyze large collections of longitudinally organized news stories about an emerging product market. The technique is illustrated using data developed by the software for a study of the emerging market for computer workstations, 1980-1990. For this study, over 60,000 pages of text in over 28,000 news stories were analyzed to produce quarterly graphs of similarity relationships between firms inferred from the patterns by which firms are co-mentioned in stories and press releases. Data from the workstation study are presented and visualized to illustrate an application of the method. Further network analysis of the unfolding category graph data suggests directions for future development of this method and related techniques for extracting structural data from large scale public discourse.

Data Collection and Sampling 2   17.35

Collecting Data on Ego-Centered Social Networks on the Web: Methodological Issues

Katja Lozar Manfreda, *Gašper Koren*, *Vasja Vehovar* and *Valentina Hlebec* (University of Ljubljana, Slovenia)

Interview assisted data collection modes are most often used to assess ego-centered networks owing to complex structure of such questionnaires. Web surveys, on the other hand, offer a variety of efficient solutions with sophisticated questionnaire interfaces and time-and-cost effectiveness. Single name generators for evaluating ego-centered networks can be effectively applied also within Web surveys, as shown in our experiments. However, visual elements of the measurement instrument have to be designed very carefully.

In this study several experiments on Burt's (1984) **name generator** were applied within Web questionnaire. Visual characteristics of name generator and instructions for respondents were varied. Effects of characteristics of measurement instrument and experimental instructions on number of listed alters, composition of network, and dropout rate, were studied.

For collecting the data on alters two different techniques for measuring **name interpreters** were applied: **alter-vise** (complete information on name interpreters is obtained for each alter separately and the variable context is changing) and **variable-vise** (complete information on name interpreters is obtained for each variable and the alter context is changing). Both approaches were evaluated with regard to composition of networks and dropout rate.

Topics: ego-centered networks, Web data collection, data quality, item nonresponse, question

wording, name generators, network composition

Sub-sampling of Alters as a Mean to Reduce the Respondent Burden in Egocentric Social Network Questionnaires

Luka Kronegger, *Vasja Vehovar*, *Valentina Hlebec* and *Gašper Koren* (University of Ljubljana, Slovenia)

In egocentric social network research each responding person (i.e. ego) typically reports the details for all persons (i.e. alters) from his/her network. This poses a considerable burden to the respondents. In interview surveys (telephone, face-to-face) this also increases the surveys costs. that order such survey. With Web surveys and self-interviewing the burden is almost entirely shifted to the respondent, who can easily quit the survey process at any stage. As a consequence, an increased response burden can introduce severe problems to survey data quality (nonresponse, measurement errors). Some studies have already shown that dropout rates in Web surveys significantly increase with the increased size of the personal network.

The aim of the paper is to examine a simplification of tipicaly the measurement tool for attaining collecting data on egocentric social networks. Instead of, say, 15 alters that certain person actually reported in name-generation process, we ask the detailed questions for only 5 alters. We thus study the pay-offs between the corresponding loss of information on one side and the benefits arising from reduced respondent burden on the other side.

First, the sub-sampling simulations were performed based on real parameters. The framework of two-stage cluster sampling was applied. Different (sub)sampling approaches showed considerable discrepancy in nonresponse bias and also in precision. The use of rank set sampling seemed to be an especially promising strategy. In particular, the number of sub-sampled alters and the type of the sampling mechanism were the most important parameters.

In the empirical part the procedure was tested with egocentric networks data from face-to-face, telephone and Web surveys in Slovenia 2001-2003. The results confirmed that in presence of the attrition this sub-sampling approach can be costs-efficient for majority of variables, if the entire mean squared error is studied. Of course, specific parameters of certain study can contribute to different evaluation conclusions for this procedure.

Variance Estimation and Design Effects in Respondent-Driven Sampling

Matthew J. Salganik (Columbia University, USA)

Previous work by Salganik and Heckathorn has shown that under certain general conditions, respondent-driven sampling is able to produce unbiased estimates about the proportion of a hidden population with a specific characteristic – for example, what percentage of drug injectors in New York City have HIV? Since respondent-driven sampling is based on a link-tracing design, constructing confidence intervals around these estimates using standard procedures, such as those from simple random sampling, often produces misleading results. In this paper, a modified bootstrap method is presented which allows researchers to construct much better confidence intervals. Results from simulation indicate that the procedure preforms well in a variety of situations. Also, using real data collected from a study of drug injectors in three

cities in Connecticut, USA we present approximate design effects of different estimates under respondent-driven sampling.

Sunday, May 16, 2004

Policy Networks   8.30

Uncovering Integration Linkages: The Effect of Differential Commitment
Robyn Keast and *Kerry Brown* (Queensland University of Technology, Australia)

Integration through networked arrangements has risen to prominence as a key mechanism for service delivery in government policy discourse. Integration under this model occurs through relationships, horizontal structures and multiplex processes. While relationships, structures and processes are important aspects of all service delivery models, it is the **dynamic nature** of these features in terms of their application to networked arrangements that set them apart from more conventional modes of delivery.

The literature has tended to treat integration efforts as consisting of uniform, constant interactions; however we argue that network agents may participate in and engage with other network members at **different levels of commitment, purpose and relational intensity**.

The paper will use a case study to demonstrate that practitioners participate in integrated service models and engage in these networked arrangements differentially.

The paper will focus on the use of **network analysis** to uncover evidence of **differentiated involvement and commitment of network participants** in working together.

Multidimensional scaling is used to provide detailed insight into the network structure and, in particular, to uncover the actual strength of the members' commitment to integration.

Link analysis within the SAS program, with its ability to colour code linkages according to count values or frequencies, provides a valuable tool to aid in showing the different levels of commitment and involvement of the different network members in the detailed analysis of the network case study.

The paper concludes that expectations of similar participation and commitment in integrated service delivery arrangements obscures subtleties and nuances of the actual variations that occur and highlights **the need to accommodate and manage these variations for sustaining involvement and optimal outcomes**.

The Challenge of Operationalizing *Actor-Centered Institutionalism*: Examples of Power Scenarios in Policy Networks
Nicolas D. Hasanagas (University of Goettingen, Germany)

The Actor-centered institutionalism holds that a policy result is produced by co-action of actor- and institution-related factors. This has been a valuable abstract framework of research rather than a concrete theory. In our research, we have tried to make it more operational for policy consulting. Specifically, we have replaced the abstract game theory with quantitative organisational and network analysis. The survey has covered 8 European countries in 2002. We have measured *actor*- and *institution*-related variables as independent ones. This time, the dependent variable (policy result) was not the decision of an actor, but its socio-political power

and its implementation. We have defined power as the status of trust, the offering of financial incentives and the institutional pressure. The actor-related variables which have proved power-relevant in this particular research are: multidisciplinarity, state character, system conformity, trustworthiness, partner strength, alternative financing resources, general and scientific persuasiveness, communication control, monitoring. The institution-related variables (network conditions) are: network size, general density, potential lobbying, state monopoly, intersectorality, oligarchy, density of financial incentives, number of scientific communication links. Not every actor-related variable can be equally power-relevant under any network conditions; *Certain actor-related variables produce optimal synergy only in combination with certain network conditions.* We here regard these optimal combinations (types) as possible power scenarios which the actors may follow in order to increase their power or to implement this effectively. We are going to present two of them as examples;
a. The "lawful" type: a multidisciplinary, system-conform and state-independent organisation can develop optimal power in a mono-sectoral, small network with high potential lobbying, and no state monopoly. b. The "re-constructor" type: a powerful actor can optimally implement its power by re-constructing current information and by imposing favourable information as "important" (closeness centrality), in non-scientific networks. Particular implications between inductive and deductive scenario-building are discussed.

Networks of Political Action and Socio-Technical Coordination: Business Associations in the U.S. Information and Communication Sector

Volker Schneider (University of Konstanz, Germany)
Johannes Bauer (Michigan State University, USA)

The paper presents and analyses data of a focal set (N=19) of national trade associations in the information and communication sector of the United States which have been identified by an expert panel based on influence reputation. The paper describes and analyses how these organizations perceive the challenges of competition, convergence, and globalization, and how they cope with such environmental pressures. A major focus is how the various trade associations compete and cooperate with each other and how they exchange information and other resources. Through network analysis of data on contact relations, information exchange and interest similarity we are able to identify collective actors and key associations playing an important role in the horizontal coordination of this heterogeneous sector. In a further step the paper also analyses influence and lobbying strategies with regard to specific resource allocation profiles and the targeting of major policy makers at the domestic level of the USA as well as international organizations such as WTO, WPO, EU and OECD playing an important role in the international regulation and standardization of this industry.

Measuring and Testing Homogeneity and Status Seeking of Actors in Networks

Marcel van Assen (Tilburg University, The Netherlands)
Frans N. Stokman (University of Groningen, The Netherlands)

In accordance with the paradigms of methodological individualism, we claim that an explanation of structural characteristics of social networks requires a link between these characteristics and the incentive structures of individuals. In the literature, behavioural confirmation and status are seen as two important instrumental goals for individuals to obtain social approval. As behavioural confirmation is more likely obtained from individuals with similar characteristics, we may expect that *homogeneity* dominates network structures in contexts where behavioural confirmation is important (like in friendship networks). In more competitive contexts, *status seeking* is likely to dominate. We argue that in *policy networks* both mechanisms operate simultaneously in the evolution of influence relations, but related to two different individual characteristics. We expect *homogeneity* with respect to *policy preferences*, i.e. influence relationships emerge easier among individuals and organizations with similar policy preferences. Simultaneously, *status seeking* dominates with respect to *power*. We will argue that status seeking will not result in many influence relationships towards higher status persons, but just the opposite, namely that in the most extreme case all influence relationships go downwards.

In order to determine the relative importance of the two mechanisms, we need measures to compare the relative importance of the two mechanisms in different contexts. In this paper, we propose such measures. Advantages of the measures are that they are simple to calculate and have a meaningful maximum and zero point. A statistical test whether the measure is different from zero is presented as well. The measures and tests are illustrated with a policy network example.

World Wide Web 8.30

National Nodes' International Web Indegree/Outdegree and Their Internal Content Structures: Middle-Eastern Domains

James A. Danowski (University of Illinois at Chicago, USA)

This paper has two goals: 1) describe the current state of Arab Internet and World-Wide Web development, and 2) explore the ties between Web development and civil society. Various indicators of Internet and Web development were gathered, as was computation of Web domain indegree, outdegree, and intra-domain linkage. Triad census analysis of the Arab network compared to the 47 nation OECD network shows it to be at an early stage of development and/or constrained by government policies. There is a core-periphery network structure with core members including UAE, Saudi Arabia, Egypt, Iran, Jordan, and Morocco. Regarding civil society, there is a two-year lagged relationship between Internet development and number of 'civil society' Web hits. The strongest predictor of 'civil society' is the intra-domain linkage of Web pages. This suggests that theoretically, both cyber-civil society and offline civil society may be driven by the same fundamental dynamic of the creation of social relationships. It is among

Web pages in the realm of the Internet and among social actors in the realm of offline civil society. The conceptualization suggests that Web page linkage and civil society are the same construct manifested in different media. Practical validity to the tie is given by government policies such as Egypt's, that has a goal of an Information and Communication Technology (ICT) club in every village. The unified communication relations theory suggests that such civil society will evolve in concert with higher intra-domain Web page linkage, not only among ICT clubs, but more widely. Extension of the theory to the inter-domain case suggests that pan-Arab civil society will grow as these nations increase their Web indegree and outdegree.

A Network Analysis of International Internet Hyperlinks

George A. Barnett (State University of New York at Buffalo, USA)
Han Woo Park (Yeung Nam University Gyeong San, South Korea)

This paper examines the structure of the international Internet as a global communication network. The number of inter-domain hyperlinks embedded in web-sites for 47 nations were gathered using Alta Vista. Data were also obtained on the bandwidth connections among 63 nations. The results indicate that the network is composed of a single group with the U.S. the most central nation in the hyperlink network, followed by the Australia, U.K., China and Japan. Most peripheral are Uruguay, Luxemburg, U.A.E., and Thailand. The U.S. is the most central nation in the bandwidth network, followed by the U.K., Germany and Hong Kong. Most peripheral are Iceland, Lithuania, and Morocco. This network had three groupings, 1) the English-speaking countries with Scandinavia, Belgium, the Netherlands, and East Asia, 2) South America, and 3) Franco-German Europe. The correlation between the two networks indicates that the physical infrastructure is an important determinant of hyperlink communication. However, it is not the only determinant, other factors that predict the structure of international Internet flows are examined. The results are discussed in terms of world system theory, the evolution of Internet and globalization.

Topics: international Internet networks

The network of the Slovenian World Wide Web: How hypertextual is it?

Gregor Petrič (University of Ljubljana, Slovenia)

The hypertext is a very important characteristic of the World Wide Web (WWW), since it provides a) fast and efficient access to information; b) important social and epistemological implications and c) relevant information for web search and mining algorithms.
The WWW was developed upon the idea of hypertext, but due to many social pressures and influences it changed to the extent, where one has to assess to what extent the WWW still reflects the idea of hypertext. Some authors are claiming that hypertext is disappearing from the WWW and consequently the new technology, which initiated many hopes for positive social change, is actually losing its most innovative features.
The substantive research problem is thus focused on the presence of hypertextual characteristics in the Slovenian WWW, but the research also includes a specific methodological approach, which will be emphasised. First, a whole network of 26.954 web sites was generated on the

basis of approximately 1.3 million of web pages in the Slovenian World Wide Web, identified by search system Najdi.si, owned by company Noviforum. The vertices of the network are web sites (aggregated web pages on the level of the social actor), while relations are the links that exist between pairs of web sites.

Hypertextual characteristics were assessed by using the methods of social network analysis, while the empirical analysis was performed with program Pajek, specialised for analysis of large and sparse networks. Relevant characteristics, such as centrality measures, centralisation indexes, diameter, k-cores and components are reported and informative graphical presentations included. The results can be informative for the global WWW since the essential characteristics of the Slovenian WWW have similar distributions to the ones assessed in other researches on significantly larger, although not sufficiently adequate for complete network analysis, proportions of the WWW.

Topics: World Wide Web, hypertext, social networks, social change, web mining

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The Architecture of the Internet Hyperlinks: A Network Analysis

Teodora Erika Uberti (Università Cattolica del Sacro Cuore, Italy)

The Internet is the modern network that enabled nearly costless flows of communication, information and ideas across the world. The actual structure of the Internet is a very complex physical and virtual network and needs to be investigated with appropriate indicators and tools of analysis.

While the "physical" infrastructure of the Internet is quite easy to depict because does not change rapidly, the "virtual" interface, the world wide web (www) is a dynamic evolving network of web pages and hyperlinks connecting these pages, changing quickly over time and, hence, needs to be investigated with appropriate relational indicators and with suitable tools. Only in this way we can get a clearer idea of the virtual interface of Internet and of the market of digital information, i.e. who produces and who consumes digital information.

The aim of this paper is twofold. First of all we want to depict the "macro" structure of the www analysing the Internet hyperlinks networks of about 50 top level domains (TLDs) (generic TLDs and some country code TLDs). Conducing a static comparative network analysis of 1993, 1998 and 2002 Internet hyperlinks networks, we will show the structural properties of the TLDs - who links to whom - and the structural changes. Keeping in mind that the www is an heterogeneous network, we will conduct a similar network analysis of the Internet hyperlinks at the "micro" level, focusing on a sample of web pages of different institutions. In particular we will focus on the web pages of universities, local authorities and chambers of commerce of some European regions. We will complete these "macro" and "micro" investigations with a complementary statistical analysis describing the distribution of the hyperlinks. Hence we will check if the www structure is more similar to small world, random or scale-free network.

Personal Networks   8.30

Is There a Turn Towards Networked Individualism?

Bernie Hogan and *Barry Wellman* (University of Toronto, Canada)

For decades, network analysts have been telling other scholars to take networks seriously because they underpin and cross-cut bounded groups and ordered hierarchies. We go further to suggest significant parts of the developed world are rapidly being organized as social networks rather than as groups and hierarchies. We provide a variety of indicators for this turn to networked individualism, from domestic relationships and community ties to the workplace and organizations.

We suggest that the domestic sphere is being renegotiated around a constellation of technologies designed for individuals, and their networks. Family composition is becoming increasingly variegated, as are stages in the life course. Community ties are also being recast as personal communities and shifting affiliations. Volunteer attendances is down, but participation in many hyper-specific online groups flourishes. Multiplex relationships and dense clusters are less likely through the latter than the former.

Workgroups represent a temporary reconfiguration of roles. Teams are task-oriented and dissolved shortly thereafter. Individuals are seeking to make their networks more sparse and position themselves as brokers and bridges. Organizations are outsourcing production wherever possible rather than swallowing all parts of the production process under vertical integration.

Overall, these shifts represent a turn towards autonomous, dynamic relationships designed to facilitate resource generation rather than persistent dense ties. They privilege direct over generalized reciprocity, contract work over waged labor, personal time management over routine, and personal lifestyle choices over adherence to prescribed cultural norms and traditional life courses. These shifts place increasing control, and risk, in the hands of the individual actors and their ability to manage a shifting social network.

Are Frenchs Different?

Michel Grossetti (Universite de Toulouse le Mirail, France)

France is often supposed to be very different from America. People are supposed to behave in different ways to have different kinds of relations. Interpreting these discurses in network analysis issues, one could imagine that french personal networks are different from americans, maybe with a stronger homophily, more family ties, etc.

I made a survey on personal networks in Toulouse's region (South-West of France), in 2001, using a transposition of the procedure that Claude Fischer used in 1977, in his survey on personal networks in the San Francisco region. I made a systematic comparison of number of links, composition of the network, density, social support et so on. I will present the results of this comparison which suggest that Frenchs in 2001 are not very different from Californians in 1977.

Beyond the comparison of usual indicators, I will make a short focus on a small change that I involontutary introduced in the survey procedure. This small change results in an interesting

change in the number of ties. Fischer found a distribution which is roughly gaussian. If we consider the number of ties as an indicator of social capital, this result would suggest that there is a "normal" number of ties with variations. My distribution is roughly log-normal, which would suggest that social capital is like wages or wealth, or scientific prestige, something cumulative.

A Re-Evaluation of the Community Question Based on Wellman's Perspective

Marina Hennig (Humboldt-Universität zu Berlin, Germany)

The effects of the far reaching social systemic division of labour on the organisation and contents of primary ties make the community question topical for many sociologists.
This study looks at the personal embeddness of families in three German cities (Berlin, Hamburg, Stuttgart) and examines the community question with data collected at the end of 2003.
The study orientated itself on Wellman's theoretical view because Wellman has taken up the community question by reconceptualising it from the network analysis perspective. This perspective looks at the impact of the differentiated social structure at the macro level on the important social relations between individuals on the micro level. The emphasis is not on social integration as the normative orientation of the integrated community but on forms and structures of the social relations as an expression of the actual integration. Wellman shifts his focus from the spatially limited communal solidarity to the characteristics of the strong relations which have an integrating function which isn't spatially limited.
The results of the study have reconfirmed the results of Wellman's East York Study and shows that networks are not a product of only one community model. As a consequence it less helpful to talk about saved, lost and liberated communities but more helpful to regard communities as a mixture of strongly knitted nuclear clusters and broader sparsely knitted relations which have access to different groups and their resources. Most networks consist of kinship, friends, local and long distance ties, multistranded and specialised ties. The current analysis of the data of this study indicates that in German cities there is no correlation between the distribution of the community.

Does Distance Make a Difference for Relationships?

Diana Mok, *Ranu Basu* and *Barry Wellman* (University of Toronto, Canada)

Even before the advent of the Internet, many strong ties with kith and kin stretched well beyond the neighborhood: the traditional domain of community. Phones, cars and planes allowed people to have contact over substantial distances. But did distance matter, when relationships no longer had the traditional ease of neighborly face-to-face contact? Although much discussed, this question has not been empirically addressed. Data from the Second East York study shows that distance matters for both near-by and further-away relationships. Near-by, there is a marked decline in the frequency of face-to-face contact at about five miles. Further away, the frequency of contact continues to decline steadily, with substantial declines happening at about 50 miles (about an hour's drive) and 100 miles (about the limit of a comfortable day trip when driving). Telephone contact is similarly affected by distance, with a marked drop in distance at about

100 miles. This suggests that face-to-face and phone contact are interrelated, and that the (high) long-distance costs of the late 1970s may have affected telephonic contact. Distance also affects the provision of tangible support (goods and services) more than it does the provision of less tangible support (emotional aid and companionship). As our data were gathered in 1979, they provide the advantage of allowing comparisons with how relationships have changed in conjunction with new forms of communication, such as the Internet and mobile phones, the focus of NetLab's new Third East York study of relationships in an era of "networked individualism".

Networks and Academic Achievement   8.30

Social Ties of Doctoral Students in Slovenia as Social Capital

Anuška Ferligoj, *Tina Kogovšek*, and *Valentina Hlebec* (University of Ljubljana, Slovenia), *Uroš Matelič* (CATI, Ljubljana, Slovenia)

Lately, there has been an increasing attention to the effect of social ties (social capital) on individual and collective performance. The main general assumption claims that an individual's or group's performance and success are to a large extent dependent on social ties. Intra-group research has shown that small, densely connected working groups have more clearly defined expectations and such working place network may enhance the group's performance, because it encourages more intensive communication and coordination within the group. For studying the social capital specific characteristics of the network and ties within the network (e. g., density of emotional ties is important for evaluation and support, weak ties are important for obtaining information for problem solution) are also important. Ties with people outside the immediate working group can also enhance performance. An individual (or a group) can be more successful if (s)he has access to relevant knowledge and experience outside his/her group. Recent research showed that performance of doctoral students varied by the department where the students studied. However, this research concentrated on studying the effects of students' personal characteristics and department characteristics and ignored the effects of students' ties within and outside his/her research group. The aim of our paper is to study the effects of ties (on the individual level and on the level of the research group) on the academic performance of the doctoral students in Slovenia. The main hypothesis is that the number, type and quality of doctoral student's ties and ties within his/her research group has an effect on his/her academic performance The data were collected in 2004 on a population of about 230 third year doctoral students. The data were collected also from researchers collaborating with doctoral students.

Religion and Academic Engagement: The Role of Social Networks

Jennifer L. Glanville (University of Iowa, USA)
David Sikkink (Notre Dame, USA)

Previous research has observed that religious participation is positively related to a wide variety of adolescent outcomes, including academic achievement, but we do not understand why this is the case. Social networks may mediate the relationship between adolescent religios-

ity and various positive outcomes because religiosity may lead adolescents to associate with more conventional peers. In addition, parental and youth religiosity may lead to greater intergenerational closure, when parents know the parents of their children's friends, which in turn facilitates parental control over their children's behavior. This project uses the National Longitudinal Study of Adolescent Health (AddHealth) to examine the potential role of social networks in mediating the relationship between religious participation and academic achievement, attachment to school, and skipping school. We find that intergenerational closure and friends' characteristics mediate only a small part of the influence of adolescent religiosity on all three dependent variables. We also examine whether the influence of religiosity on network characteristics and academic outcomes varies by race/ethnicity and by neighborhood disadvantage because previous research has suggested that religiosity may be more important among minority and disadvantaged youth than it is white and middle class youth.

Topics: religion and social networks, social networks and academic achievement, intergenerational closure

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The Influence Of Homophily On Information And Individual Knowledge Sharing

Antoinette Saint Hilaire (University of Greenwich, United Kingdom)

In higher education environments communication among students is important to the student learning process, and enables collaborative learning. The effectiveness of information and knowledge sharing are known to relate to the strength of ties, network positioning and characteristics of individual skills and experiences, etc. However, little is known how these network relations are influenced by demographic variables in higher education environments. Homophily theory states that individuals are more likely to engage in shared activities when the values and beliefs of others are similar. In this paper I am concerned with exploring whether information and knowledge sharing patterns are influenced by homophilous (ethnicity and gender) ties. Consequently, this paper reviews theoretical and empirical studies that give insight into the association between information and knowledge sharing on ethnicity and gender similarities. Preliminary research results are presented to show cohesive sub group structural patterns.

Topics: homophily, individual knowledge sharing, information sharing, social network

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The Role of Social Networks in Adolescents' Educational Self-Efficacy Beliefs and Aspirations

Markku Jokisaari, *Jukka Vuori*, *Petri Koivisto* (Finnish Institute of Occupational Health, Finland)
Jari-Erik Nurmi (University of Jyväskylä, Finland)

The association between parents' socio-economic status and their children's educational outcomes has been well documented. Besides parents, other people, such as relatives, teachers, and peers, may influence adolescents' educational beliefs and outcomes. However, research on the role of wider social ties in adolescents' educational self-efficacy beliefs and aspirations is

rare. This study used social network-measurements to get information on adolescents' social networks concerning education and career planning and to examine the role of these networks in adolescents' educational beliefs and aspirations. Research questions include, first, what kinds of social ties concerning their education and career planning do adolescents have? Second, whether network-based resources associate with adolescents' educational aspirations? Furthermore, to what extent adolescents' self-efficacy beliefs moderate the association between their social networks and educational aspirations? Finally, whether network-level support efficacy is associated with adolescents' educational self-efficacy beliefs and aspirations? To investigate these questions we analyze data from a study in which about five hundred 15- to 16-year-old Finnish adolescents during the last grade of comprehensive school (junior high-school) were examined. They were asked to fill in questionnaires concerning their educational aspirations, educational self-efficacy beliefs, academic achievement, as well as a social network inventory. The data analyses are in progress.

Exchange Networks / Game Theory　　　　　8.30

Representations of Exchange: A bilateral exchange experiment

Jacob Dijkstra (Groningen University, The Netherlands)
Marcel van Assen (Tilburg University, The Netherlands)

This paper concerns the micro-foundations of network exchange research. It investigates the effects of different *representations* of bilateral exchange situations, on the *outcomes* of exchange. In this research, exchange is represented to the subjects in two different ways. In the first representation, subjects negotiate over the division of a *resource pool.* In the second exchange representation, subjects have different amounts of resources that they can exchange with each other, in a bilateral *resource flow.*

Most exchange research employs the resource pool representation. However, it can be shown that this representation is inadequate. Moreover, the resource pool representation assumes that exchanges are *efficient, constant-sum*, and that subjects don't make *interpersonal comparisons of utility*. These assumptions seem to be violated in real-life exchanges that are more like bilateral resource flows. We report the results of a bilateral exchange experiment that tests the extent to which the assumptions of the resource pool representation are violated. In the experiment, outcomes of exchanges that were either represented by the split of a resource pool or a bilateral resource flow, are compared. The implications of violations of the assumptions of the resource pool representation would be dramatic, since they would challenge the validity of over fifty network exchange studies. This would raise the question what these studies really tell us about exchange.

Statistical Models for Real-Valued Exchange Networks

Christopher Wheat (Harvard University, USA)

Previous work on statistical models for networks with valued relations (Anderson and Wasser-

man 1995; Robins, Pattison and Wasserman 1999) can be applied to networks in which relations take on one of a discrete set of values. While these models can be applied to a wide range of substantive networks, there are some networks that have relations that cannot be meaningfully reduced to discrete categories. This paper presents the development of a statistical model for networks of continuous, real-valued relations. The model is based on the development of p1 family of models presented by Holland and Leinhardt (1981), to the extent that it explicitly models the expansiveness and popularity of individual actors in a network, as well as the reciprocity of exchange relationships. This paper outlines the characteristics of such a model, and an iterative procedure for estimating the model parameters. Results for simulated data and an illustrative empirical example are presented.

Topics: methodology, statistical models of social networks, exchange networks

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Trust and Trustworthiness in Negotiated Exchange

Davide Barrera (Utrecht University, The Netherlands)

Negotiated exchanges and trust problems can be regarded as two different forms of exchanges, the former representing exchanges with extensive negotiation and binding contracts, the latter representing asymmetric transactions in which one actor has the opportunity to deceive the other. These two forms of exchange have been extensively studied, but the two research traditions exhibit very little overlap. In this paper we investigate the effects of negotiated exchanges in different network structures on the development of mutual trust. We derive hypotheses from various theories and test them by means of an experiment in which subjects first undertake a series of negotiated exchanges under different power conditions, and then face a trust problem with one of the actors that have been involved in the previous exchanges. The trust problem is operationalized by means of a one-shot investment game which allow us to look separately at trust and trustworthiness. Our results demonstrate that negotiated exchanges increase mutual trust, but not trustworthiness. Moreover, with respect to the micro-mechanisms the evidence is mixed, in fact we find some support for both relational cohesion theory and individual social orientations.

Network Formation against Free-riders: An Experiment with Intergroup Mobility

Jun Kobayashi (University of Chicago, USA)
Hirokuni Ooura (Teikyo University, Ootsuta, Japan)

How do cooperative networks emerge against free-riders when there is intergroup mobility? In modern societies, we enjoy increasing mobility. Still, it is yet to be clarified whether such mobility helps form cooperative networks or instead benefit free-riders. To specify the effect, we conduct an experiment with 100 subjects in six sessions. Three conditions are compared, each with two sessions: high mobility, low mobility, and no mobility. Data provide two findings. (i) We observe a significant decline of cooperation when intergroup mobility is introduced. Therefore, mobility itself benefits free-riders. (ii) Nevertheless, we also find a U-shape curve of cooperation as mobility changes. Thus, cooperative networks can emerge if there is enough

mobility. This happens when they successfully exclude free-riders by escaping from them.

Topics: network formation, experiment, intergroup mobility, free-riding

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